

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



**Devices and integration in enterprise systems – Function blocks (FB) for  
process control and electronic device description language (EDDL) –  
Part 5: EDDL Built-in library**

**Les dispositifs et leur intégration dans les systèmes de l'entreprise – blocs  
fonctionnels (FB) pour les procédés industriels et le langage de description  
électronique de produit (EDDL) –  
Partie 5: Bibliothèque de Built-in EDDL**



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# INTERNATIONAL ELECTROTECHNICAL COMMISSION

## DEVICES AND INTEGRATION IN ENTERPRISE SYSTEMS – FUNCTION BLOCKS (FB) FOR PROCESS CONTROL AND ELECTRONIC DEVICE DESCRIPTION LANGUAGE (EDDL) –

### Part 5: EDDL Built-in library

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International Standard IEC 61804-5 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

This edition was developed by merging material from multiple variants of existing EDDL specifications including those from FieldComm Group (Foundation™ Fieldbus<sup>1</sup>, HART®<sup>2</sup>), PROFIBUS™<sup>3</sup> Nutzerorganisation e.V. (PNO), and ISA100\_Wireless™<sup>4</sup> Compliance Institute (ISA100 WCI). As a result, the formatting and numbering of this edition may be different from any of the individual specifications from which this edition was derived.

This edition includes the following significant technical changes with respect to the previous edition:

- Communication profiles ISA100 and GPE were added.
- The following builtins have been deprecated:
  - ABORT\_ON\_NO\_DEVICE
  - IGNORE\_NO\_DEVICE
  - RETRY\_ON\_NO\_DEVICE
  - XMTR\_ABORT\_ON\_NO\_DEVICE
  - XMTR\_IGNORE\_NO\_DEVICE
  - XMTR\_RETRY\_ON\_NO\_DEVICE
  - get\_status\_code\_string

The text of this International Standard is based on the following documents:

| CDV         | Report on voting |
|-------------|------------------|
| 65E/634/CDV | 65E/691/RVC      |

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61804 series, published under the general title *Devices and integration in enterprise systems – Function blocks (FB) for process control and electronic device description language (EDDL)*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

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## INTRODUCTION

This part of IEC 61804

- contains a list of builtins that can be used inside of EDDL methods;
- defines the functionality and parameters for each builtin;
- describes how EDDL variables can be referenced from inside EDDL methods;

EDDL features are limited by profile for each of the communication technologies. The descriptions in this part of IEC 61804 refer to these features in a general sense and not all communication technologies will support all of the features described. The profile definitions in the overview of this part and in IEC 61804-3 are referred to in order to understand the features supported by each communication technology.

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# DEVICES AND INTEGRATION IN ENTERPRISE SYSTEMS – FUNCTION BLOCKS (FB) FOR PROCESS CONTROL AND ELECTRONIC DEVICE DESCRIPTION LANGUAGE (EDDL) –

## Part 5: EDDL Builtin library

### 1 Scope

This part of IEC 61804 specifies the EDDL builtin library and provides the profiles of the various fieldbuses.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61804-3:2020, *Devices and integration in enterprise systems – Function blocks (FB) for process control and electronic device description language (EDDL) – Part 3: EDDL syntax and semantics*

ISO/IEC 9899, *Information technology – Programming Languages – C*

IEEE 754, *IEEE Standard for Binary Floating-Point Arithmetic*

### 3 Terms, definitions, acronyms and abbreviated terms

#### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61804-3 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

##### 3.1.1

##### **method-variable**

variable with scope within a method

#### 3.2 Acronyms and abbreviated terms

|      |                                        |
|------|----------------------------------------|
| CP   | Communication Profile                  |
| CPF  | Communication Profile Family           |
| CS   | Communication Server                   |
| DD   | Device Description                     |
| EDD  | Electronic Device Description          |
| EDDL | Electronic Device Description Language |

|        |                                                |
|--------|------------------------------------------------|
| FF     | Foundation Fieldbus                            |
| GPE    | Generic Protocol Extension                     |
| HART   | HART® Communication Foundation                 |
| I/O    | Input/output                                   |
| ID     | Identifier                                     |
| ISA100 | ISA100_Wireless™                               |
| PB     | PROFIBUS                                       |
| PI     | PROFIBUS & PROFINET <sup>3</sup> International |
| PN     | PROFINET                                       |
| PNO    | PROFIBUS Nutzerorganisation                    |

#### 4 Conventions for builtin descriptions

The following conventions apply for the builtin overview.

- Table 1 defines the format for the builtin overview table.
- Table 2 defines the contents of the columns of Table 1.
- EDDL basic constructs and attributes referenced in this document are written in upper case letters.

**Table 1 – Format for the builtin overview table**

| Reference | Builtin | Communication profiles |
|-----------|---------|------------------------|
|           |         |                        |

**Table 2 – Contents of the builtin overview table**

| Column                 | Text | Meaning                                                               |
|------------------------|------|-----------------------------------------------------------------------|
| Reference              |      | Reference to the respective subclause that specifies the builtin.     |
| Builtin                |      | Name of the builtin.                                                  |
| Communication profiles | ✓    | The builtin is supported by the respective Communication profile.     |
|                        | x    | The builtin is not supported by the respective Communication profile. |
|                        | d    | The usage of the builtin is deprecated.                               |

The following conventions apply for the builtin definitions.

- Table 3 defines the format for the builtins lexical element tables.
- Table 4 defines the contents of the columns of Table 3.
- EDDL basic constructs and attributes referenced in this document are written in upper case letters.

**Table 3 – Format for the builtins lexical element tables**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
|                |      |           |       |             |



**Table 4 – Contents of the lexical element table**

| Column         | Text       | Meaning                                                                                                                                                                      |
|----------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parameter name | <name>     | The name of the formal parameter.                                                                                                                                            |
|                | "<return>" | The return value of the builtin.                                                                                                                                             |
| Type           | data type  | Abstract data type (basic or derived) of the formal parameter.                                                                                                               |
| Direction      | I          | An input parameter.                                                                                                                                                          |
|                | O          | An output parameter is implicitly passed by reference so that the called builtin function can modify the value.<br>The return value of a builtin is passed by value, if any. |
|                | I/O        | An input output parameter is implicitly passed by reference so that the called builtin function can modify the value.                                                        |
|                | —          | There is no returned value (VOID).                                                                                                                                           |
| Usage          | m          | Formal parameter is mandatory.                                                                                                                                               |
|                | o          | Formal parameter is optional.                                                                                                                                                |
|                | c          | Formal parameter is conditional.                                                                                                                                             |
|                | —          | There is no returned value (VOID).                                                                                                                                           |
| Description    | <text>     | Descriptive text for the parameter.                                                                                                                                          |
|                | —          | There is no returned value (VOID).                                                                                                                                           |

## 5 Builtin categories

### 5.1 Overview

Table 5 provides an alphabetical overview of the EDDL builtin library and specify the profile per communication technology.

**Table 5 – Builtin overview**

| Reference | Builtin                         | Communication profiles |    |     |      |        |    |    |
|-----------|---------------------------------|------------------------|----|-----|------|--------|----|----|
|           |                                 | CS                     | FF | GPE | HART | ISA100 | PB | PN |
| 6.17.1    | ERROR                           | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.17.2    | _TRACE                          | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.17.3    | _WARNING                        | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.7.1     | abort                           | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.3.1     | abort_on_all_comm_errors        | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.2     | ABORT_ON_ALL_COMM_STATUS        | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.3     | ABORT_ON_ALL_DEVICE_STATUS      | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.4     | ABORT_ON_ALL_RESPONSE_CODES     | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.5     | abort_on_all_response_codes     | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.6     | ABORT_ON_COMM_ERROR             | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.7     | abort_on_comm_error             | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.8     | ABORT_ON_COMM_STATUS            | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.9     | ABORT_ON_DEVICE_STATUS          | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.10    | ABORT_ON_NO_DEVICE (deprecated) | x                      | x  | x   | d    | x      | x  | x  |

| Reference | Builtin                       | Communication profiles |    |     |      |        |    |    |
|-----------|-------------------------------|------------------------|----|-----|------|--------|----|----|
|           |                               | CS                     | FF | GPE | HART | ISA100 | PB | PN |
| 6.3.11    | ABORT_ON_RESPONSE_CODE        | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.12    | abort_on_response_code        | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.14.1    | abortTransferPort             | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.11.1    | abs                           | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.2.1     | ACKNOWLEDGE                   | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.2     | acknowledge                   | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.11.2    | acos                          | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.7.2     | add_abort_method (version A)  | ✓                      | x  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.7.3     | add_abort_method (version B)  | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.9.1     | AddTime                       | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.3    | asin                          | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.5.1     | assign                        | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.2     | assign_double                 | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.5.3     | assign_float                  | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.5.4     | assign_int                    | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.5.5     | assign_var                    | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.5.6     | assign2                       | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.11.4    | atan                          | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.1     | atof                          | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.8.2     | atoi                          | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.15.1    | browseIdentity                | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.8.3     | BUILD_MESSAGE                 | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.5    | ByteToDouble                  | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.11.6    | ByteToFloat                   | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.11.7    | ByteToLong                    | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.11.8    | ByteToShort                   | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.11.9    | cbrt                          | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.10   | ceil                          | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.14.2    | closeTransferPort             | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.11.11   | cos                           | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.12   | cosh                          | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.5.7     | dassign                       | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.2     | DATE_AND_TIME_VALUE_to_string | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.3     | Date_to_DayOfMonth            | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.4     | DATE_to_days                  | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.5     | Date_to_Month                 | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.6     | DATE_to_string                | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.7     | Date_To_Time                  | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.8     | Date_to_Year                  | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.9     | days_to_DATE                  | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |

| Reference | Builtin                    | Communication profiles |    |     |      |        |    |    |
|-----------|----------------------------|------------------------|----|-----|------|--------|----|----|
|           |                            | CS                     | FF | GPE | HART | ISA100 | PB | PN |
| 6.2.3     | DELAY                      | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.2.4     | delay                      | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.9.10    | DELAY_TIME                 | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.2.5     | delayfor                   | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.6     | delayfor2                  | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.1    | DICT_ID                    | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.8.4     | dictionary_string          | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.9.11    | DiffTime                   | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.6.1     | discard_on_exit            | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.2.7     | DISPLAY                    | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.2.8     | display                    | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.2.9     | display_bitenum            | ✓                      | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.2.10    | display_builtin_error      | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.11    | display_comm_error         | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.12    | display_comm_status        | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.2.13    | display_device_status      | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.2.14    | display_dynamics           | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.15    | display_dynamics2          | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.16    | display_message            | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.17    | display_message2           | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.18    | display_response_code      | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.19    | display_response_status    | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.2.20    | display_xmtr_status        | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.11.13   | DoubleToByte               | ✓                      | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.11.14   | drand                      | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.15   | dseed                      | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.2.21    | edit_device_value          | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.22    | edit_device_value2         | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.23    | edit_local_value           | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.24    | edit_local_value2          | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.11.16   | exp                        | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.3.13    | ext_send_command           | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.3.14    | ext_send_command_trans     | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.3.15    | fail_on_all_comm_errors    | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.3.16    | fail_on_all_response_codes | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.3.17    | fail_on_comm_error         | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.3.18    | fail_on_response_code      | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.8     | fassign                    | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.14.2    | fGetByte                   | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.4.1     | fgetval                    | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |

| Reference | Builtin                            | Communication profiles |    |     |      |        |    |    |
|-----------|------------------------------------|------------------------|----|-----|------|--------|----|----|
|           |                                    | CS                     | FF | GPE | HART | ISA100 | PB | PN |
| 6.5.9     | float_value                        | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.11.17   | FloatToByte                        | ✓                      | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.11.18   | floor                              | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.19   | fmod                               | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.20   | fpclassify                         | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.12    | From_DATE_AND_TIME_VALUE           | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.9.13    | From_TIME_VALUE                    | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.4.2     | fsetval                            | ✓                      | ✗  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.5     | ftoa                               | ✓                      | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.5.10    | fvar_value                         | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.2.25    | get_acknowledgement                | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.26    | get_acknowledgement2               | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.2    | get_block_instance_by_object_index | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.3    | get_block_instance_by_tag          | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.4    | get_block_instance_count           | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.10.1    | get_comm_error                     | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.8.6     | get_comm_error_string              | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.4.3     | get_date                           | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.12.1    | get_date_lelem                     | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.12.2    | get_date_lelem2                    | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.11    | get_date_value                     | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.12    | get_date_value2                    | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.16.1    | GET_DD_REVISION                    | ✓                      | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.10.2    | get_dds_error                      | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.27    | GET_DEV_VAR_VALUE                  | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.2.28    | get_dev_var_value                  | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.16.2    | GET_DEVICE_REVISION                | ✓                      | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.16.3    | GET_DEVICE_TYPE                    | ✓                      | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.8.7     | get_dictionary_string              | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.4.4     | get_double                         | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.12.3    | get_double_lelem                   | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.12.4    | get_double_lelem2                  | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.13    | get_double_value                   | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.14    | get_double_value2                  | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.8.8     | get_enum_string                    | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.4.5     | get_float                          | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.12.5    | get_float_lelem                    | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.12.6    | get_float_lelem2                   | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.15    | get_float_value                    | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.16    | get_float_value2                   | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |

| Reference | Builtin                            | Communication profiles |    |     |      |        |    |    |
|-----------|------------------------------------|------------------------|----|-----|------|--------|----|----|
|           |                                    | CS                     | FF | GPE | HART | ISA100 | PB | PN |
| 6.2.29    | GET_LOCAL_VAR_VALUE                | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.30    | get_local_var_value                | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.16.4    | GET_MANUFACTURER                   | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.3.19    | get_more_status                    | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.13.5    | get_resolve_status                 | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.10.3    | get_response_code                  | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.8.9     | get_response_code_string           | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.8.10    | get_rspcode_string                 | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.8.11    | get_rspcode_string_by_id           | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.4.6     | get_signed                         | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.7    | get_signed_lelem                   | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.8    | get_signed_lelem2                  | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.17    | get_signed_value                   | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.18    | get_signed_value2                  | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.8.12    | get_status_code_string(deprecated) | x                      | x  | x   | d    | x      | x  | x  |
| 6.8.13    | get_status_string                  | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.8.14    | get_stddict_string                 | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.4.7     | get_string                         | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.9    | get_string_lelem                   | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.10   | get_string_lelem2                  | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.19    | get_string_value                   | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.20    | get_string_value2                  | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.9.17    | GET_TICK_COUNT                     | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.14.4    | get_transfer_status                | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.4.8     | get_unsigned                       | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.11   | get_unsigned_lelem                 | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.12   | get_unsigned_lelem2                | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.21    | get_unsigned_value                 | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.22    | get_unsigned_value2                | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.8.15    | get_variable_string                | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.9.14    | GetCurrentDate                     | ✓                      | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.9.15    | GetCurrentDateAndTime              | ✓                      | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.9.16    | GetCurrentTime                     | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.5.23    | iassign                            | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.4.9     | igetval                            | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.3.20    | IGNORE_ALL_COMM_STATUS             | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.21    | IGNORE_ALL_DEVICE_STATUS           | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.22    | IGNORE_ALL_RESPONSE_CODES          | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.23    | IGNORE_COMM_ERROR                  | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.24    | IGNORE_COMM_STATUS                 | x                      | x  | x   | ✓    | x      | x  | x  |

| Reference | Builtin                         | Communication profiles |    |     |      |        |    |    |
|-----------|---------------------------------|------------------------|----|-----|------|--------|----|----|
|           |                                 | CS                     | FF | GPE | HART | ISA100 | PB | PN |
| 6.3.25    | IGNORE_DEVICE_STATUS            | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.26    | IGNORE_NO_DEVICE (deprecated)   | x                      | x  | x   | d    | x      | x  | x  |
| 6.3.27    | IGNORE_RESPONSE_CODE            | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.5.24    | int_value                       | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.11.21   | is_NaN                          | ✓                      | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.4.10    | isetval                         | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.4.11    | isOffline                       | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.13.6    | ITEM_ID                         | x                      | ✓  | x   | x    | x      | x  | x  |
| 6.8.16    | itoa (version A)                | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.8.17    | itoa (version B)                | x                      | x  | x   | x    | x      | x  | x  |
| 6.5.25    | ivar_value                      | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.5.26    | lassign                         | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.4.12    | lgetval                         | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.12.13   | ListDeleteElementAt (version A) | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.12.14   | ListDeleteElementAt (version B) | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.15   | ListDeleteElementAt2            | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.16   | ListInsert (version A)          | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.12.17   | ListInsert (version B)          | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.18   | ListInsert2                     | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.11.22   | log                             | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.17.4    | LOG_MESSAGE                     | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.11.23   | log10                           | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.24   | log2                            | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.5.27    | long_value                      | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.11.25   | LongToByte                      | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.4.13    | lsetval                         | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.5.28    | lvar_value                      | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.9.18    | Make_Time                       | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.13.7    | MEMBER_ID                       | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.31    | Menu                            | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.32    | MenuDisplay (version A)         | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.33    | MenuDisplay (version B)         | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.7.4     | method_abort                    | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.11.26   | nan                             | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.27   | NaN_value                       | ✓                      | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.11.28   | nanf                            | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.13.8    | ObjectReference                 | ✓                      | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.14.5    | openTransferPort                | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.7.5     | pop_abort_method                | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.11.29   | pow                             | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |

| Reference | Builtin                         | Communication profiles |    |     |      |        |    |    |
|-----------|---------------------------------|------------------------|----|-----|------|--------|----|----|
|           |                                 | CS                     | FF | GPE | HART | ISA100 | PB | PN |
| 6.7.6     | process_abort                   | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.7.7     | push_abort_method               | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.4.14    | put_date                        | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.29    | put_date_value                  | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.30    | put_date_value2                 | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.4.15    | put_double                      | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.31    | put_double_value                | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.32    | put_double_value2               | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.4.16    | put_float                       | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.33    | put_float_value                 | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.34    | put_float_value2                | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.34    | PUT_MESSAGE                     | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.2.35    | put_message                     | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.4.17    | put_signed                      | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.35    | put_signed_value                | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.36    | put_signed_value2               | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.4.18    | put_string                      | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.37    | put_string_value                | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.38    | put_string_value2               | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.4.19    | put_unsigned                    | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.39    | put_unsigned_value              | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.40    | put_unsigned_value2             | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.15.2    | re_read_file                    | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.15.3    | re_write_file                   | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.3.28    | read_value                      | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.3.29    | read_value2                     | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.3.30    | ReadCommand                     | ✓                      | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.14.6    | readItemFromDevice              | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.7.8     | remove_abort_method (version A) | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.7.9     | remove_abort_method (version B) | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.7.10    | remove_all_abort_methods        | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.13.9    | resolve_array_ref               | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.10   | resolve_array_ref2              | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.11   | resolve_block_ref               | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.12   | resolve_block_ref2              | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.13   | resolve_list_ref                | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.14   | resolve_local_ref               | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.15   | resolve_local_ref2              | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.16   | resolve_param_list_ref          | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.17   | resolve_param_ref               | ✗                      | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |

| Reference | Builtin                         | Communication profiles |    |     |      |        |    |    |
|-----------|---------------------------------|------------------------|----|-----|------|--------|----|----|
|           |                                 | CS                     | FF | GPE | HART | ISA100 | PB | PN |
| 6.13.18   | resolve_param_ref2              | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.19   | resolve_record_ref              | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.20   | resolve_record_ref2             | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.41    | ret_double_value                | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.42    | ret_double_value2               | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.43    | ret_float_value                 | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.44    | ret_float_value2                | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.45    | ret_signed_value                | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.46    | ret_signed_value2               | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.47    | ret_unsigned_value              | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.48    | ret_unsigned_value2             | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.31    | retry_on_all_comm_errors        | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.32    | RETRY_ON_ALL_COMM_STATUS        | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.33    | RETRY_ON_ALL_DEVICE_STATUS      | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.34    | RETRY_ON_ALL_RESPONSE_CODES     | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.35    | retry_on_all_response_codes     | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.36    | RETRY_ON_COMM_ERROR             | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.37    | retry_on_comm_error             | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.38    | RETRY_ON_COMM_STATUS            | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.39    | RETRY_ON_DEVICE_STATUS          | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.40    | RETRY_ON_NO_DEVICE (deprecated) | d                      | x  | d   | d    | x      | d  | d  |
| 6.3.41    | RETRY_ON_RESPONSE_CODE          | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.42    | retry_on_response_code          | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.11.30   | round                           | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.6.2     | save_on_exit                    | ✓                      | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.6.3     | save_values                     | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.19    | seconds_to_TIME_VALUE           | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.20    | seconds_to_TIME_VALUE8          | ✓                      | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.2.36    | SELECT_FROM_LIST                | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.37    | select_from_list                | ✓                      | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.38    | select_from_menu                | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.39    | select_from_menu2               | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.43    | send                            | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.44    | send_all_values                 | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.45    | send_command                    | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.46    | send_command_trans              | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.6.4     | send_on_exit                    | ✓                      | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.3.47    | send_trans                      | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.48    | send_value                      | x                      | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.49    | send_value2                     | x                      | ✓  | x   | x    | ✓      | x  | x  |



| Reference | Builtin                       | Communication profiles |    |     |      |        |    |    |
|-----------|-------------------------------|------------------------|----|-----|------|--------|----|----|
|           |                               | CS                     | FF | GPE | HART | ISA100 | PB | PN |
| 6.3.50    | SET_NUMBER_OF_RETRIES         | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.4.20    | sgetval                       | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.11.31   | ShortToByte                   | ✓                      | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.11.32   | sin                           | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.33   | sinh                          | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.34   | sqrt                          | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.4.21    | ssetval                       | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.8.19    | strcmp                        | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.18    | strleft                       | ✓                      | ✓  | ✓   | ✗    | ✓      | ✓  | ✓  |
| 6.8.20    | strlen                        | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.21    | strlwr                        | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.22    | strmid                        | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.23    | strright                      | ✓                      | ✓  | ✓   | ✗    | ✓      | ✓  | ✓  |
| 6.8.24    | strstr                        | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.25    | strtrim                       | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.26    | strupr                        | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.35   | tan                           | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.36   | tanh                          | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.21    | Time_To_Date                  | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.9.22    | TIME_VALUE_to_Hour            | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.23    | TIME_VALUE_to_Minute          | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.24    | TIME_VALUE_to_Second          | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.25    | TIME_VALUE_to_seconds         | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.26    | TIME_VALUE_to_string          | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.27    | timet_to_string               | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.28    | timet_to_TIME_VALUE           | ✓                      | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.9.29    | timet_To_TIME_VALUE           | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.9.30    | timet_to_TIME_VALUE8          | ✓                      | ✓  | ✓   | ✗    | ✓      | ✓  | ✓  |
| 6.9.31    | To_Date                       | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.9.32    | To_Date_and_Time              | ✓                      | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.9.33    | To_Time                       | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.9.34    | To_TIME_VALUE                 | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.9.35    | To_TIME_VALUE8                | ✓                      | ✓  | ✓   | ✗    | ✓      | ✓  | ✓  |
| 6.8.27    | trunc                         | ✓                      | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.13.21   | VARID                         | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.5.49    | vassign                       | ✓                      | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.3.51    | WriteCommand                  | ✓                      | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.14.7    | writeltemToDevice             | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.3.52    | XMTR_ABORT_ON_ALL_COMM_STATUS | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.3.53    | XMTR_ABORT_ON_ALL_DATA        | ✗                      | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |

| Reference | Builtin                              | Communication profiles |    |     |      |        |    |    |
|-----------|--------------------------------------|------------------------|----|-----|------|--------|----|----|
|           |                                      | CS                     | FF | GPE | HART | ISA100 | PB | PN |
| 6.3.54    | XMTR_ABORT_ON_ALL_DEVICE_STATUS      | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.55    | XMTR_ABORT_ON_ALL_RESPONSE_CODES     | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.56    | XMTR_ABORT_ON_COMM_ERROR             | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.57    | XMTR_ABORT_ON_COMM_STATUS            | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.58    | XMTR_ABORT_ON_DATA                   | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.59    | XMTR_ABORT_ON_DEVICE_STATUS          | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.60    | XMTR_ABORT_ON_NO_DEVICE (deprecated) | x                      | x  | x   | d    | x      | x  | x  |
| 6.3.61    | XMTR_ABORT_ON_RESPONSE_CODE          | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.62    | XMTR_IGNORE_ALL_COMM_STATUS          | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.63    | XMTR_IGNORE_ALL_DATA                 | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.64    | XMTR_IGNORE_ALL_DEVICE_STATUS        | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.65    | XMTR_IGNORE_ALL_RESPONSE_CODES       | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.66    | XMTR_IGNORE_COMM_ERROR               | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.67    | XMTR_IGNORE_COMM_STATUS              | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.68    | XMTR_IGNORE_DATA                     | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.69    | XMTR_IGNORE_DEVICE_STATUS            | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.70    | XMTR_IGNORE_NO_DEVICE (deprecated)   | x                      | x  | x   | d    | x      | x  | x  |
| 6.3.71    | XMTR_IGNORE_RESPONSE_CODE            | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.72    | XMTR_RETRY_ON_ALL_COMM_STATUS        | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.73    | XMTR_RETRY_ON_ALL_DATA               | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.74    | XMTR_RETRY_ON_ALL_DEVICE_STATUS      | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.75    | XMTR_RETRY_ON_ALL_RESPONSE_CODES     | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.76    | XMTR_RETRY_ON_COMM_ERROR             | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.77    | XMTR_RETRY_ON_COMM_STATUS            | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.78    | XMTR_RETRY_ON_DATA                   | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.79    | XMTR_RETRY_ON_DEVICE_STATUS          | x                      | x  | x   | ✓    | x      | x  | x  |
| 6.3.80    | XMTR_RETRY_ON_NO_DEVICE (deprecated) | x                      | x  | x   | d    | x      | x  | x  |
| 6.3.81    | XMTR_RETRY_ON_RESPONSE_CODE          | x                      | x  | x   | ✓    | x      | x  | x  |

There are the following special categories of builtins:

- User interface builtins;
- Communication builtins;
- Action builtins.

Table 6 shows restrictions to the usage of builtins, depending on their category.

**Table 6 – Usage of builtins**

| Builtin usage                                                       | User interface builtins | Communication builtins                                     | Action builtins      |
|---------------------------------------------------------------------|-------------------------|------------------------------------------------------------|----------------------|
| Methods referenced in user interface menus                          | Allowed                 | Allowed                                                    | Not allowed          |
| PRE_EDIT_ACTIONS                                                    | Allowed                 | Not recommended                                            | Allowed <sup>a</sup> |
| POST_EDIT_ACTIONS                                                   | Allowed                 | Not recommended                                            | Allowed <sup>a</sup> |
| REFRESH_ACTIONS                                                     | Not recommended         | GRAPH and CHART:<br>allowed<br><br>Others: not recommended | Allowed <sup>a</sup> |
| PRE_READ_ACTIONS                                                    | Not recommended         | Allowed                                                    | Allowed <sup>a</sup> |
| POST_READ_ACTIONS                                                   | Not recommended         | Allowed                                                    | Allowed <sup>a</sup> |
| PRE_WRITE_ACTIONS                                                   | Not recommended         | Allowed                                                    | Allowed <sup>a</sup> |
| POST_WRITE_ACTIONS                                                  | Not recommended         | Allowed                                                    | Allowed <sup>a</sup> |
| INIT_ACTIONS                                                        | Not recommended         | Allowed                                                    | Not allowed          |
| EXIT_ACTIONS                                                        | Not recommended         | Allowed                                                    | Not allowed          |
| <sup>a</sup> Shall only be used for actions called from a VARIABLE. |                         |                                                            |                      |

## 5.2 User interface builtins

User interface builtins display information and in addition some of them require interaction from the user. The list of user interface builtins are listed in Table 7.

**Table 7 – User interface builtins**

| Builtin name            |
|-------------------------|
| ACKNOWLEDGE             |
| acknowledge             |
| DELAY                   |
| delay                   |
| delayfor                |
| delayfor2               |
| DISPLAY                 |
| display                 |
| display_bitenum         |
| display_builtin_error   |
| display_comm_error      |
| display_comm_status     |
| display_device_status   |
| display_dynamics        |
| display_dynamics2       |
| display_message         |
| display_message2        |
| display_response_code   |
| display_response_status |
| display_xmtr_status     |
| edit_device_value       |

| Builtin name            |
|-------------------------|
| edit_device_value2      |
| edit_local_value        |
| edit_local_value2       |
| get_acknowledgement2    |
| get_acknowledgement     |
| GET_DEV_VAR_VALUE       |
| get_dev_var_value       |
| GET_LOCAL_VAR_VALUE     |
| get_local_var_value     |
| Menu                    |
| MenuDisplay (version A) |
| MenuDisplay (version B) |
| PUT_MESSAGE             |
| put_message             |
| SELECT_FROM_LIST        |
| select_from_list        |
| select_from_menu        |
| select_from_menu2       |

### 5.3 Communication builtins

The communication builtins allow methods to communicate with the device or to control the communication with the device. The list of communication builtins is listed in Table 8.

**Table 8 – Communication builtins**

| Builtin name                |
|-----------------------------|
| abort_on_all_comm_errors    |
| ABORT_ON_ALL_COMM_STATUS    |
| ABORT_ON_ALL_DEVICE_STATUS  |
| ABORT_ON_ALL_RESPONSE_CODES |
| abort_on_all_response_codes |
| ABORT_ON_COMM_ERROR         |
| abort_on_comm_error         |
| ABORT_ON_COMM_STATUS        |
| ABORT_ON_DEVICE_STATUS      |
| ABORT_ON_NO_DEVICE          |
| ABORT_ON_RESPONSE_CODE      |
| abort_on_response_code      |
| ext_send_command            |
| ext_send_command_trans      |
| fail_on_all_comm_errors     |
| fail_on_all_response_codes  |
| fail_on_comm_error          |
| fail_on_response_code       |

| Builtin name                     |
|----------------------------------|
| get_more_status                  |
| IGNORE_ALL_COMM_STATUS           |
| IGNORE_ALL_DEVICE_STATUS         |
| IGNORE_ALL_RESPONSE_CODES        |
| IGNORE_COMM_ERROR                |
| IGNORE_COMM_STATUS               |
| IGNORE_DEVICE_STATUS             |
| IGNORE_NO_DEVICE                 |
| IGNORE_RESPONSE_CODE             |
| read_value                       |
| read_value2                      |
| ReadCommand                      |
| retry_on_all_comm_errors         |
| RETRY_ON_ALL_COMM_STATUS         |
| RETRY_ON_ALL_DEVICE_STATUS       |
| RETRY_ON_ALL_RESPONSE_CODES      |
| retry_on_all_response_codes      |
| RETRY_ON_COMM_ERROR              |
| retry_on_comm_error              |
| RETRY_ON_COMM_STATUS             |
| RETRY_ON_DEVICE_STATUS           |
| RETRY_ON_NO_DEVICE               |
| RETRY_ON_RESPONSE_CODE           |
| retry_on_response_code           |
| send                             |
| send_all_values                  |
| send_command                     |
| send_command_trans               |
| send_trans                       |
| send_value                       |
| send_value2                      |
| SET_NUMBER_OF_RETRIES            |
| WriteCommand                     |
| XMTR_ABORT_ON_ALL_COMM_STATUS    |
| XMTR_ABORT_ON_ALL_DATA           |
| XMTR_ABORT_ON_ALL_DEVICE_STATUS  |
| XMTR_ABORT_ON_ALL_RESPONSE_CODES |
| XMTR_ABORT_ON_COMM_ERROR         |
| XMTR_ABORT_ON_COMM_STATUS        |
| XMTR_ABORT_ON_DATA               |
| XMTR_ABORT_ON_DEVICE_STATUS      |
| XMTR_ABORT_ON_NO_DEVICE          |
| XMTR_ABORT_ON_RESPONSE_CODE      |
| XMTR_IGNORE_ALL_COMM_STATUS      |

| Builtin name                     |
|----------------------------------|
| XMTR_IGNORE_ALL_DATA             |
| XMTR_IGNORE_ALL_DEVICE_STATUS    |
| XMTR_IGNORE_ALL_RESPONSE_CODES   |
| XMTR_IGNORE_COMM_ERROR           |
| XMTR_IGNORE_COMM_STATUS          |
| XMTR_IGNORE_DATA                 |
| XMTR_IGNORE_DEVICE_STATUS        |
| XMTR_IGNORE_NO_DEVICE            |
| XMTR_IGNORE_RESPONSE_CODE        |
| XMTR_RETRY_ON_ALL_COMM_STATUS    |
| XMTR_RETRY_ON_ALL_DATA           |
| XMTR_RETRY_ON_ALL_DEVICE_STATUS  |
| XMTR_RETRY_ON_ALL_RESPONSE_CODE  |
| XMTR_RETRY_ON_ALL_RESPONSE_CODES |
| XMTR_RETRY_ON_COMM_ERROR         |
| XMTR_RETRY_ON_COMM_STATUS        |
| XMTR_RETRY_ON_DATA               |
| XMTR_RETRY_ON_DEVICE_STATUS      |
| XMTR_RETRY_ON_NO_DEVICE          |
| XMTR_RETRY_ON_RESPONSE_CODE      |

#### 5.4 Action builtins

The action builtins shall only be used for actions called from a VARIABLE. They allow for accessing the value of the variable from which the action was called. The list of action builtins is listed in Table 9.

**Table 9 – Action builtins**

| Reference | Builtin name | Allowed data type for action variable | Allowed actions from which the builtin can be called                                                                                                                                               |
|-----------|--------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.4.1     | fgetval      | FLOAT, DOUBLE                         | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS<br>POST_RQSTUPDATE_ACTIONS<br>POST_USERCHANGE_ACTIONS |

| Reference | Builtin name | Allowed data type for action variable                                                         | Allowed actions from which the builtin can be called                                                                                                                                               |
|-----------|--------------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.4.2     | fsetval      | FLOAT, DOUBLE                                                                                 | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS<br>POST_RQSTUPDATE_ACTIONS<br>POST_USERCHANGE_ACTIONS |
| 6.4.3     | get_date     | DATE_AND_TIME,<br>TIME_VALUE                                                                  | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.4     | get_double   | DOUBLE                                                                                        | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.5     | get_float    | FLOAT                                                                                         | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.6     | get_signed   | INTEGER                                                                                       | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.7     | get_string   | ASCII, BITSTRING,<br>BIT_ENUMERATED,<br>ENUMERATED, EUC, INDEX,<br>PASSWORD, VISIBLE          | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.8     | get_unsigned | BIT_ENUMERATED,<br>BOOLEAN, ENUMERATED,<br>INDEX,<br>UNSIGNED_INTEGER                         | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.9     | igetval      | BIT_ENUMERATED,<br>BOOLEAN, ENUMERATED,<br>INDEX, INTEGER,<br>UNSIGNED_INTEGER,<br>TIME_VALUE | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS<br>POST_RQSTUPDATE_ACTIONS<br>POST_USERCHANGE_ACTIONS |

| Reference | Builtin name | Allowed data type for action variable                                                         | Allowed actions from which the builtin can be called                                                                                                                                               |
|-----------|--------------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.4.10    | isetval      | BIT_ENUMERATED,<br>BOOLEAN, ENUMERATED,<br>INDEX, INTEGER,<br>UNSIGNED_INTEGER,<br>TIME_VALUE | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS<br>POST_RQSTUPDATE_ACTIONS<br>POST_USERCHANGE_ACTIONS |
| 6.4.12    | lgetval      | BIT_ENUMERATED,<br>BOOLEAN, ENUMERATED,<br>INDEX, INTEGER,<br>UNSIGNED_INTEGER,<br>TIME_VALUE | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS                                                       |
| 6.4.13    | isetval      | BIT_ENUMERATED,<br>BOOLEAN, ENUMERATED,<br>INDEX, INTEGER,<br>UNSIGNED_INTEGER,<br>TIME_VALUE | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS                                                       |
| 6.4.14    | put_date     | DATE_AND_TIME,<br>TIME_VALUE                                                                  | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.15    | put_double   | DOUBLE                                                                                        | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.16    | put_float    | FLOAT                                                                                         | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.17    | put_signed   | INTEGER                                                                                       | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.18    | put_string   | ASCII, BITSTRING,<br>BIT_ENUMERATED,<br>ENUMERATED, EUC, INDEX,<br>PASSWORD, VISIBLE          | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |



| Reference | Builtin name | Allowed data type for action variable                        | Allowed actions from which the builtin can be called                                                                                                                                               |
|-----------|--------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.4.19    | put_unsigned | BIT_ENUMERATED, BOOLEAN, ENUMERATED, INDEX, UNSIGNED_INTEGER | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.20    | sgetval      | ASCII, BITSTRING, EUC, PACKED_ASCII, PASSWORD, VISIBLE       | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS<br>POST_RQSTUPDATE_ACTIONS<br>POST_USERCHANGE_ACTIONS |
| 6.4.21    | ssetval      | ASCII, BITSTRING, EUC, PACKED_ASCII, PASSWORD, VISIBLE       | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS<br>POST_RQSTUPDATE_ACTIONS<br>POST_USERCHANGE_ACTIONS |

## 6 EDDL builtin library

### 6.1 General

Clause 6 describes builtin subroutines, which can be used in an EDD. The builtins support user or device interactions. Typical user interactions are, for example, user inputs of VARIABLE values or acknowledgments. Typical device interactions are, for example, send commands to the device or interpreting response codes and status bytes. This Clause 6 contains the library of builtins.

No other builtin functions are available and a compliant EDD shall only use the library functions defined in this specification. Requirements that all conforming EDD applications shall meet are defined in this specification. A conformant EDD application shall support all library functions found in this specifications that are applicable to the respective communication profile(s). A EDD application shall support all compliant EDDs without requiring any modifications to the compliant EDD and without any additional information beyond that found in the compliant EDD.

### 6.2 User interface builtins

#### 6.2.1 Builtin ACKNOWLEDGE

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Display message and wait for key press

The builtin ACKNOWLEDGE will display the prompt and wait for acknowledgment from the user.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

ACKNOWLEDGE(prompt)

The lexical elements of the builtin ACKNOWLEDGE are shown in Table 10.

**Table 10 – Builtin ACKNOWLEDGE**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                |
|----------------|-----------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING | I         | m     | Message to be displayed (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | int       | O         | m     | One of the return codes specified in Table 377.                                                                                                                            |

### 6.2.2 Builtin acknowledge

**Communication profiles: CS, GPE, HART, PB, PN**

**Purpose: Display message and wait for key press**

The builtin acknowledge will display the prompt and wait for acknowledgment from the user.

NOTE 1 New Device Descriptions can use the builtin ACKNOWLEDGE, which supports direct referencing of VARIABLES. The lower case version of this function is maintained for backwards compatibility only.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 2 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 3 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

acknowledge(prompt, global\_var\_ids)

The lexical elements of the builtin acknowledge are shown in Table 11.

**Table 11 – Builtin acknowledge**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                |
|----------------|-----------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING | I         | m     | Message to be displayed (see 6.2.35 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| global_var_ids | Int[]     | I         | m     | An array that contains unique identifiers of VARIABLE instances.                                                                                                           |
| <return>       | int       | O         | m     | One of the return codes specified in Table 377.                                                                                                                            |

### 6.2.3 Builtin DELAY

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Display a message and delay

The builtin DELAY will display a prompt message and pause for the specified number of seconds. The delay time shall be a positive number.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

#### Lexical structure

DELAY(delay\_time, prompt)

The lexical elements of the builtin DELAY are shown in Table 12.

**Table 12 – Builtin DELAY**

| Parameter name | Type             | Direction | Usage | Description                                                                                                                                                                  |
|----------------|------------------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| delay_time     | unsigned integer | I         | m     | The delay in number of seconds.                                                                                                                                              |
| prompt         | DD_STRING        | I         | m     | A message to be displayed (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | VOID             | —         | —     | —                                                                                                                                                                            |

### 6.2.4 Builtin delay

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Display a message and delay

The builtin delay will display a prompt message, and pause for the specified number of seconds. The delay time shall be a positive number.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

NOTE 3 New Device Descriptions can use DELAY, which supports direct referencing of VARIABLES. The lower case version of this function is maintained for backwards compatibility only.

#### Lexical structure

delay(delay\_time, prompt, global\_var\_ids)

The lexical elements of the builtin delay are shown in Table 13.

**Table 13 – Builtin delay**

| Parameter name | Type             | Direction | Usage | Description                                                                                                                                                                  |
|----------------|------------------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| delay_time     | unsigned integer | I         | m     | The delay in number of seconds.                                                                                                                                              |
| prompt         | DD_STRING        | I         | m     | A message to be displayed (see 6.2.35 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| global_var_ids | Int[]            | I         | m     | An array which contains unique identifiers of VARIABLE instances.                                                                                                            |
| <return>       | VOID             | —         | —     | —                                                                                                                                                                            |

## 6.2.5 Builtin delayfor

**Communication profiles:** FF, ISA100

**Purpose:** Display a message and wait the specified time

The builtin delayfor prints a string on the application display and waits for the allotted amount of time to expire.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

```
delayfor(duration, prompt, ids, indices, id_count)
```

The lexical elements of the builtin delayfor are shown in Table 14.

**Table 14 – Builtin delayfor**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                                                 |
|----------------|-----------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| duration       | long            | I         | m     | The delay in number of seconds. This shall be a positive number.                                                                                                            |
| prompt         | DD_STRING       | I         | m     | A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| ids            | unsigned long[] | I         | m     | The item ids of a VARIABLE instance used in the prompt message.                                                                                                             |
| indices        | unsigned long[] | I         | m     | The member ids or array indices of the VARIABLEs used in the prompt message. Set to zero if there is no member id or array index.                                           |
| id_count       | long            | I         | m     | The number of array elements in the arrays for ids and indices. Set to zero if the arrays for ids and indices are NULL.                                                     |
| <return>       | long            | O         | m     | One of the return codes specified in Table 376.                                                                                                                             |

### Example

```
long status;
unsigned long ids[2];
unsigned long indices[2];
ids[0] = ids[1] = ITEM_ID(PARAM.OPERATING_TEMP);
indices[0] = MEMBER_ID(HI_LIM);
indices[1] = MEMBER_ID(LO_LIM);
status = delayfor(5, "|en|Operating temperature limits - HI: %{0}
LO: %{1}\n", ids, indices, 2);
```

### 6.2.6 Builtin delayfor2

**Communication profiles: FF, ISA100**

**Purpose: Display a message and wait the specified time**

The builtin delayfor2 prints a string on the application display and waits for the allotted amount of time to expire.

VARIABLEs, method-variables, and labels for VARIABLEs may be embedded in the prompt string with formatting information. The blk\_ids, blk\_nums, ids, indices, and id\_count parameters collectively specify the values to be embedded in the prompt.

The prompt parameter may contain more than one language translation as shown below.

```
"|en|Is limit correct?|de|Grenze richtig?"
```

Each element of the blk\_ids, blk\_nums, ids, and indices array specify a value to be embedded in the prompt. For example, in a case where there are three values embedded in a prompt, the values would be specified as follows:

```
blk_ids[0], blk_nums[0], ids[0], indices[0]
```

specifies the first value embedded in the prompt

```
blk_ids[1], blk_nums [1], ids[1], indices [1]
```

specifies the second value embedded in the prompt

```
blk_ids[2], blk_nums [2], ids[2], indices [2]
```

specifies the third value embedded in the prompt

Some of the builtin functions do not use the blk\_ids and blk\_nums parameters, while others do. When these parameters are used, the builtin function retrieves the values from the specified block. When these parameters are not used, the builtin function retrieves the values from the block that is scoped to the calling method.

Prompt strings may include format specifiers that specify values to be embedded in the prompt. A format specifier takes one of the following forms:

```
%format-specifier{array-index}
```

or

```
%L{array-index}
```

or

```
%format-specifier{local-variable-name}
```

where format-specifier specifies an optional printf format specifier, as defined in ISO/IEC 9899 plus the additions shown in Table 49. If a format specifier is not specified, the value's DISPLAY\_FORMAT attribute is used. If a DISPLAY\_FORMAT attribute is not specified, a default format is used based on the type of the value. array-index specifies an index in the blk\_ids, blk\_nums, ids, and indices array used to specify the value to be embedded in the prompt. local-variable-name specifies the name of the local variable to be embedded in the prompt. The %L form will embed the label of a variable, record member, or array element in the prompt, instead of a value.

The blk\_ids parameter specifies the item ids of the blocks to be accessed, while the blk\_nums parameter specifies the relative indices of the blocks to be accessed.

If an element of the ids parameter references a variable, the corresponding element of the indices parameter is ignored. If an element of the ids parameter references a record, the corresponding element of the indices parameter specifies a member of the record. If an element of the ids parameter references an array, the corresponding element of the indices parameter specifies an element of the array.

The elements of the blk\_ids, ids, and indices parameters are typically specified using the ITEM\_ID() and MEMBER\_ID() builtin functions. The elements of the blk\_nums parameter are typically specified using the get\_block\_instance\_by\_object\_index() and get\_block\_instance\_by\_block\_tag() builtin functions.

The blk\_ids, blk\_nums, and ids parameters may be passed as NULL if there are no values embedded in the prompt. If any of these parameters are passed as NULL, they all shall be passed as NULL.

The indices parameter may be passed as NULL if the ids parameter only references variables, i.e., it does not reference any records or arrays.

The id\_count parameter shall be passed as zero if the blk\_ids, blk\_nums, and ids parameters are passed as NULL.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

delayfor2(duration, prompt, blk\_ids, blk\_nums, ids, indices, id\_count)

The lexical elements of the builtin delayfor2 are shown in Table 15.

**Table 15 – Builtin delayfor2**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                          |
|----------------|-----------------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| duration       | long            | l         | m     | The delay in number of seconds. This shall be a positive number.                                                                                     |
| prompt         | DD_STRING       | l         | m     | A message to be displayed. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| blk_ids        | unsigned long[] | l         | m     | The item ids of the BLOCK_A instances used in the prompt message.                                                                                    |
| blk_nums       | unsigned long[] | l         | m     | The occurrence numbers of the BLOCK_A instances used in the prompt message.                                                                          |
| ids            | unsigned long[] | l         | m     | The item ids of VARIABLES, RECORDS, or ARRAYs used in the prompt.                                                                                    |

| Parameter name | Type            | Direction | Usage | Description                                                                                                                           |
|----------------|-----------------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------|
| indices        | unsigned long[] | I         | m     | The member ids of RECORDs or array indices of ARRAYs used in the prompt message. Set to zero if there is no member id or array index. |
| id_count       | long            | I         | m     | The number of array elements in the arrays for ids and indices. Set to zero if the arrays for ids and indices are NULL.               |
| <return>       | long            | O         | m     | One of the return codes specified in Table 376.                                                                                       |

### Example

```

long status;
unsigned long blk_ids[2];
unsigned long blk_nums [2];
unsigned long ids[2];
unsigned long indices[2];
blk_ids[0] = blk_ids[1] = ITEM_ID(transducer_block);
blk_nums [0] = blk_nums[1] = 0;
ids[0] = ids[1] = MEMBER_ID(OPERATING_TEMP);
indices[0] = MEMBER_ID(HI_LIM);
indices[1] = MEMBER_ID(LO_LIM);
status = delayfor2(5, "|en|Operating temperature limits - HI: %{0} LO:
%{1}\n", blk_ids, blk_nums, ids, indices, 2);

```

### 6.2.7 Builtin DISPLAY

**Communication profiles: CS, GPE, HART, PB, PN**

**Purpose: Display the specified message on the screen**

The builtin DISPLAY displays the specified message on the screen, continuously updating the dynamic variable values used in the string. The variable value will continue to be updated until operator acknowledgment is made.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

#### Lexical structure

DISPLAY(prompt)

The lexical elements of the builtin DISPLAY are shown in Table 16.

**Table 16 – Builtin DISPLAY**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                  |
|----------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING | I         | m     | A message to be displayed (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | VOID      | —         | —     | —                                                                                                                                                                            |

### 6.2.8 Builtin display

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Display the specified message on the screen

The builtin display will display the specified message on the screen, continuously updating the dynamic VARIABLE values used in the string. The VARIABLE value will continue to be updated until operator acknowledgement is made.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

NOTE 3 New Device Descriptions can use DISPLAY, which supports direct referencing of method-variables and VARIABLES. The lower case version of this function is maintained for backwards compatibility only.

#### Lexical structure

`display(prompt, global_var_ids)`

The lexical elements of the builtin display are shown in Table 17.

**Table 17 – Builtin display**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                  |
|----------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING | I         | m     | A message to be displayed (see 6.2.35 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| global_var_ids | Int[]     | I         | m     | An array which contains unique identifiers of VARIABLE instances.                                                                                                            |
| <return>       | VOID      | —         | —     | —                                                                                                                                                                            |

### 6.2.9 Builtin display\_bitenum

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Display enumeration string

The builtin display\_bitenum will display a textual representation of a BIT\_ENUMERATED VARIABLE and wait for acknowledgment from the user.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

#### Lexical structure

`display_bitenum(bitenum_variable)`

The lexical elements of the builtin display\_bitenum are shown in Table 18.

**Table 18 – Builtin display\_bitenum**

| Parameter name   | Type      | Direction | Usage | Description                                          |
|------------------|-----------|-----------|-------|------------------------------------------------------|
| bitenum_variable | Reference | I         | m     | The BIT_ENUMERATED VARIABLE that shall be displayed. |
| <return>         | VOID      | —         | —     | —                                                    |



### 6.2.10 Builtin display\_builtin\_error

**Communication profiles:** FF, ISA100

**Purpose:** Display builtin error description and wait for acknowledge

The builtin display\_builtin\_error displays on the application display device the text associated with a specified builtin error. The builtin display does not return control to the method until the user acknowledges the message.

The error codes and their text descriptions are specified in Table 376.

This builtin provides a means of debugging calls to builtin routines, which return an error. It should never be used in a final production method, because the types of errors returned by builtins should never be received in a fully debugged method.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

#### Lexical structure

display\_builtin\_error(error)

The lexical elements of the builtin display\_builtin\_error are shown in Table 19.

**Table 19 – Builtin display\_builtin\_error**

| Parameter name | Type | Direction | Usage | Description                                     |
|----------------|------|-----------|-------|-------------------------------------------------|
| error          | long | I         | m     | A code for a builtin error.                     |
| <return>       | long | O         | m     | One of the return codes specified in Table 376. |

#### Example

```
long status;
if (status != BLTIN_SUCCESS)
{
    display_builtin_error(status);
}
```

### 6.2.11 Builtin display\_comm\_error

**Communication profiles:** FF, ISA100

**Purpose:** Display communication error description and wait for acknowledge

The builtin display\_comm\_error displays the text string associated with a communications error on the application display device.

NOTE 1 A communications error of zero is not considered a communications error.

NOTE 2 The builtin does not return control to the method until the user acknowledges the message.

Internally, this builtin calls the builtin get\_comm\_error\_string to get the associated text string and the builtin get\_acknowledgement to display the associated text string and wait for user acknowledgement.

The communications error codes are defined by the consortia. Their related strings may be defined in a text dictionary.

NOTE 3 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 4 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

```
display_comm_error(error)
```

The lexical elements of the builtin display\_comm\_error are shown in Table 20.

**Table 20 – Builtin display\_comm\_error**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| error          | unsigned long | I         | m     | A code for a communication error.               |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

### Example

```
long status;
if (status == BLTIN_FAIL_COMM_ERROR)
{
    status = display_comm_error(get_comm_error());
}
```

The example uses the builtin get\_comm\_error() builtin to get the communications error code used as the argument to this builtin.

## 6.2.12 Builtin display\_comm\_status

### Communication profiles: HART

#### Purpose: Display comm status string

The builtin display\_comm\_status will display the description string(s) of the communication status VARIABLE designated by parameter 'comm\_status\_value'. The displayed string will remain on the screen until operator acknowledgement is made.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

```
display_comm_status(comm_status_value)
```

The lexical elements of the builtin display\_comm\_status are shown in Table 21.

**Table 21 – Builtin display\_comm\_status**

| Parameter name    | Type | Direction | Usage | Description                       |
|-------------------|------|-----------|-------|-----------------------------------|
| comm_status_value | int  | I         | m     | A code for a communication error. |
| <return>          | VOID | —         | —     | —                                 |

### 6.2.13 Builtin display\_device\_status

**Communication profiles: HART**

**Purpose: Display device status string**

The builtin display\_device\_status will display the description string(s) of the device status VARIABLE designated by parameter 'device\_status\_value'. The displayed string will remain on the screen until operator acknowledgement is made.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

#### Lexical structure

display\_device\_status(device\_status\_value)

The lexical elements of the builtin display\_device\_status are shown in Table 22.

**Table 22 – Builtin display\_device\_status**

| Parameter name      | Type | Direction | Usage | Description                   |
|---------------------|------|-----------|-------|-------------------------------|
| device_status_value | int  | l         | m     | A code for the device status. |
| <return>            | VOID | —         | —     | —                             |

### 6.2.14 Builtin display\_dynamics

**Communication profiles: FF, ISA100**

**Purpose: Display and update VARIABLE values**

The builtin display\_dynamics continuously displays a message on the application output device. The builtin updates the values specified in the message until interrupted by the user. Control is not returned to the method until the user interrupts.

The primary purpose of the call is to display device value information that the user wants to observe over a period of time.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

#### Lexical structure

display\_dynamics(prompt, ids, indices, id\_count)

The lexical elements of the builtin display\_dynamics are shown in Table 23.

**Table 23 – Builtin display\_dynamics**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                                                 |
|----------------|-----------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING       | I         | m     | A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| ids            | unsigned long[] | I         | m     | The item ids of the VARIABLES used in the prompt message.                                                                                                                   |
| indices        | unsigned long[] | I         | m     | The member ids or array index of the VARIABLES used in the prompt message. Set to zero if there is no member id or array index.                                             |
| id_count       | long            | I         | m     | The number of array elements in the arrays for ids and indices. Set to zero if the arrays for ids and indices are NULL.                                                     |
| <return>       | long            | O         | m     | One of the return codes specified in Table 376.                                                                                                                             |

**Example**

```

long status;
unsigned long ids[2];
unsigned long indices[2];
ids[0] = ITEM_ID(PARAM.OUT);
ids[1] = ITEM_ID(PARAM.BKCAL_IN);
indices[0] = indices[1] = MEMBER_ID(VALUE);
status = display_dynamics("|en|PID.OUT: %{0} PID.BKCAL_IN: %{1}, ids,
indices, 2);

```

**6.2.15 Builtin display\_dynamics2****Communication profiles: FF, ISA100****Purpose: Display and update VARIABLE values**

The builtin display\_dynamics2 continuously displays a message on the application output device. The builtin updates the values specified in the message until interrupted by the user. Control is not returned to the method until the user interrupts. The primary purpose of the call is to display device value information that the user wants to observe over a period of time.

The blk\_ids, blk\_nums, ids, indices, and id\_count parameters collectively specify the values to be embedded in the prompt. The blk\_ids parameter specifies the item ids of the blocks to be accessed, while the blk\_nums parameter specifies the relative indices of the blocks to be accessed.

If an element of the ids parameter references a variable, the corresponding element of the indices parameter is ignored. If an element of the ids parameter references a record, the corresponding element of the indices parameter specifies a member of the record. If an element of the ids parameter references an array, the corresponding element of the indices parameter specifies an element of the array.

The elements of the blk\_ids, ids, and indices parameters are typically specified using the ITEM\_ID() and MEMBER\_ID() builtin functions. The elements of the blk\_nums parameter are typically specified using the get\_block\_instance\_by\_object\_index() and get\_block\_instance\_by\_block\_tag() builtin functions.

The blk\_ids, blk\_nums, and ids parameters may be passed as NULL if there are no values embedded in the prompt. If any of these parameters are passed as NULL, they all shall be passed as NULL.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

`display_dynamics2(prompt, blk_ids, blk_nums, ids, indices, id_count)`

The lexical elements of the builtin `display_dynamics2` are shown in Table 24.

**Table 24 – Builtin `display_dynamics2`**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                                                 |
|----------------|-----------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING       | I         | m     | A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| blk_ids        | unsigned long[] | I         | m     | The item ids of the BLOCK_A instances used in the prompt message.                                                                                                           |
| blk_nums       | unsigned long[] | I         | m     | The occurrence numbers of the BLOCK_A instances used in the prompt message.                                                                                                 |
| ids            | unsigned long[] | I         | m     | The item ids of VARIABLES, RECORDs, or ARRAYs used in the prompt.                                                                                                           |
| indices        | unsigned long[] | I         | m     | The member ids of RECORDs or array indices of ARRAYs used in the prompt message. Set to zero if there is no member id or array index.                                       |
| id_count       | long            | I         | m     | The number of array elements in the arrays for ids and indices. Set to zero if the arrays for ids and indices are NULL.                                                     |
| <return>       | long            | O         | m     | One of the return codes specified in Table 376.                                                                                                                             |

### Example

```
long status;
unsigned long blk_ids[2];
unsigned long blk_nums [2];
unsigned long ids[2];
unsigned long indices[2];
blk_ids[0] = blk_ids[1] =
ITEM_ID(_proportional_integral_derivative_block);
blk_nums[0] = blk_nums[1] = 0;
ids[0] = MEMBER_ID(OUT);
ids[1] = MEMBER_ID(BKCAL_IN);
indices[0] = indices[1] = MEMBER_ID(VALUE);
status = display_dynamics2("|en|PID.OUT: %{0} PID.BKCAL_IN: %{1}|", blk_ids,
blk_nums, ids, indices, 2);
```

### 6.2.16 Builtin `display_message`

**Communication profiles: FF, ISA100**

**Purpose: Displays a message that requires no user acknowledgment**

The builtin `display_message` displays a message on the applications output device. It returns control to the method without requiring user acknowledgment.

This call is used to inform the user of system status changes that require no action. The message should remain available for review at least until a subsequent call potentially replaces the message with a new one, or the method ends.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

`display_message(prompt, ids, indices, id_count)`

The lexical elements of the builtin `display_message` are shown in Table 25.

**Table 25 – Builtin `display_message`**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                                                 |
|----------------|-----------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING       | I         | m     | A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| ids            | unsigned long[] | I         | m     | The item ids of the VARIABLES used in the prompt message.                                                                                                                   |
| indices        | unsigned long[] | I         | m     | The member ids or array index of the VARIABLES used in the prompt message. Set to zero if there is no member id or array index.                                             |
| id_count       | long            | I         | m     | The number of array elements in the arrays for ids and indices. Set to zero if the arrays for ids and indices are NULL.                                                     |
| <return>       | long            | O         | m     | One of the return codes specified in Table 376.                                                                                                                             |

### Example

```
long status;
unsigned long ids[1];
unsigned long indices[1];
status = display_message("|en|All clear\n", ids, indices, 0);
```

### 6.2.17 Builtin `display_message2`

**Communication profiles: FF, ISA100**

**Purpose: Displays a message that requires no user acknowledgment**

The builtin `display_message2` displays a message on the applications output device. It returns control to the method without requiring user acknowledgment. This call is used to inform the user of system status changes that require no action. The message should remain available for review at least until a subsequent call potentially replaces the message with a new one, or the method ends.

The `blk_ids` parameter specifies the item ids of the blocks to be accessed, while the `blockInstances` parameter specifies the relative indices of the blocks to be accessed.

If an element of the `ids` parameter references a variable, the corresponding element of the `indices` parameter is ignored. If an element of the `ids` parameter references a record, the corresponding element of the `indices` parameter specifies a member of the record. If an element of the `ids` parameter references an array, the corresponding element of the `indices` parameter specifies an element of the array.

The elements of the `blk_ids`, `ids`, and `indices` parameters are typically specified using the builtins `ITEM_ID` and `MEMBER_ID`. The elements of the `bl_nums` parameter are typically specified using the builtins `get_block_instance_by_object_index` and `get_block_instance_by_block_tag`.

The blk\_ids, blk\_nums, and ids parameters may be passed as NULL if there are no values embedded in the prompt. If any of these parameters are passed as NULL, they all shall be passed as NULL.

The indices parameter may be passed as NULL if the ids parameter only references variables, i.e., it does not reference any records or arrays.

The count parameter shall be passed as zero if the blk\_ids, blk\_nums, and indices parameters are passed as NULL.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

display\_message2(prompt, blk\_ids, blk\_nums, ids, indices, id\_count)

The lexical elements of the builtin display\_message2 are shown in Table 26.

**Table 26 – Builtin display\_message2**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                                                 |
|----------------|-----------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING       | I         | m     | A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| blk_ids        | unsigned long[] | I         | m     | The item ids of the BLOCK_A instances used in the prompt message.                                                                                                           |
| blk_nums       | unsigned long[] | I         | m     | The occurrence numbers of the BLOCK_A instances used in the prompt message.                                                                                                 |
| ids            | unsigned long[] | I         | m     | The item ids of the VARIABLES, RECORDs, or ARRAYs used in the prompt message.                                                                                               |
| indices        | unsigned long[] | I         | m     | The member ids or array index of the VARIABLES used in the prompt message. Set to zero if there is no member id or array index.                                             |
| id_count       | long            | I         | m     | The number of array elements in the arrays for ids and indices. Set to zero if the arrays for ids and indices are NULL.                                                     |
| <return>       | long            | O         | m     | One of the return codes specified in Table 376.                                                                                                                             |

### Example

```
long status;
unsigned long blk_ids[1];
unsigned long blk_nums[1];
unsigned long ids[1];
unsigned long indices[1];
blk_ids[0] = ITEM_ID(__analog_input_block);
blk_nums[0] = 0;
ids[0] = MEMBER_ID(MODE_BLK);
indices[0] = MEMBER_ID(TARGET);
status = display_message2("|en|Target Mode is %{0}\n", blk_ids, blk_nums,
ids, indices, 1);
```

### 6.2.18 Builtin display\_response\_code

**Communication profiles: FF, ISA100**

**Purpose: Display response code description and wait for acknowledge**

The builtin display\_response\_code displays the description of a response code for an item. The display builtin does not return control to the method until the user has acknowledged the message.

Internally, this builtin calls the builtin get\_response\_code\_string to get the associated text string and the builtin get\_acknowledgement to display the associated text string and wait for user acknowledgement.

A response code is a value representing an application-specific error condition. A response code value of zero is not considered an error response code. Each response code and response code type is defined in the EDD.

The parameter id and member\_id refer to a parameter, which may have a response code associated with it after it was last read or written. The parameter id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID and the name or reference of the variable in question.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

#### Lexical structure

display\_response\_code(id, member\_id, code)

The lexical elements of the builtin display\_response\_code are shown in Table 27.

**Table 27 – Builtin display\_response\_code**

| Parameter name | Type          | Direction | Usage | Description                                                   |
|----------------|---------------|-----------|-------|---------------------------------------------------------------|
| id             | unsigned long | I         | m     | The item id of the item which generated the response code.    |
| member_id      | unsigned long | I         | m     | The member id of the item which generated the response code.  |
| code           | unsigned long | I         | m     | The response code as received from builtin get_response_code. |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.               |

#### Example

```
long status;
unsigned long id;
unsigned long member;
unsigned long code;
if (status == BLTIN_FAIL_RESPONSE_CODE)
{
    get_response_code(&code, &id, &member);
    status = display_response_code(id, member, code);
}
```

The example uses the builtin get\_response\_code() to get the response code returned on the previous communications request.



### 6.2.19 Builtin display\_response\_status

**Communication profiles:** HART

**Purpose:** Display response status string

The builtin display\_response\_status will display the string associated with the specified value of the response\_code octet received from the specified COMMAND NUMBER. The displayed string will remain on the screen until operator acknowledgement is made.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

#### Lexical structure

display\_response\_status(command\_num, response\_code\_value)

The lexical elements of the builtin display\_response\_status are shown in Table 28.

**Table 28 – Builtin display\_response\_status**

| Parameter name      | Type | Direction | Usage | Description                                                                 |
|---------------------|------|-----------|-------|-----------------------------------------------------------------------------|
| command_num         | Int  | I         | m     | The NUMBER of the COMMAND from which the response status has been received. |
| response_code_value | int  | I         | m     | The response code to display in a prompt.                                   |
| <return>            | VOID | —         | —     | —                                                                           |

### 6.2.20 Builtin display\_xmtr\_status

**Communication profiles:** HART

**Purpose:** Display transmitter status string

The builtin display\_xmtr\_status will display a description string associated with the bit indicated by parameter 'status\_mask' in the VARIABLE designated by parameter 'bit\_enum\_var\_name'. The string is displayed irrespective of whether the bit indicated by the status\_mask is set or not. The displayed string will remain on the screen until operator acknowledgement is made.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

#### Lexical structure

display\_xmtr\_status(bit\_enum\_var\_name, status\_mask)

The lexical elements of the builtin display\_xmtr\_status are shown in Table 29.

**Table 29 – Builtin display\_xmtr\_status**

| Parameter name    | Type | Direction | Usage | Description                                                |
|-------------------|------|-----------|-------|------------------------------------------------------------|
| bit_enum_var_name | int  | l         | m     | A reference to a VARIABLE instance of type BIT_ENUMERATED. |
| status_mask       | int  | l         | m     | A bit mask indicating the bit to displayed.                |
| <return>          | VOID | —         | —     | —                                                          |

**6.2.21 Builtin edit\_device\_value****Communication profiles: FF, ISA100****Purpose: Displays a device value as defined in EDDL and lets the user modify it**

The builtin edit\_device\_value displays a prompt with a device value specified by the param\_id and param\_member\_id. The user can edit the displayed value.

A device value may reside in the cache of a caching EDD application, and the value shall not be written to the device until a method terminates or the value is explicitly sent to the device by the method.

The application edits and verifies the values entered for the device value. This editing is based on VARIABLE arithmetic types defined in the original EDD for each VARIABLE. The EDDL attributes associated with VARIABLES may include

- HANDLING
- DISPLAY\_FORMAT
- EDIT\_FORMAT
- MIN\_VALUE
- MAX\_VALUE

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

**Lexical structure**

```
edit_device_value(prompt, ids, indices, id_count, param_id,
param_member_id)
```

The lexical elements of the builtin edit\_device\_value are shown in Table 30.

**Table 30 – Builtin edit\_device\_value**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                                                 |
|----------------|-----------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING       | l         | m     | A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| ids            | unsigned long[] | l         | m     | The item ids of the VARIABLES used in the prompt message.                                                                                                                   |
| indices        | unsigned long[] | l         | m     | The member ids or array index of the VARIABLES used in the prompt message. Set to zero if there is no member id or array index.                                             |
| id_count       | long            | l         | m     | The number of array elements in the arrays for ids and indices. Set to zero if the arrays for ids and indices are NULL.                                                     |
| param_id       | unsigned long   | l         | m     | The item id of the VARIABLE to be modified.                                                                                                                                 |

| Parameter name  | Type          | Direction | Usage | Description                                     |
|-----------------|---------------|-----------|-------|-------------------------------------------------|
| param_member_id | unsigned long | I         | m     | The member id of the VARIABLE to be modified.   |
| <return>        | long          | O         | m     | One of the return codes specified in Table 376. |

### Example

```
long status;
unsigned long id;
unsigned long ids[1];
unsigned long indices[1];
id = ITEM_ID(PARAM.HI_LIM);
status = edit_device_value("|en|Enter new HI_LIM value:\n", ids, indices,
0, id, 0);
status = send_value(id, 0);
```

## 6.2.22 Builtin edit\_device\_value2

**Communication profiles: FF, ISA100**

**Purpose: Displays a device value as defined in EDDL and lets the user modify it**

The builtin edit\_device\_value2 displays a prompt and allows the user to edit the variable, record member, or array element specified by the blk\_id, blk\_num, param\_id and param\_member\_id parameters.

A device value may reside in the cache of a caching EDD application, and the value shall not be written to the device until a method terminates or the value is explicitly sent to the device by the method.

The blk\_ids, blk\_nums, ids, indices, and count parameters collectively specify the values to be embedded in the prompt.

The application edits and verifies the values entered for the device value. This editing is based on attributes of the variable, record member, or array element defined in the original EDD for each VARIABLE. The EDDL attributes associated with VARIABLES may include:

- HANDLING
- DISPLAY\_FORMAT
- EDIT\_FORMAT
- MIN\_VALUE
- MAX\_VALUE

The blk\_ids parameter specifies the item ids of the blocks to be accessed, while the blk\_nums parameter specifies the relative indices of the blocks to be accessed.

If an element of the ids parameter references a variable, the corresponding element of the indices parameter is ignored. If an element of the ids parameter references a record, the corresponding element of the indices parameter specifies a member of the record. If an element of the ids parameter references an array, the corresponding element of the indices parameter specifies an element of the array.

The elements of the blk\_ids, ids, and indices parameters are typically specified using the builtin ITEM\_ID and MEMBER\_ID. The elements of the blk\_nums parameter are typically specified using the builtins get\_block\_instance\_by\_object\_index and get\_block\_instance\_by\_block\_tag.

The blk\_ids, blk\_nums, and ids parameters may be passed as NULL if there are no values embedded in the prompt. If any of these parameters are passed as NULL, they all shall be passed as NULL.

The indices parameter may be passed as NULL if the ids parameter only references variables, i.e., it does not reference any records or arrays.

The count parameter shall be passed as zero if the blk\_ids, blk\_nums, and ids parameters are passed as NULL.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

```
edit_device_value2(prompt, blk_ids, blk_nums, ids, indices, id_count,
blk_id, blk_num, param_id, param_member_id)
```

The lexical elements of the builtin edit\_device\_value2 are shown in Table 31.

**Table 31 – Builtin edit\_device\_value2**

| Parameter name  | Type            | Direction | Usage | Description                                                                                                                                                                 |
|-----------------|-----------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt          | DD_STRING       | I         | m     | A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| blk_ids         | unsigned long[] | I         | m     | The item ids of the BLOCK_A instances used in the prompt message.                                                                                                           |
| blk_nums        | unsigned long[] | I         | m     | The occurrence numbers of the BLOCK_A instances used in the prompt message.                                                                                                 |
| ids             | unsigned long[] | I         | m     | The item ids of the VARIABLES, RECORDs, or ARRAYs used in the prompt message.                                                                                               |
| indices         | unsigned long[] | I         | m     | The member ids or array index of the record members and/or array elements used in the prompt message. Set to zero if there is no member id or array index.                  |
| id_count        | long            | I         | m     | The number of elements in the blk_ids, blk_nums, ids and indices arrays. Set to zero if the arrays for ids and indices are NULL.                                            |
| blk_id          | unsigned long   | I         | m     | The item id of the BLOCK_A instance to be modified.                                                                                                                         |
| blk_num         | unsigned long   | I         | m     | The occurrence number of the BLOCK_A instance to be modified.                                                                                                               |
| param_id        | unsigned long   | I         | m     | The item id of the VARIABLE to be modified.                                                                                                                                 |
| param_member_id | unsigned long   | I         | m     | The member id of the VARIABLE to be modified.                                                                                                                               |
| <return>        | long            | O         | m     | One of the return codes specified in Table 376.                                                                                                                             |

**Example**

```

long status;
unsigned long blk_ids[1];
unsigned long blk_nums[1];
unsigned long ids[1];
unsigned long indices[1];
unsigned long blk_id;
unsigned long blk_num;
unsigned long param_id;
blk_id = ITEM_ID(__analog_input_block);
blk_num = 0;
param_id = MEMBER_ID(HI_LIM);
status = edit_device_value2("\n|Enter new HI_LIM value:\n", blk_ids,
blk_nums, ids, indices, 0, blk_id, blk_num, param_id, 0);

```

**6.2.23 Builtin edit\_local\_value****Communication profiles: FF, ISA100****Purpose: Displays a method-variable and lets the user modify it**

The builtin edit\_local\_value displays a prompt with the method-variable name specified by the parameter local\_var. The local\_var parameter is a null-terminated C string of characters. The user can edit the displayed value of the method-variable.

The EDD application is responsible for preventing invalid values from being returned by performing checks based on the method-variable type only. The method shall perform range checking on returned values.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

**Lexical structure**

```
edit_local_value(prompt, ids, indices, id_count, local_var)
```

The lexical elements of the builtin edit\_local\_value are shown in Table 32.

**Table 32 – Builtin edit\_local\_value**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                                                 |
|----------------|-----------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING       | I         | m     | A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| ids            | unsigned long[] | I         | m     | The item ids of the VARIABLES used in the prompt message.                                                                                                                   |
| indices        | unsigned long[] | I         | m     | The member ids or array index of the VARIABLES used in the prompt message. Set to zero if there is no member id or array index.                                             |
| id_count       | long            | I         | m     | The number of array elements in the arrays for ids and indices. Set to zero if the arrays for ids and indices are NULL.                                                     |
| local_var      | char[]          | I         | m     | The name of the local VARIABLE that may be modified.                                                                                                                        |
| <return>       | long            | O         | m     | One of the return codes specified in Table 376.                                                                                                                             |

**Example**

```
long status;
unsigned long ids[1];
unsigned long indices[1];
float offset;
offset = 1.0;
status = edit_local_value("|en|Please enter offset...\n", ids, indices, 0,
"offset");
```

**6.2.24 Builtin edit\_local\_value2****Communication profiles: FF, ISA100****Purpose: Displays a method-variable and lets the user modify it**

The builtin `edit_local_value2` displays a prompt with the method-variable name specified by the parameter `local_var`. The `local_var` parameter is a null-terminated C string of characters. The user can edit the displayed value of the method-variable.

The `blk_ids`, `blk_nums`, `ids`, `indices`, and `count` parameters collectively specify the values to be embedded in the prompt.

The EDD application is responsible for preventing invalid values from being returned by performing checks based on the method-variable type only. The method shall perform range checking on returned values.

The `blk_ids` parameter specifies the item `ids` of the blocks to be accessed, while the `blk_nums` parameter specifies the relative indices of the blocks to be accessed.

If an element of the `ids` parameter references a variable, the corresponding element of the `indices` parameter is ignored. If an element of the `ids` parameter references a record, the corresponding element of the `indices` parameter specifies a member of the record. If an element of the `ids` parameter references an array, the corresponding element of the `indices` parameter specifies an element of the array.

The elements of the `blk_ids`, `ids`, and `indices` parameters are typically specified using the builtin `ITEM_ID` and `MEMBER_ID`. The elements of the `blk_nums` parameter are typically specified using the builtin `get_block_instance_by_object_index` and `get_block_instance_by_block_tag`.

The `blk_ids`, `blk_nums`, and `ids` parameters may be passed as `NULL` if there are no values embedded in the prompt. If any of these parameters are passed as `NULL`, they all shall be passed as `NULL`.

The `indices` parameter may be passed as `NULL` if the `ids` parameter only references variables, i.e., it does not reference any records or arrays.

The `count` parameter shall be passed as zero if the `blk_ids`, `blk_nums`, and `ids` parameters are passed as `NULL`.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

**Lexical structure**

```
edit_local_value2(prompt, blk_ids, blk_nums, ids, indices, id_count,
local_var)
```

The lexical elements of the builtin `edit_local_value2` are shown in Table 33.

**Table 33 – Builtin edit\_local\_value2**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                                                 |
|----------------|-----------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING       | I         | m     | A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| blk_ids        | unsigned long[] | I         | m     | The item ids of the BLOCK_A instances used in the prompt message.                                                                                                           |
| blk_nums       | unsigned long[] | I         | m     | The occurrence numbers of the BLOCK_A instances used in the prompt message.                                                                                                 |
| ids            | unsigned long[] | I         | m     | The item ids of the VARIABLES used in the prompt message.                                                                                                                   |
| indices        | unsigned long[] | I         | m     | The member ids or array index of the VARIABLES used in the prompt message. Set to zero if there is no member id or array index.                                             |
| id_count       | long            | I         | m     | The number of array elements in the arrays for ids and indices. Set to zero if the arrays for ids and indices are NULL.                                                     |
| local_var      | char[]          | I         | m     | The name of the local VARIABLE that may be modified.                                                                                                                        |
| <return>       | long            | O         | m     | One of the return codes specified in Table 376.                                                                                                                             |

**Example**

```

long status;
float offset;
unsigned long blk_ids[2];
unsigned long blk_nums[2];
unsigned long ids[2];
unsigned long indices[0];
offset = 1.0;
blk_ids[0] = blk_ids[1] = ITEM_ID(transducer_block);
blk_nums[0] = blk_nums[1] = 0;
ids[0] = MEMBER_ID(LOW_LIMIT);
ids[1] = MEMBER_ID(HIGH_LIMIT);
indices[0] = indices[1] = 0;
status = edit_local_value2("|en|Please enter offset between %{0} and
%{1}\n", blk_ids, blk_nums, ids, indices, 2, "offset");

```

**6.2.25 Builtin get\_acknowledgement****Communication profiles: FF, ISA100****Purpose: Displays a message that requires user acknowledgment**

The builtin get\_acknowledgement displays the provided prompt message on the application display device and returns to the method after the user acknowledges the message.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

**Lexical structure**

```
get_acknowledgement(prompt, ids, indices, id_count)
```

The lexical elements of the builtin get\_acknowledgement are shown in Table 34.

**Table 34 – Builtin get\_acknowledgement**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                                                 |
|----------------|-----------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING       | I         | m     | A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| ids            | unsigned long[] | I         | m     | The item ids of the VARIABLES used in the prompt message.                                                                                                                   |
| indices        | unsigned long[] | I         | m     | The member ids or array indices of the VARIABLES used in the prompt message. Set to zero if there is no member id or array indices.                                         |
| id_count       | long            | I         | m     | The number of array elements in the arrays for ids and indices. Set to zero if the arrays for ids and indices are NULL.                                                     |
| <return>       | long            | O         | m     | One of the return codes specified in Table 376.                                                                                                                             |

**Example**

```

long status;
unsigned long ids[1];
unsigned long indices[1];
status = get_acknowledgement("|en|W A R N\n loop should be removed from
auto mode\n", ids, indices, 0,);

```

**6.2.26 Builtin get\_acknowledgement2****Communication profiles: FF, ISA100****Purpose: Displays a message that requires user acknowledgment**

The builtin get\_acknowledgement2 displays the provided prompt message on the application display device and returns to the method after the user acknowledges the message. The blk\_ids, blk\_nums, ids, indices, and count parameters collectively specify the values to be embedded in the prompt.

The blk\_ids parameter specifies the item ids of the blocks to be accessed, while the blk\_nums parameter specifies the relative indices of the blocks to be accessed.

If an element of the ids parameter references a variable, the corresponding element of the indices parameter is ignored. If an element of the ids parameter references a record, the corresponding element of the indices parameter specifies a member of the record. If an element of the ids parameter references an array, the corresponding element of the indices parameter specifies an element of the array.

The elements of the blk\_ids, ids, and indices parameters are typically specified using the builtins ITEM\_ID and MEMBER\_ID. The elements of the blk\_nums parameter are typically specified using the builtins get\_block\_instance\_by\_object\_index and get\_block\_instance\_by\_block\_tag.

The blk\_ids, blk\_nums, and ids parameters may be passed as NULL if there are no values embedded in the prompt. If any of these parameters are passed as NULL, they all shall be passed as NULL.

The indices parameter may be passed as NULL if the ids parameter only references variables, i.e., it does not reference any records or arrays.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.



NOTE 2 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

```
get_acknowledgement2(prompt, blk_ids, blk_nums, ids, indices, id_count)
```

The lexical elements of the builtin `get_acknowledgement2` are shown in Table 35.

**Table 35 – Builtin `get_acknowledgement2`**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                                                 |
|----------------|-----------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING       | I         | m     | A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| blk_ids        | unsigned long[] | I         | m     | The item ids of the BLOCK_A instances used in the prompt message.                                                                                                           |
| blk_nums       | unsigned long[] | I         | m     | The occurrence numbers of the BLOCK_A instances used in the prompt message.                                                                                                 |
| ids            | unsigned long[] | I         | m     | The item ids of the VARIABLES, RECORD, or ARRAYs used in the prompt message.                                                                                                |
| indices        | unsigned long[] | I         | m     | The member ids or array indices of the members and/or array elements used in the prompt message. Set to zero if there is no member id or array indices.                     |
| id_count       | long            | I         | m     | The number of array elements in the arrays for ids and indices. Set to zero if the arrays for ids and indices are NULL.                                                     |
| <return>       | long            | O         | m     | One of the return codes specified in Table 376.                                                                                                                             |

### Example

```
long status;
unsigned long blk_ids[2];
unsigned long blk_nums[2];
unsigned long ids[2];
unsigned long indices[2];
blk_ids[0] = blk_ids[1] = ITEM_ID(transducer_block);
blk_nums[0] = blk_nums[1] = 0;
ids[0] = MEMBER_ID(LOW_LIMIT);
ids[1] = MEMBER_ID(HIGH_LIMIT);
indices[0] = indices[1] = 0;
status = get_acknowledgement2("Setting LOW = %{0} and HIGH = %{1}\n",
blk_ids, blk_nums, ids, indices, 2);
```

### 6.2.27 Builtin GET\_DEV\_VAR\_VALUE

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Display the specified prompt message and allow the user to edit the value of a VARIABLE

The builtin `GET_DEV_VAR_VALUE` will display the specified prompt message, and allow the user to edit the value of a VARIABLE. The edited copy of the VARIABLE value will be updated when the new value is entered, but will not be sent to the device. This shall be done explicitly using one of the send command functions.

`PRE_EDIT_ACTIONS` of the VARIABLE will be called prior to prompting the new value. `POST_EDIT_ACTIONS` will be called after a new value is entered.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

GET\_DEV\_VAR\_VALUE(prompt, device\_var\_name)

The lexical elements of the builtin GET\_DEV\_VAR\_VALUE are shown in Table 36.

**Table 36 – Builtin GET\_DEV\_VAR\_VALUE**

| Parameter name  | Type      | Direction | Usage | Description                                                                                                                                                                                        |
|-----------------|-----------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt          | DD_STRING | I         | m     | A message to be displayed (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                       |
| device_var_name | reference | I         | m     | The referenced name of the VARIABLE, which can be edited.                                                                                                                                          |
| <return>        | int       | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the variable was successfully modified, or BI_ERROR if an error occurred entering the new value or accessing the specified variable. |

### 6.2.28 Builtin get\_dev\_var\_value

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Display the specified prompt message and allow the user to edit<sup>5</sup> the value of a VARIABLE

The builtin get\_dev\_var\_value will display the specified prompt message and allow the user to edit the value of a VARIABLE. The edited copy of the VARIABLE value will be updated when the new value is entered but will not be sent to the device. This shall be done explicitly using one of the send command functions.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

PRE\_EDIT\_ACTIONS of the VARIABLE will be called prior to prompting the new value. POST\_EDIT\_ACTIONS will be called after a new value is entered.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

NOTE 3 New Device Descriptions can use GET\_DEV\_VAR\_VALUE, which supports direct referencing of method-variables and VARIABLES. The lower case version of this function is maintained for backwards compatibility only.

### Lexical structure

get\_dev\_var\_value(prompt, global\_var\_ids, device\_var\_name)

The lexical elements of the builtin get\_dev\_var\_value are shown in Table 37.

<sup>5</sup> The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

**Table 37 – Builtin get\_dev\_var\_value**

| Parameter name  | Type      | Direction | Usage | Description                                                                                                                                                                                        |
|-----------------|-----------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt          | DD_STRING | I         | m     | A message to be displayed (see 6.2.35 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                       |
| global_var_ids  | Int[]     | I         | m     | An array which contains unique identifiers of VARIABLE instance.                                                                                                                                   |
| device_var_name | reference | I         | m     | The name of the VARIABLE, which can be edited.                                                                                                                                                     |
| <return>        | int       | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the variable was successfully modified, or BI_ERROR if an error occurred entering the new value or accessing the specified variable. |

**6.2.29 Builtin GET\_LOCAL\_VAR\_VALUE**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** display the specified prompt message and allow the user to edit the value of a method-variable

The builtin GET\_LOCAL\_VAR\_VALUE will display the specified prompt message and allow the user to edit the value of a method-variable.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

**Lexical structure**

GET\_LOCAL\_VAR\_VALUE(prompt, local\_var\_name)

The lexical elements of the builtin GET\_LOCAL\_VAR\_VALUE are shown in Table 38.

**Table 38 – Builtin GET\_LOCAL\_VAR\_VALUE**

| Parameter name | Type       | Direction | Usage | Description                                                                                                                                                                                         |
|----------------|------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING  | I         | m     | A message to be displayed (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                        |
| local_var_name | referenced | I         | m     | The name of the method-variable to edit.                                                                                                                                                            |
| <return>       | int        | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the variable was successfully modified, and BI_ERROR if an error occurred entering the new value or accessing the specified variable. |

**6.2.30 Builtin get\_local\_var\_value**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** display the specified prompt message and allow the user to edit the value of a method-variable

The builtin get\_local\_var\_value will display the specified prompt message and allow the user to edit the value of a method-variable.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

NOTE 3 New Device Descriptions can use GET\_LOCAL\_VAR\_VALUE, which supports direct referencing of method-variables and VARIABLES. The lower case version of this function is maintained for backwards compatibility only.

### Lexical structure

`get_local_var_value(prompt, global_var_ids, local_var_name)`

The lexical elements of the builtin `get_local_var_value` are shown in Table 39.

**Table 39 – Builtin `get_local_var_value`**

| Parameter name | Type       | Direction | Usage | Description                                                                                                                                                                                         |
|----------------|------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING  | I         | m     | A message to be displayed (see 6.2.35 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                        |
| global_var_ids | Int[]      | I         | o     | An array which contains unique identifiers of VARIABLE instance.                                                                                                                                    |
| local_var_name | referenced | I         | o     | The name of the local VARIABLE to edit.                                                                                                                                                             |
| <return>       | int        | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the variable was successfully modified, and BI_ERROR if an error occurred entering the new value or accessing the specified variable. |

### 6.2.31 Builtin Menu

**Communication profiles: CS, GPE, HART, PB, PN**

**Purpose: Display a menu to the user**

The builtin Menu will display a MENU and wait for acknowledgment from the user using a single option (i.e., "OK").

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

Communication profiles: HART

The MENU referenced from this builtin shall not contain other methods or edit displays as menu items.

The MENU shall be treated as a MENU with STYLE DIALOG regardless of the actual STYLE of the MENU and any sub menu items of type MENU shall be of style GROUP.

Communication profiles: CS, GPE, PB, PN

The MENU shall be treated as a MENU with STYLE DIALOG regardless of the actual STYLE of the MENU.

### Lexical structure

Menu (menu)

If the EDD application is unable to display the menu, an error will be returned.

The lexical elements of the builtin Menu are shown in Table 40.

**Table 40 – Builtin Menu**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                           |
|----------------|-----------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| menu           | reference | I         | m     | The MENU to be displayed.                                                                                                                                                             |
| <return>       | long      | O         | m     | Communication profiles: CS, GPE, HART, PB, PN<br>One of the return codes specified in Table 377.<br>BI_SUCCESS if the function was successful and<br>BI_ERROR if the function failed. |

### 6.2.32 Builtin MenuDisplay (version A)

**Communication profiles: CS, GPE, HART, PB, PN**

**Purpose: Display a menu to the user and a supplied list of options for the user to select**

The builtin MenuDisplay will display a MENU and wait for a user acknowledgement by selecting one option from the supplied option list. In addition to this, to avoid operator confusion, option\_list should not use phrases like "Abort" and "Cancel". Once a selection is made, the option position in the option list is returned. The position in the list is zero-based. For example, if the provided list contains two items and the first item is selected, this function will return a 0. If the second item is selected, a 1 is returned.

The options are passed to the function as a single string with semicolon separators between the options. If no options are listed, the function will return an error.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return. The cancel mechanism to abort the method shall be provided by the EDD application.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

NOTE 3 Some limited display EDD applications are only able to display 4 buttons. Thus when three developer-defined buttons are included (plus the standard Abort mechanism), it is possible that the "Help" button is no longer available.

**Communication profiles: HART**

No more than 3 user-defined options are allowed, excluding the cancel mechanism that shall be provided by the EDD application.

The MENU shall be treated as a MENU with STYLE DIALOG regardless of the actual STYLE of the MENU and any sub menu items of type MENU shall be of style GROUP. The MENU referenced from this builtin shall not contain other methods or edit displays as menus items.

**Communication profiles: CS, GPE, PB, PN**

The MENU shall be treated as a MENU with STYLE DIALOG regardless of the actual STYLE of the MENU.

### Lexical structure

MenuDisplay(menu, options, selection)

If the EDD application is unable to display the menu, an error will be returned.

The lexical elements of the builtin MenuDisplay are shown in Table 41.

**Table 41 – Builtin MenuDisplay**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                                                                     |
|----------------|-----------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| menu           | reference | I         | m     | The MENU to be displayed.                                                                                                                                                                                                       |
| options        | DD_STRING | I         | m     | The option string, consisting of separated text, that defines a set of options presented to the user. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| selection      | long*     | O         | m     | The zero-based selected option (see options parameter).                                                                                                                                                                         |
| <return>       | long      | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the function was successful and BI_ERROR if the function failed. If BI_ERROR is returned, the value of selection is not defined.                                  |

### 6.2.33 Builtin MenuDisplay (version B)

**Communication profiles: FF, ISA100**

**Purpose: Display a menu to the user and a supplied list of options for the user to select**

The builtin MenuDisplay will display a MENU and wait for a user acknowledgement by selecting one option from the supplied option list. In addition to this, to avoid operator confusion, option\_list should not use phrases like "Abort" and "Cancel". Once a selection is made, the option position in the option list is returned. The position in the list is zero-based. For example, if the provided list contains two items and the first item is selected, this function will return a 0. If the second item is selected, a 1 is returned.

The options are passed to the function as a single string with semicolon separators between the options. If no options are listed, the Function will return an error.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

NOTE 3 Some limited display EDD applications are only able to display 4 buttons. Thus when three developer-defined buttons are included (plus the standard Abort mechanism), it is possible that the "Help" button is no longer available.

No more than 3 user-defined options are allowed, excluding the cancel mechanism that shall be provided by the EDD application.

The MENU shall be treated as a MENU with STYLE DIALOG regardless of the actual STYLE of the MENU. The MENU referenced from this builtin shall not contain other methods or edit displays as menu items.

#### Lexical structure

MenuDisplay(menu, options, selection)

If the EDD application is unable to display the menu, an error will be returned.

The lexical elements of the builtin MenuDisplay are shown in Table 42.

**Table 42 – Builtin MenuDisplay**

| Parameter name | Type          | Direction | Usage | Description                                                                                                                                                                                                                     |
|----------------|---------------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| menu           | unsigned long | I         | m     | The item id of the MENU to be displayed.                                                                                                                                                                                        |
| options        | DD_STRING     | I         | m     | The option string, consisting of separated text, that defines a set of options presented to the user. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| selection      | long*         | O         | m     | The zero-based selected option (see options parameter).                                                                                                                                                                         |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376 .                                                                                                                                                                                |

### Example

```

long select;
long step;
select = 0;
step = 0;
do
{
    switch (step)
    {
        case 0:
            MenuDisplay(ITEM_ID(wizard_step0), "NEXT", &select);
            step++;
            break;
        case 1:
            MenuDisplay(ITEM_ID(wizard_step1), "BACK;NEXT", &select);
            if (select == 0)
                step = 0;
            if (select == 1)
                step = 2;
            break;
        case 2:
            MenuDisplay(ITEM_ID(wizard_step2), "FINISH", &select);
            step++;
            break;
        default:
            break;
    }
} while (step < 3);

```

### 6.2.34 Builtin PUT\_MESSAGE

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Displays the specified message on the screen

The builtin PUT\_MESSAGE will display the specified message on the screen. Any embedded variable references will be expanded to the current value of the variable. ENUMERATED variables should be displayed according to their textual representation when defined. When an ENUMERATED value is undefined, they should be displayed according to their numerical representation.

Communication profiles: HART

BIT\_ENUMERATED variables shall be displayed as integers in hexadecimal format.

Communication profiles: PB, PN, CS, GPE

BIT\_ENUMERATED variables should either be displayed numerically as a hexadecimal integer, or according to the textual representation containing all bits set to "1".

No operator input is accepted by PUT\_MESSAGE and the user is not offered the opportunity to abort the method.

Method execution continues immediately i.e., does not block the method execution. The message string may contain embedded references to any combination of method-variables and VARIABLE values. The message should remain available for review at least until a subsequent call potentially replaces the message with a new one, or the method ends.

References to variables may be embedded on the message string allowing their value to be displayed using the syntax specified in 6.2.40.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

PUT\_MESSAGE (message)

The lexical elements of the builtin PUT\_MESSAGE are shown in Table 43.

**Table 43 – Builtin PUT\_MESSAGE**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                  |
|----------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| message        | DD_STRING | I         | m     | A message to be displayed (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | VOID      | —         | —     | —                                                                                                                                                                            |

### Example

```
int sum;
PUT_MESSAGE("The sum is: %[5.2f]{sum}");
```

The example displays the value of the variable “sum”.

```
PUT_MESSAGE("The loop current is %[4.2f,D]{loop_current} mA");
```

The example displays and continuously updates the value of the variable “loop\_current”.

```
PUT_MESSAGE("%[L]{flow_value} = %{flow_value}");
```

The example displays the label and the value of the variable “flow\_value”.

### 6.2.35 Builtin put\_message

Communication profiles: CS, GPE, HART, PB, PN

**Purpose:** Displays the specified message on the screen

The builtin put\_message will display the specified message on the screen. Any embedded variable references will be expanded to the current value of the variable. ENUMERATED variables should be displayed according to their textual when defined. When an ENUMERATED value is undefined, they should be displayed according to their numerical representation.



Communication profiles: HART

BIT\_ENUMERATED variables shall be displayed as integers in hexadecimal format.

Communication profiles: PB, PN, CS, GPE

BIT\_ENUMERATED variables should either be displayed numerically as a hexadecimal integer, or according to the textual representation containing all bits set to "1".

No operator input is accepted by `put_message` and the user is not offered the opportunity to abort the method. Method execution continues immediately i.e., does not block the method execution. The message should remain available for review at least until a subsequent call potentially replaces the message with a new one, or the method ends.

Any number of identifiers may be accessed by the string, but the array entries accessed shall contain valid variable identifiers. The message string may contain references to any combination of method-variables and VARIABLE values. References to method-variables shall be referenced by name, and references to VARIABLES shall be referenced by `global_var_id`.

The following syntax is used to reference a VARIABLE from the list of VARIABLES given in the parameter `global_var_ids`:

`%{global-var-ids-array-index}`

or

`%[format]{global-var-ids-array-index}`

The optional format supports all fprintf format strings the programming language-C (see ISO/IEC 9899:1999) plus the additions shown in Table 49. If the format string is not included then the default formatting specified in IEC 61804-3 shall be used.

NOTE 1 While not recommended for new DDs, (lowercase) `put_message` is supported (for backward compatibility).

NOTE 2 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 3 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

`put_message(message, global_var_ids)`

The lexical elements of the builtin `put_message` are shown in Table 44.

**Table 44 – Builtin `put_message`**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                          |
|----------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| message        | DD_STRING | I         | m     | A message to be displayed. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| global_var_ids | int[]     | I         | m     | An array which contains unique identifiers of VARIABLE instance.                                                                                     |
| <return>       | VOID      | —         | —     | —                                                                                                                                                    |

### Example

```
int ids[2];
ids[0] = VARID(pressure_units);
ids[1] = VARID(pressure_value);
put_message("Pressure value = {%1} {%0}",ids);
```

The example gets the id of the variables “pressure\_value” and “pressure\_units” and passes it to the builtin put\_message for display.

### 6.2.36 Builtin SELECT\_FROM\_LIST

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Allow user to select one of multiple options

The builtin SELECT\_FROM\_LIST will display a prompt and a supplied list of options for the user to select from. The options are passed to the function as a single string with semicolon separators between the options. Once a selection is made, the position of that option in the option list is returned. The position in the list is zero-based. For example, if the list provided contains two items and if the first item is selected, this function will return 0. If the second item is selected, a 1 is returned. There shall be at least two options in the select list.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

#### Lexical structure

SELECT\_FROM\_LIST(prompt, option\_list)

The lexical elements of the builtin SELECT\_FROM\_LIST are shown in Table 45.

**Table 45 – Builtin SELECT\_FROM\_LIST**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                                             |
|----------------|-----------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING | I         | m     | A message to be displayed (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                            |
| option_list    | DD_STRING | I         | m     | The option string, consisting of separated text, that defines the menu items. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | int       | O         | m     | The result of the selection as position in the option list (zero based).                                                                                                                                |

#### Example

```
int result;
result = SELECT_FROM_LIST("Is this correct?", "Yes;No");
if (result == 0) { ... } // user selected "yes"
else { ... }
```

This function would display the prompt "Is this correct?" and the two options "Yes" and "No". If "Yes" is selected, a 0 is returned and the code in the if statement is executed. If "No" is selected, a 1 is returned and the code in the else statement is executed.

### 6.2.37 Builtin select\_from\_list

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Allow user to select one of multiple options

The builtin select\_from\_list will display a prompt and a supplied list of options for the user to select from. Once a selection is made, the position of that option in the option list is returned. The position in the list is zero-based. For example, if the list provided contains two items and if the first item is selected, this function will return a 0. If the second item is selected, a 1 is returned.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

The options are passed to the function as a single string with semicolon separators between the options. There shall be at least two options in the select list.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

NOTE 3 New Device Descriptions can use SELECT\_FROM\_LIST, which supports direct referencing of method-variables and VARIABLES. The lower case version of this function is maintained for backwards compatibility only.

#### Lexical structure

```
select_from_list(prompt, global_var_ids, option_list)
```

The lexical elements of the builtin select\_from\_list are shown in Table 46.

**Table 46 – Builtin select\_from\_list**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                                                       |
|----------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING | I         | m     | A message to be displayed (see 6.2.35 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                                      |
| global_var_ids | Int[]     | I         | m     | An array which contains unique identifiers of VARIABLE instances.                                                                                                                                                 |
| option_list    | DD_STRING | I         | m     | The option string, consisting of semicolon separated text, that defines the menu items. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | int       | O         | m     | The result of the selection as position (zero based).                                                                                                                                                             |

### 6.2.38 Builtin select\_from\_menu

**Communication profiles:** FF, ISA100

**Purpose:** Displays a menu of choices and allows the user to select from them

The builtin select\_from\_menu displays a list of options or menu items for the user to select from and retrieves the selection number. When the user has made a choice, it is returned to the calling method. Selection numbers start at 1 and range up to the number of options specified by the parameter options.

The option string defines the menu from which the user selects. It is a string consisting of the selection options; each option is separated from the other options with a semi-colon. Each option may have language codes embedded in it. The first menu item shall be the default, i.e., it is pre-selected.

The application displays the strings in accordance with the following guidelines:

- the menu items appear on the screen in the same order as listed in the string;
- the prompt string appears at the top of the menu display on the screen;
- the prompt string is not selectable;
- the menu is presented vertically.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

### Lexical structure

`select_from_menu(prompt, ids, indices, id_count, options, selection)`

The lexical elements of the builtin `select_from_menu` are shown in Table 47.

**Table 47 – Builtin `select_from_menu`**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                                                                             |
|----------------|-----------------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING       | I         | m     | A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                             |
| ids            | unsigned long[] | I         | m     | The item ids of the VARIABLES used in the prompt message.                                                                                                                                               |
| indices        | unsigned long[] | I         | m     | The member ids or indices of the VARIABLES used in the prompt message.                                                                                                                                  |
| id_count       | long            | I         | m     | The number of REFERENCE_ARRAY elements in the REFERENCE_ARRAY for ids and indices. Set to zero if the REFERENCE_ARRAY for ids and indices are zero.                                                     |
| options        | DD_STRING       | I         | m     | The option string, consisting of separated text, that defines the menu items. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| selection      | long            | O         | m     | The result of the selection as position (zero based).                                                                                                                                                   |
| <return>       | long            | O         | m     | One of the return codes specified in Table 376.                                                                                                                                                         |

### Example

```

long status;
unsigned long paramIds[1];
unsigned long memberIds[1];
int choice;
float new_value;

status = select_from_menu("|en|Is limit correct?|de|Grenze richtig?",
paramIds, memberIds, 0, "|en|Yes|de|Ja;|en|No|de|Nein", &choice);

switch (choice)
{
case 1:
    status = put_float_value(MEMBER_ID(HI_LIM), new_value);
    status = send_all_values();
    break;

default:
    break;
}

```

### 6.2.39 Builtin select\_from\_menu2

**Communication profiles: FF, ISA100**

**Purpose: Displays a menu of choices and allows the user to select from them**

The builtin select\_from\_menu2 displays a list of options or menu items for the user to select from and retrieves the selection number. When the user has made a choice it is returned to the calling method. Selection numbers start at 1 and range up to the number of options specified by the parameter options.

The blk\_ids, blk\_nums, ids, indices, and id\_count parameters collectively specify the values to be embedded in the prompt.

The blk\_ids parameter specifies the item ids of the blocks to be accessed, while the blk\_nums parameter specifies the relative indices of the blocks to be accessed.

If an element of the ids parameter references a variable, the corresponding element of the indices parameter is ignored. If an element of the ids parameter references a record, the corresponding element of the indices parameter specifies a member of the record. If an element of the ids parameter references an array, the corresponding element of the indices parameter specifies an element of the array.

The elements of the blk\_ids, ids, and indices parameters are typically specified using the builtins ITEM\_ID and MEMBER\_ID. The elements of the blk\_nums parameter are typically specified using the builtins get\_block\_instance\_by\_object\_index and get\_block\_instance\_by\_block\_tag.

The blk\_ids, blk\_nums, and ids parameters may be passed as NULL if there are no values embedded in the prompt. If any of these parameters are passed as NULL, they all shall be passed as NULL.

The indices parameter may be passed as NULL if the ids parameter only references variables, i.e., it does not reference any records or arrays.

The id\_count parameter shall be passed as zero if the blk\_ids, blk\_nums, and ids parameters are passed as NULL.

The options string defines the menu from which the user selects. It is a string consisting of the selection options; each option is separated from the other options with a semi-colon. Each option may have language codes embedded in it. The first menu item shall be the default, i.e., it is pre-selected.

The application displays the strings in accordance with the following guidelines:

- the menu items appear on the screen in the same order as listed in the string;
- the prompt string appears at the top of the menu display on the screen;
- the prompt string is not selectable;
- the menu is presented vertically.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

#### Lexical structure

```
select_from_menu2(prompt, blk_ids, blk_nums, ids, indices, id_count,
options, selection)
```

The lexical elements of the builtin select\_from\_menu2 are shown in Table 48.

**Table 48 – Builtin select\_from\_menu2**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                                                                             |
|----------------|-----------------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING       | I         | m     | A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                             |
| blk_ids        | unsigned long[] | I         | m     | The item ids of the BLOCK_A instances used in the prompt message.                                                                                                                                       |
| blk_nums       | unsigned long[] | I         | m     | The occurrence numbers of the BLOCK_A instances used in the prompt message.                                                                                                                             |
| ids            | unsigned long[] | I         | m     | The item ids of the VARIABLES used in the prompt message.                                                                                                                                               |
| indices        | unsigned long[] | I         | m     | The member ids or indices of the VARIABLES used in the prompt message.                                                                                                                                  |
| id_count       | long            | I         | m     | The number of REFERENCE_ARRAY elements in the REFERENCE_ARRAY for ids and indices. Set to zero if the REFERENCE_ARRAY for ids and indices are zero.                                                     |
| options        | DD_STRING       | I         | m     | The option string, consisting of separated text, that defines the menu items. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| selection      | long            | O         | m     | The result of the selection as position (zero based).                                                                                                                                                   |
| <return>       | long            | O         | m     | One of the return codes specified in Table 376.                                                                                                                                                         |

**Example**

```

long status;
unsigned long blk_ids[2];
unsigned long blk_nums[2];
unsigned long ids[2];
unsigned long indices[2];
long choice;

blk_ids[0] = ITEM_ID(analog_input_block);
blk_nums[0] = 0;
ids[0] = MEMBER_ID(MODE_BLK);
indices[0] = MEMBER_ID(ACTUAL);

blk_ids[1] = ITEM_ID(__analog_input_block);
blk_nums[1] = 1;
ids[1] = MEMBER_ID(MODE_BLK);
indices[1] = MEMBER_ID(ACTUAL);

status = select_from_menu2("AI1 Mode: %{0}, AI2 Mode: %{1}\nIs this
correct?", blk_ids, blk_nums, ids, indices, 2, "Yes;No" &choice);

```

**6.2.40 Prompt string formats**

References to VARIABLES may be embedded on the prompt string allowing their value to be displayed using the following syntax:

```
%{variable-reference}
```

or

```
%[format]{variable-reference}
```

The variable-reference is the identifier of a method-variable or a VARIABLE. Method-variable and VARIABLES may be mixed in the same message. The optional format supports all fprintf format strings in the programming language-C (see ISO/IEC 9899:1999) plus the additions shown in Table 49. If the format string is not included then the default formatting specified in IEC 61804-3 shall be used.

**Table 49 – Format options**

| Format | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D      | The referenced item is of CLASS DYNAMIC and the display shall be updated continuously while the method execution is blocked by the builtin function. Items of CLASS DYNAMIC that are referenced without the D option shall not be updated dynamically. Items that are not of CLASS DYNAMIC that are referenced with the D option shall not be displayed dynamically. Non-blocking UI builtins (e.g. PUT_MESSAGE and put_message) will display a snapshot of the dynamic value only once. If a display format is given in addition to the "D" specifier, the D specifier shall be separated from the format specifier by a comma.<br>Example: PUT_MESSAGE ("The variable with label '%L'{myVar}' has dynamic value: %[3.1f,D]{myVar}"); |
| L      | The LABEL of the referenced item shall be displayed.<br>Example: PUT_MESSAGE ("The label of my variable is: %[L]{myVar}");                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| U      | The unit of the referenced item shall be displayed.<br>Example: PUT_MESSAGE ("The units of my variable is: %[U]{myVar}");                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

### 6.3 Communication builtins

#### 6.3.1 Builtin abort\_on\_all\_comm\_errors

**Communication profiles: FF, ISA100**

**Purpose: Set to abort for all communication errors**

The builtin abort\_on\_all\_comm\_errors sets the method to abort upon receiving any communication error.

When a method is started, it does not abort on a communication error until abort\_on\_all\_comm\_errors is called. This frees a method from having to handle any communication error codes by aborting the method if it receives any communications error.

After this call, any builtin call which makes a communication request that returns an error will cause the method to abort and execution of its abort method list to be started. Communications error codes are non-zero and are EDD application dependent (each EDD application defines its own codes).

#### Lexical structure

abort\_on\_all\_comm\_errors(VOID)

The lexical element of the builtin abort\_on\_all\_comm\_errors is shown in Table 50.

**Table 50 – Builtin abort\_on\_all\_comm\_errors**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

**Example**

```
abort_on_all_comm_errors();
```

**6.3.2 Builtin ABORT\_ON\_ALL\_COMM\_STATUS****Communication profiles:** HART**Purpose:** Set to abort for all communications status

The builtin ABORT\_ON\_ALL\_COMM\_STATUS will set all of the bits in the comm status abort mask. This will cause the system to abort the current method if the device returns any comm status value. Comm status is defined to be the first data octet returned in a transaction, when bit 7 of this octet is set to 1.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks, and their default values.

The mask affected by this function is used by the builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

**Lexical structure**

```
ABORT_ON_ALL_COMM_STATUS (VOID)
```

The lexical element of the builtin ABORT\_ON\_ALL\_COMM\_STATUS is shown in Table 51.

**Table 51 – Builtin ABORT\_ON\_ALL\_COMM\_STATUS**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

**6.3.3 Builtin ABORT\_ON\_ALL\_DEVICE\_STATUS****Communication profiles:** HART**Purpose:** Set to abort for all device status

The builtin ABORT\_ON\_ALL\_DEVICE\_STATUS will set all of the bits in the device status abort mask. This will cause the system to abort the current method if the device returns any non-zero device status value. The first two bytes of every slave response contains status information. The first byte returned indicates response code status when the most significant bit (bit 7) is 0. The second byte returned, device status, is only meaningful if the first returns response code status. Device status is defined to be the second data octet returned in a transaction.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this function is used by the builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

**Lexical structure**

```
ABORT_ON_ALL_DEVICE_STATUS (VOID)
```



The lexical element of the builtin ABORT\_ON\_ALL\_DEVICE\_STATUS is shown in Table 52.

**Table 52 – Builtin ABORT\_ON\_ALL\_DEVICE\_STATUS**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.4 Builtin ABORT\_ON\_ALL\_RESPONSE\_CODES

**Communication profiles: HART**

**Purpose: Set to abort for all response codes**

The builtin ABORT\_ON\_ALL\_RESPONSE\_CODES will set all of the bits in the response code abort mask. This will cause the system to abort the current method if the device returns any non-zero response code value.

The response code is defined to be the first data octet returned in a transaction, when bit 7 of this octet is 0.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send command function for implementation of the masks. See ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this function is used by the builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

NOTE Delayed responses and busies are Data-Link level codes and are not returned to Methods. I.e., the lower levels of the communications stack or the Remote I/O manage/react to the Response Codes. Depending on the end device being communicated with, a METHOD can see a DR\_DEAD (the DR failed).

#### Lexical structure

ABORT\_ON\_ALL\_RESPONSE\_CODES (VOID)

The lexical element of the builtin ABORT\_ON\_ALL\_RESPONSE\_CODES is shown in Table 53.

**Table 53 – Builtin ABORT\_ON\_ALL\_RESPONSE\_CODES**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.5 Builtin abort\_on\_all\_response\_codes

**Communication profiles: FF, ISA100**

**Purpose: Set to abort for all response codes**

The builtin abort\_on\_all\_response\_codes causes the method to abort if it receives any non-zero response code, after calling a builtin, which results in a request to a device. This builtin frees a method from having to handle any error response codes. When a method is started, it does not abort on any response code until this builtin is called. A response code is a value representing an application-specific error condition. A response code value of zero is not considered as an error response code. Each response code and response code type is defined in the EDD.

**Lexical structure**

`abort_on_all_response_codes (VOID)`

The lexical element of the builtin `abort_on_all_response_codes` is shown in Table 54.

**Table 54 – Builtin `abort_on_all_response_codes`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

**Example**

```
abort_on_all_response_codes();
```

**6.3.6 Builtin `ABORT_ON_COMM_ERROR`****Communication profiles: HART**

**Purpose:** Abort if any communications error is found by the master or the slave

The builtin `ABORT_ON_COMM_ERROR` will set the comm error abort mask in such a way that the method will be aborted if a comm error is found in the device or in the EDD application while sending a command.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See builtin `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

**Lexical structure**

`ABORT_ON_COMM_ERROR (VOID)`

The lexical element of the builtin `ABORT_ON_COMM_ERROR` is shown in Table 55.

**Table 55 – Builtin `ABORT_ON_COMM_ERROR`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

**6.3.7 Builtin `abort_on_comm_error`****Communication profiles: FF, ISA100**

**Purpose:** Sets the mask used for aborting the method when a communications error is detected by the slave device

The builtin `abort_on_comm_error` causes the method to abort if it receives a specific communications error.

When a method is started, it does not abort on a specific communications error until builtin `abort_on_comm_error` is called.

NOTE A communications error of zero is not considered a communications error.

This builtin permits the method writer to select which communications errors should be handled by the method and it frees a method from having to handle a specific communications error code.

The communications error codes are defined by the consortia. Their related strings may be defined in a text dictionary.

### Lexical structure

```
abort_on_comm_error(error)
```

The lexical elements of the builtin `abort_on_comm_error` are shown in Table 56.

**Table 56 – Builtin `abort_on_comm_error`**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| error          | unsigned long | I         | m     | A communications error code.                    |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

### Example

```
long status;
status = abort_on_comm_error(E_ACCESS_HARDWARE_FAULT);
```

## 6.3.8 Builtin `ABORT_ON_COMM_STATUS`

### Communication profiles: HART

**Purpose:** Sets the mask used for aborting the method when a communications error is detected by the slave device

The builtin `ABORT_ON_COMM_STATUS` will set the correct bit(s) in the comm status abort mask in such a way that the specified `comm_status` value will cause the method to abort. Comm status is defined to be the first data octet returned in a transaction, when bit 7 of this octet is set. The value of `comm_status` may be set to any value from 0x00 to 0x7F.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

```
ABORT_ON_COMM_STATUS(comm_status)
```

The lexical elements of the builtin `ABORT_ON_COMM_STATUS` are shown in Table 57.

**Table 57 – Builtin `ABORT_ON_COMM_STATUS`**

| Parameter name | Type          | Direction | Usage | Description                              |
|----------------|---------------|-----------|-------|------------------------------------------|
| comm_status    | unsigned char | I         | m     | A bit mask for the communication status. |
| <return>       | VOID          | —         | —     | —                                        |

### 6.3.9 Builtin ABORT\_ON\_DEVICE\_STATUS

#### Communication profiles: HART

#### Purpose: Set the device status abort mask

The builtin ABORT\_ON\_DEVICE\_STATUS will set the correct bit(s) in the device status abort mask such that the specified device status value will cause the method to abort. The first two bytes of every slave response contain status information. The first byte returned indicates response code status when the most significant bit (bit 7) is 0. The second byte returned, device status, is only meaningful if response code status is the first byte returned. Device status is defined to be the second data octet returned in a transaction. The value of device\_status can be set to cause the current method to abort on any combination of device status bits. This is accomplished by creating a mask that will be ANDed to the device status. The value of device\_status may be set to any value from 0x00 to 0x7F.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this function is used by the builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

#### Lexical structure

ABORT\_ON\_DEVICE\_STATUS(device\_status)

The lexical elements of the builtin ABORT\_ON\_DEVICE\_STATUS are shown in Table 58.

**Table 58 – Builtin ABORT\_ON\_DEVICE\_STATUS**

| Parameter name | Type         | Direction | Usage | Description                       |
|----------------|--------------|-----------|-------|-----------------------------------|
| device_status  | unsigned int | i         | m     | A bit mask for the device status. |
| <return>       | VOID         | —         | —     | —                                 |

### 6.3.10 Builtin ABORT\_ON\_NO\_DEVICE (deprecated)

#### Communication profiles:

#### Purpose: Abort if no device is found

The builtin ABORT\_ON\_NO\_DEVICE will set the no device abort mask in such a way that the method will be aborted if no device is found while sending a command.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this function is used by the builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

#### Lexical structure

ABORT\_ON\_NO\_DEVICE(VOID)

The lexical element of the builtin ABORT\_ON\_NO\_DEVICE is shown in Table 59.

**Table 59 – Builtin ABORT\_ON\_NO\_DEVICE**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

**6.3.11 Builtin ABORT\_ON\_RESPONSE\_CODE****Communication profiles: HART****Purpose: Set response code abort mask**

The builtin ABORT\_ON\_RESPONSE\_CODE will set the correct bit in the response code abort mask such that the specified response code value will cause the method to abort. The first two bytes of every slave response contains status information. The response code is defined to be the first data octet returned in a transaction, when bit 7 of this octet is 0. The response\_code value can be set to cause the method to abort on any one response code. The value of response\_code may be set to any value from 0 to 127.

To cause the current HART command to be aborted on multiple different response codes, this builtin has to be called once for each response code to be aborted.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method.

The list of all the available masks with default values is shown in Table 60:

**Table 60 – Available abort and retry masks**

| Mask                            | Default value                           |
|---------------------------------|-----------------------------------------|
| response_code_abort_mask        | ACCESS_RESTRICTED   CMD_NOT_IMPLEMENTED |
| response_code_retry_mask        | All bits set to 0                       |
| cmd_48_response_code_abort_mask | ACCESS_RESTRICTED   CMD_NOT_IMPLEMENTED |
| cmd_48_response_code_retry_mask | All bits set to 0                       |
| device_status_abort_mask        | DEVICE_MALFUNCTION                      |
| device_status_retry_mask        | All bits set to 0                       |
| cmd_48_device_status_abort_mask | DEVICE_MALFUNCTION                      |
| cmd_48_device_status_retry_mask | All bits set to 0                       |
| comm_status_abort_mask          | All bits set to 0                       |
| comm_status_retry_mask          | All bits set to 1                       |
| cmd_48_comm_status_abort_mask   | All bits set to 0                       |
| cmd_48_comm_status_retry_mask   | All bits set to 1                       |
| no_device_abort_mask            | All bits set to 1                       |
| comm_error_abort_mask           | All bits set to 1                       |
| comm_error_retry_mask           | All bits set to 0                       |
| cmd_48_no_device_abort_mask     | All bits set to 1                       |
| cmd_48_comm_error_abort_mask    | All bits set to 1                       |
| cmd_48_comm_error_retry_mask    | All bits set to 0                       |
| cmd_48_data_abort_mask          | All bits set to 0                       |
| cmd_48_data_retry_mask          | All bits set to 0                       |

The mask affected by this builtin is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`ABORT_ON_RESPONSE_CODE(response_code)`

The lexical elements of the builtin `ABORT_ON_RESPONSE_CODE` are shown in Table 61.

**Table 61 – Builtin `ABORT_ON_RESPONSE_CODE`**

| Parameter name              | Type              | Direction      | Usage          | Description                                               |
|-----------------------------|-------------------|----------------|----------------|-----------------------------------------------------------|
| <code>response_code</code>  | <code>int</code>  | <code>I</code> | <code>m</code> | The response code that should be added to the abort mask. |
| <code>&lt;return&gt;</code> | <code>VOID</code> | —              | —              | —                                                         |

### 6.3.12 Builtin `abort_on_response_code`

**Communication profiles:** FF, ISA100

**Purpose:** Set response code abort mask

The builtin `abort_on_response_code` causes the method to abort upon receiving the specified non-zero response code. This builtin frees a method from having to handle a specific non-zero response code.

When a method is started, it will not abort on a specific response code until this builtin is called. A response code is a value representing an application-specific error condition.

NOTE A response code value of zero is not considered an error response code. Each response code type is defined in the EDD.

### Lexical structure

`abort_on_response_code(code)`

The lexical elements of the builtin `abort_on_response_code` are shown in Table 62.

**Table 62 – Builtin `abort_on_response_code`**

| Parameter name              | Type                       | Direction      | Usage          | Description                                     |
|-----------------------------|----------------------------|----------------|----------------|-------------------------------------------------|
| <code>code</code>           | <code>unsigned long</code> | <code>I</code> | <code>m</code> | A bit mask for the response code.               |
| <code>&lt;return&gt;</code> | <code>long</code>          | <code>O</code> | <code>m</code> | One of the return codes specified in Table 376. |

### Example

```
long status;
status = abort_on_response_code(RC_INVALID_ENTRY);
```

### 6.3.13 Builtin `ext_send_command`

**Communication profiles:** HART

**Purpose:** Send command

The builtin `ext_send_command` has the same functionality as the `send_command` function, except that the command status and data octets returned from the device with command 48 are also returned.

The calling function is responsible for allocating the arrays for the data to be returned. The `cmd_status`, and `more_data_status` VARIABLES are pointers to 3-octet arrays, and the `more_data_info` VARIABLE is a pointer to an array whose size is equal to the number of data octets that can be returned by the device in command 48 (maximum 25). If the status bit indicating that more data is available is returned (status class MORE), command 48 is automatically issued. If command 48 was not issued, the `more_data_status`, and `more_data_info` octets are set to zero.

The octets in the `cmd_status` array and the status bytes from command 48 (if it was sent) are logically ANDed with the appropriate abort masks to determine if the method should be aborted. If there is a match, the method is aborted and the abort methods (if any were designated) are run. If there is no match for the abort masks, the same data is ANDed with the appropriate retry masks. If there is a match, the command will be retried (either the specified command, or command 48). This continues until either the command succeeds, an abort occurs, or the maximum number of retries is reached. When command 48 is indirectly sent as a result of the device status response, the `cmd 48 xxx` mask values that are set using the `XMTR_xxx` builtins are used to control the aborting and retrying for command 48. The other mask values and related builtins are used to control the aborting and retrying for the directly sent command (including command 48 if it was directly sent).

### Lexical structure

```
ext_send_command(cmd_number, cmd_status, more_data_status, more_data_info)
```

The lexical elements of the builtin `ext_send_command` are shown in Table 63.

**Table 63 – Builtin `ext_send_command`**

| Parameter name                | Type   | Direction | Usage | Description                                                                                                                                                                                                                              |
|-------------------------------|--------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>cmd_number</code>       | int    | I         | m     | The COMMAND number.                                                                                                                                                                                                                      |
| <code>cmd_status</code>       | char[] | I         | m     | The COMMAND status.                                                                                                                                                                                                                      |
| <code>more_data_status</code> | char[] | I         | m     | Specifies if more status data is available.                                                                                                                                                                                              |
| <code>more_data_info</code>   | char[] | I         | m     | Specifies if more info is available.                                                                                                                                                                                                     |
| <return>                      | int    | O         | m     | One of the return codes specified in Table 377. Returns <code>BI_SUCCESS</code> if the command was successful, <code>BI_COMM_ERROR</code> if an error occurred sending the command, or <code>BI_NO_DEVICE</code> if no device was found. |

#### 6.3.14 Builtin `ext_send_command_trans`

**Communication profiles:** HART

**Purpose:** Send specified command transaction

The builtin `ext_send_command_trans` sends the command with the specified transaction to the device. This function is to be used to send commands that have been defined with multiple transactions.

builtin `ext_send_command_trans` has the same functionality as the `send_command_trans` function, except that the command status and data octets returned from the device with command 48 are also returned.

The calling function is responsible for allocating the arrays for the data to be returned. The `cmd_status`, and `more data status` variables are pointers to 3-octet arrays, and the `more-data-info` variable is a pointer to an array whose size is equal to the number of data octets that can be returned by the device in command 48 (maximum 25). If command 48 was not issued, the `more_data_status`, and `more_data_info` octets are set to zero.

The octets in the `cmd_status` array and the status bytes from command 48 (if it was sent) are logically ANDed with the appropriate abort masks to determine if the method should be aborted. If there is a match, the method is aborted and the abort methods (if any were designated) are run. If there is no match for the abort masks, the same data is ANDed with the appropriate retry masks. If there is a match, the command will be retried (either the specified command, or command 48). This continues until either the command succeeds, an abort occurs, or the maximum number of retries is reached. When command 48 is indirectly sent as a result of the device status response, the `cmd 48 xxx` mask values that are set using the `XMTR_xxx` builtins are used to control the aborting and retrying for command 48. The other mask values and related builtins are used to control the aborting and retrying for the directly sent command (including command 48 if it was directly sent).

### Lexical structure

```
ext_send_command_trans(cmd_number, transaction, cmd_status,
more_data_status, more_data_info)
```

The lexical elements of the builtin `ext_send_command_trans` are shown in Table 64.

**Table 64 – Builtin `ext_send_command_trans`**

| Parameter name                | Type   | Direction | Usage | Description                                                                                                                                                                                                                              |
|-------------------------------|--------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>cmd_number</code>       | int    | I         | m     | The COMMAND number.                                                                                                                                                                                                                      |
| <code>transaction</code>      | int    | I         | m     | The number of the TRANSACTION.                                                                                                                                                                                                           |
| <code>cmd_status</code>       | char[] | I         | m     | The COMMAND status.                                                                                                                                                                                                                      |
| <code>more_data_status</code> | char[] | I         | m     | Specifies if more status data is available.                                                                                                                                                                                              |
| <code>more_data_info</code>   | char[] | I         | m     | Specifies if more info is available.                                                                                                                                                                                                     |
| <code>&lt;return&gt;</code>   | int    | O         | m     | One of the return codes specified in Table 377. Returns <code>BI_SUCCESS</code> if the command was successful, <code>BI_COMM_ERROR</code> if an error occurred sending the command, or <code>BI_NO_DEVICE</code> if no device was found. |

### 6.3.15 Builtin `fail_on_all_comm_errors`

**Communication profiles:** FF, ISA100

**Purpose:** Return control to method in case of communication errors

The builtin `fail_on_all_comm_errors` causes control to be returned to the calling method after any communications error is detected by the called builtin instead of aborting the method or retrying the communications request.

Instead of aborting the method or attempting to retry a failing communications request when any communications error occurs, the builtin `fail_on_all_comm_errors` initializes the builtins to send a communications error code to the method.

When a communications error occurs, the builtin performing a communications request returns the error `BLTIN_FAIL_COMM_ERROR`. The method can call the builtin `get_comm_error` and subsequently `get_comm_error_string` to obtain additional information about the error and later display the error string, if appropriate.

### Lexical structure

```
fail_on_all_comm_errors(VOID)
```

The lexical element of the builtin `fail_on_all_comm_errors` is shown in Table 65.



**Table 65 – Builtin fail\_on\_all\_comm\_errors**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

**Example**

```
fail_on_all_comm_errors();
```

**6.3.16 Builtin fail\_on\_all\_response\_codes**

**Communication profiles: FF, ISA100**

**Purpose: Return control to method in case of response codes**

The builtin fail\_on\_all\_response\_codes causes control to be returned to the calling method after any non-zero response code is detected by the called builtin instead of aborting the method or retrying.

When a response code error occurs, any builtin performing a request returns the error BLTIN\_FAIL\_RESPONSE\_CODE. The method can call the builtin get\_comm\_error and subsequently get\_comm\_error\_string to obtain additional information about the error, if appropriate.

A response code is a value representing an application-specific error condition.

NOTE A response code value of zero is not considered an error response code. Each response code and response code type is defined in the EDD.

**Lexical structure**

```
fail_on_all_response_codes(VOID)
```

The lexical element of the builtin fail\_on\_all\_response\_codes is shown in Table 66.

**Table 66 – Builtin fail\_on\_all\_response\_codes**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

**Example**

```
fail_on_all_response_codes();
```

**6.3.17 Builtin fail\_on\_comm\_error**

**Communication profiles: FF, ISA100**

**Purpose: Return control to method in case of specified communication error**

The builtin fail\_on\_comm\_error causes control to be returned to the calling method after the specified communications error is detected by the called builtin instead of aborting the method or retrying.

When the specified communications error occurs, any builtin performing a communications request returns the error BLTIN\_FAIL\_COMM\_ERROR. The method can call the builtin get\_comm\_error and then get\_comm\_error\_string to obtain additional information about the error and later display it, if appropriate.

The communications error codes are defined by the consortia. Their related strings may be defined in a text dictionary. A communications error of zero is not considered a communications error.

### Lexical structure

```
fail_on_comm_error(error)
```

The lexical elements of the builtin fail\_on\_comm\_error are shown in Table 67.

**Table 67 – Builtin fail\_on\_comm\_error**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| error          | unsigned long | I         | m     | A communication error code.                     |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

### Example

```
long status;
status = fail_on_comm_error(E_ACCESS_HARDWARE_FAULT);
```

### 6.3.18 Builtin fail\_on\_response\_code

**Communication profiles: FF, ISA100**

**Purpose: Return control to method in case of specified response code**

The builtin fail\_on\_response\_code causes control to be returned to the calling method after a specific non-zero response code is detected by the called builtin instead of aborting the method or retrying.

When the specified response code error occurs, any builtin performing a request returns the error BLTIN\_FAIL\_RESPONSE\_CODE. The method can call the builtin get\_comm\_error and subsequently get\_comm\_error\_string to obtain additional information about the error and later display it, if appropriate.

A response code is a value representing an application-specific error condition.

NOTE A response code value of zero is not considered an error response code. Each response code and response code type is defined in the EDD.

### Lexical structure

```
fail_on_response_code(code)
```

The lexical elements of the builtin fail\_on\_response\_code are shown in Table 68.

**Table 68 – Builtin fail\_on\_response\_code**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| code           | unsigned long | I         | m     | A response code.                                |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

### Example

```
long status;
status = fail_on_response_code(RC_INVALID_ENTRY);
```

### 6.3.19 Builtin get\_more\_status

**Communication profiles:** HART

**Purpose:** Get results of command 48

The builtin get\_more\_status will issue a command 48 to the device and return the response code, communications status, and command status octets in the status array provided. It will also return any data octets returned in the more\_data\_info array. This function will process the status/data octets in the same manner as the send command.

The calling function is responsible for allocating the arrays for the data to be returned. The parameter more\_data\_status is a 3-octet array, and the more\_data\_info is an array whose size is equal to the number of data octets that can be returned by the device in command 48 (maximum 25).

The octets in the more\_data\_status bytes from command 48 are logically ANDed with the appropriate abort masks to determine if the method should be aborted. If there is a match, the method is aborted and the abort methods (if any were designated) are run. If there is no match for the abort masks, the same data is ANDed with the appropriate retry masks. If there is a match, the command will be retried (either the specified command, or command 48). This continues until either the command succeeds, an abort occurs, or the maximum number of retries is reached. The cmd 48 xxx mask values that are set using the XMTR\_xxx builtins are used to control the aborting and retrying for command 48.

#### Lexical structure

```
get_more_status(more_data_status, more_data_info)
```

The lexical elements of the builtin get\_more\_status are shown in Table 69.

**Table 69 – Builtin get\_more\_status**

| Parameter name   | Type   | Direction | Usage | Description                                                                                                                                                                                       |
|------------------|--------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| more_data_status | char[] |           | m     | Specifies if more info is available.                                                                                                                                                              |
| more_data_info   | char[] | l         | m     | Specifies if more info is available.                                                                                                                                                              |
| <return>         | int    | O         | m     | One of the return codes specified in Table 377. Returns BI_SUCCESS if the command was successful, BI_COMM_ERROR if an error occurred sending the command, or BI_NO_DEVICE if no device was found. |

### 6.3.20 Builtin IGNORE\_ALL\_COMM\_STATUS

**Communication profiles:** HART

**Purpose:** Ignore all communications status bits

The builtin IGNORE\_ALL\_COMM\_STATUS will clear all of the bits in the comm status retry mask and comm status abort mask. This will cause the system to ignore all bits in the comm status value. Comm status is defined to be the first data octet returned in a transaction, when bit 7 of this octet is set.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the builtin send\_command for implementation of the masks. See ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`IGNORE_ALL_COMM_STATUS (VOID)`

The lexical element of the builtin `IGNORE_ALL_COMM_STATUS` is shown in Table 70.

**Table 70 – Builtin `IGNORE_ALL_COMM_STATUS`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.21 Builtin `IGNORE_ALL_DEVICE_STATUS`

**Communication profiles:** HART

**Purpose:** Ignore all device status bits

The builtin `IGNORE_ALL_DEVICE_STATUS` will clear all of the bits in the device status retry mask and device status abort mask. This will cause the system to ignore all bits in the device status octet. The first two bytes of every slave response contains status information. The first byte returned indicates response code status when the most significant bit (bit 7) is 0. The second byte returned, device status, is only meaningful if the first returns response code status. Device status is defined to be the second data octet returned in a transaction.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the builtin `send_command` for implementation of the masks. See `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`IGNORE_ALL_DEVICE_STATUS (VOID)`

The lexical element of the builtin `IGNORE_ALL_DEVICE_STATUS` is shown in Table 71.

**Table 71 – Builtin `IGNORE_ALL_DEVICE_STATUS`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.22 Builtin `IGNORE_ALL_RESPONSE_CODES`

**Communication profiles:** HART

**Purpose:** Ignore all response codes

The builtin `IGNORE_ALL_RESPONSE_CODES` will clear all of the bits in the response code retry mask and response code abort mask. This will cause the system to ignore all response code values returned from the device.

The first two bytes of every slave response contains status information. The response code is defined to be the first data octet returned in a transaction, when bit 7 of this octet is 0.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the builtin `send_command` for implementation of the masks. See builtin `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`IGNORE_ALL_RESPONSE_CODES (VOID)`

The lexical element of the builtin `IGNORE_ALL_RESPONSE_CODES` is shown in Table 72.

**Table 72 – Builtin `IGNORE_ALL_RESPONSE_CODES`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.23 Builtin `IGNORE_COMM_ERROR`

#### Communication profiles: HART

#### Purpose: Ignore communication error

The builtin `IGNORE_COMM_ERROR` will set the comm error retry mask and comm error abort mask such that any communications error condition in the device or the EDD application will be ignored while sending a command. The first two bytes of every slave response contains status information. The first byte returned indicates communication status when the most significant bit (bit 7) is 1.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See builtin `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`IGNORE_COMM_ERROR (VOID)`

The lexical element of the builtin `IGNORE_COMM_ERROR` is shown in Table 73.

**Table 73 – Builtin `IGNORE_COMM_ERROR`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.24 Builtin IGNORE\_COMM\_STATUS

**Communication profiles:** HART

**Purpose:** Ignore specific communications status bits

The builtin IGNORE\_COMM\_STATUS will clear the bit(s) in the comm status retry mask and comm status abort mask such that the specified bits in the comm\_status value will be ignored. comm\_status is defined to be the first data octet returned in a transaction, when bit 7 of this octet is 1. The value of comm\_status may be set to any value from 0x00 to 0x7F, where each bit corresponds to a communication status returned from the device.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this function is used by the builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

#### Lexical structure

IGNORE\_COMM\_STATUS(comm\_status)

The lexical elements of the builtin IGNORE\_COMM\_STATUS are shown in Table 74.

**Table 74 – Builtin IGNORE\_COMM\_STATUS**

| Parameter name | Type | Direction | Usage | Description                                |
|----------------|------|-----------|-------|--------------------------------------------|
| comm_status    | int  | I         | m     | The new retry and abort mask for ignoring. |
| <return>       | VOID | —         | —     | —                                          |

### 6.3.25 Builtin IGNORE\_DEVICE\_STATUS

**Communication profiles:** HART

**Purpose:** Ignore specific device status bits

The builtin IGNORE\_DEVICE\_STATUS will clear the correct bit(s) in the device status retry mask and device status abort mask such that the specified bits in the device status octet are ignored. Device status is defined to be the second data octet returned in a transaction.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this function is used by the builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

#### Lexical structure

IGNORE\_DEVICE\_STATUS(device\_status)

The lexical elements of the builtin IGNORE\_DEVICE\_STATUS are shown in Table 75.

**Table 75 – Builtin IGNORE\_DEVICE\_STATUS**

| Parameter name | Type | Direction | Usage | Description                                |
|----------------|------|-----------|-------|--------------------------------------------|
| device_status  | int  | l         | m     | The new retry and abort mask for ignoring. |
| <return>       | VOID | —         | —     | —                                          |

**6.3.26 Builtin IGNORE\_NO\_DEVICE (deprecated)****Communication profiles: HART****Purpose: Ignore if no device is found**

The builtin IGNORE\_NO\_DEVICE will clear the correct bits in the no device retry mask and no device abort mask such that the no-device condition should be ignored while sending a command.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this function is used by the builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

**Lexical structure**

IGNORE\_NO\_DEVICE(VOID)

The lexical element of the builtin IGNORE\_NO\_DEVICE is shown in Table 76.

**Table 76 – Builtin IGNORE\_NO\_DEVICE**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

**6.3.27 Builtin IGNORE\_RESPONSE\_CODE****Communication profiles: HART****Purpose: Ignore specific response codes**

The builtin IGNORE\_RESPONSE\_CODE will clear the correct bit in the response code retry mask and response code abort mask such that the specified response code value will be ignored. The response code is defined to be the first data octet returned in a transaction, when bit 7 of this octet is 0. The value of response\_code may be set to any value from 0 to 127.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this function is used by the builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

**Lexical structure**

IGNORE\_RESPONSE\_CODE(response\_code)

The lexical elements of the builtin IGNORE\_RESPONSE\_CODE are shown in Table 77.

**Table 77 – Builtin IGNORE\_RESPONSE\_CODE**

| Parameter name | Type | Direction | Usage | Description                                                |
|----------------|------|-----------|-------|------------------------------------------------------------|
| response_code  | int  | I         | m     | The response code that should be added to the ignore mask. |
| <return>       | VOID | —         | —     | —                                                          |

### 6.3.28 Builtin read\_value

**Communication profiles: FF, ISA100**

**Purpose: Updates a parameter value in the cache by reading it from the device**

The builtin read\_value causes the value of the parameter to be read from the device and stores the value in the cache.

The builtin read\_value does nothing in a non-caching EDD application because a non-caching EDD application does not have a cache to update.

The read\_value builtin is subject to the same read and write timeouts as when an application is reading or writing a value.

The parameters id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID and the name or reference of the variable in question.

#### Lexical structure

```
read_value(id, member_id)
```

The lexical elements of the builtin read\_value are shown in Table 78.

**Table 78 – Builtin read\_value**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| id             | unsigned long | I         | o     | The item id of the VARIABLE to access.          |
| member_id      | unsigned long | I         | o     | The member id of the VARIABLE to access.        |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

#### Example

```
long status;
status = read_value(ITEM_ID(PARAM.PV_SCALE), MEMBER_ID(UNIT_CD));
```

### 6.3.29 Builtin read\_value2

**Communication profiles: FF, ISA100**

**Purpose: Reads a variable, record member, or array element from the device**

The builtin read\_value2 causes the parameter value to be read from the device and stores the value in the cache.



The builtin `read_value2` does nothing in a non-caching EDD application because a non-caching EDD application does not have a cache to update.

The `id` parameter specifies the item id of the block to be accessed, while the `blk_num` parameter specifies the occurrence number of the block to be accessed.

If the `id` parameter references a simple variable, the `member_id` parameter is ignored. If the `id` parameter references a record, the `member_id` parameter specifies a member of the record. If the `id` parameter references an array parameter, the `member_id` parameter specifies an element of the array.

The parameters `blk_id`, `id` and `member_id` are specified using the builtins `ITEM_ID` and `MEMBER_ID`. The `blk_num` parameter is specified using the builtins `get_block_instance_by_object_index` and `get_block_instance_by_block_tag`.

If the `id` parameter references a record and the `member_id` parameter equals zero, the entire record is read from the device. Similarly, if the `id` parameter references an array and the `member_id` parameter equals zero the entire array is read from the device.

### Lexical structure

```
read_value2(blk_id, blk_num, id, member_id)
```

The lexical elements of the builtin `read_value2` are shown in Table 79.

**Table 79 – Builtin `read_value2`**

| Parameter name              | Type          | Direction | Usage | Description                                              |
|-----------------------------|---------------|-----------|-------|----------------------------------------------------------|
| <code>blk_id</code>         | unsigned long | I         | m     | The item id of the BLOCK_A instance to access.           |
| <code>blk_num</code>        | unsigned long | I         | m     | The occurrence number of the BLOCK_A instance to access. |
| <code>id</code>             | unsigned long | I         | o     | The item id of the VARIABLE to access.                   |
| <code>member_id</code>      | unsigned long | I         | o     | The member id of the VARIABLE to access.                 |
| <code>&lt;return&gt;</code> | long          | O         | m     | One of the return codes specified in Table 376.          |

### Example

```
long status;
status = read_value2(ITEM_ID(__analog_input_block), 0, MEMBER_ID(PV_SCALE),
MEMBER_ID(UNIT_CD));
```

### 6.3.30 Builtin ReadCommand

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Execute read command

The builtin `ReadCommand` allows reading variables with a given command.

### Lexical structure

```
ReadCommand(command_identifier)
```

The lexical elements of the builtin `ReadCommand` are shown in Table 80.

**Table 80 – Builtin ReadCommand**

| Parameter name     | Type      | Direction | Usage | Description                                                                                           |
|--------------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------|
| command_identifier | reference | I         | m     | The id of the command to execute.                                                                     |
| <return>           | long      | O         | m     | A protocol specific error value, the encoding of which is defined by the specific protocol or device. |

**6.3.31 Builtin retry\_on\_all\_comm\_errors****Communication profiles: FF, ISA100****Purpose: Retry builtin in case of communication errors**

The builtin `retry_on_all_comm_errors` causes the last request made by a method to be tried again after any communications error. A request will be retried three times before it fails and an error return is returned.

This builtin frees a method from having to explicitly retry a request after any communications errors.

The communication error codes are defined in the standard profiles and their related strings are defined in the text dictionary.

NOTE A communications error of zero is not considered a communications error.

**Lexical structure**

```
retry_on_all_comm_errors(VOID)
```

The lexical element of the builtin `retry_on_all_comm_errors` is shown in Table 81.

**Table 81 – Builtin retry\_on\_all\_comm\_errors**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

**Example**

```
retry_on_all_comm_errors();
```

**6.3.32 Builtin RETRY\_ON\_ALL\_COMM\_STATUS****Communication profiles: HART****Purpose: Set to retry for all comm status**

The builtin `RETRY_ON_ALL_COMM_STATUS` will set all of the bits in the comm status retry mask. This will cause the system to retry the current command if the device returns any comm status value. Comm status is defined to be the first data octet returned in a transaction, when bit 7 of this octet is set.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See builtin `ABORT_ON_RESPONSE_CODE` for a list of the available masks, and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`RETRY_ON_ALL_COMM_STATUS (VOID)`

The lexical element of the builtin `RETRY_ON_ALL_COMM_STATUS` is shown in Table 82.

**Table 82 – Builtin `RETRY_ON_ALL_COMM_STATUS`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.33 Builtin `RETRY_ON_ALL_DEVICE_STATUS`

**Communication profiles:** HART

**Purpose:** Set to retry for all device status

The builtin `RETRY_ON_ALL_DEVICE_STATUS` will set all of the bits in the device status retry mask. This will cause the system to retry the current command if the device returns any device status value. The first two bytes of every slave response contains status information. The first byte returned indicates response code status when the most significant bit (bit 7) is 0. The second byte returned, device status, is only meaningful if the first returns response code status. Device status is defined to be the second data octet returned in a transaction.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See builtin `ABORT_ON_RESPONSE_CODE` for a list of the available masks, and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`RETRY_ON_ALL_DEVICE_STATUS (VOID)`

The lexical element of the builtin `RETRY_ON_ALL_DEVICE_STATUS` is shown in Table 83.

**Table 83 – Builtin `RETRY_ON_ALL_DEVICE_STATUS`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.34 Builtin `RETRY_ON_ALL_RESPONSE_CODES`

**Communication profiles:** HART

**Purpose:** Set to retry for all response codes

The builtin `RETRY_ON_ALL_RESPONSE_CODES` will set all of the bits in the response code retry mask. This will cause the system to retry the current command if the device returns any non-zero response code value.

The first two bytes of every slave response contains status information. The response code is defined to be the first data octet returned in a transaction, when bit 7 of this octet is 0.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function implementation of the masks. See builtin `ABORT_ON_RESPONSE_CODE` for a list of the available masks, and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`RETRY_ON_ALL_RESPONSE_CODES (VOID)`

The lexical element of the builtin `RETRY_ON_ALL_RESPONSE_CODES` is shown in Table 84.

**Table 84 – Builtin `RETRY_ON_ALL_RESPONSE_CODES`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.35 Builtin `retry_on_all_response_codes`

**Communication profiles:** FF, ISA100

**Purpose:** Set to retry for all response codes

The builtin `retry_on_all_response_codes` causes the last request made by a method to be retried after any response code. A request will be retried three times before it fails and an error return is returned. This is the default action by the builtins when a method is just started.

This builtin frees a method from having to explicitly retry a request after any response code.

A response code is an integer value representing an application-specific error condition.

NOTE A response code value of zero is not considered an error response code. Each response code and response code type is defined in the EDD.

### Lexical structure

`retry_on_all_response_codes (void)`

The lexical element of the builtin `retry_on_all_response_codes` is shown in Table 85.

**Table 85 – Builtin `retry_on_all_response_codes`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### Example

```
retry_on_all_response_codes();
```

### 6.3.36 Builtin RETRY\_ON\_COMM\_ERROR

**Communication profiles:** HART

**Purpose:** Retry if communications error is found

The builtin RETRY\_ON\_COMM\_ERROR will set the comm error retry mask such that the current command will be retried if a comm error is detected in the device or EDD application while sending the command. The first two bytes of every slave response contains status information.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this function is used by the builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

#### Lexical structure

RETRY\_ON\_COMM\_ERROR(VOID)

The lexical element of the builtin RETRY\_ON\_COMM\_ERROR is shown in Table 86.

**Table 86 – Builtin RETRY\_ON\_COMM\_ERROR**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.37 Builtin retry\_on\_comm\_error

**Communication profiles:** FF, ISA100

**Purpose:** Retry if communications error is found

The builtin retry\_on\_comm\_error causes the last request made by a method to be retried after a specified communications error. A request will be retried three times before it fails and an error return is returned.

This builtin frees a method from having to explicitly retry a request after a given communications error is received.

The communications error codes are defined by the consortia. Their related strings may be defined in a text dictionary. A communications error of zero is not considered a communications error.

#### Lexical structure

retry\_on\_comm\_error(error)

The lexical elements of the builtin retry\_on\_comm\_error are shown in Table 87.

**Table 87 – Builtin `retry_on_comm_error`**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| error          | unsigned long | I         | m     | The communication errors.                       |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

**Example**

```
long status;
status = retry_on_comm_error(E_ACCESS_HARDWARE_FAULT);
```

**6.3.38 Builtin `RETRY_ON_COMM_STATUS`****Communication profiles: HART****Purpose: Set the communications status retry mask**

The builtin `RETRY_ON_COMM_STATUS` will set the correct bit(s) in the comm status retry mask such that any matching set bit of the communication status will cause the current command to be retried. Comm status is defined to be the first data octet returned in a transaction, when bit 7 of this octet is 1.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_method` function for implementation of the masks. See builtin `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

**Lexical structure**

```
RETRY_ON_COMM_STATUS(comm_status)
```

The lexical elements of the builtin `RETRY_ON_COMM_STATUS` are shown in Table 88.

**Table 88 – Builtin `RETRY_ON_COMM_STATUS`**

| Parameter name | Type | Direction | Usage | Description                              |
|----------------|------|-----------|-------|------------------------------------------|
| comm_status    | int  | I         | m     | The new communication status retry mask. |
| <return>       | VOID | —         | —     | —                                        |

**6.3.39 Builtin `RETRY_ON_DEVICE_STATUS`****Communication profiles: HART****Purpose: Set device status retry mask**

The builtin `RETRY_ON_DEVICE_STATUS` will set the correct bit(s) in the device status retry mask such that any matching set bit of the device status will cause the current command to be retried. The first two bytes of every slave response contains status information. The first byte returned indicates response code status when the most significant bit (bit 7) is 0. The second byte returned, device status, is only meaningful if the first returns response code status. Device status is defined to be the second data octet returned in a transaction. The value of `device_status` can be set to cause the system to retry the current HART command on any

combination of device status bits. The value of `device_status` may be set to any value from 0x00 to 0x7F, where each bit corresponds to a device status returned from the device.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See builtin `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`RETRY_ON_DEVICE_STATUS(device_status)`

The lexical elements of the builtin `RETRY_ON_DEVICE_STATUS` are shown in Table 89.

**Table 89 – Builtin `RETRY_ON_DEVICE_STATUS`**

| Parameter name             | Type | Direction | Usage | Description                              |
|----------------------------|------|-----------|-------|------------------------------------------|
| <code>device_status</code> | int  | l         | m     | The new communication status retry mask. |
| <return>                   | VOID | —         | —     | —                                        |

### 6.3.40 Builtin `RETRY_ON_NO_DEVICE` (deprecated)

**Communication profiles: CS, GPE, HART**

**Purpose: Retry if no device is found**

The builtin `RETRY_ON_NO_DEVICE` will set the no device retry mask such that the current command will be retried if no device is found while sending a command.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See builtin `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`RETRY_ON_NO_DEVICE(VOID)`

The lexical element of the builtin `RETRY_ON_NO_DEVICE` is shown in Table 90.

**Table 90 – Builtin `RETRY_ON_NO_DEVICE`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.41 Builtin `RETRY_ON_RESPONSE_CODE`

**Communication profiles:** HART

**Purpose:** Set response code retry mask

The builtin `RETRY_ON_RESPONSE_CODE` will set the correct bit in the response code retry mask such that the specified response code value will cause the current command to be retried. The first two bytes of every slave response contains status information. The response code is defined to be the first data octet returned in a transaction, when bit 7 of this octet is 0. The value of `response_code` can be set to cause the system to retry the current HART command on any one response code. The value of `response_code` may be set to any value from 0 to 127.

To cause the current HART command to be retried on multiple different response codes, this builtin has to be called once for each response code to be retried.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See builtin `ABORT_ON_RESPONSE_CODE` for a list of available masks and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

#### Lexical structure

`RETRY_ON_RESPONSE_CODE(response_code)`

The lexical elements of the builtin `RETRY_ON_RESPONSE_CODE` are shown in Table 91.

**Table 91 – Builtin `RETRY_ON_RESPONSE_CODE`**

| Parameter name             | Type | Direction | Usage | Description                                               |
|----------------------------|------|-----------|-------|-----------------------------------------------------------|
| <code>response_code</code> | int  | —         | m     | The response code that should be added to the retry mask. |
| <return>                   | VOID | —         | —     | —                                                         |

### 6.3.42 Builtin `retry_on_response_code`

**Communication profiles:** FF, ISA100

**Purpose:** Set response code retry mask

The builtin `retry_on_response_code` causes the last request made by a method to be retried three times after a specific response code is received.

This builtin frees a method from having to explicitly retry a request after a given response code is received.

A response code is a value representing an application-specific error condition.

NOTE A response code value of zero is not considered an error response code. Each response code and response code type is defined in the EDD.

Retries the method's last request upon receiving the specified response code.

#### Lexical structure

`retry_on_response_code(code)`



The lexical elements of the builtin `retry_on_response_code` are shown in Table 92.

**Table 92 – Builtin `retry_on_response_code`**

| Parameter name    | Type          | Direction | Usage | Description                                     |
|-------------------|---------------|-----------|-------|-------------------------------------------------|
| <code>code</code> | unsigned long | I         | m     | The response code being resolved.               |
| <return>          | long          | O         | m     | One of the return codes specified in Table 376. |

### Example

```
long status;
status = retry_on_response_code(RC_INVALID_ENTRY);
```

### 6.3.43 Builtin send

#### Communication profiles: HART

#### Purpose: Send the specified command

The builtin `send` will send the specified command and return the response code, communications status, and command status respectively in the `cmd_status` array. The Device Status byte in the Field Device response shall be inspected. Any bit having Status Class of "MORE" that is Set (1) in Device Status shall result in Command 48 being automatically issued.

The octets in the `cmd_status` array and the status bytes from command 48 (if it was sent) are logically ANDed with the appropriate abort masks to determine if the method should be aborted. If there is a match, the method is aborted and the abort methods (if any were designated) are run. If there is no match for the abort masks, the same data is ANDed with the appropriate retry masks. If there is a match, the command will be retried (either the specified command, or command 48). This continues until either the command succeeds, an abort occurs, or the maximum number of retries is reached. When command 48 is indirectly sent as a result of the device status response, the `cmd 48 xxx` mask values that are set using the `XMTR_xxx` builtins are used to control the aborting and retrying for command 48. The other mask values and related builtins are used to control the aborting and retrying for the directly sent command (including command 48 if it was directly sent).

The status octets for the command are returned in the `cmd_status` parameter, a pointer to a 3-octet array of unsigned char, which is allocated in the method making the call.

#### Lexical structure

```
send(cmd_number, cmd_status)
```

The lexical elements of the builtin `send` are shown in Table 93.

**Table 93 – Builtin `send`**

| Parameter name          | Type  | Direction | Usage | Description                                                                                                                                                                                     |
|-------------------------|-------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>cmd_number</code> | int   | I         | m     | The number of command to send.                                                                                                                                                                  |
| <code>cmd_status</code> | char* | O         | m     | The status octets of the send command.                                                                                                                                                          |
| <return>                | int   | O         | m     | One of the return codes specified in Table 377.<br>BI_SUCCESS if the command was successful,<br>BI_COMM_ERROR if an error occurred sending the command, or BI_NO_DEVICE if no device was found. |

**Example**

```
int result;
char cmd_status[STATUS_SIZE];
result = send(40, cmd_status);
```

In the above example, if any bits of Status Class "MORE" are set in cmd\_status[STATUS\_DEVICE\_STATUS] is set, Command 48 will automatically be dispatched before the send function returns.

**6.3.44 Builtin send\_all\_values**

**Communication profiles:** FF, ISA100

**Purpose:** send modified values to device

The builtin send\_all\_values sends all of the values in the variable table that the method modified but has not previously sent to the device. This action changes the device values to match the values set by the method.

This builtin does nothing for a non-caching EDD application because it does not have a variable table.

**Lexical structure**

```
send_all_values(VOID)
```

The lexical element of the builtin send\_all\_values is shown in Table 94.

**Table 94 – Builtin send\_all\_values**

| Parameter name | Type | Direction | Usage | Description                                     |
|----------------|------|-----------|-------|-------------------------------------------------|
| <return>       | long | O         | m     | One of the return codes specified in Table 376. |

**Example**

```
long status;
status = send_all_values();
```

**6.3.45 Builtin send\_command**

**Communication profiles:** HART

**Purpose:** Send the specified command

The builtin send\_command will send the specified command. The status/data octets from the command are then logically ANDed with the appropriate abort masks to determine if the method should be aborted. If there is a match, the method is aborted and the abort methods (if any were designated) are run. If there is no match for the abort masks, the same data is ANDed with the appropriate retry masks. If there is a match, the command will be retried. This continues until either the command succeeds, an abort occurs, or the maximum number of retries is reached. No status or data octets are returned with this function. The cmd 48 xxx mask values that are set using the XMTR\_xxx builtins do not affect the aborting or retrying for the send\_command builtin.

**Lexical structure**

```
send_command(cmd_number)
```

The lexical elements of the builtin send\_command are shown in Table 95.

**Table 95 – Builtin send\_command**

| Parameter name | Type | Direction | Usage | Description                                                                                                                                                                                     |
|----------------|------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| cmd_number     | int  | I         | m     | The number of command to send.                                                                                                                                                                  |
| <return>       | int  | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the function was successful, BI_COMM_ERROR if an error occurred sending the HART command, or BI_NO_DEVICE if no device was found. |

#### 6.3.46 Builtin send\_command\_trans

##### Communication profiles: HART

##### Purpose: Send the command with the specified transaction

The builtin send\_command\_trans sends the command with the specified transaction to the device. This function is to be used to send commands that have been defined with multiple transactions.

The builtin send\_command\_trans will send the specified command. The status/data octets from the command are then logically ANDed with the appropriate abort masks to determine if the method should be aborted. If there is a match, the method is aborted and the abort methods (if any were designated) are run. If there is no match for the abort masks, the same data is ANDed with the appropriate retry masks. If there is a match, the command will be retried. This continues until either the command succeeds, an abort occurs, or the maximum number of retries is reached. No status or data octets are returned with this command. The cmd 48 xxx mask values that are set using the XMTR\_xxx builtins do not affect the aborting or retrying for the send\_command builtin.

##### Lexical structure

```
send_command_trans(cmd_number, transaction)
```

The lexical elements of the builtin send\_command\_trans are shown in Table 96.

**Table 96 – Builtin send\_command\_trans**

| Parameter name | Type | Direction | Usage | Description                                                                                                                                                                                     |
|----------------|------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| cmd_number     | int  | I         | m     | The number of command to send.                                                                                                                                                                  |
| transaction    | int  | I         | m     | The number of the TRANSACTION.                                                                                                                                                                  |
| <return>       | int  | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the function was successful, BI_COMM_ERROR if an error occurred sending the HART command, or BI_NO_DEVICE if no device was found. |

#### 6.3.47 Builtin send\_trans

##### Communication profiles: HART

##### Purpose: Send the command with the specified transaction

The builtin send\_trans sends a command with the specified transaction to the device. This function is to be used to send commands that have been defined with multiple transactions.

The builtin `send_trans` will send the specified command and return the response code, communications status, and device status in the `cmd_status` array. The Device Status byte in the Field Device response shall be inspected. Any bit having Status Class of "MORE" that is Set (1) in Device Status shall result in Command 48 being automatically issued.

The octets in the `cmd_status` array and the status bytes from command 48 (if it was sent) are logically ANDed with the appropriate abort masks to determine if the method should be aborted. If there is a match, the method is aborted and the abort methods (if any were designated) are run. If there is no match for the abort masks, the same data is ANDed with the appropriate retry masks. If there is a match, the command will be retried (either the specified command, or command 48). This continues until either the command succeeds, an abort occurs, or the maximum number of retries is reached. When command 48 is indirectly sent as a result of the device status response, the `cmd 48 xxx` mask values that are set using the `XMTR_xxx` builtins are used to control the aborting and retrying for command 48. The other mask values and related builtins are used to control the aborting and retrying for the directly sent command (including command 48 if it was directly sent).

The status octets for the command are returned in the `cmd_status` parameter, a 3-octet array, allocated in the method making the call.

### Lexical structure

```
send_trans(cmd_number, transaction, cmd_status)
```

The lexical elements of the builtin `send_trans` are shown in Table 97.

**Table 97 – Builtin `send_trans`**

| Parameter name           | Type  | Direction | Usage | Description                                                                                                                                                                                                                      |
|--------------------------|-------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>cmd_number</code>  | int   | I         | m     | The number of command to send.                                                                                                                                                                                                   |
| <code>transaction</code> | int   | I         | m     | The number of the TRANSACTION.                                                                                                                                                                                                   |
| <code>cmd_status</code>  | char* | O         | m     | The status octets of the send command.                                                                                                                                                                                           |
| <return>                 | int   | O         | m     | One of the return codes specified in Table 377. <code>BI_SUCCESS</code> if the command was successful, <code>BI_COMM_ERROR</code> if an error occurred sending the command, or <code>BI_NO_DEVICE</code> if no device was found. |

### 6.3.48 Builtin `send_value`

**Communication profiles:** FF, ISA100

**Purpose:** Sends a variable table value to the device

The builtin `send_value` causes the value of the specified variable in the cache to be sent to the device, thus updating the device value. This builtin does nothing in a non-caching EDD application, because a non-caching EDD application does not have a cache.

Some values are `READ_ONLY` in the device and cannot be written. Attempting to do so will cause a builtin error to be returned.

The parameters `id` and `member_id` are specified using the builtins `ITEM_ID` and `MEMBER_ID` and the name or reference of the variable in question.

### Lexical structure

```
send_value(id, member_id)
```

The lexical elements of the builtin `send_value` are shown in Table 98.

**Table 98 – Builtin send\_value**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| id             | unsigned long | I         | m     | The item id of the VARIABLE to read.            |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE to read.          |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

**Example**

```

long status;
unsigned long id;
id = ITEM_ID(PARAM.HI_LIM);
status = edit_device_value ("|en|Enter new HI_LIM value:\n", 0, 0, 0, id,
0); status = send_value(id, 0);

```

**6.3.49 Builtin send\_value2****Communication profiles: FF, ISA100**

**Purpose:** Sends the value of a variable, record member, or array element to the device

The builtin send\_value2 causes the value of the specified variable, record member, or array element in the cache to be sent to the device, thus updating the device value. This builtin does nothing in a non-caching EDD application, because a non-caching EDD application does not have a cache.

Some values are READ\_ONLY in the device and cannot be written. Attempting to do so will cause a builtin error to be returned.

The blk\_id parameter specifies the item id of the block to be accessed, while the blk\_num parameter specifies the occurrence number of the block to be accessed.

If the id parameter references a simple variable, the member\_id parameter is ignored. If the id parameter references a record, the member\_id parameter specifies a member of the record. If the id parameter references an array parameter, the member\_id parameter specifies an element of the array.

The parameters blk\_id, id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID. The blk\_num parameter is specified using the builtins get\_block\_instance\_by\_object\_index and get\_block\_instance\_by\_block\_tag.

If the id parameter references a record and the member\_id parameter equals zero, the entire record is written to the device.

Similarly, if the id parameter references an array and the member\_id parameter equals zero, the entire array is written to the device.

**Lexical structure**

```
send_value2(blk_id, blk_num, id, member_id)
```

The lexical elements of the builtin send\_value2 are shown in Table 99.

**Table 99 – Builtin send\_value2**

| Parameter name | Type          | Direction | Usage | Description                                              |
|----------------|---------------|-----------|-------|----------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the BLOCK_A instance to access.           |
| blk_num        | unsigned long | I         | m     | The occurrence number of the BLOCK_A instance to access. |
| id             | unsigned long | I         | m     | The item id of the VARIABLE to read.                     |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE to read.                   |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.          |

**Example**

```

long status;
unsigned long aiBlock;
unsigned long id;

aiBlock = ITEM_ID(__analog_input_block);
id = MEMBER_ID(HI_LIM);

status = edit_device_value2("|en|Enter new HI_LIM value:\n", 0, 0, 0, 0, 0,
aiBlock, 0, id, 0);
status = send_value2(aiBlock, 0, id, 0);

```

**6.3.50 Builtin SET\_NUMBER\_OF\_RETRIES****Communication profiles: CS, GPE, HART****Purpose: Set the number of times a command is retried**

The builtin SET\_NUMBER\_OF\_RETRIES sets up the number of times a command will be retried due to the appropriate retry masks. This value is defaulted to 0 at the beginning of each method.

**Lexical structure**

```
SET_NUMBER_OF_RETRIES(n)
```

The lexical elements of the builtin SET\_NUMBER\_OF\_RETRIES are shown in Table 100.

**Table 100 – Builtin SET\_NUMBER\_OF\_RETRIES**

| Parameter name | Type | Direction | Usage | Description                                     |
|----------------|------|-----------|-------|-------------------------------------------------|
| n              | int  | I         | m     | The number of retries of a command.             |
| <return>       | int  | O         | m     | One of the return codes specified in Table 377. |

**6.3.51 Builtin WriteCommand****Communication profiles: CS, GPE, PB, PN****Purpose: Execute write command**

The builtin WriteCommand allows to write variables with a given command.

**Lexical structure**

```
WriteCommand(command_identifier)
```

The lexical elements of the builtin WriteCommand are shown in Table 101.

**Table 101 – Builtin WriteCommand**

| Parameter name     | Type      | Direction | Usage | Description                                                                                           |
|--------------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------|
| command_identifier | reference | I         | m     | The Identifier of the COMMAND to execute.                                                             |
| <return>           | long      | O         | m     | A protocol specific error value, the encoding of which is defined by the specific protocol or device. |

### 6.3.52 Builtin XMTR\_ABORT\_ON\_ALL\_COMM\_STATUS

**Communication profiles: HART**

**Purpose: Set to abort for all command 48 communication status**

The builtin XMTR\_ABORT\_ON\_ALL\_COMM\_STATUS will set all of the bits in the command 48 comm status abort mask. This will cause the system to abort the current method if the device returns any command 48 comm status value. Comm status is defined to be the first octet returned in a transaction, when bit 7 of this octet is set. The comm status can be set to a value from 0x00 to 0x7F, where each bit corresponds to a communications error received from the device.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

#### Lexical structure

XMTR\_ABORT\_ON\_ALL\_COMM\_STATUS(VOID)

The lexical element of the builtin XMTR\_ABORT\_ON\_ALL\_COMM\_STATUS is shown in Table 102.

**Table 102 – Builtin XMTR\_ABORT\_ON\_ALL\_COMM\_STATUS**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.53 Builtin XMTR\_ABORT\_ON\_ALL\_DATA

**Communication profiles: HART**

**Purpose: Set to abort for all command 48 data**

The builtin XMTR\_ABORT\_ON\_ALL\_DATA will set all of the bits in the command 48 data abort masks. This will cause the system to abort if any bit in command 48 is set.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will be valid only during the current method. See send\_command for implementation of the masks. See ABORT\_ON\_RESPONSE\_CODE for a list of the available masks, and their default values.

The mask affected by this function is used by the builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY` functions.

### Lexical structure

`XMTR_ABORT_ON_ALL_DATA(VOID)`

The lexical element of the builtin `XMTR_ABORT_ON_ALL_DATA` is shown in Table 103.

**Table 103 – Builtin XMTR\_ABORT\_ON\_ALL\_DATA**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.54 Builtin XMTR\_ABORT\_ON\_ALL\_DEVICE\_STATUS

**Communication profiles:** HART

**Purpose:** Set to abort for all command 48 communications status

The builtin `XMTR_ABORT_ON_ALL_DEVICE_STATUS` will set all of the bits in the command 48 device status abort mask. This will cause the system to abort the current method if the device returns any command 48 device status value. Device status is defined to be the second data octet returned in a transaction.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See builtin `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`XMTR_ABORT_ON_ALL_DEVICE_STATUS(VOID)`

The lexical element of the builtin `XMTR_ABORT_ON_ALL_DEVICE_STATUS` is shown in Table 104.

**Table 104 – Builtin XMTR\_ABORT\_ON\_ALL\_DEVICE\_STATUS**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.55 Builtin XMTR\_ABORT\_ON\_ALL\_RESPONSE\_CODES

**Communication profiles:** HART

**Purpose:** Set to abort for all command 48 response codes

The builtin `XMTR_ABORT_ON_ALL_RESPONSE_CODES` will set all of the bits in the command 48 response code abort mask. This will cause the system to abort the current method if the device returns any command 48 response code value.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function



for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

### Lexical structure

XMTR\_ABORT\_ON\_ALL\_RESPONSE\_CODES (VOID)

The lexical element of the builtin XMTR\_ABORT\_ON\_ALL\_RESPONSE\_CODES is shown in Table 105.

**Table 105 – Builtin XMTR\_ABORT\_ON\_ALL\_RESPONSE\_CODES**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.56 Builtin XMTR\_ABORT\_ON\_COMM\_ERROR

**Communication profiles:** HART

**Purpose:** Abort if communications error is found during command 48

The builtin XMTR\_ABORT\_ON\_COMM\_ERROR will set the command 48 comm error abort mask such that the method will be aborted if a comm error is found while sending command 48.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

### Lexical structure

XMTR\_ABORT\_ON\_COMM\_ERROR (VOID)

The lexical element of the builtin XMTR\_ABORT\_ON\_COMM\_ERROR is shown in Table 106.

**Table 106 – Builtin XMTR\_ABORT\_ON\_COMM\_ERROR**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.57 Builtin XMTR\_ABORT\_ON\_COMM\_STATUS

**Communication profiles:** HART

**Purpose:** Add status abort mask to command 48

The builtin XMTR\_ABORT\_ON\_COMM\_STATUS will set the correct bit(s) in the command 48 comm status abort mask such that the specified command 48 comm status value will cause the method to abort. Comm status is defined to be the first data octet returned in a transaction, when bit 7 of this octet is 1. The comm\_status\_value can be set to a value from 0 to 127, where each bit corresponds to a communications error received from the device.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See builtin `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`XMTR_ABORT_ON_COMM_STATUS(comm_status)`

The lexical elements of the builtin `XMTR_ABORT_ON_COMM_STATUS` are shown in Table 107.

**Table 107 – Builtin `XMTR_ABORT_ON_COMM_STATUS`**

| Parameter name              | Type              | Direction      | Usage          | Description                     |
|-----------------------------|-------------------|----------------|----------------|---------------------------------|
| <code>comm_status</code>    | <code>int</code>  | <code>l</code> | <code>m</code> | The new comm status abort mask. |
| <code>&lt;return&gt;</code> | <code>VOID</code> | —              | —              | —                               |

### 6.3.58 Builtin `XMTR_ABORT_ON_DATA`

#### Communication profiles: HART

**Purpose: Abort if specified data bit in command 48 is set**

The builtin `XMTR_ABORT_ON_DATA` will set the correct bit(s) in the command 48 abortmask such that the method will be aborted if the specified bit is set in the data field returned by command 48.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See builtin `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`XMTR_ABORT_ON_DATA(data, bit)`

The lexical elements of the builtin `XMTR_ABORT_ON_DATA` are shown in Table 108.

**Table 108 – Builtin `XMTR_ABORT_ON_DATA`**

| Parameter name              | Type              | Direction      | Usage          | Description                                            |
|-----------------------------|-------------------|----------------|----------------|--------------------------------------------------------|
| <code>data</code>           | <code>int</code>  | <code>l</code> | <code>m</code> | Zero based index into command 48 data field.           |
| <code>bit</code>            | <code>int</code>  | <code>l</code> | <code>m</code> | Bit number (0..7). Bit 0 is the least significant bit. |
| <code>&lt;return&gt;</code> | <code>VOID</code> | —              | —              | —                                                      |

### 6.3.59 Builtin XMTR\_ABORT\_ON\_DEVICE\_STATUS

#### Communication profiles: HART

#### Purpose: Add status abort mask to command 48

The builtin XMTR\_ABORT\_ON\_DEVICE\_STATUS will set the correct bit(s) in the command 48 device status abort mask in such a way that any matching set bit of the command 48 device status will cause the method to abort. Device status is defined to be the second data octet returned in a transaction. The device\_status value can be set to a value from 0 to 127, where each bit corresponds to a device status returned from the device.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this function is used by the send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

#### Lexical structure

XMTR\_ABORT\_ON\_DEVICE\_STATUS(device\_status)

The lexical elements of the builtin XMTR\_ABORT\_ON\_DEVICE\_STATUS are shown in Table 109.

**Table 109 – Builtin XMTR\_ABORT\_ON\_DEVICE\_STATUS**

| Parameter name | Type | Direction | Usage | Description                       |
|----------------|------|-----------|-------|-----------------------------------|
| device_status  | int  | I         | m     | The new device status abort mask. |
| <return>       | VOID | —         | —     | —                                 |

### 6.3.60 Builtin XMTR\_ABORT\_ON\_NO\_DEVICE (deprecated)

#### Communication profiles:

#### Purpose: Abort if no device is found during command 48

The builtin XMTR\_ABORT\_ON\_NO\_DEVICE will set the command 48 no device mask such that the method will be aborted if no device is found while sending a command 48.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

#### Lexical structure

XMTR\_ABORT\_ON\_NO\_DEVICE(VOID)

The lexical element of the builtin XMTR\_ABORT\_ON\_NO\_DEVICE is shown in Table 110.

**Table 110 – Builtin XMTR\_ABORT\_ON\_NO\_DEVICE**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

**6.3.61 Builtin XMTR\_ABORT\_ON\_RESPONSE\_CODE****Communication profiles: HART****Purpose: Add response code abort mask to command 48**

The builtin XMTR\_ABORT\_ON\_RESPONSE\_CODE will set the correct bit in the command 48 response code abort mask such that the specified command 48 response code value will cause the method to abort. The response code is defined to be the first data octet returned in a transaction, when bit 7 of this octet is 0.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

**Lexical structure**

```
XMTR_ABORT_ON_RESPONSE_CODE(response_code)
```

The lexical elements of the builtin XMTR\_ABORT\_ON\_RESPONSE\_CODE are shown in Table 111.

**Table 111 – Builtin XMTR\_ABORT\_ON\_RESPONSE\_CODE**

| Parameter name | Type | Direction | Usage | Description                       |
|----------------|------|-----------|-------|-----------------------------------|
| response_code  | int  | l         | m     | The new response code abort mask. |
| <return>       | VOID | —         | —     | —                                 |

**6.3.62 Builtin XMTR\_IGNORE\_ALL\_COMM\_STATUS****Communication profiles: HART****Purpose: Ignore all command 48 status bits**

The builtin XMTR\_IGNORE\_ALL\_COMM\_STATUS will clear all of the bits in the command 48 comm status retry mask and command 48 comm status abort mask. This will cause the system to ignore all bits in the comm status value. Comm status is defined to be the first data octet returned in a transaction, when bit 7 of this octet is set.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

XMTR\_IGNORE\_ALL\_COMM\_STATUS (VOID)

The lexical element of the builtin XMTR\_IGNORE\_ALL\_COMM\_STATUS is shown in Table 112.

**Table 112 – Builtin XMTR\_IGNORE\_ALL\_COMM\_STATUS**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.63 Builtin XMTR\_IGNORE\_ALL\_DATA

**Communication profiles:** HART

**Purpose:** Ignore all command 48 device status bits

The builtin XMTR\_IGNORE\_ALL\_DATA will clear all of the bits in the command 48 data retry mask and command 48 data abort mask. This will cause the system to ignore all data in the command 48 response message.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will be valid only during the current method. See send\_command for implementation of the masks. See ABORT\_ON\_RESPONSE\_CODE for a list of the available masks, and their default values.

The mask affected by this function is used by the send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY functions.

### Lexical structure

XMTR\_IGNORE\_ALL\_DATA (VOID)

The lexical element of the builtin XMTR\_IGNORE\_ALL\_DATA is shown in Table 113.

**Table 113 – Builtin XMTR\_IGNORE\_ALL\_DATA**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.64 Builtin XMTR\_IGNORE\_ALL\_DEVICE\_STATUS

**Communication profiles:** HART

**Purpose:** Ignore all command 48 device status bits

The builtin XMTR\_IGNORE\_ALL\_DEVICE\_STATUS will clear all of the bits in the command 48 device status retry mask and command 48 device status abort mask. This will cause the system to ignore all bits in the command 48 device status octet. Device status is defined to be the second data octet returned in a transaction.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

### Lexical structure

XMTR\_IGNORE\_ALL\_DEVICE\_STATUS (VOID)

The lexical element of the builtin XMTR\_IGNORE\_ALL\_DEVICE\_STATUS is shown in Table 114.

**Table 114 – Builtin XMTR\_IGNORE\_ALL\_DEVICE\_STATUS**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.65 Builtin XMTR\_IGNORE\_ALL\_RESPONSE\_CODES

**Communication profiles:** HART

**Purpose:** Ignore all command 48 response codes

The builtin XMTR\_IGNORE\_ALL\_RESPONSE\_CODES will clear all of the bits in the command 48 response code retry mask and command 48 response code abort mask. This will cause the system to ignore all response code values returned from the device.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

### Lexical structure

XMTR\_IGNORE\_ALL\_RESPONSE\_CODES (VOID)

The lexical element of the builtin XMTR\_IGNORE\_ALL\_RESPONSE\_CODES is shown in Table 115.

**Table 115 – Builtin XMTR\_IGNORE\_ALL\_RESPONSE\_CODES**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.66 Builtin XMTR\_IGNORE\_COMM\_ERROR

**Communication profiles:** HART

**Purpose:** Ignore if communications error is found during command 48

The builtin XMTR\_IGNORE\_COMM\_ERROR will clear all bits in the command 48 comm error retry mask and command 48 comm error abort mask such that a communications error condition will be ignored while sending command 48.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

### Lexical structure

XMTR\_IGNORE\_COMM\_ERROR(VOID)

The lexical element of the builtin XMTR\_IGNORE\_COMM\_ERROR is shown in Table 116.

**Table 116 – Builtin XMTR\_IGNORE\_COMM\_ERROR**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.67 Builtin XMTR\_IGNORE\_COMM\_STATUS

**Communication profiles: HART**

**Purpose: Ignore specific command 48 communications status bits**

The builtin XMTR\_IGNORE\_COMM\_STATUS will clear the correct bit(s) in the command 48 comm status retry mask and command 48 comm status abort mask such that the specified bits in the command 48 comm status value will be ignored. Comm status is defined to be the first data octet returned in a transaction, when bit 7 of this octet is set.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

### Lexical structure

XMTR\_IGNORE\_COMM\_STATUS(comm\_status)

The lexical elements of the builtin XMTR\_IGNORE\_COMM\_STATUS are shown in Table 117.

**Table 117 – Builtin XMTR\_IGNORE\_COMM\_STATUS**

| Parameter name | Type | Direction | Usage | Description                               |
|----------------|------|-----------|-------|-------------------------------------------|
| comm_status    | int  | l         | m     | The new comm status abort and retry mask. |
| <return>       | VOID | —         | —     | —                                         |

### 6.3.68 Builtin XMTR\_IGNORE\_DATA

**Communication profiles: HART**

**Purpose: Ignore specific Command 48 data bits**

The builtin XMTR\_IGNORE\_DATA shall reset the specified bit, in the specified byte, in the command 48 data retry mask and command 48 data abort data mask such that the method will ignore the specified bit in the data field returned by command 48.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will be valid only during the current method. See send\_command for implementation of the masks.

See ABORT\_ON\_RESPONSE\_CODE for a list of the available masks, and their default values.

The mask affected by this builtin is used by the builtin `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY` functions.

### Lexical structure

```
XMTR_IGNORE_DATA(data, bit)
```

The lexical elements of the builtin `XMTR_IGNORE_DATA` are shown in Table 118.

**Table 118 – Builtin XMTR\_IGNORE\_DATA**

| Parameter name | Type | Direction | Usage | Description                                            |
|----------------|------|-----------|-------|--------------------------------------------------------|
| Data           | int  | l         | m     | Zero based index into command 48 data field.           |
| Bit            | int  | l         | m     | Bit number (0..7). Bit 0 is the least significant bit. |
| <return>       | VOID | —         | —     | —                                                      |

### 6.3.69 Builtin XMTR\_IGNORE\_DEVICE\_STATUS

**Communication profiles:** HART

**Purpose:** Ignore specific command 48 status bits

The builtin `XMTR_IGNORE_DEVICE_STATUS` will clear the correct bit(s) in the command 48 device status retry mask and command 48 device status abort mask such that the specified bits in the command 48 device status octet are ignored. Device status is defined to be the second data octet returned in a transaction.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

```
XMTR_IGNORE_DEVICE_STATUS(device_status)
```

The lexical elements of the builtin `XMTR_IGNORE_DEVICE_STATUS` are shown in Table 119.

**Table 119 – Builtin XMTR\_IGNORE\_DEVICE\_STATUS**

| Parameter name | Type | Direction | Usage | Description                                         |
|----------------|------|-----------|-------|-----------------------------------------------------|
| device_status  | int  | l         | m     | The bits to be cleared in the abort and retry mask. |
| <return>       | VOID | —         | —     | —                                                   |

### 6.3.70 Builtin XMTR\_IGNORE\_NO\_DEVICE (deprecated)

**Communication profiles:** HART

**Purpose:** Ignore if no device is found during command 48

The builtin `XMTR_IGNORE_NO_DEVICE` will set the command 48 no device retry mask and command 48 no device abort mask such that the no device condition should be ignored while sending a command 48.



The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`XMTR_IGNORE_NO_DEVICE(VOID)`

The lexical element of the builtin `XMTR_IGNORE_NO_DEVICE` is shown in Table 120.

**Table 120 – Builtin `XMTR_IGNORE_NO_DEVICE`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.71 Builtin `XMTR_IGNORE_RESPONSE_CODE`

**Communication profiles:** HART

**Purpose:** Ignore specific command 48 response codes

The builtin `XMTR_IGNORE_RESPONSE_CODE` will clear the correct bit in the command 48 response code retry mask and command 48 response code abort mask in such a way that the specified command 48 response code value will be ignored. The response code is defined to be the first data octet returned in a transaction, when bit 7 of this octet is 0.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the `send_command` function for implementation of the masks. See `ABORT_ON_RESPONSE_CODE` for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY`.

### Lexical structure

`XMTR_IGNORE_RESPONSE_CODE(response_code)`

The lexical elements of the builtin `XMTR_IGNORE_RESPONSE_CODE` are shown in Table 121.

**Table 121 – Builtin `XMTR_IGNORE_RESPONSE_CODE`**

| Parameter name | Type | Direction | Usage | Description                 |
|----------------|------|-----------|-------|-----------------------------|
| response_code  | int  | l         | m     | The new response code mask. |
| <return>       | VOID | —         | —     | —                           |

### 6.3.72 Builtin XMTR\_RETRY\_ON\_ALL\_COMM\_STATUS

#### Communication profiles: HART

#### Purpose: Set to retry for all command 48 communications status

The builtin XMTR\_RETRY\_ON\_ALL\_COMM\_STATUS will set all of the bits in the command 48 comm status retry mask. This will cause the system to retry command 48 if the device returns any command 48 communications status value. Comm status is defined to be the first data byte returned in a HART transaction, when bit 7 of this byte is set.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will be valid only during the current method. See send\_command for implementation of the masks. See ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY functions.

#### Lexical structure

XMTR\_RETRY\_ON\_ALL\_COMM\_STATUS (VOID)

The lexical element of the builtin XMTR\_RETRY\_ON\_ALL\_COMM\_STATUS is shown in Table 122.

**Table 122 – Builtin XMTR\_RETRY\_ON\_ALL\_COMM\_STATUS**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.73 Builtin XMTR\_RETRY\_ON\_ALL\_DATA

#### Communication profiles: HART

#### Purpose: Set to retry for all command 48 device status

The builtin XMTR\_RETRY\_ON\_ALL\_DATA will set all of the bits in the command 48 data retry mask. This will cause the system to retry if any bit in command 48 is set.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will be valid only during the current method. See send\_command for implementation of the masks. See ABORT\_ON\_RESPONSE\_CODE for a list of the available masks, and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY functions.

#### Lexical structure

XMTR\_RETRY\_ON\_ALL\_DATA (VOID)

The lexical element of the builtin XMTR\_RETRY\_ON\_ALL\_DATA is shown in Table 123.

**Table 123 – Builtin XMTR\_RETRY\_ON\_ALL\_DATA**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.74 Builtin XMTR\_RETRY\_ON\_ALL\_DEVICE\_STATUS

**Communication profiles:** HART

**Purpose:** Set to retry for all command 48 device status

The builtin XMTR\_RETRY\_ON\_ALL\_DEVICE\_STATUS will set all of the bits in the command 48 device status retry mask. This will cause the system to retry command 48 if the device returns any command 48 device status value. Device status is defined to be the second data octet returned in a transaction.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

#### Lexical structure

XMTR\_RETRY\_ON\_ALL\_DEVICE\_STATUS (VOID)

The lexical element of the builtin XMTR\_RETRY\_ON\_ALL\_DEVICE\_STATUS is shown in Table 124.

**Table 124 – Builtin XMTR\_RETRY\_ON\_ALL\_DEVICE\_STATUS**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.75 Builtin XMTR\_RETRY\_ON\_ALL\_RESPONSE\_CODES

**Communication profiles:** HART

**Purpose:** Set to retry for all command 48 response codes

The builtin XMTR\_RETRY\_ON\_ALL\_RESPONSE\_CODE will set all of the bits in the command 48 response code retry mask. This will cause the system command 48 to be retried if the device returns any command 48 response code value.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

#### Lexical structure

XMTR\_RETRY\_ON\_ALL\_RESPONSE\_CODES (VOID)

The lexical element of the builtin XMTR\_RETRY\_ON\_ALL\_RESPONSE\_CODES is shown in Table 125.

**Table 125 – Builtin XMTR\_RETRY\_ON\_ALL\_RESPONSE\_CODES**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

**6.3.76 Builtin XMTR\_RETRY\_ON\_COMM\_ERROR****Communication profiles:** HART**Purpose:** Retry if communications error is found during command 48

The builtin XMTR\_RETRY\_ON\_COMM\_ERROR will set the command 48 comm error retry mask such that command 48 will be retried if a comm error is found while sending command 48.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

**Lexical structure**

```
XMTR_RETRY_ON_COMM_ERROR(VOID)
```

The lexical element of the builtin XMTR\_RETRY\_ON\_COMM\_ERROR is shown in Table 126.

**Table 126 – Builtin XMTR\_RETRY\_ON\_COMM\_ERROR**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

**6.3.77 Builtin XMTR\_RETRY\_ON\_COMM\_STATUS****Communication profiles:** HART**Purpose:** Add status retry mask to command 48

The builtin XMTR\_RETRY\_ON\_COMM\_STATUS will set the correct bit(s) in the command 48 comm status retry mask in such a way that the specified command 48 comm status value will cause command 48 to be retried. Comm status is defined to be the first data octet returned in a transaction, when bit 7 of this is 1.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

**Lexical structure**

```
XMTR_RETRY_ON_COMM_STATUS(comm_status)
```

The lexical elements of the builtin XMTR\_RETRY\_ON\_COMM\_STATUS are shown in Table 127.

**Table 127 – Builtin XMTR\_RETRY\_ON\_COMM\_STATUS**

| Parameter name | Type | Direction | Usage | Description                     |
|----------------|------|-----------|-------|---------------------------------|
| comm_status    | int  | l         | m     | The new comm status retry mask. |
| <return>       | VOID | —         | —     | —                               |

**6.3.78 Builtin XMTR\_RETRY\_ON\_DATA****Communication profiles: HART****Purpose: Retry if specified data bit in command 48 is set**

The builtin XMTR\_RETRY\_ON\_DATA will set the specified bit(s) in the command 48 data retry mask in such a way that the command 48 will be retried if the specified bit is set in the data field returned by command 48.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

**Lexical structure**

```
XMTR_RETRY_ON_DATA(data, bit)
```

The lexical elements of the builtin XMTR\_RETRY\_ON\_DATA are shown in Table 128.

**Table 128 – Builtin XMTR\_RETRY\_ON\_DATA**

| Parameter name | Type | Direction | Usage | Description                                            |
|----------------|------|-----------|-------|--------------------------------------------------------|
| data           | int  | l         | m     | Zero based index into command 48 data field.           |
| bit            | int  | l         | m     | Bit number (0..7). Bit 0 is the least significant bit. |
| <return>       | VOID | —         | —     | —                                                      |

**6.3.79 Builtin XMTR\_RETRY\_ON\_DEVICE\_STATUS****Communication profiles: HART****Purpose: Add status retry mask to command 48**

The builtin XMTR\_RETRY\_ON\_DEVICE\_STATUS will set the correct bit(s) in the command 48 device status retry mask in such a way that any matching set bit of the command 48 device status will cause command 48 to be retried. Device status is defined to be the second data octet returned in a transaction.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

### Lexical structure

XMTR\_RETRY\_ON\_DEVICE\_STATUS(device\_status)

The lexical elements of the builtin XMTR\_RETRY\_ON\_DEVICE\_STATUS are shown in Table 129.

**Table 129 – Builtin XMTR\_RETRY\_ON\_DEVICE\_STATUS**

| Parameter name | Type | Direction | Usage | Description                       |
|----------------|------|-----------|-------|-----------------------------------|
| device_status  | INT4 | l         | m     | The new device status retry mask. |
| <return>       | VOID | —         | —     | —                                 |

### 6.3.80 Builtin XMTR\_RETRY\_ON\_NO\_DEVICE (deprecated)

**Communication profiles:** HART

**Purpose:** Retry if no device is found during command 48

The builtin XMTR\_RETRY\_ON\_NO\_DEVICE will set the command 48 nodevice retry mask in such a way that command 48 will be retried if no device is found while sending command 48.

The retry and abort masks are reset to their values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

### Lexical structure

XMTR\_RETRY\_ON\_NO\_DEVICE(VOID)

The lexical element of the builtin XMTR\_RETRY\_ON\_NO\_DEVICE is shown in Table 130.

**Table 130 – Builtin XMTR\_RETRY\_ON\_NO\_DEVICE**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.3.81 Builtin XMTR\_RETRY\_ON\_RESPONSE\_CODE

**Communication profiles:** HART

**Purpose:** Add response code retry mask to command 48

The builtin XMTR\_RETRY\_ON\_RESPONSE\_CODE will set the correct bit in command 48 the response code retry mask in such a way that the specified command 48 response code value will cause command 48 to be retried. The response code is defined to be the first data octet returned in a transaction, when bit 7 of this octet is 0.

The retry and abort masks are reset to their default values at the start of each method, so the new mask value will only be valid during the current method. See the send\_command function for implementation of the masks. See builtin ABORT\_ON\_RESPONSE\_CODE for a list of the available masks and their default values.

The mask affected by this builtin is used by the builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY.

## Lexical structure

XMTR\_RETRY\_ON\_RESPONSE\_CODE(response\_code)

The lexical element of the builtin XMTR\_RETRY\_ON\_RESPONSE\_CODE is shown in Table 131.

**Table 131 – Builtin XMTR\_RETRY\_ON\_RESPONSE\_CODE**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

## 6.4 Action builtins

### 6.4.1 Builtin fgetval

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Get VARIABLE value

The builtin fgetval is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin returns the value of a VARIABLE as it was received from the connected device. Custom calculations may then be performed on the VARIABLE value before it is stored in the EDD application. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be retrieved, or if the VARIABLE is not of the appropriate type defined in Table 9.

## Lexical structure

fgetval(VOID)

The lexical element of the builtin fgetval is shown in Table 132.

**Table 132 – Builtin fgetval**

| Parameter name | Type   | Direction | Usage | Description                |
|----------------|--------|-----------|-------|----------------------------|
| <return>       | double | O         | m     | The value of the VARIABLE. |

## Example

```
double fval;
fval = fgetval();
fval = fval + 10;
```

### 6.4.2 Builtin fsetval

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Set VARIABLE value

The builtin fsetval is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin sets the value of a VARIABLE to the specified value. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be set, or if the VARIABLE is not of the appropriate type defined in Table 9.

### Lexical structure

fsetval(value)

The lexical elements of the builtin fsetval are shown in Table 133.

**Table 133 – Builtin fsetval**

| Parameter name | Type   | Direction | Usage | Description                     |
|----------------|--------|-----------|-------|---------------------------------|
| value          | double | I         | m     | The new value for the VARIABLE. |
| <return>       | double | O         | m     | The value of the VARIABLE.      |

### 6.4.3 Builtin get\_date

**Communication profiles: FF, ISA100**

**Purpose: Get current value of a date VARIABLE**

The builtin get\_date is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin returns the value of a VARIABLE as it was received from the connected device. Custom calculations may then be performed on the VARIABLE before it is stored in the EDD application. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be retrieved, or if the VARIABLE is not of the appropriate type defined in Table 9.

The methods associated with pre-edit, post-edit, post-read, or pre-write actions are run when a VARIABLE, which has one of these actions defined as an attribute, is read or written by an application, a user method, or an edit method.

### Lexical structure

get\_date(data, size)

The lexical elements of the builtin get\_date are shown in Table 134.

**Table 134 – Builtin get\_date**

| Parameter name | Type   | Direction | Usage | Description                                                                                                                    |
|----------------|--------|-----------|-------|--------------------------------------------------------------------------------------------------------------------------------|
| data           | char[] | O         | m     | The returned value of the VARIABLE. The structure of this octet buffer is defined in Annex B of IEC 61804-3:___ <sup>6</sup> . |
| size           | long   | I/O       | m     | The returned length of the VARIABLE.                                                                                           |
| <return>       | long   | O         | m     | One of the return codes specified in Table 376.                                                                                |

### Example

```
long status, date_size;
char date_value[8];

date_size = 8;
status = get_date(date_value, &date_size);
```

<sup>6</sup> Under preparation. Stage at the time of publication: IEC RPUB 61804-4:2020.



#### 6.4.4 Builtin get\_double

**Communication profiles: FF, ISA100**

**Purpose: Get double value from VARIABLE**

The builtin get\_double is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin returns the value of the VARIABLE as it was received from the connected device. Custom calculations may then be performed on the VARIABLE value before it is stored in the EDD application. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be retrieved, or if the VARIABLE is not of the appropriate type defined in Table 9.

The methods associated with pre-edit, post-edit, post-read, or pre-write actions are run when a VARIABLE, which has one of these actions defined as an attribute, is read by an application or another method.

#### Lexical structure

get\_double(value)

The lexical elements of the builtin get\_double are shown in Table 135.

**Table 135 – Builtin get\_double**

| Parameter name | Type   | Direction | Usage | Description                                     |
|----------------|--------|-----------|-------|-------------------------------------------------|
| value          | double | O         | m     | The returned value of the VARIABLE.             |
| <return>       | long   | O         | m     | One of the return codes specified in Table 376. |

#### Example

```
long status;
double value;
status = get_double(&value);
```

#### 6.4.5 Builtin get\_float

**Communication profiles: FF, ISA100**

**Purpose: Get float value from VARIABLE**

The builtin get\_float is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin returns the value of a VARIABLE as it was received from a connected device. Custom calculations may then be performed on the VARIABLE value before it is stored in the EDD application. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be retrieved, or if the VARIABLE is not of the appropriate type defined in Table 9.

The methods associated with pre-edit, post-edit, post-read, or pre-write actions are run when a VARIABLE, which has one of these actions defined as an attribute, is read by an application, a user method, or an edit method.

#### Lexical structure

get\_float(value)

The lexical elements of the builtin `get_float` are shown in Table 136.

**Table 136 – Builtin `get_float`**

| Parameter name | Type  | Direction | Usage | Description                                     |
|----------------|-------|-----------|-------|-------------------------------------------------|
| value          | float | O         | m     | The returned value of the VARIABLE.             |
| <return>       | long  | O         | m     | One of the return codes specified in Table 376. |

#### Example

```
long status;
float value;
status = get_float(&value);
```

#### 6.4.6 Builtin `get_signed`

**Communication profiles: FF, ISA100**

**Purpose: Get scaled signed value of VARIABLE**

The builtin `get_signed` is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin returns the value of a VARIABLE as it was received from the connected device. Custom calculations may then be performed on the VARIABLE value before it is stored in the EDD application. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be retrieved, or if the VARIABLE is not of the appropriate type defined in Table 9.

The methods associated with pre-edit, post-edit, post-read, or pre-write actions are run when a VARIABLE, which has one of these actions defined as an attribute, is read by an application, a user method, or an edit method.

#### Lexical structure

```
get_signed(value)
```

The lexical elements of the builtin `get_signed` are shown in Table 137.

**Table 137 – Builtin `get_signed`**

| Parameter name | Type | Direction | Usage | Description                                     |
|----------------|------|-----------|-------|-------------------------------------------------|
| value          | long | O         | m     | The returned value of the signed VARIABLE.      |
| <return>       | long | O         | m     | One of the return codes specified in Table 376. |

#### Example

```
long status;
long value;
status = get_signed(&value);
```

### 6.4.7 Builtin get\_string

**Communication profiles: FF, ISA100**

**Purpose: Get string value of VARIABLE**

The builtin get\_string is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin returns the value of a VARIABLE as it was received from a connected device. Custom calculations may then be performed on the VARIABLE value before it is saved in the EDD application.

VARIABLEs of these data types shall be handled by the method because they are not supported by the programming language-C. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be retrieved, or if the VARIABLE is not of the appropriate type defined in Table 9.

The method associated with pre-edit, post-edit, post-read, or post-write actions are run when a VARIABLE, which has one of these actions defined as an attribute, is read by an application, a user method, or an edit method.

#### Lexical structure

```
get_string(string, len)
```

The lexical elements of the builtin get\_string are shown in Table 138.

**Table 138 – Builtin get\_string**

| Parameter name | Type  | Direction | Usage | Description                                                        |
|----------------|-------|-----------|-------|--------------------------------------------------------------------|
| string         | char* | O         | m     | The buffer for the returned string.                                |
| len            | long* | I/O       | m     | The maximum size of the string. The returned length of the string. |
| <return>       | int   | O         | m     | One of the return codes specified in Table 376.                    |

#### Example

```
long status;
long len;
char buf[256];
status = get_string(buf, &len);
```

### 6.4.8 Builtin get\_unsigned

**Communication profiles: FF, ISA100**

**Purpose: Get unsigned value from VARIABLE**

The builtin get\_unsigned is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin returns the value of a VARIABLE as it was received from the connected device. Custom calculations may then be performed on the VARIABLE value before it is stored in the EDD application. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be retrieved, or if the VARIABLE is not of the appropriate type defined in Table 9.

The method associated with pre-edit, post-edit, post-read, or pre-write actions are run when a VARIABLE, which has one of these actions defined as an attribute, is read by an application, a user method, or an edit method.

### Lexical structure

```
get_unsigned(value)
```

The lexical elements of the builtin get\_unsigned are shown in Table 139.

**Table 139 – Builtin get\_unsigned**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| value          | unsigned long | O         | m     | The returned value.                             |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

### Example

```
long status;
unsigned long value;
status = get_unsigned(&value);
```

### 6.4.9 Builtin igetval

**Communication profiles: CS, GPE, HART, PB, PN**

**Purpose: Get the value of a VARIABLE**

The builtin igetval is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin returns the value of a VARIABLE as it was received from the connected device. Custom calculations may then be performed on the VARIABLE value before it is stored in the EDD application. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be retrieved, or if the VARIABLE is not of the appropriate type defined in Table 9.

### Lexical structure

```
igetval(VOID)
```

The lexical element of the builtin igetval is shown in Table 140.

**Table 140 – Builtin igetval**

| Parameter name | Type      | Direction | Usage | Description                |
|----------------|-----------|-----------|-------|----------------------------|
| <return>       | long long | O         | m     | The value of the VARIABLE. |

### 6.4.10 Builtin isetval

**Communication profiles: CS, GPE, HART, PB, PN**

**Purpose: Set VARIABLE value**

The builtin isetval is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin sets the value of a VARIABLE to the specified value. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be set, or if the VARIABLE is not of the appropriate type defined in Table 9.

### Lexical structure

```
isetval(value)
```

The lexical elements of the builtin isetval are shown in Table 141.

**Table 141 – Builtin isetval**

| Parameter name | Type      | Direction | Usage | Description                    |
|----------------|-----------|-----------|-------|--------------------------------|
| value          | long long | I         | m     | The new value of the VARIABLE. |
| <return>       | long long | O         | m     | The value of the VARIABLE.     |

### 6.4.11 Builtin isOffline

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Determine whether the EDD Application can currently communicate with the field device

The builtin isOffline returns a non-zero value when the EDD Application state (within the context of the calling method) is currently "Offline".

### Lexical structure

```
isOffline()
```

The lexical element of the builtin isOffline is shown in Table 142.

**Table 142 – Builtin isOffline**

| Parameter name | Type | Direction | Usage | Description                                                                                                                                  |
|----------------|------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <return>       | int  | O         | m     | Non-zero if the EDD application is offline and cannot communicate with the device, 0 if the EDD application can communicate with the device. |

### Example

```
int offline;
offline = isOffline();
```

### 6.4.12 Builtin lgetval

**Communication profiles:** CS, GPE, PB, PN

### Purpose

The builtin lgetval is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin returns the value of a VARIABLE as it was received from the connected device. Custom calculations may then be performed on the VARIABLE value before it is stored in the EDD application. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be retrieved, or if the VARIABLE is not of the appropriate type defined in Table 9.

**Lexical structure**

```
lgetval (VOID)
```

The lexical element of the builtin lgetval is shown in Table 143.

**Table 143 – Builtin lgetval**

| Parameter name | Type | Direction | Usage | Description                |
|----------------|------|-----------|-------|----------------------------|
| <return>       | int  | O         | m     | The value of the VARIABLE. |

**6.4.13 Builtin lsetval**

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Set long value

The builtin lsetval is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin sets the value of a VARIABLE to the specified value. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be set, or if the VARIABLE is not of the appropriate type defined in Table 9.

**Lexical structure**

```
lsetval (value)
```

The lexical elements of the builtin lsetval are shown in Table 144.

**Table 144 – Builtin lsetval**

| Parameter name | Type | Direction | Usage | Description                    |
|----------------|------|-----------|-------|--------------------------------|
| value          | int  |           | m     | The new value of the VARIABLE. |
| <return>       | int  | O         | m     | The value of the VARIABLE.     |

**6.4.14 Builtin put\_date**

**Communication profiles:** FF, ISA100

**Purpose:** Store date value in VARIABLE

The builtin put\_date is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin sets the value of a VARIABLE to the specified value. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be set, or if the VARIABLE is not of the appropriate type defined in Table 9.

**Lexical structure**

```
put_date (data, size)
```

The lexical elements of the builtin put\_date are shown in Table 145.

**Table 145 – Builtin put\_date**

| Parameter name | Type   | Direction | Usage | Description                                     |
|----------------|--------|-----------|-------|-------------------------------------------------|
| data           | char[] | I         | m     | The new value of the VARIABLE.                  |
| size           | long   | I         | m     | The length of the new value.                    |
| <return>       | long   | O         | m     | One of the return codes specified in Table 376. |

**Example**

```
long date_size, status;
char date_value[7];
```

```
/* set DATE_AND_TIME to August 19, 2016 14:30:03 */
```

```
date_size = 7;
date_value[0]=0x0B;      /* 3 seconds = 3000 ms = 0xBB8 */
date_value[1]=0xB8;
date_value[2]= 30;       /* 30 minutes */
date_value[3]= 14;       /* 14 hours */
date_value[4]=0xB3;      /* 0xB3 = (5 (Friday) << 5) + 19 (day of month) */
date_value[5]= 8;        /* August = 8 */
date_value[6]= 116;      /* year of 2016 = 116 + 1900 */
```

```
status = put_date(date_value, date_size);
```

**6.4.15 Builtin put\_double****Communication profiles: FF, ISA100****Purpose: Store double value to VARIABLE**

The builtin put\_double is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin sets the value of a VARIABLE to the specified value. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be set, or if the VARIABLE is not of the appropriate type defined in Table 9.

**Lexical structure**

```
put_double(value)
```

The lexical elements of the builtin put\_double are shown in Table 146.

**Table 146 – Builtin put\_double**

| Parameter name | Type   | Direction | Usage | Description                                     |
|----------------|--------|-----------|-------|-------------------------------------------------|
| value          | double | I         | m     | The new value of the VARIABLE.                  |
| <return>       | long   | O         | m     | One of the return codes specified in Table 376. |

**Example**

```
long status;
double value;
value = 3.14159;
status = put_double(value);
```

### 6.4.16 Builtin put\_float

**Communication profiles: FF, ISA100**

**Purpose: Store float value to VARIABLE**

The builtin put\_float is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin sets the value of a VARIABLE to the specified value. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be set, or if the VARIABLE is not of the appropriate type defined in Table 9.

#### Lexical structure

put\_float(value)

The lexical elements of the builtin put\_float are shown in Table 147.

**Table 147 – Builtin put\_float**

| Parameter name | Type   | Direction | Usage | Description                                                                                                                                                                                     |
|----------------|--------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| value          | double | I         | m     | The new value of the VARIABLE.<br>The value is passed as a double to allow an expression to be passed.<br>Many compilers perform a single to double conversion prior to evaluating expressions. |
| <return>       | long   | O         | m     | One of the return codes specified in Table 376.                                                                                                                                                 |

#### Example

```
long status;
float value;
value = 279.55025;
status = put_float((double) value);
```

### 6.4.17 Builtin put\_signed

**Communication profiles: FF, ISA100**

**Purpose: Store signed value to VARIABLE**

The builtin put\_signed is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin sets the value of a VARIABLE to the specified value. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be set, or if the VARIABLE is not of the appropriate type specified in Table 9.

#### Lexical structure

put\_signed(value)

The lexical elements of the builtin put\_signed are shown in Table 148.



**Table 148 – Builtin put\_signed**

| Parameter name | Type | Direction | Usage | Description                                     |
|----------------|------|-----------|-------|-------------------------------------------------|
| value          | long | I         | m     | The new value of the VARIABLE.                  |
| <return>       | long | O         | m     | One of the return codes specified in Table 376. |

**Example**

```

long status;
long value;
value = -3592;
status = put_signed(value);

```

**6.4.18 Builtin put\_string**

**Communication profiles: FF, ISA100**

**Purpose: Store string value to VARIABLE**

The builtin put\_string is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin sets the value of a VARIABLE to the specified value. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be set, or if the VARIABLE is not of the appropriate type defined in Table 9.

VARIABLEs with data types of enumerated, bit enumerated, and index shall be handled by the method because they are not supported by the programming language-C.

**Lexical structure**

```
put_string(string, len)
```

The lexical elements of the builtin put\_string are shown in Table 149.

**Table 149 – Builtin put\_string**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                              |
|----------------|-----------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING | I         | m     | The new value of the VARIABLE. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| len            | long      | I         | m     | The length of the new value.                                                                                                                             |
| <return>       | long      | O         | m     | One of the return codes specified in Table 376.                                                                                                          |

**Example**

```

long status;
status = put_string("xyz", 3);

```

#### 6.4.19 Builtin put\_unsigned

**Communication profiles:** FF, ISA100

**Purpose:** Store unsigned value to VARIABLE

The builtin put\_unsigned is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin sets the value of a VARIABLE to the specified value. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be set, or if the VARIABLE is not of the appropriate type defined in Table 9.

#### Lexical structure

put\_unsigned(value)

The lexical elements of the builtin put\_unsigned are shown in Table 150.

**Table 150 – Builtin put\_unsigned**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| value          | unsigned long | I         | o     | The new value of the VARIABLE.                  |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

#### Example

```
long status;
unsigned long value;
value = 123;
status = put_unsigned(value);
```

#### 6.4.20 Builtin sgetval

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Get the value of a VARIABLE of a string type

The builtin sgetval is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin returns the value of a VARIABLE as it was received from the connected device. Custom calculations may then be performed on the VARIABLE value before it is stored in the EDD application. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be retrieved, or if the VARIABLE is not of the appropriate type defined in Table 9.

#### Lexical structure

sgetval(value)

The lexical elements of the builtin sgetval are shown in Table 151.

**Table 151 – Builtin sgetval**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                          |
|----------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| value          | DD_STRING | O         | m     | The value of the VARIABLE. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | int       | O         | m     | BI_SUCCESS if the assignment was successful.                                                                                                         |

**Example**

```
DD_STRING sval;
sgetval(sval);
```

In the above example (assume that this is in a pre-edit method on the VARIABLE “tag”, an 8 character variable), sval will be set to the current value of the VARIABLE “tag”.

**6.4.21 Builtin ssetval**

**Communication profiles: CS, GPE, HART, PB, PN**

**Purpose: Set the value of a VARIABLE of a string type**

The builtin ssetval is specifically designed to be used in VARIABLE actions. Refer to Table 9 for the list of action types which may call this builtin.

This builtin sets the value of a VARIABLE to the specified value. If the string passed in is longer than the size specified for the VARIABLE, it will be truncated to fit. If the string passed in is shorter than the size specified for the VARIABLE, it will be padded with spaces. The method aborts if it is not an action called from a VARIABLE, if the value of the VARIABLE cannot be set, or if the VARIABLE is not of the appropriate type defined in Table 9.

**Lexical structure**

```
ssetval(value)
```

The lexical elements of the builtin ssetval are shown in Table 152.

**Table 152 – Builtin ssetval**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                          |
|----------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| value          | DD_STRING | I         | m     | The value of the VARIABLE. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | DD_STRING | O         | m     | The value of the VARIABLE.                                                                                                                           |

**6.5 Variable access builtins****6.5.1 Builtin assign**

**Communication profiles: FF, ISA100**

**Purpose: Sets the value of a parameter**

The builtin assign sets the value of a VARIABLE to another VARIABLE's value. It reads the value of the source VARIABLE (from either the device or the variable table) and sets the value of the destination VARIABLE (to either the device or the variable table) equal to the value of the source VARIABLE.

NOTE The builtin is a shorthand way of doing an `get_<type>_value` followed by a `put_<type>_value` where `<type>` is any one of the following value types: date, float, double, signed, string, unsigned.

The parameters `dst_id`, `src_id`, `dst_member_id`, and `src_member_id` are specified using the builtins `ITEM_ID` and `MEMBER_ID` and the reference of the VARIABLE. Both the source VARIABLES and the destination VARIABLE shall have the same type.

### Lexical structure

```
assign(dst_id, dst_member_id, src_id, src_member_id)
```

The lexical elements of the builtin `assign` are shown in Table 153.

**Table 153 – Builtin assign**

| Parameter name              | Type          | Direction | Usage | Description                                     |
|-----------------------------|---------------|-----------|-------|-------------------------------------------------|
| <code>dst_id</code>         | unsigned long | I         | m     | The item id of the destination VARIABLE.        |
| <code>dst_member_id</code>  | unsigned long | I         | m     | The member id of the destination VARIABLE.      |
| <code>src_id</code>         | unsigned long | I         | m     | The item id of the source VARIABLE.             |
| <code>src_member_id</code>  | unsigned long | I         | m     | The member id of the source VARIABLE.           |
| <code>&lt;return&gt;</code> | long          | O         | m     | One of the return codes specified in Table 376. |

### Example

```
long status;
status = assign(ITEM_ID(PARAM.OUT), MEMBER_ID(VALUE),
```

## 6.5.2 Builtin assign\_double

**Communication profiles: CS, GPE, HART, PB, PN**

**Purpose: Assign a value to a VARIABLE of type double**

The builtin `assign_double` assigns a value to a VARIABLE. The referenced VARIABLE shall be VARIABLE of type DOUBLE.

### Lexical structure

```
assign_double(device_var, new_value)
```

The lexical elements of the builtin `assign_double` are shown in Table 154.

**Table 154 – Builtin assign\_double**

| Parameter name              | Type      | Direction | Usage | Description                                                                                                                                                                              |
|-----------------------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>device_var</code>     | reference | I         | m     | The name of the VARIABLE.                                                                                                                                                                |
| <code>new_value</code>      | double    | I         | m     | The new value of the referenced VARIABLE.                                                                                                                                                |
| <code>&lt;return&gt;</code> | int       | O         | m     | One of the return codes specified in Table 377. <code>BI_SUCCESS</code> if the assignment was successful, and <code>BI_ERROR</code> if the VARIABLE identifier was invalid or erroneous. |

### Example

```
assign_double(pressure_upper_range_value, 1.2345678);
```

In this example, the VARIABLE `pressure_upper_range_value` will be set to the float value 1,2345678.

### 6.5.3 Builtin `assign_float`

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Assign a value to a VARIABLE of type float

The builtin `assign_float` assigns a value to VARIABLE. The referenced VARIABLE shall be a VARIABLE of type FLOAT.

#### Lexical structure

```
assign_float(device_var, new_value)
```

The lexical elements of the builtin `assign_float` are shown in Table 155.

**Table 155 – Builtin `assign_float`**

| Parameter name              | Type      | Direction | Usage | Description                                                                                                                                                       |
|-----------------------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>device_var</code>     | reference | I         | m     | The name of the VARIABLE.                                                                                                                                         |
| <code>new_value</code>      | double    | I         | m     | The new value of the referenced VARIABLE.                                                                                                                         |
| <code>&lt;return&gt;</code> | int       | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the assignment was successful, and BI_ERROR if either VARIABLE identifier was invalid or erroneous. |

#### Example

```
assign_float(pressure_upper_range_value, 1.23);
```

In this example, the VARIABLE `pressure_upper_range_value` will be set to the floating point value 1,23.

### 6.5.4 Builtin `assign_int`

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Assign a value to a VARIABLE of type integer

The builtin `assign_int` assigns a value to VARIABLE. The referenced VARIABLE shall be a VARIABLE of type INTEGER.

#### Lexical structure

```
assign_int(device_var, new_value)
```

The lexical elements of the builtin `assign_int` are shown in Table 156.

**Table 156 – Builtin `assign_int`**

| Parameter name              | Type      | Direction | Usage | Description                                                                                                                                                       |
|-----------------------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>device_var</code>     | reference | I         | m     | The name of the VARIABLE.                                                                                                                                         |
| <code>new_value</code>      | int       | I         | m     | The new value of the referenced VARIABLE.                                                                                                                         |
| <code>&lt;return&gt;</code> | int       | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the assignment was successful, and BI_ERROR if either VARIABLE identifier was invalid or erroneous. |

**Example**

```
assign_int(pressure_upper_range_value, 1);
```

In this example, the VARIABLE `pressure_upper_range_value` will be set to the integer value 1.

**6.5.5 Builtin assign\_var**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Assign value of one VARIABLE to another

The builtin `assign_var` assigns a value of the source VARIABLE to the destination VARIABLE. Both VARIABLES shall have the same type.

**Lexical structure**

```
assign_var(destination_var, source_var)
```

The lexical elements of the builtin `assign_var` are shown in Table 157.

**Table 157 – Builtin assign\_var**

| Parameter name               | Type      | Direction | Usage | Description                                                                                                                                                       |
|------------------------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>destination_var</code> | reference | I         | m     | The name of the destination VARIABLE.                                                                                                                             |
| <code>source_var</code>      | reference | I         | m     | The name of the source VARIABLE.                                                                                                                                  |
| <code>&lt;return&gt;</code>  | int       | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the assignment was successful, and BI_ERROR if either VARIABLE identifier was invalid or erroneous. |

**Example**

```
vassign(pressure_units, range_units);
```

In this example, the current value of `range_units` will be stored in the current value of `pressure_units`.

**6.5.6 Builtin assign2**

**Communication profiles:** FF, ISA100

**Purpose:** Sets the value of a VARIABLE, record member, or array element

The builtin `assign2` reads a value from the source block and writes it to the destination block. In a caching EDD application, the source value is retrieved from the source block's variable table and stored in the destination block's variable table, whereas in a non-caching EDD application the source value is read from the source block in the device and written to the destination block in the device.

The `dst_blk_id`, `dst_blk_num`, `dst_id`, and `dst_member_id` parameters collectively specify the destination VARIABLE, record member, or array element; while the `src_blk_id`, `src_blk_num`, `src_id`, and `src_member_id` parameters collectively specify the source VARIABLE, record member, or array element.

The `dst_blk_id` and `src_blk_id` parameters specify the item id of the blocks to be accessed, while the `dst_blk_num` and `src_blk_num` parameters specify the relative indices of the blocks to be accessed.

If the `dst_id` parameter references a simple VARIABLE, the `dst_member_id` parameter is ignored. If the `dst_id` parameter references a record, the `dst_member_id` parameter specifies a member of the record. If the `dst_id` parameter references an array parameter, the `dst_member_id` parameter specifies an element of the array.

If the `src_id` parameter references a simple VARIABLE, the `src_member_id` parameter is ignored. If the `src_id` parameter references a record, the `src_member_id` parameter specifies a member of the record. If the `src_id` parameter references an array parameter, the `src_member_id` parameter specifies an element of the array.

The `dst_blk_id`, `src_blk_id`, `dst_id`, `src_id`, `dst_member_id`, and `src_member_id` parameters are typically specified using the builtins `ITEM_ID` and `MEMBER_ID`. The `dst_blk_num` and `src_blk_num` parameters are typically specified using the builtins `get_block_instance_by_object_index` and `get_block_instance_by_block_tag`.

NOTE This built-in function provides a shorthand way of performing a `get_<type>_value2()` followed by a `put_<type>_value2()`, where `<typw>` is one of the following: date, float, double, signed, string, unsigned.

Both the source value and the destination value shall have the same type.

### Lexical structure

```
assign2(dst_blk_id, dst_blk_num, dst_id, dst_member_id, src_blk_id,
src_blk_num, src_id, src_member_id)
```

The lexical elements of the builtin `assign2` are shown in Table 158.

**Table 158 – Builtin assign2**

| Parameter name              | Type          | Direction | Usage | Description                                                      |
|-----------------------------|---------------|-----------|-------|------------------------------------------------------------------|
| <code>dst_blk_id</code>     | unsigned long | I         | m     | The item id of the destination block.                            |
| <code>dst_blk_num</code>    | unsigned long | I         | m     | The occurrence number of the destination block.                  |
| <code>dst_id</code>         | unsigned long | I         | m     | The item id of the destination VARIABLE, record, or array.       |
| <code>dst_member_id</code>  | unsigned long | I         | m     | The member id of the destination record member or array element. |
| <code>src_blk_id</code>     | unsigned long | I         | m     | The item id of the source block.                                 |
| <code>src_blk_num</code>    | unsigned long | I         | m     | The occurrence number of the source block.                       |
| <code>src_id</code>         | unsigned long | I         | m     | The item id of the source VARIABLE, record, or array.            |
| <code>src_member_id</code>  | unsigned long | I         | m     | The member id of the source record member or array element.      |
| <code>&lt;return&gt;</code> | long          | O         | m     | One of the return codes specified in Table 376.                  |

### Example

```
long status;
unsigned long aiBlock;
aiBlock = ITEM_ID(__analog_input_block);
status = assign2(aiBlock, 0, MEMBER_ID(OUT), MEMBER_ID(VALUE),
aiBlock, 0, MEMBER_ID(PV), MEMBER_ID(VALUE));
```

### 6.5.7 Builtin dassign

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Assign a value to a VARIABLE of type double

The builtin dassign assigns a value to a VARIABLE. The referenced VARIABLE shall be a VARIABLE of type DOUBLE.

#### Lexical structure

```
dassign(device_var, new_value)
```

The lexical elements of the builtin dassign are shown in Table 159.

**Table 159 – Builtin dassign**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                    |
|----------------|-----------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| device_var     | reference | I         | m     | The name of the VARIABLE.                                                                                                                                      |
| new_value      | double    | I         | m     | The new value of the referenced VARIABLE.                                                                                                                      |
| <return>       | int       | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the assignment was successful, and BI_ERROR if the VARIABLE identifier was invalid or erroneous. |

### 6.5.8 Builtin fassign

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Assign a value to a VARIABLE of type float

The builtin fassign assigns a value to a VARIABLE. The referenced VARIABLE shall be a VARIABLE of type FLOAT.

#### Lexical structure

```
fassign(device_var, new_value)
```

The lexical elements of the builtin fassign are shown in Table 160.

**Table 160 – Builtin fassign**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                       |
|----------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| device_var     | reference | I         | m     | The name of the VARIABLE.                                                                                                                                         |
| new_value      | double    | I         | m     | The new value of the referenced VARIABLE.                                                                                                                         |
| <return>       | int       | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the assignment was successful, and BI_ERROR if either VARIABLE identifier was invalid or erroneous. |

### 6.5.9 Builtin float\_value

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Get the value of a VARIABLE of type float

The builtin float\_value returns the value of the specified VARIABLE. The referenced VARIABLE shall be of type FLOAT.



**Lexical structure**

```
float_value(source_var_name)
```

The lexical elements of the builtin float\_value are shown in Table 161.

**Table 161 – Builtin float\_value**

| Parameter name  | Type      | Direction | Usage | Description                       |
|-----------------|-----------|-----------|-------|-----------------------------------|
| source_var_name | reference | I         | m     | The name of a VARIABLE reference. |
| <return>        | double    | O         | m     | The value of the VARIABLE.        |

**Example**

```
float fval;
fval = float_value(pressure_upper_range_value);
```

In this example, the value of pressure\_upper\_range\_value is returned and stored in the method-variable fval.

**6.5.10 Builtin fvar\_value**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Get the value of a VARIABLE of type float

The builtin fvar\_value returns the value of the specified VARIABLE. The referenced VARIABLE shall be of type FLOAT.

**Lexical structure**

```
fvar_value(source_var)
```

The lexical elements of the builtin fvar\_value are shown in Table 162.

**Table 162 – Builtin fvar\_value**

| Parameter name | Type      | Direction | Usage | Description                         |
|----------------|-----------|-----------|-------|-------------------------------------|
| source_var     | reference | I         | m     | The name of the VARIABLE reference. |
| <return>       | double    | O         | m     | The value of the VARIABLE.          |

**6.5.11 Builtin get\_date\_value**

**Communication profiles:** FF, ISA100

**Purpose:** Gets the current value of a date VARIABLE

The builtin get\_date\_value retrieves the current scaled value of the specified VARIABLE from the cache or device and returns it.

The value is an octet buffer that may contain up to eight characters and a VARIABLE of device type date-and-time, time, or duration.

The parameters id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID and the name or reference of the VARIABLE in question.

**Lexical structure**

```
get_date_value(id, member_id, data, size)
```

The lexical elements of the builtin get\_date\_value are shown in Table 163.

**Table 163 – Builtin get\_date\_value**

| Parameter name | Type          | Direction | Usage | Description                                              |
|----------------|---------------|-----------|-------|----------------------------------------------------------|
| id             | unsigned long | I         | m     | An id of a VARIABLE reference.                           |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE to access.                 |
| data           | char[]        | O         | m     | A buffer of max. 8 octets for the result of the builtin. |
| size           | long          | O         | m     | The size of the used buffer.                             |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.          |

**Example**

```
long status, date_size;
char date_buf[8];
```

```
status = get_date_value(ITEM_ID(PARAM.CALIBRATION), MEMBER_ID(DATE),
date_buf, &date_size);
```

**6.5.12 Builtin get\_date\_value2****Communication profiles: FF, ISA100****Purpose: Retrieves the value of a VARIABLE, record member or array element**

The builtin get\_date\_value2 retrieves the current scaled value of the specified VARIABLE from the cache or device and returns it.

The value is an octet buffer that may contain up to eight characters and contain a VARIABLE of device type date-and-time, time, or duration.

The blk\_id parameter specifies the item id of the block to be accessed, while the blk\_num parameter specifies the occurrence number of the block to be accessed.

If the id parameter references a simple VARIABLE, the member\_id parameter is ignored. If the id parameter references a record, the member\_id parameter specifies a member of the record. If the id parameter references an array parameter, the member\_id parameter specifies an element of the array.

The blk\_id, id, and member\_id parameters are typically specified using the builtins ITEM\_ID and MEMBER\_ID.

The blk\_num parameter is typically specified using the builtins get\_block\_instance\_by\_object\_index and get\_block\_instance\_by\_block\_tag.

The value and length parameters specify a buffer that, upon return, contains up to eight characters with a data type of Date, Time of Day, or Time Difference.

The type of the specified VARIABLE, record member or array element shall be one of the following:

- DATE\_AND\_TIME
- TIME
- DURATION

**Lexical structure**

```
get_date_value2(blk_id, blk_num, id, member_id, data, size)
```

The lexical elements of the builtin `get_date_value2` are shown in Table 164.

**Table 164 – Builtin `get_date_value2`**

| Parameter name | Type          | Direction | Usage | Description                                              |
|----------------|---------------|-----------|-------|----------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the BLOCK_A instance to access.           |
| blk_num        | unsigned long | I         | m     | The occurrence number of the BLOCK_A instance to access. |
| id             | unsigned long | I         | m     | An id of a VARIABLE, RECORD, or ARRAY reference.         |
| member_id      | unsigned long | I         | m     | The record member or array element to be accessed.       |
| data           | char[]        | O         | m     | A buffer of max. 8 octets for the result of the builtin. |
| size           | long          | O         | m     | The size of the used buffer.                             |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.          |

**Example**

```
long status, date_size;
char date_buf[8];
```

```
status = get_date_value2(ITEM_ID(transducer_block), 0,
MEMBER_ID(CALIBRATION), MEMBER_ID(TEMP), date_buf, &date_size);
```

**6.5.13 Builtin `get_double_value`**

**Communication profiles:** FF, ISA100

**Purpose:** Gets the current value of a double float VARIABLE

The builtin `get_double_value` retrieves the current scaled value of the specified VARIABLE from the cache or device and returns it.

The parameters `id` and `member_id` are specified using the builtins `ITEM_ID` and `MEMBER_ID` and the name or reference of the VARIABLE.

The VARIABLE shall have a data type of DOUBLE.

**Lexical structure**

```
get_double_value(id, member_id, value)
```

The lexical elements of the builtin `get_double_value` are shown in Table 165.

**Table 165 – Builtin get\_double\_value**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| id             | unsigned long | I         | m     | The item id of the VARIABLE to access.          |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE to access.        |
| value          | double        | O         | m     | The returned value of the VARIABLE.             |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

**Example**

```
long status;
double value;
status = get_double_value(ITEM_ID(PARAM.SAMPLE), 0, &value);
```

**6.5.14 Builtin get\_double\_value2****Communication profiles: FF, ISA100****Purpose: Gets the current value of a VARIABLE, record member or array element**

The builtin `get_double_value2` retrieves the current scaled value of the specified VARIABLE, record member or array element from the cache or device and returns it.

The `blk_id` parameter specifies the item id of the block to be accessed, while the `blk_num` parameter specifies the occurrence number of the block to be accessed.

If the `id` parameter references a simple VARIABLE, the `member_id` parameter is ignored. If the `id` parameter references a record, the `member_id` parameter specifies a member of the record. If the `id` parameter references an array parameter, the `member_id` parameter specifies an element of the array.

The parameters `blk_id`, `id` and `member_id` are specified using the builtins `ITEM_ID` and `MEMBER_ID` and the name or reference of the VARIABLE. The `blk_num` parameter is typically specified using the Builtins `get_block_instance_by_object_index` and `get_block_instance_by_block_tag`.

The VARIABLE, record member or array shall have a data type of DOUBLE.

**Lexical structure**

```
get_double_value2(blk_id, blk_num, id, member_id, value)
```

The lexical elements of the builtin `get_double_value2` are shown in Table 166.

**Table 166 – Builtin get\_double\_value2**

| Parameter name | Type          | Direction | Usage | Description                                              |
|----------------|---------------|-----------|-------|----------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the BLOCK_A instance to access.           |
| blk_num        | unsigned long | I         | m     | The occurrence number of the BLOCK_A instance to access. |
| id             | unsigned long | I         | m     | The Item id of the VARIABLE to access.                   |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE to access.                 |
| value          | double        | O         | m     | The returned value of the VARIABLE.                      |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.          |

**Example**

```
long status;
double value;
status = get_double_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(SAMPLE), 0, &value);
```

**6.5.15 Builtin get\_float\_value****Communication profiles: FF, ISA100****Purpose: Gets the current scaled value of a floating-point VARIABLE**

The builtin get\_float\_value retrieves the current scaled value of the specified VARIABLE from the cache or device and returns it.

The parameters id and member id are specified using the builtins ITEM\_ID and MEMBER\_ID and the name or reference of the VARIABLE.

The VARIABLE shall have a data type of FLOAT.

**Lexical structure**

```
get_float_value(id, member_id, value)
```

The lexical elements of the builtin get\_float\_value are shown in Table 167.

**Table 167 – Builtin get\_float\_value**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| id             | unsigned long | I         | m     | The item id of the VARIABLE to access.          |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE to access.        |
| value          | float         | O         | m     | The returned value of the VARIABLE.             |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

**Example**

```
long status;
float value;
status = get_float_value(ITEM_ID(PARAM.SAMPLE), 0, &value);
```

### 6.5.16 Builtin get\_float\_value2

**Communication profiles: FF, ISA100**

**Purpose: Retrieves the value of a VARIABLE, record member or array element**

The builtin get\_float\_value2 retrieves the current scaled value of the specified VARIABLE from the cache or device and returns it.

The blk\_id parameter specifies the item id of the block to be accessed, while the blk\_num parameter specifies the occurrence number of the block to be accessed.

If the id parameter references a simple VARIABLE, the member\_id parameter is ignored. If the id parameter references a record, the member\_id parameter specifies a member of the record. If the id parameter references an array parameter, the member\_id parameter specifies an element of the array.

The parameters blk\_id, id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID and the name or reference of the VARIABLE. The blk\_num parameter is typically specified using the builtins get\_block\_instance\_by\_object\_index and get\_block\_instance\_by\_block\_tag.

The type of the specified VARIABLE, record member or array element shall be FLOAT.

#### Lexical structure

```
get_float_value2(blk_id, blk_num, id, member_id, value)
```

The lexical elements of the builtin get\_float\_value2 are shown in Table 168.

**Table 168 – Builtin get\_float\_value2**

| Parameter name | Type          | Direction | Usage | Description                                              |
|----------------|---------------|-----------|-------|----------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the BLOCK_A instance to access.           |
| blk_num        | unsigned long | I         | m     | The occurrence number of the BLOCK_A instance to access. |
| id             | unsigned long | I         | m     | The item id of the VARIABLE to access.                   |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE to access.                 |
| value          | float         | O         | m     | The returned value of the VARIABLE.                      |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.          |

#### Example

```
long status;
float value;
status = get_float_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(SAMPLE), 0, &value);
```

### 6.5.17 Builtin get\_signed\_value

**Communication profiles:** FF, ISA100

**Purpose:** Gets the current scaled value of a signed integer VARIABLE

The builtin get\_signed\_value retrieves the current scaled value of the specified VARIABLE from the cache or device and returns it.

The id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID and the name or reference of the VARIABLE. The VARIABLE shall have a data type of signed long.

#### Lexical structure

get\_signed\_value(id, member\_id, value)

The lexical elements of the builtin get\_signed\_value are shown in Table 169.

**Table 169 – builtin get\_signed\_value**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| id             | unsigned long | I         | m     | The item id of the VARIABLE to access.          |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE to access.        |
| value          | signed long   | O         | m     | The returned value of the signed VARIABLE.      |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

#### Example

```
long status;
long value;
status = get_signed_value(ITEM_ID(PARAM.PV_SCALE), MEMBER_ID(DECIMAL_PT),
&value);
```

### 6.5.18 Builtin get\_signed\_value2

**Communication profiles:** FF, ISA100

**Purpose:** Retrieves the value of a VARIABLE, record member or array element

The builtin get\_signed\_value2 retrieves the current scaled value of the specified VARIABLE, record member or array element from the cache or device and returns it.

The blk\_id parameter specifies the item id of the block to be accessed, while the blk\_num parameter specifies the occurrence number of the block to be accessed.

If the id parameter references a simple VARIABLE, the member\_id parameter is ignored. If the id parameter references a record, the member\_id parameter specifies a member of the record. If the id parameter references an array parameter, the member\_id parameter specifies an element of the array.

The blk\_id, id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID. The Blk\_num parameter is specified using the builtins get\_block\_instance\_by\_object\_index and get\_block\_instance\_by\_block\_tag.

The VARIABLE, record member or array element shall have a data type of signed long.

**Lexical structure**

```
get_signed_value2(blk_id, blk_num, id, member_id, value)
```

The lexical elements of the builtin `get_signed_value2` are shown in Table 170.

**Table 170 – Builtin `get_signed_value2`**

| Parameter name | Type          | Direction | Usage | Description                                              |
|----------------|---------------|-----------|-------|----------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the BLOCK_A instance to access.           |
| blk_num        | unsigned long | I         | m     | The occurrence number of the BLOCK_A instance to access. |
| id             | unsigned long | I         | m     | The item id of the VARIABLE to access.                   |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE to access.                 |
| value          | signed long   | O         | m     | The returned value of the signed VARIABLE.               |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.          |

**Example**

```
long status;
long value;
status = get_signed_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(PV_SCALE), MEMBER_ID(DECIMAL_PT), &value);
```

**6.5.19 Builtin `get_string_value`**

**Communication profiles:** FF, ISA100

**Purpose:** Gets the current value of a string VARIABLE

The builtin `get_string_value` retrieves the current string value of the specified VARIABLE from the cache or device and returns it.

The `id` and `member_id` are specified using the builtins `ITEM_ID` and `MEMBER_ID` and the name or reference of the variable in question.

The VARIABLE shall have a data type of `char` and be a byte buffer that can contain various non-ANSI data types such as:

- `VISIBLE`
- `OCTET`
- `PASSWORD`
- `BITSTRING`
- `EUC`
- `ASCII`

**Lexical structure**

```
get_string_value(id, member_id, string, len)
```

The lexical elements of the builtin `get_string_value` are shown in Table 171.



**Table 171 – Builtin get\_string\_value**

| Parameter name | Type          | Direction | Usage | Description                                                                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------------------------------------------------------|
| id             | unsigned long | I         | m     | The id of a VARIABLE reference.                                                                 |
| member_id      | unsigned long | I         | m     | The member id of a BLOCK_A, PARAMETER_LIST, RECORD, VALUE_ARRAY, COLLECTION or REFERENCE_ARRAY. |
| string         | char*         | O         | m     | The buffer of result string.                                                                    |
| len            | long          | O         | m     | The size of the result string.                                                                  |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.                                                 |

**Example**

```

long status;
long len;
char buf[256];
len = 256;
status = get_string_value(ITEM_ID(PARAM.TAG_DESC), 0, buf, &len);

```

**6.5.20 Builtin get\_string\_value2****Communication profiles: FF, ISA100****Purpose: Retrieves the value of a VARIABLE, record member or array element**

The builtin get\_string\_value2 retrieves the current string value of the specified VARIABLE, record member or array element from the cache or device and returns it.

The blk\_id parameter specifies the item id of the block to be accessed, while the blk\_num parameter specifies the occurrence number of the block to be accessed.

If the id parameter references a simple VARIABLE, the member\_id parameter is ignored. If the id parameter references a record, the member\_id parameter specifies a member of the record. If the id parameter references an array parameter, the member\_id parameter specifies an element of the array.

The parameters blk\_id, id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID. The blk\_num parameter is specified using the builtins get\_block\_instance\_by\_object\_index and get\_block\_instance\_by\_block\_tag.

The type of the specified VARIABLE, record member or array element shall be one of the following:

- EUC
- ASCII
- PASSWORD
- BITSTRING
- VISIBLE
- OCTET

**Lexical structure**

```
get_string_value2(blk_id, blk_num, id, member_id, string, len)
```

The lexical elements of the builtin get\_string\_value2 are shown in Table 172.

**Table 172 – Builtin get\_string\_value2**

| Parameter name | Type          | Direction | Usage | Description                                                                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the BLOCK_A instance to access.                                                  |
| blk_num        | unsigned long | I         | m     | The occurrence number of the BLOCK_A instance to access.                                        |
| id             | unsigned long | I         | m     | The id of a VARIABLE reference.                                                                 |
| member_id      | unsigned long | I         | m     | The member id of a BLOCK_A, PARAMETER_LIST, RECORD, VALUE_ARRAY, COLLECTION or REFERENCE_ARRAY. |
| string         | char*         | O         | m     | Specifies the buffer of result string.                                                          |
| len            | long          | O         | m     | The size of the result string.                                                                  |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.                                                 |

**Example**

```

long status;
long len;
char buf[256];
len = 256;
status = get_string_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(TAG_DESC), 0, buf, &len);

```

**6.5.21 Builtin get\_unsigned\_value****Communication profiles: FF, ISA100****Purpose: Gets the current value of an unsigned integer VARIABLE**

The builtin get\_unsigned\_value retrieves the current scaled value of the specified VARIABLE from the cache or device and returns it.

The parameters id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID and the name or reference of the VARIABLE in question.

The VARIABLE shall have a data type of unsigned. An unsigned value may contain VARIABLES of the following data types:

- UNSIGNED
- ENUMERATED
- BIT\_ENUMERATED
- INDEX
- BOOLEAN

VARIABLEs with data types of enumerated, bit\_enumerated, and index shall be handled by the method because they are not supported by the programming language-C.

**Lexical structure**

```
get_unsigned_value(id, member_id, value)
```

The lexical elements of the builtin get\_unsigned\_value are shown in Table 173.

**Table 173 – Builtin get\_unsigned\_value**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| id             | unsigned long | I         | m     | The item id of the VARIABLE to access.          |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE to access.        |
| value          | unsigned long | O         | m     | The returned value of the VARIABLE.             |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

**Example**

```
long status;
unsigned long value;
status = get_unsigned_value (ITEM_ID (PARAM.PV_STATE), 0, &value);
```

**6.5.22 Builtin get\_unsigned\_value2****Communication profiles: FF, ISA100****Purpose: Retrieves the value of a VARIABLE, record member or array element**

The builtin get\_unsigned\_value2 retrieves the current scaled value of the specified VARIABLE, record member or array element from the cache or device and returns it.

The blk\_id parameter specifies the item id of the block to be accessed, while the blockInstance parameter specifies the occurrence number of the block to be accessed.

If the id parameter references a simple VARIABLE, the member\_id parameter is ignored. If the id parameter references a record, the member\_id parameter specifies a member of the record. If the id parameter references an array parameter, the member\_id parameter specifies an element of the array.

The parameters blk\_id, id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID. The blk\_num parameter is specified using the builtins get\_block\_instance\_by\_object\_index and get\_block\_instance\_by\_block\_tag.

The VARIABLE shall have a data type of unsigned. An unsigned value may contain VARIABLES of the following data types:

- UNSIGNED
- ENUMERATED
- BIT\_ENUMERATED
- INDEX
- BOOLEAN

VARIABLEs with data types of enumerated, bit\_enumerated, and index shall be handled by the method because they are not supported by the programming language-C.

**Lexical structure**

```
get_unsigned_value2 (blk_id, blk_num, id, member_id, value)
```

The lexical elements of the builtin get\_unsigned\_value2 are shown in Table 174.

**Table 174 – Builtin get\_unsigned\_value2**

| Parameter name | Type          | Direction | Usage | Description                                              |
|----------------|---------------|-----------|-------|----------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the BLOCK_A instance to access.           |
| blk_num        | unsigned long | I         | m     | The occurrence number of the BLOCK_A instance to access. |
| id             | unsigned long | I         | m     | The item id of the VARIABLE to access.                   |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE to access.                 |
| value          | unsigned long | O         | m     | The returned value of the VARIABLE.                      |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.          |

**Example**

```
long status;
unsigned long value;
status = get_unsigned_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(PV_STATE), 0, &value);
```

**6.5.23 Builtin iassign**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Assign a value to a VARIABLE of type integer

The builtin iassign will assign the specified value to the VARIABLE. The VARIABLE shall reference a VARIABLE of type INTEGER.

**Lexical structure**

```
iassign(device_var, new_value)
```

The lexical elements of the builtin iassign are shown in Table 175.

**Table 175 – Builtin iassign**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                       |
|----------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| device_var     | reference | I         | m     | The name of the VARIABLE to access.                                                                                                                               |
| new_value      | int       | I         | m     | The new value of the VARIABLE.                                                                                                                                    |
| <return>       | int       | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the assignment was successful, and BI_ERROR if either VARIABLE identifier was invalid or erroneous. |

**6.5.24 Builtin int\_value**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Get the value of a VARIABLE of type integer

The builtin int\_value will return the value of the specified VARIABLE. The VARIABLE shall be of type INTEGER.

**Lexical structure**

```
int_value(variable)
```

The lexical elements of the builtin `int_value` are shown in Table 176.

**Table 176 – Builtin `int_value`**

| Parameter name | Type      | Direction | Usage | Description                                  |
|----------------|-----------|-----------|-------|----------------------------------------------|
| variable       | reference | I         | m     | The VARIABLE whose value shall be retrieved. |
| <return>       | int       | O         | m     | The value of the VARIABLE.                   |

**6.5.25 Builtin `ivar_value`**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Get the value of a VARIABLE of type integer

The builtin `ivar_value` will return the value of the specified VARIABLE. The VARIABLE `source_var_name` shall be of type INTEGER.

**Lexical structure**

```
ivar_value(source_var_name)
```

The lexical elements of the builtin `ivar_value` are shown in Table 177.

**Table 177 – Builtin `ivar_value`**

| Parameter name  | Type      | Direction | Usage | Description                |
|-----------------|-----------|-----------|-------|----------------------------|
| source_var_name | reference | I         | m     | The name of the VARIABLE.  |
| <return>        | int       | O         | m     | The value of the VARIABLE. |

**6.5.26 Builtin `lassign`**

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Assign long value to VARIABLE

The builtin `lassign` will assign the specified value to the VARIABLE. The VARIABLE shall be reference a VARIABLE of type long.

**Lexical structure**

```
lassign(var_name, new_value)
```

The lexical elements of the builtin `lassign` are shown in Table 178.

**Table 178 – Builtin `lassign`**

| Parameter name | Type      | Direction | Usage | Description                                     |
|----------------|-----------|-----------|-------|-------------------------------------------------|
| var_name       | reference | I         | m     | The name of the VARIABLE.                       |
| new_value      | long      | I         | m     | The new value of the VARIABLE.                  |
| <return>       | int       | O         | m     | One of the return codes specified in Table 377. |

**6.5.27 Builtin long\_value****Communication profiles:** CS, GPE, PB, PN**Purpose:** Get long value of VARIABLE

The builtin long\_value will return the value of the specified VARIABLE. The VARIABLE source\_var\_name shall reference a VARIABLE of type long.

**Lexical structure**

```
long_value(source_var_name)
```

The lexical elements of the builtin long\_value are shown in Table 179.

**Table 179 – Builtin long\_value**

| Parameter name  | Type      | Direction | Usage | Description                |
|-----------------|-----------|-----------|-------|----------------------------|
| source_var_name | reference | I         | m     | The name of the VARIABLE.  |
| <return>        | int       | O         | m     | The value of the VARIABLE. |

**6.5.28 Builtin lvar\_value****Communication profiles:** CS, GPE, PB, PN**Purpose:** Get long value

The builtin lvar\_value will return the value of the specified VARIABLE.

**Lexical structure**

```
lvar_value(source_var_name)
```

The lexical elements of the builtin lvar\_value are shown in Table 180.

**Table 180 – Builtin lvar\_value**

| Parameter name  | Type      | Direction | Usage | Description                |
|-----------------|-----------|-----------|-------|----------------------------|
| source_var_name | reference | I         | m     | The name of the VARIABLE.  |
| <return>        | long      | O         | m     | The value of the VARIABLE. |

**6.5.29 Builtin put\_date\_value****Communication profiles:** FF, ISA100**Purpose:** Puts the specified value of a date\_and\_time, time, or duration

The builtin put\_date\_value stores the provided value of the specified scaled VARIABLE into the cache or device.

The parameters id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID and the name or reference of the VARIABLE in question.

It puts the specified value of the date\_and\_time, time, or duration VARIABLE into the cache or device.

The VARIABLE shall have a data type of char. The char string may contain up to eight chars and contain a VARIABLE of the following data types:

- DATE\_AND\_TIME
- TIME
- DURATION

### Lexical structure

put\_date\_value(id, member\_id, data, size)

The lexical elements of the builtin put\_date\_value are shown in Table 181.

**Table 181 – Builtin put\_date\_value**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| id             | unsigned long | I         | o     | The item id of the VARIABLE to access.          |
| member_id      | unsigned long | I         | o     | The member id of the VARIABLE to access.        |
| data           | char[]        | I         | m     | The new value of the VARIABLE.                  |
| size           | long          | I         | m     | The length of the new value.                    |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

### Example

```
long duration_size, status;
char duration_value[6];

/* set DURATION to 25 (days): 10 (hours): 20: 05.218 */

duration_size = 6;
duration_value[0] = 0x02; /*0x0237B4E2 = 37205218 ms since midnight */
duration_value[1] = 0x37;
duration_value[2] = 0xB4;
duration_value[3] = 0xE2;
duration_value[4] = 0x00; /*0x0019 = 25 days */
duration_value[5] = 0x19;

status = put_date_value(ITEM_ID(PARAM.CALIBRATION), MEMBER_ID(DURATION),
duration_value, duration_size);
```

### 6.5.30 Builtin put\_date\_value2

**Communication profiles: FF, ISA100**

**Purpose: Sets the value of a VARIABLE, record member or array element**

The builtin put\_date\_value2 stores the provided value of the specified scaled VARIABLE into the cache or device.

The blk\_id parameter specifies the item id of the block to be accessed, while the blk\_num parameter specifies the occurrence number of the block to be accessed.

If the id parameter references a simple VARIABLE, the member\_id parameter is ignored. If the id parameter references a record, the member\_id parameter specifies a member of the record. If the id parameter references an array parameter, the member\_id parameter specifies an element of the array.

The parameters `blk_id`, `id` and `member_id` are specified using the builtins `ITEM_ID` and `MEMBER_ID`. The `blk_num` parameter is specified using the builtins `get_block_instance_by_object_index` and `get_block_instance_by_block_tag` built-in functions.

The `VARIABLE`, record member or array element shall have a data type of `char`. The `char` string may contain up to eight chars and contain a `VARIABLE` of the following data types:

- `DATA_AND_TIME`
- `TIME`
- `DURATION`

### Lexical structure

```
put_date_value2(blk_id, blk_num, id, member_id, data, size)
```

The lexical elements of the builtin `put_date_value2` are shown in Table 182.

**Table 182 – Builtin `put_date_value2`**

| Parameter name              | Type                | Direction | Usage | Description                                                           |
|-----------------------------|---------------------|-----------|-------|-----------------------------------------------------------------------|
| <code>blk_id</code>         | unsigned long       | I         | m     | The item id of the <code>BLOCK_A</code> instance to access.           |
| <code>blk_num</code>        | unsigned long       | I         | m     | The occurrence number of the <code>BLOCK_A</code> instance to access. |
| <code>id</code>             | unsigned long       | I         | o     | The item id of the <code>VARIABLE</code> to access.                   |
| <code>member_id</code>      | unsigned long       | I         | o     | The member id of the <code>VARIABLE</code> to access.                 |
| <code>data</code>           | <code>char[]</code> | I         | m     | The new value of the <code>VARIABLE</code> .                          |
| <code>size</code>           | long                | I         | m     | The length of the new value.                                          |
| <code>&lt;return&gt;</code> | long                | O         | m     | One of the return codes specified in Table 376.                       |

### Example

```
long status, time_size;
char time[6];

/* set TIME to Oct 14, 2010 03:03:03 */

time_size = 6;
time[0]=0; /* 0xA79658 = 10983000 ms since midnight */
time[1]=0xA7;
time[2]=0x96;
time[3]=0x58;
time[4]=0x26; /* 0x2637 = 9783 days since January 1, 1984 */
time[5]=0x37;

status = put_date_value2(ITEM_ID(transducer_block), 0,
MEMBER_ID(CALIBRATION), MEMBER_ID(TIME), time, time_size);
```

### 6.5.31 Builtin `put_double_value`

**Communication profiles:** FF, ISA100

**Purpose:** Puts the specified scaled value of a double `VARIABLE`

The builtin `put_double_value` stores the provided value of the specified scaled `VARIABLE` into the cache or device.



The parameters `id` and `member_id` are specified using the builtins `ITEM_ID` and `MEMBER_ID` and the name or reference of the `VARIABLE` in question.

The `VARIABLE` shall have a data type of `DOUBLE`.

### Lexical structure

```
put_double_value(id, member_id, value)
```

The lexical elements of the builtin `put_double_value` are shown in Table 183.

**Table 183 – Builtin `put_double_value`**

| Parameter name         | Type          | Direction | Usage | Description                                           |
|------------------------|---------------|-----------|-------|-------------------------------------------------------|
| <code>id</code>        | unsigned long | I         | o     | The item id of the <code>VARIABLE</code> to access.   |
| <code>member_id</code> | unsigned long | I         | o     | The member id of the <code>VARIABLE</code> to access. |
| <code>value</code>     | double        | I         | m     | The new value of the <code>VARIABLE</code> .          |
| <return>               | long          | O         | m     | One of the return codes specified in Table 376.       |

### Example

```
long status;
double value;
value = 100090.738;
status = put_double_value(ITEM_ID(PARAM_SAMPLE), 0, value);
```

### 6.5.32 Builtin `put_double_value2`

**Communication profiles:** FF, ISA100

**Purpose:** Sets the value of a `VARIABLE`, record member or array element

The builtin `put_double_value2` stores the provided value of the specified scaled `VARIABLE`, record member or array element into the cache or device.

The `blk_id` parameter specifies the item id of the block to be accessed, while the `blk_num` parameter specifies the occurrence number of the block to be accessed.

If the `id` parameter references a simple `VARIABLE`, the `member_id` parameter is ignored. If the `id` parameter references a record, the `member_id` parameter specifies a member of the record. If the `id` parameter references an array parameter, the `member_id` parameter specifies an element of the array.

The parameters `blk_id`, `id` and `member_id` are specified using the builtins `ITEM_ID` and `MEMBER_ID`. The `blk_num` parameter is specified using the builtins `get_block_instance_by_object_index` and `get_block_instance_by_block_tag`.

The `VARIABLE`, record member or array element shall have a data type of `DOUBLE`.

### Lexical structure

```
put_double_value2(blk_id, blk_num, id, member_id, value)
```

The lexical elements of the builtin `put_double_value2` are shown in Table 184.

**Table 184 – Builtin put\_double\_value2**

| Parameter name | Type          | Direction | Usage | Description                                              |
|----------------|---------------|-----------|-------|----------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the BLOCK_A instance to access.           |
| blk_num        | unsigned long | I         | m     | The occurrence number of the BLOCK_A instance to access. |
| id             | unsigned long | I         | o     | The item id of the VARIABLE to access.                   |
| member_id      | unsigned long | I         | o     | The member id of the VARIABLE to access.                 |
| value          | double        | I         | m     | The new value of the VARIABLE.                           |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.          |

**Example**

```

long status;
double value;
value = 1000090.738;
status = put_double_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(SAMPLE), 0, value);

```

**6.5.33 Builtin put\_float\_value****Communication profiles: FF, ISA100****Purpose: Puts the specified value of a floating-point VARIABLE**

The builtin put\_float\_value stores the provided value of the specified scaled VARIABLE in the cache or the device.

The type of value is double to accommodate automatic promotion, which could occur whenever two floating-point values are multiplied.

The parameters id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID builtins and the name or reference of the VARIABLE in question.

The VARIABLE shall have a data type of FLOAT.

**Lexical structure**

```
put_float_value(id, member_id, value)
```

The lexical elements of the builtin put\_float\_value are shown in Table 185.

**Table 185 – Builtin put\_float\_value**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| id             | unsigned long | I         | o     | The item id of the VARIABLE to access.          |
| member_id      | unsigned long | I         | o     | The member id of the VARIABLE to access.        |
| value          | double        | I         | m     | The new value of the VARIABLE.                  |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

**Example**

```

long status;
float value;
value = 57.2958;
status = put_float_value2(ITEM_ID(PARAM.SAMPLE), 0, (double) value);

```

**6.5.34 Builtin put\_float\_value2****Communication profiles: FF, ISA100****Purpose: Sets the value of a VARIABLE, record member or array element**

The builtin put\_float\_value2 stores the provided value of the specified scaled VARIABLE, record member or array element in the cache or the device.

The type of value is double to accommodate automatic promotion, which could occur whenever two floating-point values are multiplied.

The blk\_id parameter specifies the item id of the block to be accessed, while the blk\_num parameter specifies the occurrence number of the block to be accessed.

If the id parameter references a simple VARIABLE, the member\_id parameter is ignored. If the id parameter references a record, the member\_id parameter specifies a member of the record. If the id parameter references an array parameter, the member\_id parameter specifies an element of the array.

The parameters blk\_id, id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID builtins. The blk\_num parameter is specified using the builtins get\_block\_instance\_by\_object\_index and get\_block\_instance\_by\_block\_tag.

The VARIABLE shall have a data type of FLOAT.

**Lexical structure**

```
put_float_value2(blk_id, blk_num, id, member_id, value)
```

The lexical elements of the builtin put\_float\_value2 are shown in Table 186.

**Table 186 – Builtin put\_float\_value2**

| Parameter name | Type          | Direction | Usage | Description                                              |
|----------------|---------------|-----------|-------|----------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the BLOCK_A instance to access.           |
| blk_num        | unsigned long | I         | m     | The occurrence number of the BLOCK_A instance to access. |
| id             | unsigned long | I         | o     | The item id of the VARIABLE to access.                   |
| member_id      | unsigned long | I         | o     | The member id of the VARIABLE to access.                 |
| value          | double        | I         | m     | The new value of the VARIABLE.                           |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.          |

**Example**

```

long status;
float value;
value = 57.2958;
status = put_float_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(SAMPLE), 0, (double) value);

```

**6.5.35 Builtin put\_signed\_value****Communication profiles: FF, ISA100****Purpose: Puts the specified value of a signed integer VARIABLE**

The builtin put\_signed\_value stores the new value of the specified scaled VARIABLE into the cache or device.

The parameters id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID and the name or reference of the VARIABLE in question.

The VARIABLE to be written shall have a long data type.

**Lexical structure**

```
put_signed_value(id, member_id, value)
```

The lexical elements of the builtin put\_signed\_value are shown in Table 187.

**Table 187 – Builtin put\_signed\_value**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| id             | unsigned long | I         | o     | The item id of the VARIABLE to access.          |
| member_id      | unsigned long | I         | o     | The member id of the VARIABLE to access.        |
| value          | long          | I         | m     | The new value of the VARIABLE.                  |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

**Example**

```

long status;
status = put_signed_value(ITEM_ID(PARAM.PV_SCALE), MEMBER_ID(DECIMAL_PT),
3);

```

**6.5.36 Builtin put\_signed\_value2****Communication profiles: FF, ISA100****Purpose: Sets the value of a VARIABLE, record member or array element**

The builtin put\_signed\_value2 stores the new value of the specified scaled VARIABLE, record member or array element into the cache or device.

The blk\_id parameter specifies the item id of the block to be accessed, while the blk\_num parameter specifies the occurrence number of the block to be accessed.

If the `id` parameter references a simple `VARIABLE`, the `member_id` parameter is ignored. If the `id` parameter references a record, the `member_id` parameter specifies a member of the record. If the `id` parameter references an array parameter, the `member_id` parameter specifies an element of the array.

The parameters `blk_id`, `id` and `member_id` are specified using the builtins `ITEM_ID` and `MEMBER_ID`. The `blk_num` parameter is specified using the builtins `get_block_instance_by_object_index` and `get_block_instance_by_block_tag`.

The `VARIABLE`, record member or array element to be written shall have a long data type.

### Lexical structure

```
put_signed_value2(blk_id, blk_num, id, member_id, value)
```

The lexical elements of the builtin `put_signed_value2` are shown in Table 188.

**Table 188 – Builtin `put_signed_value2`**

| Parameter name              | Type          | Direction | Usage | Description                                                           |
|-----------------------------|---------------|-----------|-------|-----------------------------------------------------------------------|
| <code>blk_id</code>         | unsigned long | I         | m     | The item id of the <code>BLOCK_A</code> instance to access.           |
| <code>blk_num</code>        | unsigned long | I         | m     | The occurrence number of the <code>BLOCK_A</code> instance to access. |
| <code>id</code>             | unsigned long | I         | o     | The item id of the <code>VARIABLE</code> to access.                   |
| <code>member_id</code>      | unsigned long | I         | o     | The member id of the <code>VARIABLE</code> to access.                 |
| <code>value</code>          | long          | I         | m     | The new value of the <code>VARIABLE</code> .                          |
| <code>&lt;return&gt;</code> | long          | O         | m     | One of the return codes specified in Table 376.                       |

### Example

```
long status;
status = put_signed_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(PV_SCALE), MEMBER_ID(DECIMAL_PT), 3);
```

### 6.5.37 Builtin `put_string_value`

**Communication profiles:** FF, ISA100

**Purpose:** Sets the value of a string `VARIABLE`

The builtin `put_string_value` stores the provided value of the specified `VARIABLE` into the cache or device.

The parameters `id` and `member_id` are specified using the builtins `ITEM_ID` and `MEMBER_ID` and the name or reference of the `VARIABLE` in question.

The `VARIABLE` shall have a data type of `char`; a `char` string may contain `VARIABLES` of the following data types:

- ASCII
- PASSWORD
- EUC (extended unicode)
- BITSTRING

- VISIBLE
- OCTET

VARIABLEs with data types of enumerated, bit\_enumerated, and index shall be handled by the method because they are not supported by the programming language-C.

### Lexical structure

```
put_string_value(id, member_id, string, len)
```

The lexical elements of the builtin put\_string\_value are shown in Table 189.

**Table 189 – Builtin put\_string\_value**

| Parameter name | Type          | Direction | Usage | Description                                                                                                                                              |
|----------------|---------------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| id             | unsigned long | l         | o     | The item id of the VARIABLE to access.                                                                                                                   |
| member_id      | unsigned long | l         | o     | The member id of the VARIABLE to access.                                                                                                                 |
| string         | DD_STRING     | l         | m     | The new value of the VARIABLE. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| len            | long          | l         | m     | The length of the new value.                                                                                                                             |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.                                                                                                          |

### Example

```
long status;
status = put_string_value(ITEM_ID(PARAM.TAG_DESC), 0, "|en|PID-101", 11);
```

### 6.5.38 Builtin put\_string\_value2

**Communication profiles: FF, ISA100**

**Purpose: Sets the value of a VARIABLE, record member, or array element**

The builtin put\_string\_value2 stores the provided value of the specified VARIABLE, record member or array element into the cache or device.

The blk\_id parameter specifies the item id of the block to be accessed, while the blk\_num parameter specifies the occurrence number of the block to be accessed.

If the id parameter references a simple VARIABLE, the member\_id parameter is ignored. If the id parameter references a record, the member\_id parameter specifies a member of the record. If the id parameter references an array parameter, the member\_id parameter specifies an element of the array.

The parameters blk\_id, id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID. The blk\_num parameter is specified using the builtins get\_block\_instance\_by\_object\_index and get\_block\_instance\_by\_block\_tag.

The VARIABLE, record member or array element shall have a data type of char; a char string may contain VARIABLEs of the following data types:

- ASCII
- PASSWORD

- EUC (extended unicode)
- BITSTRING
- VISIBLE
- OCTET

VARIABLEs, record members or array elements with data types of enumerated, bit\_enumerated, and index shall be handled by the method because they are not supported by programming language-C.

### Lexical structure

```
put_string_value2(blk_id, blk_num, id, member_id, string, len)
```

The lexical elements of the builtin put\_string\_value2 are shown in Table 190.

**Table 190 – Builtin put\_string\_value2**

| Parameter name | Type          | Direction | Usage | Description                                                                                                                                                                               |
|----------------|---------------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| blk_id         | unsigned long | l         | m     | The item id of the BLOCK_A instance to access.                                                                                                                                            |
| blk_num        | unsigned long | l         | m     | The occurrence number of the BLOCK_A instance to access.                                                                                                                                  |
| id             | unsigned long | l         | o     | The item id of the VARIABLE, record, or array to access.                                                                                                                                  |
| member_id      | unsigned long | l         | o     | The member id of the VARIABLE, record member, or array element to access.                                                                                                                 |
| string         | DD_STRING     | l         | m     | The new value of the VARIABLE, record member, or array element. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| len            | long          | l         | m     | The length of the new value.                                                                                                                                                              |
| <return>       | long          | o         | m     | One of the return codes specified in Table 376.                                                                                                                                           |

### Example

```
long status;
status = put_string_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(TAG_DESC), 0, "|en|PID-101", 11);
```

### 6.5.39 Builtin put\_unsigned\_value

**Communication profiles: FF, ISA100**

**Purpose: Sets the value of an unsigned VARIABLE**

The builtin put\_unsigned\_value stores the provided value of the specified scaled VARIABLE into the cache or device.

The parameters id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID and the name or reference of the VARIABLE in question.

The VARIABLE shall have a data type of unsigned. An unsigned value may contain VARIABLEs of the following data types:

- UNSIGNED
- ENUMERATED

- BIT\_ENUMERATED
- INDEX
- BOOLEAN

VARIABLEs of these data types shall be handled by the method because they are not supported by the programming language-C. The variable shall be valid in the cache or device.

### Lexical structure

```
put_unsigned_value(id, member_id, value)
```

The lexical elements of the builtin put\_unsigned\_value are shown in Table 191.

**Table 191 – Builtin put\_unsigned\_value**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| id             | unsigned long | I         | o     | The item id of the VARIABLE to access.          |
| member_id      | unsigned long | I         | o     | The member id of the VARIABLE to access.        |
| value          | unsigned long | I         | o     | The new value of the VARIABLE.                  |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

### Example

```
long status;
unsigned long value;
value = 0xFEEE;
status = put_unsigned_value(ITEM_ID(PARAM.PV_STATE), 0, value);
```

### 6.5.40 Builtin put\_unsigned\_value2

**Communication profiles: FF, ISA100**

**Purpose: Sets the value of a VARIABLE, record member or array element**

The builtin put\_unsigned\_value2 stores the provided value of the specified scaled VARIABLE into the cache or device.

The blk\_id parameter specifies the item id of the block to be accessed, while the blk\_num parameter specifies the occurrence number of the block to be accessed.

If the id parameter references a simple VARIABLE, the member\_id parameter is ignored. If the id parameter references a record, the member\_id parameter specifies a member of the record. If the id parameter references an array parameter, the member\_id parameter specifies an element of the array.

The parameters blk\_id, id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID. The blk\_num parameter is specified using the builtins get\_block\_instance\_by\_object\_index and get\_block\_instance\_by\_block\_tag.

The VARIABLE, record member or array element shall have a data type of unsigned. An unsigned value may contain VARIABLEs of the following data types:

- UNSIGNED
- ENUMERATED



- BIT\_ENUMERATED
- INDEX
- BOOLEAN

VARIABLEs, of these data types shall be handled by the method because they are not supported by the programming language-C.

### Lexical structure

```
put_unsigned_value2(blk_id, blk_num, id, member_id, value)
```

The lexical elements of the builtin put\_unsigned\_value2 are shown in Table 192.

**Table 192 – Builtin put\_unsigned\_value2**

| Parameter name | Type          | Direction | Usage | Description                                              |
|----------------|---------------|-----------|-------|----------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the BLOCK_A instance to access.           |
| blk_num        | unsigned long | I         | m     | The occurrence number of the BLOCK_A instance to access. |
| id             | unsigned long | I         | o     | The item id of the VARIABLE to access.                   |
| member_id      | unsigned long | I         | o     | The member id of the VARIABLE to access.                 |
| value          | unsigned long | I         | o     | The new value of the VARIABLE.                           |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.          |

### Example

```
long status;
unsigned long value;
value = 0xFEEE;
status = put_unsigned_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(PV_STATE), 0, value);
```

### 6.5.41 Builtin ret\_double\_value

**Communication profiles:** FF, ISA100

**Purpose:** Gets the current value of a double VARIABLE

The builtin ret\_double\_value calls the builtin get\_double\_value and returns the value.

### Lexical structure

```
ret_double_value(id, member_id)
```

The lexical elements of the builtin ret\_double\_value are shown in Table 193.

**Table 193 – Builtin ret\_double\_value**

| Parameter name | Type          | Direction | Usage | Description                    |
|----------------|---------------|-----------|-------|--------------------------------|
| id             | unsigned long | I         | m     | The item id of the VARIABLE.   |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE. |
| <return>       | double        | O         | m     | The specified value.           |

**Example**

```
double value;
value = ret_double_value (ITEM_ID (PARAM.SAMPLE), 0);
```

**6.5.42 Builtin ret\_double\_value2****Communication profiles: FF, ISA100****Purpose: Retrieves the value of a VARIABLE, record member or array element**

The builtin ret\_double\_value2 calls the builtin get\_double\_value2 and returns the value.

**Lexical structure**

```
ret_double_value2 (blk_id, blk_num, id, member_id)
```

The lexical elements of the builtin ret\_double\_value2 are shown in Table 194.

**Table 194 – Builtin ret\_double\_value2**

| Parameter name | Type          | Direction | Usage | Description                                                         |
|----------------|---------------|-----------|-------|---------------------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the block to be accessed.                            |
| blk_num        | unsigned long | I         | m     | The occurrence number of the block to be accessed.                  |
| id             | unsigned long | I         | m     | The item id of the VARIABLE, record, or array to be accessed.       |
| member_id      | unsigned long | I         | m     | The member id of the record member or array element to be accessed. |
| <return>       | double        | O         | m     | The specified value.                                                |

**Example**

```
double value;
value = ret_double_value2 (ITEM_ID (__analog_input_block), 0,
MEMBER_ID (SAMPLE), 0);
```

**6.5.43 Builtin ret\_float\_value****Communication profiles: FF, ISA100****Purpose: Gets the current value of a float VARIABLE**

The builtin ret\_float\_value calls the builtin get\_float\_value and returns the value.

**Lexical structure**

```
ret_float_value (id, member_id)
```

The lexical elements of the builtin `ret_float_value` are shown in Table 195.

**Table 195 – Builtin `ret_float_value`**

| Parameter name | Type          | Direction | Usage | Description                    |
|----------------|---------------|-----------|-------|--------------------------------|
| id             | unsigned long | I         | m     | The item id of the VARIABLE.   |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE. |
| <return>       | float         | O         | m     | The specified value.           |

#### Example

```
float value;
value = ret_float_value(ITEM_ID(PARAM.SAMPLE), 0);
```

#### 6.5.44 Builtin `ret_float_value2`

**Communication profiles:** FF, ISA100

**Purpose:** Retrieves the value of a VARIABLE, record member or array element

The builtin `ret_float_value2` calls the builtin `get_float_value2` and returns the value.

#### Lexical structure

```
ret_float_value2(blk_id, blk_num, id, member_id)
```

The lexical elements of the builtin `ret_float_value2` are shown in Table 196.

**Table 196 – Builtin `ret_float_value2`**

| Parameter name | Type          | Direction | Usage | Description                                                         |
|----------------|---------------|-----------|-------|---------------------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the block to be accessed.                            |
| blk_num        | unsigned long | I         | m     | The occurrence number of the block to be accessed.                  |
| id             | unsigned long | I         | m     | The item id of the VARIABLE, record, or array to be accessed.       |
| member_id      | unsigned long | I         | m     | The member id of the record member or array element to be accessed. |
| <return>       | float         | O         | m     | The specified value.                                                |

#### Example

```
float value;
value = ret_float_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(SAMPLE), 0);
```

#### 6.5.45 Builtin `ret_signed_value`

**Communication profiles:** FF, ISA100

**Purpose:** Gets the current value of a signed integer VARIABLE

The builtin `ret_signed_value` calls the builtin `get_signed_value` and returns the value.

**Lexical structure**

```
ret_signed_value(id, member_id)
```

The lexical elements of the builtin `ret_signed_value` are shown in Table 197.

**Table 197 – Builtin `ret_signed_value`**

| Parameter name | Type          | Direction | Usage | Description                    |
|----------------|---------------|-----------|-------|--------------------------------|
| id             | unsigned long | I         | m     | The item id of the VARIABLE.   |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE. |
| <return>       | long          | O         | m     | The specified value.           |

**Example**

```
long value;
value = ret_signed_value(ITEM_ID(PARAM.SAMPLE), 0);
```

**6.5.46 Builtin `ret_signed_value2`**

**Communication profiles:** FF, ISA100

**Purpose:** Retrieves the value of a VARIABLE, record member or array element

The builtin `ret_signed_value2` calls the builtin `get_signed_value2` and returns the value.

**Lexical structure**

```
ret_signed_value2(blk_id, blk_num, id, member_id)
```

The lexical elements of the builtin `ret_signed_value2` are shown in Table 198.

**Table 198 – Builtin `ret_signed_value2`**

| Parameter name | Type          | Direction | Usage | Description                                                         |
|----------------|---------------|-----------|-------|---------------------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the block to be accessed.                            |
| blk_num        | unsigned long | I         | m     | The occurrence number of the block to be accessed.                  |
| id             | unsigned long | I         | m     | The item id of the VARIABLE, record, or array to be accessed.       |
| member_id      | unsigned long | I         | m     | The member id of the record member or array element to be accessed. |
| <return>       | long          | O         | m     | The specified value.                                                |

**Example**

```
long value;
value = ret_signed_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(SAMPLE), 0);
```

### 6.5.47 Builtin ret\_unsigned\_value

**Communication profiles:** FF, ISA100

**Purpose:** Gets the current value of a unsigned integer VARIABLE

The builtin ret\_unsigned\_value calls the builtin get\_unsigned\_value and returns the value.

#### Lexical structure

```
ret_unsigned_value(id, member_id)
```

The lexical elements of the builtin ret\_unsigned\_value are shown in Table 199.

**Table 199 – Builtin ret\_unsigned\_value**

| Parameter name | Type          | Direction | Usage | Description                    |
|----------------|---------------|-----------|-------|--------------------------------|
| id             | unsigned long | I         | m     | The item id of the VARIABLE.   |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE. |
| <return>       | unsigned long | O         | m     | The specified value.           |

#### Example

```
unsigned long value;
value = ret_unsigned_value(ITEM_ID(PARAM.SAMPLE), 0);
```

### 6.5.48 Builtin ret\_unsigned\_value2

**Communication profiles:** FF, ISA100

**Purpose:** Retrieves the value of a VARIABLE, record member or array element

The builtin ret\_unsigned\_value2 calls the builtin get\_unsigned\_value2 and returns the value.

#### Lexical structure

```
ret_unsigned_value2(blk_id, blk_num, id, member_id)
```

The lexical elements of the builtin ret\_unsigned\_value2 are shown in Table 200.

**Table 200 – Builtin ret\_unsigned\_value2**

| Parameter name | Type          | Direction | Usage | Description                                                         |
|----------------|---------------|-----------|-------|---------------------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the block to be accessed.                            |
| blk_num        | unsigned long | I         | m     | The occurrence number of the block to be accessed.                  |
| id             | unsigned long | I         | m     | The item id of the VARIABLE, record, or array to be accessed.       |
| member_id      | unsigned long | I         | m     | The member id of the record member or array element to be accessed. |
| <return>       | unsigned long | O         | m     | The specified value.                                                |

**Example**

```
unsigned long value;
value = ret_unsigned_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(SAMPLE), 0);
```

**6.5.49 Builtin vassign**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Assign value of one VARIABLE to another

The builtin vassign will assign the value of the source VARIABLE to the destination VARIABLE. Both VARIABLES shall have the same type.

**Lexical structure**

```
vassign(dest_var, source_var)
```

The lexical elements of the builtin vassign are shown in Table 201.

**Table 201 – Builtin vassign**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                       |
|----------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| dest_var       | reference | I         | m     | The identifier of the destination VARIABLE.                                                                                                                       |
| source_var     | reference | I         | m     | The identifier of the source VARIABLE.                                                                                                                            |
| <return>       | int       | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the assignment was successful, and BI_ERROR if either VARIABLE identifier was invalid or erroneous. |

**6.6 Normal termination builtins****6.6.1 Builtin discard\_on\_exit**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Discard any VARIABLE changes made in a method when the method exits

The builtin discard\_on\_exit sets the termination action to discard any changes made by the method to VARIABLE values stored in a cache, which have not already been sent to the device. It causes the method to discard any changes to VARIABLE values in the cache when the method ends, and overrides any calls to save\_values().

When a method modifies a VARIABLE value in a caching EDD application, it is changing a resident copy of that value. This change is effective only for the life of the method. To change the value(s) in the device, the method shall send the value(s) to the device or call send\_on\_exit. To save the values only in the cache (rather than send them to the device), call the builtin save\_on\_exit.

After the method termination, the changed values in the cache return to the device values that existed before they were changed by the method.

All values that have been changed but not sent to the device are handled at the termination of the method by either discarding them, sending them to the device, or saving the changes in a way that survives the end of the method (but does not affect the values in the device).

This builtin takes no action in a non-caching EDD application because all parameter values are written directly to the device.

Communication profiles: FF, HART, ISA100

If a method does not call builtin `discard_on_exit`, `save_on_exit`, or `send_on_exit` prior to exiting properly, any changes made by the method are discarded as if `discard_on_exit` was called.

Communication profiles: CS, GPE, PB, PN

If a method does not call builtin `discard_on_exit`, `save_on_exit`, or `send_on_exit` prior to exiting properly, any changes made by the method are saved as if `save_on_exit` was called.

## Lexical structure

`discard_on_exit(VOID)`

The lexical element of the builtin `discard_on_exit` is shown in Table 202.

**Table 202 – Builtin `discard_on_exit`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

## Example

```
discard_on_exit();
```

## 6.6.2 Builtin `save_on_exit`

**Communication profiles:** CS, FF, GPE, ISA100, PB, PN

**Purpose:** Save modified values

The builtin `save_on_exit` sets the termination action to save any changes made by the method to variables in the variable table not already sent to the device. The values in the device are not affected. As long as the application has not changed the values, the values are saved as if written by an application.

When a method modifies a variable's value in the variable table, the value is not written to the device until the method terminates. The changes to the variable table are effective only for the life of the method. To make the values permanent in the variable table, the method shall save the values before exiting.

All values that have been changed, but not sent to the device, are handled at the termination of the method by either sending them to the device, discarding them, or saving the value changes in a way that survives the end of the method (but does not affect the device). Saved values can be used by other methods.

Communication profiles: FF, ISA100

If a method does not call builtin `discard_on_exit`, `save_on_exit`, or `send_on_exit` prior to exiting properly, any changes made by the method are discarded as if `discard_on_exit` was called.

Communication profiles: CS, GPE, PB, PN

If a method does not call builtin `discard_on_exit`, `save_on_exit`, or `send_on_exit` prior to exiting properly, any changes made by the method are saved as if `save_on_exit` was called.

If the method aborts, then the builtin `discard_on_exit` option is enforced even if builtin `save_on_exit` was called before the method aborted.

### Lexical structure

`save_on_exit(VOID)`

The lexical element of the builtin `save_on_exit` is shown in Table 203.

**Table 203 – Builtin `save_on_exit`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### Example

`save_on_exit();`

### 6.6.3 Builtin `save_values`

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Make VARIABLE values permanent

The builtin `save_values` immediately causes the values of all VARIABLES modified during a method session to remain (e.g. by committing them to the calling cache).

Communication profiles: HART

Any VARIABLES changed by the method are discarded when the method finishes running. These values are not automatically saved or sent to the device. Any VARIABLES modified after the builtin `save_values` was called will not remain unless the builtin `save_values` is called again. VARIABLES that are modified, but are not sent to the connected device, will be restored to their previous value if this function is not called.

Communication profiles: PB, PN, CS, GPE

`save_values` is used to save the VARIABLE values immediately. By default VARIABLE values are automatically saved when the method exits properly.

### Lexical structure

`save_values(VOID)`

The lexical element of the builtin `save_values` is shown in Table 204.

**Table 204 – Builtin `save_values`**

| Parameter name | Type | Direction | Usage | Description                                     |
|----------------|------|-----------|-------|-------------------------------------------------|
| <return>       | int  | O         | m     | One of the return codes specified in Table 377. |



#### 6.6.4 Builtin send\_on\_exit

**Communication profiles:** CS, FF, GPE, ISA100, PB, PN

**Purpose:** Send modified values to device

The builtin send\_on\_exit sets the termination action to send any changes made by the method to variables stored in the variable table of the EDD application, which have not already been sent to the device. This builtin does nothing in a non-caching EDD application, because a non-caching EDD application does not have a cache.

When a method modifies a variable value, it changes a copy of that value. This change is effective only for the life of the method. In order to make the change in the device, the method shall send the value(s) to the device or call this builtin before the method exits.

All values that are changed, but not sent to the device, are handled at the termination of the method by either sending them to the device, discarding them, or saving the value changes in a way that survives the end of the method. The changed values in the variable table are sent after the method terminates.

Communication profiles: FF, ISA100

If a method does not call builtin discard\_on\_exit, save\_on\_exit or send\_on\_exit prior to exiting properly, any changes made by the method are discarded as if discard\_on\_exit was called.

Communication profiles: CS, GPE, PB, PN

If a method does not call builtin discard\_on\_exit, save\_on\_exit or send\_on\_exit prior to exiting properly, any changes made by the method are saved as if save\_on\_exit was called.

If the method aborts then the builtin discard\_on\_exit option is enforced, even if builtin save\_on\_exit, or builtin send\_on\_exit were called before the method aborted.

#### Lexical structure

send\_on\_exit(VOID)

The lexical element of the builtin send\_on\_exit is shown in Table 205.

**Table 205 – Builtin send\_on\_exit**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

#### Example

```
send_on_exit();
```

## 6.7 Abnormal termination builtins

### 6.7.1 Builtin abort

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Abort the current method

The builtin abort will display a message indicating that the method has been aborted and wait for acknowledgement from the user. Once acknowledgement has been made, the system will execute any abort methods in the abort method list and will exit the method.

#### Lexical structure

abort (VOID)

The lexical element of the builtin abort is shown in Table 206.

**Table 206 – Builtin abort**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.7.2 Builtin add\_abort\_method (version A)

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Add a method to the abort method list

The builtin add\_abort\_method adds a method to the bottom of the abort method list, which is the list of methods to be executed if the current method is aborted. The abort method list can hold up to 20 methods at any one time. The methods are executed in order starting from the top of the list and ending with the bottom. The same method may be added to the list more than once. A single instance of a method is removed from the abort method list after that method has completed execution.

Abort methods are only executed when the method is aborted, and not when the method exits under normal operating conditions. Methods can be aborted due to an abort mask condition when sending a command, or when the builtin abort or process\_abort is called, or when the user aborts the method.

#### Lexical structure

add\_abort\_method (abort\_method\_id)

The lexical elements of the builtin add\_abort\_method are shown in Table 207.

**Table 207 – Builtin add\_abort\_method**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                     |
|----------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| abort_method   | reference | I         | m     | A reference to a METHOD.                                                                                                                        |
| <return>       | int       | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the method was successfully added to the list, and BI_ERROR if the list was full. |

### 6.7.3 Builtin add\_abort\_method (version B)

**Communication profiles: FF, ISA100**

**Purpose: Add a method to the abort method list**

The builtin add\_abort\_method adds an abort method to the calling method's abort method list. The abort method list is the list of methods which will be executed if the method aborts. The abort method list applies only to the current execution of the method. The abort method list can hold up to 20 methods at any one time.

Methods abort when response codes or communication errors occur which have been set to trigger an abort via other builtin calls, for example, abort\_on\_all\_comm\_errors and abort\_on\_all\_response\_codes. Methods can also be explicitly aborted by a direct call to builtin method\_abort, or when an error occurs. The normal completion of a method is not considered an abort.

The abort method list is initially empty when a method begins execution. The abort methods are added to the back of the list and are removed and run from the front of the list in the order they appear, i.e. first-in first-out. An abort method may appear more than once in the list.

Abort methods may be shared between methods, meaning two methods may have the same abort method in their respective abort method lists.

The method\_id parameter is specified by the method writer using the builtin ITEM\_ID and the name of the method. Abort methods cannot call add\_abort\_method.

#### Lexical structure

add\_abort\_method(method\_id)

The lexical elements of the builtin add\_abort\_method are shown in Table 208.

**Table 208 – Builtin add\_abort\_method**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| method_id      | unsigned long | I         | m     | The Item id of the method.                      |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

#### Example

```
long status;
status = add_abort_method(ITEM_ID(log_abort));
```

### 6.7.4 Builtin method\_abort

**Communication profiles: FF, ISA100**

**Purpose: Abort method and wait for acknowledge**

The builtin method\_abort displays a message indicating that the method is aborting and waits for acknowledgment from the user.

After the acknowledgment, the abort methods in the abort method list are executed one after another from the front of the list (where the first abort method was added to the list) to the back of the list. The abort method list is maintained only for the execution of a single invocation of the method.

After the abort methods are executed, the method terminates and control is returned to the application.

If an abort method calls `method_abort`, the abort method list processing is immediately terminated.

### Lexical structure

```
method_abort(prompt)
```

The lexical elements of the builtin `method_abort` are shown in Table 209.

**Table 209 – Builtin `method_abort`**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                  |
|----------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt         | DD_STRING | I         | m     | A message to be displayed (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | VOID      | —         | —     | —                                                                                                                                                                            |

### Example

```
method_abort("Method aborting...\n");
```

## 6.7.5 Builtin `pop_abort_method`

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Removes an abort method from the top of the abort list

The builtin `pop_abort_method` removes an abort method from the top of the abort method list, which is the list of methods to be executed if the current method is aborted. Abort methods shall not be removed during an abort method.

### Lexical structure

```
pop_abort_method(VOID)
```

The lexical element of the builtin `pop_abort_method` is shown in Table 210.

**Table 210 – Builtin `pop_abort_method`**

| Parameter name | Type | Direction | Usage | Description                                                                                                                                                                                                                    |
|----------------|------|-----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <return>       | int  | o         | m     | One of the return codes specified in Table 377. Returns BI_SUCCESS if the method was successfully removed from the list, and BI_ERROR if either no methods are in the list or if this function was run during an abort method. |

## 6.7.6 Builtin `process_abort`

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Run methods in the abort list

The builtin `process_abort` will abort the current method and execute any abort methods that are in the abort method list. Unlike the builtin `abort`, no message will be displayed when this function is executed. This builtin function may not be run from inside an abort method.

### Lexical structure

`process_abort(VOID)`

The lexical element of the builtin `process_abort` is shown in Table 211.

**Table 211 – Builtin `process_abort`**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

### 6.7.7 Builtin `push_abort_method`

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Add a method to the top of the abort list

The builtin `push_abort_method` adds a method to the top of the abort method list, which is the list of methods to be executed if the current method is aborted. The abort method list can hold up to 20 methods at any one time. The methods are executed in order starting from the top of the list and ending with the bottom. The same method may be added to the list more than once. A single instance of a method is removed from the abort method list after that method has completed execution.

Abort methods are only executed when the method is aborted, and not when the method exits under normal operating conditions. Methods can be aborted due to an abort mask condition when sending a command, or when the builtin `abort` or `process_abort` is called, or when the user aborts the method.

### Lexical Structure

`push_abort_method(abort_method_id)`

The lexical elements of the builtin `push_abort_method` are shown in Table 212.

**Table 212 – Builtin `push_abort_method`**

| Parameter name            | Type      | Direction | Usage | Description                                                                                                                                             |
|---------------------------|-----------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>abort_method</code> | reference | l         | m     | A reference to a METHOD.                                                                                                                                |
| <return>                  | int       | o         | m     | One of the return codes specified in Table 377. Returns BI_SUCCESS if the method was successfully added to the list, and BI_ERROR if the list was full. |

### 6.7.8 Builtin `remove_abort_method` (version A)

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Removes a method from the abort method list

The builtin `remove_abort_method` will remove a method from the abort method list, which is the list of methods to be executed if the current method is aborted. This builtin will remove the first occurrence of the specified method in the list, starting with the first method added. If there are multiple occurrences of a specific method, only the first one is removed. Abort methods shall not be removed during an abort method.

### Lexical structure

`remove_abort_method(abort_method_name)`

The lexical elements of the builtin `remove_abort_method` are shown in Table 213.

**Table 213 – Builtin remove\_abort\_method**

| Parameter name | Type      | Direction | Usage | Description                                     |
|----------------|-----------|-----------|-------|-------------------------------------------------|
| abort_method   | reference | I         | m     | A reference to a METHOD.                        |
| <return>       | int       | O         | m     | One of the return codes specified in Table 377. |

**6.7.9 Builtin remove\_abort\_method (version B)****Communication profiles: FF, ISA100****Purpose: Removes a method from the abort method list**

The builtin remove\_abort\_method moves a method from the abort method list. The abort method list contains the methods that are to be executed if the primary method aborts.

This builtin removes the first occurrence of the method that it finds in the list, starting at the front of the list and moving to the back. The front of the list has the abort methods that were added first (FIFO). If the method occurs more than once in the list, the subsequent occurrences are not removed.

The method\_id parameter is specified by the method writer using the builtins ITEM\_ID and the name of the method. Abort methods cannot call remove\_abort\_method.

**Lexical structure**

```
remove_abort_method(method_id)
```

The lexical elements of the builtin remove\_abort\_method are shown in Table 214.

**Table 214 – Builtin remove\_abort\_method**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| method_id      | unsigned long |           | m     | The id of the method.                           |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

**Example**

```
long status;
status = remove_abort_method(ITEM_ID(log_info));
```

**6.7.10 Builtin remove\_all\_abort\_methods****Communication profiles: CS, FF, GPE, HART, ISA100, PB, PN****Purpose: Remove all methods from abort list**

The builtin remove\_all\_abort\_methods removes all methods from the abort method list. This builtin is similar to the builtin remove\_abort\_method (Version A) or remove\_abort\_method (Version B) except that it removes all of the abort methods. remove\_all\_abort\_methods shall not be called from an abort method. If remove\_all\_abort\_methods is encountered by the EDD application in an abort method, it shall be ignored.

**Lexical structure**

```
remove_all_abort_methods(VOID)
```

The lexical element of the builtin remove\_all\_abort\_methods is shown in Table 215.

**Table 215 – Builtin remove\_all\_abort\_methods**

| Parameter name | Type | Direction | Usage | Description |
|----------------|------|-----------|-------|-------------|
| <return>       | VOID | —         | —     | —           |

**Example**

```
remove_all_abort_methods();
```

**6.8 String builtins****6.8.1 Builtin atof**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Convert string to floating-point

The builtin converts a string into a floating-point value.

**Lexical structure**

```
atof(str)
```

The lexical elements of the builtin atof are shown in Table 216.

**Table 216 – Builtin atof**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                                                              |
|----------------|-----------|-----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| str            | DD_STRING | I         | m     | The text to convert. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                                                                           |
| <return>       | double    | O         | m     | The floating-point value produced by interpreting the input characters as a number. The return value is 0,0 if the input cannot be converted to a value of that type. The return value is undefined in case of overflow. |

**6.8.2 Builtin atoi**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Convert string to integer

The builtin converts a string into an integer value.

**Lexical structure**

```
atoi(str)
```

The lexical elements of the builtin atoi are shown in Table 217.

**Table 217 – Builtin atoi**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                                                  |
|----------------|-----------|-----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| str            | DD_STRING | I         | m     | The text to convert. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                                                               |
| <return>       | int       | O         | m     | The integer value produced by interpreting the input characters as a number. The return value 0 if the input cannot be converted to a value of that type. The return value is undefined in case of overflow. |

### 6.8.3 Builtin BUILD\_MESSAGE

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Build a string containing values of method-variables and/or VARIABLES

The builtin BUILD\_MESSAGE returns a string based on a format specification. Any variable reference contained in the format string will be expanded to the current value. Method-variables and VARIABLES can be referenced in the message parameter. For more information, refer to the builtin PUT\_MESSAGE.

#### Lexical structure

BUILD\_MESSAGE(string)

The lexical elements of the builtin BUILD\_MESSAGE are shown in Table 218.

**Table 218 – Builtin BUILD\_MESSAGE**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                 |
|----------------|-----------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING | I         | m     | The format specification (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | DD_STRING | O         | m     | The formatted string.                                                                                                                                                       |

#### Example

```
int value;
DD_STRING message;
message = BUILD_MESSAGE("The value is %d.", value);
```

### 6.8.4 Builtin dictionary\_string

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Get dictionary string from name

The builtin dictionary\_string returns the dictionary string associated with the given name in the current language. If the string is not available in the current language, the English string is returned. If the string is not found in the dictionary, the function returns "ERROR: Dict String Not Found". The parameter dict\_string\_name is the handle of the string as it appears in the dictionary.

NOTE Communication profiles HART: "ERROR: Dict String Not Found" is a standard string defined in the dictionary ( [400,0] dict\_str\_not\_found).



## Lexical structure

`dictionary_string(dict_string_name)`

The lexical elements of the builtin `dictionary_string` are shown in Table 219.

**Table 219 – Builtin `dictionary_string`**

| Parameter name                | Type      | Direction | Usage | Description                                                                                                         |
|-------------------------------|-----------|-----------|-------|---------------------------------------------------------------------------------------------------------------------|
| <code>dict_string_name</code> | reference | l         | m     | Handle of the string as it appears in the dictionary.                                                               |
| <return>                      | DD_STRING | o         | m     | The dictionary string if successful, "ERROR: Dict String Not Found" if string could not be found in the dictionary. |

## Example

```
ACKNOWLEDGE ( dictionary_string ( remove_loop_from_auto ) );
```

## 6.8.5 Builtin `ftoa`

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Convert float in string

The builtin converts a floating-point value into a text string.

## Lexical structure

`ftoa(f)`

The lexical elements of the builtin `ftoa` are shown in Table 220.

**Table 220 – Builtin `ftoa`**

| Parameter name | Type      | Direction | Usage | Description                                  |
|----------------|-----------|-----------|-------|----------------------------------------------|
| <code>f</code> | float     | l         | m     | A floating-point value to convert to a text. |
| <return>       | DD_STRING | o         | m     | The floating-point value as a string.        |

## 6.8.6 Builtin `get_comm_error_string`

**Communication profiles:** FF, ISA100

**Purpose:** Get string description for communication error code

The builtin `get_comm_error_string` retrieves the text description associated with a specific communications error code. If possible, the description of the communications error is used; if the description is not available, a default communications error message with the error number is used. The return code identifies which text description is returned.

The communications error codes are defined by the consortia. Their related strings may be defined in a text dictionary. A communications error of zero is not considered a communications error.

## Lexical structure

`get_comm_error_string(error, string, maxlen)`

The lexical elements of the builtin `get_comm_error_string` are shown in Table 221.

**Table 221 – Builtin get\_comm\_error\_string**

| Parameter name | Type          | Direction | Usage | Description                                                                                                                                                         |
|----------------|---------------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| error          | unsigned long | I         | m     | The communication error code.                                                                                                                                       |
| string         | DD_STRING     | O         | m     | A description of the communication error. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| maxlen         | long          | I         | m     | The maximal length of string.                                                                                                                                       |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.                                                                                                                     |

**Example**

```

long status;
char msg[256];
if (status == BLTIN_FAIL_COMM_ERROR)
{
    status = get_comm_error_string(get_comm_error(), msg, 256);
    status = get_acknowledgement(msg, 0, 0, 0,);
}

```

**6.8.7 Builtin get\_dictionary\_string****Communication profiles: CS, GPE, HART, PB, PN****Purpose: Retrieve the text dictionary string**

The builtin get\_dictionary\_string will retrieve the text dictionary string associated with the given name in the current language. If the string is not available in the current language, the English string will be retrieved. If the string is not defined in either language, an error condition occurs, and the function will return BI\_ERROR. If the string is longer than the max\_str\_len parameter, the string will be truncated. The parameter dict\_string\_name is the name of the string as it appears in the text dictionary.

**Lexical structure**

```
get_dictionary_string(dict_string_name, string, max_str_len)
```

The lexical elements of the builtin get\_dictionary\_string are shown in Table 222.

**Table 222 – Builtin get\_dictionary\_string**

| Parameter name   | Type      | Direction | Usage | Description                                                                                                                                               |
|------------------|-----------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| dict_string_name | reference | I         | m     | The name of a dictionary entry.                                                                                                                           |
| string           | DD_STRING | I         | m     | A buffer for the result string. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| max_str_len      | int       | I         | m     | The maximum length of the buffer.                                                                                                                         |
| <return>         | int       | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if successful, BI_ERROR if string could not be found.                                          |

### Example

```
DD_STRING disp_string1; /* a variable to hold the string */
int slen1;
slen1 = 65535;          /* the maximum size to limit the string (use a
large value to get all of it) */

get_dictionary_string(remove_loop_from_auto, disp_string1, slen1);
ACKNOWLEDGE(disp_string1);
```

### 6.8.8 Builtin get\_enum\_string

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Get string for enumeration value

The builtin `get_enum_string` returns the description string associated of a specific enumeration element of an enumerated or bit enumerated variable. The enumeration element is specified by the value. The value shall be valid for the specified VARIABLE.

#### Lexical structure

```
get_enum_string(variable, value, string)
```

The lexical elements of the builtin `get_enum_string` are shown in Table 223.

**Table 223 – Builtin get\_enum\_string**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                 |
|----------------|-----------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| variable       | DD_ITEM   | I         | m     | An enumerated or bit enumerated variable.                                                                                                                                   |
| value          | int       | I         | m     | A value of the variable.                                                                                                                                                    |
| string         | DD_STRING | O         | m     | String associated with the value of the variable. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | int       | O         | m     | One of the return codes specified in Table 376. BI_SUCCESS if successful, BI_ERROR if string could not be found.                                                            |

### 6.8.9 Builtin get\_response\_code\_string

**Communication profiles:** FF, ISA100

**Purpose:** Gets description of response code for specified item

The builtin `get_response_code_string` searches the response codes of the specified VARIABLE and returns the description of the specified response code. If the response code is not found, and if the item is a member of a RECORD or an element of a REFERENCE\_ARRAY, then the RECORD or REFERENCE\_ARRAY is checked for the specified code.

The method developer calls this builtin if the description of a response code is unknown and shall be displayed. Otherwise, if the response code is known, the method can determine what to do in the presence of certain errors. Also non-standard error descriptions can be displayed by an application instead of the standard response codes.

Before calling this builtin, the method shall use the builtin `get_response_code` to get the `item_id` and `member_id` for the item with a response code. The parameters `id` and `member_id` are specified using the builtins `ITEM_ID` and `MEMBER_ID` and the name or reference of the VARIABLE.

**Lexical structure**

```
get_response_code_string(id, member_id, code, string, maxlen)
```

The lexical elements of the builtin `get_response_code_string` are shown in Table 224.

**Table 224 – Builtin `get_response_code_string`**

| Parameter name | Type          | Direction | Usage | Description                                                        |
|----------------|---------------|-----------|-------|--------------------------------------------------------------------|
| id             | unsigned long | I         | m     | The item id of the item to find.                                   |
| member_id      | unsigned long | I         | m     | The member id of the item to find.                                 |
| code           | unsigned long | I         | m     | The response code for which the descriptive string is to be found. |
| string         | char*         | O         | m     | The buffer for the returned response code description.             |
| maxlen         | long          | I         | m     | The maximum length of the buffer.                                  |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.                    |

**Example**

```
long status;
unsigned long id;
unsigned long member;
unsigned long code;
long maxlen;
char msg[256];
if (status == BLTIN_FAIL_RESPONSE_CODE)
{
    maxlen = 256;
    status = get_response_code(&code, &id, &member);
    status = get_response_code_string(id, member, code, msg, maxlen);
    status = get_acknowledgement(msg, 0, 0, 0);
}
```

**6.8.10 Builtin `get_rspcode_string`****Communication profiles: HART****Purpose: Get a response code string**

The builtin `get_rspcode_string` will return the response code string for the specified command and response code. If the string is longer than the maximum length defined in `length`, the string is truncated.

**Lexical structure**

```
get_rspcode_string(cmd_number, code, string, length)
```

The lexical elements of the builtin `get_rspcode_string` are shown in Table 225.

**Table 225 – Builtin get\_rspcode\_string**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                        |
|----------------|-----------|-----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| cmd_number     | int       | I         | m     | The command number.                                                                                                                                                |
| code           | int       | I         | m     | The response code.                                                                                                                                                 |
| string         | DD_STRING | O         | m     | The buffer for the response code string. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| length         | int       | I         | m     | The maximum length of the string buffer.                                                                                                                           |
| <return>       | int       | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if successful, BI_ERROR if string could not be found.                                                   |

**6.8.11 Builtin get\_rspcode\_string\_by\_id****Communication profiles:** CS, GPE, PB, PN**Purpose:** Get a response code string

The builtin `get_rspcode_string_by_id` returns a string representation of a given `response_code` (returned by `ReadCommand`, `WriteCommand`).

**Lexical structure**

```
get_rspcode_string_by_id(command, response_code, result)
```

The lexical elements of the builtin `get_rspcode_string_by_id` are shown in Table 226.

**Table 226 – Builtin get\_rspcode\_string\_by\_id**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                               |
|----------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| command        | reference | I         | m     | The command from which the <code>response_code</code> was delivered.                                                                                                                      |
| response_code  | int       | I         | m     | The <code>response_code</code> value (as returned from <code>ReadCommand</code> or <code>WriteCommand</code> ).                                                                           |
| result         | DD_STRING | O         | m     | String representation of the given <code>response_code</code> . String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | int       | O         | m     | One of the return codes specified in Table 377.                                                                                                                                           |

**6.8.12 Builtin get\_status\_code\_string (deprecated)****Communication profiles:** HART**Purpose:** Get a status code string

The builtin `get_status_code_string` has the same functionality as builtin `get_enum_string`. If the string is longer than the maximum length defined in `status_string_length`, the string is truncated.

**Lexical structure**

```
get_status_code_string(variable_name, status_code, status_string,
status_string_length)
```

The lexical elements of the builtin `get_status_code_string` are shown in Table 227.

**Table 227 – Builtin get\_status\_code\_string**

| Parameter name       | Type      | Direction | Usage | Description                                                                                                                                                                        |
|----------------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| variable_name        | char[]    | I         | m     | The name of the VARIABLE to access.                                                                                                                                                |
| status_code          | int       | I         | m     | The value of interesting status code.                                                                                                                                              |
| status_string        | DD_STRING | O         | m     | The buffer of the returned value of the signed VARIABLE. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| status_string_length | int       | I         | m     | The maximum size of the buffer.                                                                                                                                                    |
| <return>             | int       | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if successful, BI_ERROR if string could not be found.                                                                   |

### 6.8.13 Builtin get\_status\_string

Communication profiles: FF, ISA100

**Purpose:** Get description of a specific value of an enumerated or bit enumerated VARIABLE

The builtin get\_status\_string searches the members of the referenced ENUMERATED or BIT\_ENUMERATED VARIABLE and returns the description of the member matching the status in the given buffer.

The builtin gets the string associated with an ENUMERATED or BIT\_ENUMERATED value. The most common use of ENUMERATED and BIT\_ENUMERATED VARIABLES is to get a string associated with a status bit defined in the device for a particular status. The strings associated with ENUMERATED and BIT\_ENUMERATED VARIABLES are defined in EDDL.

The parameters id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID and the name or reference of the variable in question.

#### Lexical structure

```
get_status_string(id, member_id, status, string, maxlen)
```

The lexical elements of the builtin get\_status\_string are shown in Table 228.

**Table 228 – Builtin get\_status\_string**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| id             | unsigned long | I         | m     | The item id of the VARIABLE to access.          |
| member_id      | unsigned long | I         | m     | The member id of the VARIABLE to access.        |
| status         | unsigned long | I         | m     | The value to search.                            |
| string         | char*         | O         | m     | The buffer for the returned string.             |
| maxlen         | long          | I         | m     | The maximum size of the buffer.                 |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

**Example**

```

long status;
unsigned long device_status;
unsigned long id;
unsigned long member;
long maxlen;
char msg[256];
maxlen = 256;
id = ITEM_ID(PARAM.PV_SCALE);
member = MEMBER_ID(UNIT_CD);
status = get_status_string(id, member, device_status, msg, maxlen);

```

**6.8.14 Builtin get\_stddict\_string**

**Communication profiles:** FF, ISA100

**Purpose:** Gets standard text dictionary string

The builtin `get_stddict_string` takes a text dictionary identifier and returns the corresponding text string in the supplied string buffer. The returned string is in the correct language for the application.

A text dictionary entry is composed of three parts: a unique id, a name, and a multilingual description. The builtin strings are defined in the standard `dct` file.

**Lexical structure**

```
get_stddict_string(id, string, maxlen)
```

The lexical elements of the builtin `get_stddict_string` are shown in Table 229.

**Table 229 – Builtin `get_stddict_string`**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| id             | unsigned long | I         | m     | The text dictionary identifier.                 |
| string         | char          | O         | m     | The returned buffer for the string.             |
| maxlen         | long          | I         | m     | The maximum size of the buffer.                 |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

**Example**

```

long status;
long len;
char msg[256];
len = 256;
status = get_stddict_string(DICT_ID(square_root), msg, &len);

```

**6.8.15 Builtin get\_variable\_string**

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Get string representation of variable

The builtin `get_variable_string` will get a textual representation of the referenced VARIABLE.

**Lexical structure**

```
get_variable_string(device_var_name, destination_string)
```

The lexical elements of the builtin `get_variable_string` are shown in Table 230.

**Table 230 – Builtin `get_variable_string`**

| Parameter name     | Type      | Direction | Usage | Description                                                                                                                                                                                 |
|--------------------|-----------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| device_var_name    | reference | I         | m     | The name of the referenced VARIABLE.                                                                                                                                                        |
| destination_string | DD_STRING | O         | m     | Buffer for the textual representation of the referenced VARIABLE. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>           | int       | O         | m     | One of the return codes specified in Table 377.                                                                                                                                             |

**6.8.16 Builtin `itoa` (version A)**

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Convert integer in string

The builtin converts an integer value into a string.

**Lexical structure**

```
itoa(i)
```

The lexical elements of the builtin `itoa` are shown in Table 231.

**Table 231 – Builtin `itoa` (version A)**

| Parameter name | Type      | Direction | Usage | Description                          |
|----------------|-----------|-----------|-------|--------------------------------------|
| i              | int       | I         | m     | An integer value to convert to text. |
| <return>       | DD_STRING | O         | m     | The returned text.                   |

**6.8.17 Builtin `itoa` (version B)**

**Communication profiles:** HART

**Purpose:** Convert integer in string

The builtin `itoa` converts an integer value into a string. Radix is the base of the value (shall be between 2 and 36). If radix equals 10 and value is negative, the first character of the stored string shall be the minus sign (–).

**Lexical structure**

```
itoa(i, destination, radix)
```

The lexical elements of the builtin `itoa` are shown in Table 232.



**Table 232 – Builtin itoa (version B)**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                         |
|----------------|-----------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| i              | int       | I         | m     | An integer value to convert to text.                                                                                                                                |
| destination    | DD_STRING | I         | m     | The string in which text is to be stored. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| radix          | int       | I         | m     | The base of the value (2 = binary, 8 = octal, 10 = decimal, 16 = hexadecimal).                                                                                      |
| <return>       | DD_STRING | O         | m     | The returned string.                                                                                                                                                |

### 6.8.18 Builtin strleft

**Communication profiles:** CS, FF, GPE, ISA100, PB, PN

**Purpose:** Get substring from the beginning of a string

The builtin strleft extracts a substring from the beginning of a string.

#### Lexical structure

strleft(string, length)

The lexical elements of the builtin strleft are shown in Table 233.

**Table 233 – Builtin strleft**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                 |
|----------------|-----------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING | I         | m     | The input string. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| length         | int       | I         | m     | The number of characters to be extracted from the input string.                                                                             |
| <return>       | DD_STRING | O         | m     | The specified substring.                                                                                                                    |

### 6.8.19 Builtin strcmp

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Compares two strings

The builtin strcmp compares two strings lexicographically, and returns the relation as described in Table 234.

#### Lexical structure

strcmp(string1, string2)

The lexical elements of the builtin strcmp are shown in Table 234.

**Table 234 – Builtin strcmp**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                      |
|----------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| string1        | DD_STRING | I         | m     | The first string. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                      |
| string2        | DD_STRING | I         | m     | The second string. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                     |
| <return>       | int       | O         | m     | Zero if string1 and string2 are the same, returns a negative value if string1 is less than string2, returns a positive value if string1 is greater than string2. |

**Example**

```
DD_STRING buffer1 = "PT_101"
DD_STRING buffer2 = "PP_101"
int compare_result;
compare_result = strcmp( buffer1, buffer2 );
```

In this example, the value of compare\_result will be greater than 0.

**6.8.20 Builtin strlen**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Get the length of a string

The builtin strlen returns the length (number of characters) of a string.

**Lexical structure**

```
strlen(string)
```

The lexical elements of the builtin strlen are shown in Table 235.

**Table 235 – Builtin strlen**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                          |
|----------------|-----------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING | I         | m     | The string whose length is to be returned. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | int       | O         | m     | The length of the string.                                                                                                                                            |

**Example**

```
DD_STRING buffer;
buffer = "Unleash the power of EDDL!";
int len;
len = strlen(buffer);
```

In this example, the value of len will be set to 26.

### 6.8.21 Builtin strlwr

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Convert a string to lower case

The builtin strlwr returns a lower-case version of a string.

#### Lexical structure

strlwr(string)

The lexical elements of the builtin strlwr are shown in Table 236.

**Table 236 – Builtin strlwr**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                           |
|----------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING | I         | m     | The string to be converted. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | DD_STRING | O         | m     | A lower-case version of the string.                                                                                                                   |

#### Example

```
DD_STRING buffer;
long_tag = "Unleash the power of EDDL!";
send(22);
buffer = strlwr(long_tag);
```

In this example, buffer will be "unleash the power of eddl!".

### 6.8.22 Builtin strmid

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Get a substring from a string specifying starting position and length

The builtin strmid returns a substring of a string. It copies from the start position of string the amount of characters stated by length to a buffer and returns it. The first character of the string starts at position zero.

#### Lexical structure

strmid(string, position, length)

The lexical elements of the builtin strmid are shown in Table 237.

**Table 237 – Builtin strmid**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                |
|----------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING | I         | m     | The input string. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                |
| position       | int       | I         | m     | The first character to be extracted from the input string. This is a zero-based position (i.e. index 0 specifies the first character in the input string). |
| length         | int       | I         | m     | The number of characters to be extracted from the input string.                                                                                            |
| <return>       | DD_STRING | O         | m     | The specified substring.                                                                                                                                   |

**Example**

```
DD_STRING string1 = "PT_101"
DD_STRING string2;
string2 = strmid(string1, 0, 2);
```

In this example, the value of string2 will be set to "PT" .

**6.8.23 Builtin strright**

**Communication profiles:** CS, FF, GPE, ISA100, PB, PN

**Purpose:** get substring from the end of a string

The builtin strright extracts a substring from the end of a string.

**Lexical structure**

```
strright(string, length)
```

The lexical elements of the builtin strright are shown in Table 238.

**Table 238 – Builtin strright**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                 |
|----------------|-----------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING | I         | m     | The input string. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| length         | int       | I         | m     | The number of characters to be extracted from the input string.                                                                             |
| <return>       | DD_STRING | O         | m     | The specified substring.                                                                                                                    |

**6.8.24 Builtin strstr**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Find a substring

The builtin strstr returns a substring of a string.

**Lexical structure**

```
strstr(string, search_string)
```

The lexical elements of the builtin strstr are shown in Table 239.

**Table 239 – Builtin strstr**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                          |
|----------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING | I         | m     | The string to be searched. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| search_string  | DD_STRING | I         | m     | The search string. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).         |
| <return>       | DD_STRING | O         | m     | The substring beginning with the first occurrence of search_string, or an empty string ("") if the search_string cannot be found.                    |

### Example

```
DD_STRING buffer;
buffer = "Unleash the power of EDDL!";
tag = strstr(buffer, "power");
```

In this example, tag will contain the string "power of", as the call to strstr will return the DD\_STRING "power of EDDL!", which will get truncated to 8 characters when converted to the tag ASCII DD-Variable.

### 6.8.25 Builtin strtrim

**Communication profiles: CS, FF, GPE, HART, ISA100, PB, PN**

**Purpose: Remove leading and trailing whitespace characters from a string**

The builtin strtrim trims any leading and trailing whitespace from a string. Whitespace characters that are removed are space (' '), tab ('\t'), carriage return ('\r'), newline ('\n'), vertical tab ('\v'), and formfeed ('\f').

### Lexical structure

```
strtrim(string)
```

The lexical elements of the builtin strtrim are shown in Table 240.

**Table 240 – Builtin strtrim**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                         |
|----------------|-----------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING | I         | m     | The string to be trimmed. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | DD_STRING | O         | m     | A string with leading and trailing whitespace removed.                                                                                              |

### Example

```
DD_STRING buffer1 = " PT_101 "
DD_STRING buffer2;
buffer2 = strtrim(buffer1);
```

In this example, the value of buffer2 will be set to "PT\_101".

### 6.8.26 Builtinstrupr

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Convert a string to upper case

The builtinstrupr returns an upper-case version of a string.

#### Lexical structure

`strupr(string)`

The lexical elements of the builtinstrupr are shown in Table 241.

**Table 241 – Builtinstrupr**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                           |
|----------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING | I         | m     | The string to be converted. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | DD_STRING | O         | m     | An upper-case version of the string.                                                                                                                  |

#### Example

```
DD_STRING buffer;
long_tag = "Unleash the power of EDDL!";
send(22);
buffer = strupr(long_tag);
```

In this example, buffer will be "UNLEASH THE POWER OF EDDL!", yet, long\_tag will remain "Unleash the power of EDDL!".

### 6.8.27 Builtintrunc

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Truncate

The builtintrunc truncates a floating-point value to the nearest integer that is less than or equal to the specified floating point value.

#### Lexical structure

`trunc(x)`

The lexical elements of the builtintrunc are shown in Table 242.

**Table 242 – Builtintrunc**

| Parameter name | Type   | Direction | Usage | Description                               |
|----------------|--------|-----------|-------|-------------------------------------------|
| x              | double | I         | m     | A floating-point value.                   |
| <return>       | double | O         | m     | The truncated value rounded towards zero. |

#### Example

```
double v, value;
v = trunc(value);
```

## 6.9 Date time builtins

### 6.9.1 Builtin AddTime

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Add time to a time value

The builtin AddTime adds a number of seconds to a time\_t value.

#### Lexical structure

AddTime(t0, seconds)

The lexical elements of the builtin AddTime are shown in Table 243.

**Table 243 – Builtin AddTime**

| Parameter name | Type   | Direction | Usage | Description                   |
|----------------|--------|-----------|-------|-------------------------------|
| t0             | time_t | l         | m     | The initial time_t value.     |
| seconds        | double | l         | m     | The number of seconds to add. |
| <return>       | time_t | o         | m     | the calculated time_t value.  |

#### Example

```
time_t t, tplus2;
tplus2 = AddTime(t0, 2.0);
```

### 6.9.2 Builtin DATE\_AND\_TIME\_VALUE\_to\_string

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Create formatted string from date and TIME\_VALUE(4)

The builtin DATE\_AND\_TIME\_VALUE\_to\_string creates a string representation of a DATE and a TIME\_VALUE(4). The programming language-C strftime function defines the structure of the format string.

#### Lexical structure

DATE\_AND\_TIME\_VALUE\_to\_string(string, format, date, time\_value)

The lexical elements of the builtin DATE\_AND\_TIME\_VALUE\_to\_string are shown in Table 244.

**Table 244 – Builtin DATE\_AND\_TIME\_VALUE\_to\_string**

| Parameter name | Type          | Direction | Usage | Description                                                                                                                                                                                   |
|----------------|---------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING     | I/O       | m     | The string into which the formatted DATE and TIME_VALUE are copied. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| format         | DD_STRING     | I         | m     | How the DATE and TIME_VALUE are to be formatted. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                    |
| date           | long          | I         | m     | A long value containing the DATE to be formatted.                                                                                                                                             |
| time_value     | unsigned long | I         | m     | The TIME_VALUE to be formatted.                                                                                                                                                               |
| <return>       | int           | O         | m     | The number of characters actually copied or -1 if an error occurs (e.g. format specifiers that are not applicable to the source data type).                                                   |

**6.9.3 Builtin Date\_to\_DayOfMonth****Communication profiles: CS, GPE, HART, PB, PN****Purpose: Calculate day of month from date**

The builtin Date\_to\_DayOfMonth calculates the day of the month from a given number of days since 1 January 1900.

**Lexical structure**

```
Date_to_DayOfMonth(date)
```

The lexical elements of the builtin Date\_to\_DayOfMonth are shown in Table 245.

**Table 245 – Builtin Date\_to\_DayOfMonth**

| Parameter name | Type | Direction | Usage | Description                                                                                   |
|----------------|------|-----------|-------|-----------------------------------------------------------------------------------------------|
| date           | long | I         | m     | A long value containing the DATE.                                                             |
| <return>       | int  | O         | m     | The day of month. -1 is returned if the EDD application detects an invalid or erroneous DATE. |

**6.9.4 Builtin DATE\_to\_days****Communication profiles: CS, GPE, HART, PB, PN****Purpose: Calculate number of days between two dates**

The builtin DATE\_to\_days calculates the number of days between two dates.

**Lexical structure**

```
DATE_to_days(date1, date0)
```

The lexical elements of the builtin DATE\_to\_days are shown in Table 246.



**Table 246 – Builtin DATE\_to\_days**

| Parameter name | Type | Direction | Usage | Description                                                                                                          |
|----------------|------|-----------|-------|----------------------------------------------------------------------------------------------------------------------|
| date1          | long | I         | m     | The more recent date.                                                                                                |
| date0          | long | I         | m     | The less recent date.                                                                                                |
| <return>       | long | O         | m     | The number of days between date1 and date0 (date1 – date0). If date1 is less than date 0, the result is unspecified. |

### 6.9.5 Builtin Date\_to\_Month

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Calculate month from date

The builtin Date\_to\_Month calculates the month from a given number of days since 1 January 1900.

#### Lexical structure

Date\_to\_Month(date)

The lexical elements of the builtin Date\_to\_Month are shown in Table 247.

**Table 247 – Builtin Date\_to\_Month**

| Parameter name | Type | Direction | Usage | Description                                                                            |
|----------------|------|-----------|-------|----------------------------------------------------------------------------------------|
| date           | long | I         | m     | A long value containing the DATE.                                                      |
| <return>       | int  | O         | m     | The month. -1 is returned if the EDD application detects an invalid or erroneous DATE. |

### 6.9.6 Builtin DATE\_to\_string

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Create formatted string from date

The builtin DATE\_to\_string creates a string representation of a DATE. The programming language-C strftime function defines the structure of the format string.

#### Lexical structure

DATE\_to\_string(string, format, date)

The lexical elements of the builtin DATE\_to\_string are shown in Table 248.

**Table 248 – Builtin DATE\_to\_string**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                   |
|----------------|-----------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING | I         | m     | The string into which the formatted DATE is copied. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| format         | DD_STRING | I         | m     | How the DATE is to be formatted. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                    |
| date           | long      | I         | m     | A long value containing the DATE.                                                                                                                                             |
| <return>       | int       | O         | m     | The number of character actually copied or -1 if an error occurs (e.g. format specifiers that are not applicable to the source data type).                                    |

**6.9.7 Builtin Date\_To\_Time****Communication profiles:** CS, GPE, HART, PB, PN**Purpose:** Create time from date

The builtin Date\_To\_Time creates a time\_t from a date value. The time of day is set to 00:00:00.

**Lexical structure**

Date\_To\_Time(date)

The lexical elements of the builtin Date\_To\_Time are shown in Table 249.

**Table 249 – Builtin Date\_To\_Time**

| Parameter name | Type   | Direction | Usage | Description                       |
|----------------|--------|-----------|-------|-----------------------------------|
| date           | long   | I         | m     | A long value containing the DATE. |
| <return>       | time_t | O         | m     | A time_t value.                   |

**6.9.8 Builtin Date\_to\_Year****Communication profiles:** CS, GPE, HART, PB, PN**Purpose:** Calculate year from date

The builtin Date\_to\_Year calculates the year from a given number of days since 1 January 1900.

**Lexical structure**

Date\_to\_Year(date)

The lexical elements of the builtin Date\_to\_Year are shown in Table 250.

**Table 250 – Builtin Date\_to\_Year**

| Parameter name | Type | Direction | Usage | Description                                                                                      |
|----------------|------|-----------|-------|--------------------------------------------------------------------------------------------------|
| date           | long | I         | m     | A long value containing the DATE.                                                                |
| <return>       | int  | O         | m     | The year (4 digits). -1 is returned if the EDD application detects an invalid or erroneous DATE. |

### 6.9.9 Builtin days\_to\_DATE

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Add days to date

The builtin days\_to\_DATE calculates a future date by adding a number of days to a DATE.

#### Lexical structure

days\_to\_DATE(days, date)

The lexical elements of the builtin days\_to\_DATE are shown in Table 251.

**Table 251 – Builtin days\_to\_DATE**

| Parameter name | Type | Direction | Usage | Description                               |
|----------------|------|-----------|-------|-------------------------------------------|
| days           | long | I         | m     | The number of days to add to the DATE.    |
| date           | long | I         | m     | A long value containing the initial DATE. |
| <return>       | long | O         | m     | A long value containing the DATE.         |

### 6.9.10 Builtin DELAY\_TIME

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Pause the current method for the number of seconds specified

The builtin DELAY\_TIME will pause for the specified number of seconds. The delay time shall be a positive number. While DELAY\_TIME is executing, the METHOD cannot be continued or aborted by the user.

#### Lexical structure

DELAY\_TIME(delay\_time)

The lexical elements of the builtin DELAY\_TIME are shown in Table 252.

**Table 252 – Builtin DELAY\_TIME**

| Parameter name | Type             | Direction | Usage | Description                     |
|----------------|------------------|-----------|-------|---------------------------------|
| delay_time     | unsigned integer | I         | m     | The delay in number of seconds. |
| <return>       | VOID             | —         | —     | —                               |

### 6.9.11 Builtin DiffTime

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate time difference

The builtin DiffTime calculates the difference between two calendar times and returns the difference in seconds as a double.

#### Lexical structure

DiffTime(t1, t0)

The lexical elements of the builtin DiffTime are shown in Table 253.

**Table 253 – Builtin DiffTime**

| Parameter name | Type   | Direction | Usage | Description                                  |
|----------------|--------|-----------|-------|----------------------------------------------|
| t1             | time_t | l         | m     | The more recent time.                        |
| t0             | time_t | l         | m     | The less recent time.                        |
| <return>       | double | o         | m     | The difference between t1 and t0 in seconds. |

**Example**

```
double seconds;
time_t t1, t0;
seconds = DiffTime(t1, t0);
```

**6.9.12 Builtin From\_DATE\_AND\_TIME\_VALUE**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Create time from date and TIME\_VALUE(4)

The builtin From\_DATE\_AND\_TIME\_VALUE creates a time\_t from a DATE and a TIME\_VALUE(4).

**Lexical structure**

From\_DATE\_AND\_TIME\_VALUE(date, time\_value)

The lexical elements of the builtin From\_DATE\_AND\_TIME\_VALUE are shown in Table 254.

**Table 254 – Builtin From\_DATE\_AND\_TIME\_VALUE**

| Parameter name | Type          | Direction | Usage | Description                                                            |
|----------------|---------------|-----------|-------|------------------------------------------------------------------------|
| date           | long          | l         | m     | The DATE value.                                                        |
| time_value     | unsigned long | l         | m     | The TIME_VALUE(4) value.                                               |
| <return>       | time_t        | O         | m     | The time_t that was created or -1 if an invalid parameter is detected. |

**6.9.13 Builtin From\_TIME\_VALUE**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Create time from TIME\_VALUE

The builtin From\_TIME\_VALUE creates a time\_t from a TIME\_VALUE(4) and the current date (midnight) or from a TIME\_VALUE(8).

**Lexical structure**

From\_TIME\_VALUE(time\_value)

The lexical elements of the builtin From\_TIME\_VALUE are shown in Table 255.

**Table 255 – Builtin From\_TIME\_VALUE**

| Parameter name | Type                                      | Direction | Usage | Description                                                                                                                                                                 |
|----------------|-------------------------------------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| time_value     | unsigned long<br>or<br>unsigned long long | I         | m     | The TIME_VALUE value. A TIME_VALUE(8) is passed in as an unsigned long long and is an absolute time. A TIME_VALUE(4) is passed in as an unsigned long and is a time of day. |
| <return>       | time_t                                    | O         | m     | The time_t that was created or -1 if an invalid parameter is detected.                                                                                                      |

**6.9.14 Builtin GetCurrentDate**

**Communication profiles:** CS, FF, GPE, ISA100, PB, PN

**Purpose:** Return the current calendar date

The builtin GetCurrentDate returns the EDD application's best approximation of the current calendar date.

**Lexical structure**

```
GetCurrentDate()
```

The lexical element of the builtin GetCurrentDate is shown in Table 256.

**Table 256 – Builtin GetCurrentDate**

| Parameter name | Type   | Direction | Usage | Description                |
|----------------|--------|-----------|-------|----------------------------|
| <return>       | time_t | O         | m     | The current calendar date. |

**Example**

```
time_t today;
today = GetCurrentDate();
```

**6.9.15 Builtin GetCurrentDateAndTime**

**Communication profiles:** CS, FF, GPE, ISA100, PB, PN

**Purpose:** Return the current calendar date and time

The builtin GetCurrentDateAndTime returns the EDD application's best approximation of the current calendar date and time.

**Lexical structure**

```
GetCurrentDateAndTime()
```

The lexical element of the builtin GetCurrentDateAndTime is shown in Table 257.

**Table 257 – Builtin GetCurrentDateAndTime**

| Parameter name | Type   | Direction | Usage | Description                         |
|----------------|--------|-----------|-------|-------------------------------------|
| <return>       | time_t | o         | m     | The current calendar date and time. |

**Example**

```
time_t today;
today = GetCurrentDateAndTime();
```

**6.9.16 Builtin GetCurrentTime**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Get current EDD application time

The builtin GetCurrentTime gets the current time from the EDD application's best approximation of the current calendar time.

**Lexical structure**

GetCurrentTime(VOID)

The lexical element of the builtin GetCurrentTime is shown in Table 258.

**Table 258 – Builtin GetCurrentTime**

| Parameter name | Type   | Direction | Usage | Description                |
|----------------|--------|-----------|-------|----------------------------|
| <return>       | time_t | o         | m     | The current calendar time. |

**Example**

```
time_t today;
today = GetCurrentTime();
```

**6.9.17 Builtin GET\_TICK\_COUNT**

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Get time in ms

The builtin GET\_TICK\_COUNT returns the time in ms since the last system boot. It can be used for time stamps.

**Lexical structure**

GET\_TICK\_COUNT(VOID)

The lexical element of the builtin GET\_TICK\_COUNT is shown in Table 259.

**Table 259 – Builtin GET\_TICK\_COUNT**

| Parameter name | Type | Direction | Usage | Description                                |
|----------------|------|-----------|-------|--------------------------------------------|
| <return>       | long | O         | m     | The time in ms since the last system boot. |

**6.9.18 Builtin Make\_Time**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Create Time from input parameters

The builtin Make\_Time creates a time\_t from its input parameters. It allows an arbitrary calendar time to be created. The year is the calendar year (e.g., 2004) and the hour is in the range 0 to 23. The isDST is non-zero if the time is the local daylight savings time (i.e., summer-time).

### Lexical structure

`Make_Time(year, month, day, hour, minute, second, isDST)`

The lexical elements of the builtin `Make_Time` are shown in Table 260.

**Table 260 – Builtin `Make_Time`**

| Parameter name | Type   | Direction | Usage | Description                                                                                                                                           |
|----------------|--------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| year           | int    | I         | m     | The year.                                                                                                                                             |
| month          | int    | I         | m     | The month.                                                                                                                                            |
| day            | int    | I         | m     | The day.                                                                                                                                              |
| hour           | int    | I         | m     | The hour.                                                                                                                                             |
| minute         | int    | I         | m     | The minute.                                                                                                                                           |
| second         | int    | I         | m     | The second.                                                                                                                                           |
| isDST          | int    | I         | m     | Specifies whether daylight savings time is in effect. If zero, daylight savings time is not in effect; otherwise, daylight savings time is in effect. |
| <return>       | time_t | O         | m     | The time_t that was created or -1 if an invalid parameter is detected.                                                                                |

### Example

```
time_t t;
t = Make_Time(1,1,1970, 0, 0, 0, 0);
```

### 6.9.19 Builtin `seconds_to_TIME_VALUE`

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Convert seconds to `TIME_VALUE(4)`

The builtin `seconds_to_TIME_VALUE` converts a seconds value to a `TIME_VALUE`.

### Lexical structure

`seconds_to_TIME_VALUE(seconds)`

The lexical element of the builtin `seconds_to_TIME_VALUE` is shown in Table 261.

**Table 261 – Builtin `seconds_to_TIME_VALUE`**

| Parameter name | Type          | Direction | Usage | Description                           |
|----------------|---------------|-----------|-------|---------------------------------------|
| seconds        | double        | I         | m     | The number of seconds.                |
| <return>       | unsigned long | O         | m     | The <code>TIME_VALUE(4)</code> value. |

### Example

```
unsigned long v;
double secs;
v = seconds_to_TIME_VALUE(secs);
```

**6.9.20 Builtin seconds\_to\_TIME\_VALUE8****Communication profiles:** CS, FF, GPE, ISA100, PB, PN**Purpose:** Convert seconds to a TIME\_VALUE(8)

The builtin seconds\_to\_TIME\_VALUE8 converts a seconds value to a TIME\_VALUE(8).

**Lexical structure**

seconds\_to\_TIME\_VALUE8(seconds)

The lexical element of the builtin seconds\_to\_TIME\_VALUE is shown in Table 262.

**Table 262 – Builtin seconds\_to\_TIME\_VALUE**

| Parameter name | Type               | Direction | Usage | Description              |
|----------------|--------------------|-----------|-------|--------------------------|
| seconds        | double             | I         | m     | The number of seconds.   |
| <return>       | unsigned long long | O         | m     | The TIME_VALUE(8) value. |

**6.9.21 Builtin Time\_To\_Date****Communication profiles:** CS, GPE, HART, PB, PN**Purpose:** Create date from time

The builtin Time\_To\_Date creates a DATE value from a calendar date and time.

**Lexical structure**

Time\_To\_Date(t)

The lexical elements of the builtin Time\_To\_Date are shown in Table 263.

**Table 263 – Builtin Time\_To\_Date**

| Parameter name | Type   | Direction | Usage | Description       |
|----------------|--------|-----------|-------|-------------------|
| t              | time_t | I         | m     | The time_t value. |
| <return>       | long   | O         | m     | The DATE value.   |

**6.9.22 Builtin TIME\_VALUE\_to\_Hour****Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN**Purpose:** Extract hour from TIME\_VALUE

The builtin TIME\_VALUE\_to\_Hour extracts the hour component from a TIME\_VALUE.

**Lexical structure**

TIME\_VALUE\_to\_Hour(time\_value)

The lexical elements of the builtin TIME\_VALUE\_to\_Hour are shown in Table 264.



**Table 264 – Builtin TIME\_VALUE\_to\_Hour**

| Parameter name | Type                                      | Direction | Usage | Description                                                                                                                                                                         |
|----------------|-------------------------------------------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| time_value     | unsigned long<br>or<br>unsigned long long | I         | m     | The TIME_VALUE. A TIME_VALUE(8) is passed in as an unsigned long long and is an absolute time. A TIME_VALUE(4) is passed in as an unsigned long and is a duration or a time of day. |
| <return>       | int                                       | O         | m     | The hour component.                                                                                                                                                                 |

**Example**

```
int hour;
unsigned long value;
hour = TIME_VALUE_to_Hour(value);
```

**6.9.23 Builtin TIME\_VALUE\_to\_Minute**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Extract minute from TIME\_VALUE

The builtin TIME\_VALUE\_to\_Minute extracts the minute component from a TIME\_VALUE.

**Lexical structure**

```
TIME_VALUE_to_Minute(time_value)
```

The lexical elements of the builtin TIME\_VALUE\_to\_Minute are shown in Table 265.

**Table 265 – Builtin TIME\_VALUE\_to\_Minute**

| Parameter name | Type                                      | Direction | Usage | Description                                                                                                                                                                         |
|----------------|-------------------------------------------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| time_value     | unsigned long<br>or<br>unsigned long long | I         | m     | The TIME_VALUE. A TIME_VALUE(8) is passed in as an unsigned long long and is an absolute time. A TIME_VALUE(4) is passed in as an unsigned long and is a duration or a time of day. |
| <return>       | int                                       | O         | m     | The minute component.                                                                                                                                                               |

**Example**

```
int minute;
unsigned long value;
minute = TIME_VALUE_to_Minute(value);
```

**6.9.24 Builtin TIME\_VALUE\_to\_Second**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Extract second from TIME\_VALUE

The builtin TIME\_VALUE\_to\_Second extracts the seconds component from a TIME\_VALUE.

**Lexical structure**

```
TIME_VALUE_to_Second(time_value)
```

The lexical elements of the builtin TIME\_VALUE\_to\_Second are shown in Table 266.

**Table 266 – Builtin TIME\_VALUE\_to\_Second**

| Parameter name | Type                                      | Direction | Usage | Description                                                                                                                                                                         |
|----------------|-------------------------------------------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| time_value     | unsigned long<br>or<br>unsigned long long | I         | m     | The TIME_VALUE. A TIME_VALUE(8) is passed in as an unsigned long long and is an absolute time. A TIME_VALUE(4) is passed in as an unsigned long and is a duration or a time of day. |
| <return>       | int                                       | O         | m     | The seconds component.                                                                                                                                                              |

**Example**

```
int second;
unsigned long value;
second = TIME_VALUE_to_Second(value);
```

**6.9.25 Builtin TIME\_VALUE\_to\_seconds**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Convert TIME\_VALUE to number of seconds

The builtin TIME\_VALUE\_to\_seconds converts a TIME\_VALUE to a number of seconds.

**Lexical structure**

```
TIME_VALUE_to_seconds(time_value)
```

The lexical elements of the builtin TIME\_VALUE\_to\_seconds are shown in Table 267.

**Table 267 – Builtin TIME\_VALUE\_to\_seconds**

| Parameter name | Type                                      | Direction | Usage | Description                                                                                                                                                                            |
|----------------|-------------------------------------------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| time_value     | unsigned long<br>or<br>unsigned long long | I         | m     | The TIME_VALUE. A TIME_VALUE(8) is passed in as an unsigned long long and is an absolute time. A TIME_VALUE(4) is passed in as an unsigned long and is a duration or a time of day.    |
| <return>       | double                                    | O         | m     | The number of seconds of the duration or seconds since midnight if a TIME_VALUE(4) was given or the number of seconds since January 1 <sup>st</sup> 1972 if a TIME_VALUE(8) was given. |

**Example**

```
double seconds;
unsigned long value;
seconds = TIME_VALUE_to_seconds(value);
```

**6.9.26 Builtin TIME\_VALUE\_to\_string**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Create formatted string from TIME\_VALUE

The builtin TIME\_VALUE\_to\_string creates a string representation of a TIME\_VALUE. The programming language-C strftime function defines the structure of the format string.

### Lexical structure

`TIME_VALUE_to_string(string, format, time_value)`

The lexical elements of the builtin `TIME_VALUE_to_string` are shown in Table 268.

**Table 268 – Builtin `TIME_VALUE_to_string`**

| Parameter name | Type                                      | Direction | Usage | Description                                                                                                                                                                                                                                |
|----------------|-------------------------------------------|-----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING                                 | O         | m     | The string into which the formatted <code>TIME_VALUE</code> is copied. String types that are not a <code>DD_STRING</code> may be also be used and will be automatically promoted to a <code>DD_STRING</code> (see 6.18.3).                 |
| format         | DD_STRING                                 | I         | m     | How the <code>TIME_VALUE</code> is to be formatted. String types that are not a <code>DD_STRING</code> may be also be used and will be automatically promoted to a <code>DD_STRING</code> (see 6.18.3).                                    |
| time_value     | unsigned long<br>or<br>unsigned long long | I         | m     | The <code>TIME_VALUE</code> to be formatted. A <code>TIME_VALUE(8)</code> is passed in as an unsigned long long and is an absolute time. A <code>TIME_VALUE(4)</code> is passed in as an unsigned long and is a duration or a time of day. |
| <return>       | int                                       | O         | m     | The number of characters actually copied or -1 if an error occurs (e.g. format specifiers that are not applicable to the source data type).                                                                                                |

### Example

```
DD_STRING str[50];
int length;
unsigned long value;
length = TIME_VALUE_to_string(str, "%m/%d/%y", value);
```

### 6.9.27 Builtin `timet_to_string`

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Create a formatted string from time

The builtin `timet_to_string` creates a string representation of a `time_t`. The programming language-C `strftime` function defines the structure of the format string.

### Lexical structure

`timet_to_string(string, format, timet)`

The lexical elements of the builtin `timet_to_string` are shown in Table 269.

**Table 269 – Builtin `timet_to_string`**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                              |
|----------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING | O         | m     | The string into which formatted <code>time_t</code> is copied. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| format         | DD_STRING | I         | m     | How the <code>time_t</code> is to be formatted. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).                |
| timet          | time_t    | I         | m     | The <code>time_t</code> to be formatted.                                                                                                                                                 |
| <return>       | int       | O         | m     | The number of characters actually copied or -1 if an error occurs (e.g. format specifiers that are not applicable to the source data type).                                              |

**Example**

```
DD_STRING str[50];
int length;
time_t value;
length = timet_to_string(str, "%m/%d/%y", value);
```

**6.9.28 Builtin `timet_to_TIME_VALUE`**

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Convert time to TIME\_VALUE(4)

The builtin `timet_to_TIME_VALUE` converts the time of day part of a `time_t` to a TIME\_VALUE(4).

**Lexical structure**

```
timet_to_TIME_VALUE(timet)
```

The lexical elements of the builtin `timet_to_TIME_VALUE` are shown in Table 270.

**Table 270 – Builtin `timet_to_TIME_VALUE`**

| Parameter name | Type          | Direction | Usage | Description                                                                                                |
|----------------|---------------|-----------|-------|------------------------------------------------------------------------------------------------------------|
| timet          | time_t        | I         | m     | The <code>time_t</code> value to convert.                                                                  |
| <return>       | unsigned long | O         | m     | The TIME_VALUE(4) value corresponding to the time of day given by the input parameter <code>timet</code> . |

**Example**

```
unsigned long t;
time_t value;
t = timet_to_TIME_VALUE(value);
```

**6.9.29 Builtin `timet_To_TIME_VALUE`**

**Communication profiles:** HART

**Purpose:** Convert time to TIME\_VALUE(4)

The builtin `timet_To_TIME_VALUE` converts the time of day part of a `time_t` to a TIME\_VALUE(4).

**Lexical structure**

```
timet_To_TIME_VALUE(timet)
```

The lexical elements of the builtin `timet_To_TIME_VALUE` are shown in Table 271.

**Table 271 – Builtin `timet_To_TIME_VALUE`**

| Parameter name | Type          | Direction | Usage | Description                                                                                  |
|----------------|---------------|-----------|-------|----------------------------------------------------------------------------------------------|
| timet          | time_t        | I         | m     | The time_t value to convert.                                                                 |
| <return>       | unsigned long | O         | m     | The TIME_VALUE(4) value corresponding to the time of day given by the input parameter timet. |

**6.9.30 Builtin `timet_to_TIME_VALUE8`**

**Communication: Profiles:** CS, FF, GPE, ISA100, PB, PN

**Purpose:** Convert time to TIME\_VALUE(8)

The builtin `timet_to_TIME_VALUE` converts time\_t to a TIME\_VALUE(8).

**Lexical structure**

```
timet_to_TIME_VALUE8(timet)
```

The lexical elements of the builtin `timet_to_TIME_VALUE` are shown in Table 272.

**Table 272 – Builtin `timet_to_TIME_VALUE8`**

| Parameter name | Type               | Direction | Usage | Description                                                                                    |
|----------------|--------------------|-----------|-------|------------------------------------------------------------------------------------------------|
| timet          | time_t             | I         | m     | The time_t value to convert.                                                                   |
| <return>       | unsigned long long | O         | m     | The TIME_VALUE(8) value corresponding to the date and time given by the input parameter timet. |

**6.9.31 Builtin `To_Date`**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Create date from input parameters

The builtin `To_Date` creates a DATE from year, month and day. The year is the calendar year (e.g., 2004). The EDD application may verify the validity of the parameters and set the result to the nearest legal DATE.

**Lexical structure**

```
To_Date(year, month, day)
```

The lexical elements of the builtin `To_Date` are shown in Table 273.

**Table 273 – Builtin `To_Date`**

| Parameter name | Type | Direction | Usage | Description     |
|----------------|------|-----------|-------|-----------------|
| year           | int  | I         | m     | The year.       |
| month          | int  | I         | m     | The month.      |
| day            | int  | I         | m     | The day.        |
| <return>       | long | O         | m     | The DATE value. |

### 6.9.32 Builtin To\_Date\_and\_Time

Communication profiles: CS, GPE, PB, PN

**Purpose:** Create DATE\_AND\_TIME from input parameters

The builtin To\_Date\_and\_Time converts a days, hour, minute, second and millisecond value to a DATE\_AND\_TIME value.

NOTE The return value can be assigned to a DATE\_AND\_TIME variable.

#### Lexical structure

To\_Date\_and\_Time(days, hour, minute, second, millisecond)

The lexical elements of the builtin To\_Date\_and\_Time are shown in Table 274.

**Table 274 – Builtin To\_Date\_and\_Time**

| Parameter name | Type               | Direction | Usage | Description                                                                                                |
|----------------|--------------------|-----------|-------|------------------------------------------------------------------------------------------------------------|
| days           | int                | I         | m     | The number of days since January 1 <sup>st</sup> , 1900. The number of days can only be a positive number. |
| hour           | int                | I         | m     | The hour.                                                                                                  |
| minute         | int                | I         | m     | The minute.                                                                                                |
| second         | int                | I         | m     | The second.                                                                                                |
| millisecond    | int                | I         | m     | The millisecond.                                                                                           |
| <return>       | unsigned long long | O         | m     | The DATE_AND_TIME value corresponding to the given time_t value packaged in an unsigned long long value.   |

### 6.9.33 Builtin To\_Time

Communication profiles: CS, GPE, HART, PB, PN

**Purpose:** Create a time from input parameters

The builtin To\_Time creates a time\_t value from its input arguments.

#### Lexical structure

To\_Time(date, hour, minute, second, isDST)

The lexical elements of the builtin To\_Time are shown in Table 275.

**Table 275 – Builtin To\_Time**

| Parameter name | Type   | Direction | Usage | Description                                                                                                                                           |
|----------------|--------|-----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| date           | long   | I         | m     | A long value containing the DATE.                                                                                                                     |
| hour           | int    | I         | m     | The hour.                                                                                                                                             |
| minute         | int    | I         | m     | The minute.                                                                                                                                           |
| second         | int    | I         | m     | The second.                                                                                                                                           |
| isDST          | int    | I         | m     | Specifies whether daylight savings time is in effect. If zero, daylight savings time is not in effect; otherwise, daylight savings time is in effect. |
| <return>       | time_t | O         | m     | The time_t value.                                                                                                                                     |

### 6.9.34 Builtin To\_TIME\_VALUE

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Create TIME\_VALUE(4) from input parameters

The builtin To\_TIME\_VALUE creates a TIME\_VALUE from its input arguments.

#### Lexical structure

To\_TIME\_VALUE(hours, minutes, seconds)

The lexical elements of the builtin To\_TIME\_VALUE are shown in Table 276.

**Table 276 – Builtin To\_TIME\_VALUE**

| Parameter name | Type          | Direction | Usage | Description                                                                                                       |
|----------------|---------------|-----------|-------|-------------------------------------------------------------------------------------------------------------------|
| hours          | int           | I         | m     | The number of hours.                                                                                              |
| minutes        | int           | I         | m     | The number of minutes.                                                                                            |
| seconds        | int           | I         | m     | The number of seconds.                                                                                            |
| <return>       | unsigned long | O         | m     | The TIME_VALUE(4) value corresponding to the time of day given by the input parameter hours, minutes and seconds. |

#### Example

```
double time;
time = To_TIME_VALUE(12, 0, 0);
```

### 6.9.35 Builtin To\_TIME\_VALUE8

**Communication profiles:** CS, FF, GPE, ISA100, PB, PN

**Purpose:** Create TIME\_VALUE(8) from input parameters

The builtin To\_TIME\_VALUE8 creates a TIME\_VALUE(8) from its input arguments.

#### Lexical structure

To\_TIME\_VALUE8(year, month, day, hour, minute, second)

The lexical elements of the builtin To\_TIME\_VALUE are shown in Table 277.

**Table 277 – Builtin To\_TIME\_VALUE8**

| Parameter name | Type               | Direction | Usage | Description                                                    |
|----------------|--------------------|-----------|-------|----------------------------------------------------------------|
| year           | int                | I         | m     | The year.                                                      |
| month          | int                | I         | m     | The month.                                                     |
| day            | int                | I         | m     | The day.                                                       |
| hour           | int                | I         | m     | The hour.                                                      |
| minute         | int                | I         | m     | The minute.                                                    |
| second         | int                | I         | m     | The second.                                                    |
| <return>       | unsigned long long | O         | m     | The TIME_VALUE(8) value corresponding to the input parameters. |

## 6.10 Diagnostic builtins

### 6.10.1 Builtin `get_comm_error`

**Communication profiles:** FF, ISA100

**Purpose:** Get communication error code

The builtin `get_comm_error` returns the communications error code received from an application in the event of a builtin return code of `BLTIN_FAIL_COMM_ERROR`.

This builtin is used primarily for debugging purposes to determine what type of communications failures are occurring by displaying the communications error for the method writer to see.

In rare cases, the method could react to specific communications errors. However, the method should specify alternate handling of communications errors by way of the following:

- `fail_on_all_comm_errors`
- `fail_on_comm_error`
- `abort_on_all_comm_errors`
- `ABORT_ON_COMM_ERROR`

The alternate handling may cause the method to abort or immediately process the error based on the presence of a communications error.

The communications error codes are defined by the consortia. Their related strings may be defined in a text dictionary. A communications error of zero is not considered a communications error. The builtin gets the communications error code returned from the last communications request.

#### Lexical structure

`get_comm_error(VOID)`

The lexical element of the builtin `get_comm_error` is shown in Table 278.

**Table 278 – Builtin `get_comm_error`**

| Parameter name | Type          | Direction | Usage | Description                 |
|----------------|---------------|-----------|-------|-----------------------------|
| <return>       | unsigned long | O         | m     | A communication error code. |

#### Example

```
long status;
if (status == BLTIN_FAIL_COMM_ERROR)
{
    status = display_comm_error(get_comm_error());
}
```

### 6.10.2 Builtin `get_dds_error`

**Communication profiles:** FF, ISA100

**Purpose:** Return EDD error code

The builtin `get_dds_error` returns the EDD error generated by an earlier call, and optionally returns a text string describing the error.



By calling this builtin, a method may determine the specific EDD error code related to the received return code BLTIN\_DDS\_ERROR. A textual representation of the error message is put into a provided buffer with a given maximum length.

This builtin provides a means of debugging calls to builtin routines, which are returning an error. It should never be used in a final production method, because the types of errors that are returned with get\_dds\_error should never be received in a fully debugged method.

The EDD error and optional description returned are for the most recent EDD error.

### Lexical structure

get\_dds\_error(string, maxlen)

The lexical elements of the builtin get\_dds\_error are shown in Table 279.

**Table 279 – Builtin get\_dds\_error**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                  |
|----------------|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| string         | DD_STRING | O         | m     | An output buffer for the description of the error. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| maxlen         | long      | I         | m     | The maximum length of the output buffer (string) in octets.                                                                                                                  |
| <return>       | long      | O         | m     | An error code generated by an earlier builtin call.                                                                                                                          |

### Example

```
long status;
char msg[256];
if(status == BLTIN_DDS_ERROR)
{
    status = get_dds_error(msg, 256);
}
```

### 6.10.3 Builtin get\_response\_code

**Communication profiles:** FF, ISA100

**Purpose:** Get response code for last communication request

The builtin get\_response\_code returns the response code received from a device in the event of a builtin communications call returning the error BLTIN\_FAIL\_RESPONSE\_CODE. It also returns the value reference (err\_id, err\_member\_id) information associated with the original request. The original request is the last builtin call that caused communication.

A response code is a value representing an application-specific error condition.

**NOTE** A response code value of zero is not considered an error response code. Each response code and response code type is defined in the EDD.

Gets the response code returned on the last communications request, and the item id and member id for the value being accessed when the response code was returned.

### Lexical structure

get\_response\_code(resp\_code, err\_id, err\_member\_id)

The lexical elements of the builtin get\_response\_code are shown in Table 280.

**Table 280 – Builtin get\_response\_code**

| Parameter name | Type          | Direction | Usage | Description                                                    |
|----------------|---------------|-----------|-------|----------------------------------------------------------------|
| resp_code      | unsigned long | O         | m     | The number of the returned response code.                      |
| err_id         | unsigned long | O         | m     | The returned item id of the item generating the response code. |
| err_member_id  | unsigned long | O         | m     | The returned member id of the item causing a response code.    |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.                |

**Example**

```

long status;
unsigned long id;
unsigned long member;
unsigned long code;
if (status == BLTIN_FAIL_RESPONSE_CODE)
{
    status = get_response_code(&code, &id, &member);
    status = display_response_code(id, member, code);
}

```

**6.11 Math builtins****6.11.1 Builtin abs****Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN**Purpose:** Calculate absolute value

The builtin abs returns the absolute value of a floating-point value.

**Lexical structure**

abs(x)

The lexical elements of the builtin abs are shown in Table 281.

**Table 281 – Builtin abs**

| Parameter name | Type   | Direction | Usage | Description             |
|----------------|--------|-----------|-------|-------------------------|
| x              | double | I         | m     | A floating-point value. |
| <return>       | double | O         | m     | The absolute value.     |

**Example**

```

double v, value;
v = abs(value);

```

**6.11.2 Builtin acos****Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN**Purpose:** Calculate arc cosine

The builtin acos returns the arc cosine of a floating-point value. The value is forced to be in the range [-1, +1].

**Lexical structure**

`acos(x)`

The lexical elements of the builtin `acos` are shown in Table 282.

**Table 282 – Builtin `acos`**

| Parameter name              | Type   | Direction | Usage | Description             |
|-----------------------------|--------|-----------|-------|-------------------------|
| <code>x</code>              | double | I         | m     | A floating-point value. |
| <code>&lt;return&gt;</code> | double | O         | m     | The arc cosine.         |

**Example**

```
double v, value;
v = acos(value);
```

**6.11.3 Builtin `asin`**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate arc sine

The builtin `asin` returns the arc sine of a floating-point value. The value is forced to be in the range  $[-1, +1]$ .

**Lexical structure**

`asin(x)`

The lexical elements of the builtin `asin` are shown in Table 283.

**Table 283 – Builtin `asin`**

| Parameter name              | Type   | Direction | Usage | Description             |
|-----------------------------|--------|-----------|-------|-------------------------|
| <code>x</code>              | double | I         | m     | A floating-point value. |
| <code>&lt;return&gt;</code> | double | O         | m     | The arc sine.           |

**Example**

```
double v, value;
v = asin(value);
```

**6.11.4 Builtin `atan`**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate arc tangent

The builtin `atan` returns the arc tangent of a floating-point value. The value is forced to be in the range  $[-1, +1]$ .

**Lexical structure**

`atan(x)`

The lexical elements of the builtin `atan` are shown in Table 284.

**Table 284 – Builtin atan**

| Parameter name | Type   | Direction | Usage | Description             |
|----------------|--------|-----------|-------|-------------------------|
| x              | double | I         | m     | A floating-point value. |
| <return>       | double | O         | m     | The arc tangent.        |

**Example**

```
double v, value;
v = atan(value);
```

**6.11.5 Builtin ByteToDouble**

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Calculate double from bytes

The builtin ByteToDouble will return a double value from a vector of eight octets.

**Lexical structure**

```
ByteToDouble(in1, in2, in3, in4, in5, in6, in7, in8)
```

The lexical element of the builtin ByteToDouble is shown in Table 285.

**Table 285 – Builtin ByteToDouble**

| Parameter name | Type          | Direction | Usage | Description                                                  |
|----------------|---------------|-----------|-------|--------------------------------------------------------------|
| in1            | unsigned char | I         | m     | First element of the double value (most significant byte).   |
| in2            | unsigned char | I         | m     | Second element of the double value.                          |
| in3            | unsigned char | I         | m     | Third element of the double value.                           |
| in4            | unsigned char | I         | m     | Fourth element of the double value.                          |
| in5            | unsigned char | I         | m     | Fifth element of the double value.                           |
| in6            | unsigned char | I         | m     | Sixth element of the double value.                           |
| in7            | unsigned char | I         | m     | Seventh element of the double value.                         |
| in8            | unsigned char | I         | m     | Eighth element of the double value (least significant byte). |
| <return>       | double        | O         | m     | A double value from the given vector of eight octets.        |

**6.11.6 Builtin ByteToFloat**

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Calculate float from bytes

The builtin ByteToFloat will return a floating value from a vector of four octets.

**Lexical structure**

```
ByteToFloat(in1, in2, in3, in4)
```

The lexical elements of the builtin ByteToFloat are shown in Table 286.

**Table 286 – Builtin ByteToFloat**

| Parameter name | Type          | Direction | Usage | Description                                                  |
|----------------|---------------|-----------|-------|--------------------------------------------------------------|
| in1            | unsigned char | I         | m     | First element of the float value (most significant byte).    |
| in2            | unsigned char | I         | m     | Second element of the float value.                           |
| in3            | unsigned char | I         | m     | Third element of the float value.                            |
| in4            | unsigned char | I         | m     | Fourth element of the float value (least significant byte).  |
| <return>       | float         | O         | m     | A floating-point value from the given vector of four octets. |

**6.11.7 Builtin ByteToLong****Communication profiles:** CS, GPE, PB, PN**Purpose:** Calculate long from bytes

The builtin ByteToLong will return a long value from a vector of four octets.

**Lexical structure**

```
ByteToLong(in1, in2, in3, in4)
```

The lexical elements of the builtin ByteToLong are shown in Table 287.

**Table 287 – Builtin ByteToLong**

| Parameter name | Type          | Direction | Usage | Description                                                |
|----------------|---------------|-----------|-------|------------------------------------------------------------|
| in1            | unsigned char | I         | m     | First element of the long value (most significant byte).   |
| in2            | unsigned char | I         | m     | Second element of the long value.                          |
| in3            | unsigned char | I         | m     | Third element of the long value.                           |
| in4            | unsigned char | I         | m     | Fourth element of the long value (least significant byte). |
| <return>       | long          | O         | m     | A long value from the given vector of four octets.         |

**6.11.8 Builtin ByteToShort****Communication profiles:** CS, GPE, PB, PN**Purpose:** Calculate short from bytes

The builtin ByteToShort will return a short value from a vector of two octets.

**Lexical structure**

```
ByteToShort(in1, in2)
```

The lexical elements of the builtin ByteToShort are shown in Table 288.

**Table 288 – Builtin ByteToShort**

| Parameter name | Type          | Direction | Usage | Description                                                 |
|----------------|---------------|-----------|-------|-------------------------------------------------------------|
| in1            | unsigned char | I         | m     | First element of the short value (most significant byte).   |
| in2            | unsigned char | I         | m     | Second element of the short value (least significant byte). |
| <return>       | short         | O         | m     | A short value from the given vector of two octets.          |

**6.11.9 Builtin cbrt**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate cubic root

The builtin cbrt returns the cubic root of a floating-point value.

**Lexical structure**

`cbrt(x)`

The lexical elements of the builtin cbrt are shown in Table 289.

**Table 289 – Builtin cbrt**

| Parameter name | Type   | Direction | Usage | Description             |
|----------------|--------|-----------|-------|-------------------------|
| x              | double | I         | m     | A floating-point value. |
| <return>       | double | O         | m     | The cubic root.         |

**Example**

```
double v, value;
v = cbrt(value);
```

**6.11.10 Builtin ceil**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate next higher integer

The builtin ceil returns the smallest integral value not less than a specified floating-point value (next higher integer value).

**Lexical structure**

`ceil(x)`

The lexical elements of the builtin ceil are shown in Table 290.

**Table 290 – Builtin ceil**

| Parameter name | Type   | Direction | Usage | Description             |
|----------------|--------|-----------|-------|-------------------------|
| x              | double | I         | m     | A floating-point value. |
| <return>       | double | O         | m     | The ceiling value.      |

**Example**

```
double v, value;
v = ceil(value);
```

**6.11.11 Builtin cos**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate cosine

The builtin cos returns the cosine of a floating-point value (measured in radians).

**Lexical structure**

cos(x)

The lexical elements of the builtin cos are shown in Table 291.

**Table 291 – Builtin cos**

| Parameter name | Type   | Direction | Usage | Description             |
|----------------|--------|-----------|-------|-------------------------|
| x              | double | I         | m     | A floating-point value. |
| <return>       | double | O         | m     | The cosine.             |

**Example**

```
double v, value;
v = cos(value);
```

**6.11.12 Builtin cosh**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate hyperbolic cosine

The builtin cosh returns the hyperbolic cosine of a floating-point value.

**Lexical structure**

cosh(x)

The lexical elements of the builtin cosh are shown in Table 292.

**Table 292 – Builtin cosh**

| Parameter name | Type   | Direction | Usage | Description             |
|----------------|--------|-----------|-------|-------------------------|
| x              | double | I         | m     | A floating-point value. |
| <return>       | double | O         | m     | The hyperbolic cosine.  |

**Example**

```
double v, value;
v = cosh(value);
```

**6.11.13 Builtin DoubleToByte****Communication profiles:** CS, GPE, PB, PN**Purpose:** Calculate Bytes from double

The builtin DoubleToByte will provide a vector of unsigned char values representing the particular elements of a double value.

**Lexical structure**

```
DoubleToByte(in, out1, out2, out3, out4, out5, out6, out7, out8)
```

The lexical elements of the builtin DoubleToByte are shown in Table 293.

**Table 293 – Builtin DoubleToByte**

| Parameter name | Type          | Direction | Usage | Description                                                  |
|----------------|---------------|-----------|-------|--------------------------------------------------------------|
| in             | double        | l         | m     | The double value to convert.                                 |
| out1           | unsigned char | O         | m     | First element of the double value (most significant byte).   |
| out2           | unsigned char | O         | m     | Second element of the double value.                          |
| out3           | unsigned char | O         | m     | Third element of the double value.                           |
| out4           | unsigned char | O         | m     | Fourth element of the double value.                          |
| out5           | unsigned char | O         | m     | Fifth element of the double value.                           |
| out6           | unsigned char | O         | m     | Sixth element of the double value.                           |
| out7           | unsigned char | O         | m     | Seventh element of the double value.                         |
| out8           | unsigned char | O         | m     | Eighth element of the double value (least significant byte). |
| <return>       | VOID          | —         | —     | —                                                            |

**6.11.14 Builtin drand****Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN**Purpose:** Calculate random value

The builtin drand() returns random double precision values uniformly distributed across the range from 0 to 1.

**Lexical structure**

```
double drand()
```

The lexical element of the builtin drand is shown in Table 294.

**Table 294 – Builtin drand**

| Parameter name | Type   | Direction | Usage | Description                                                                                |
|----------------|--------|-----------|-------|--------------------------------------------------------------------------------------------|
| <return>       | double | O         | m     | Returns random double precision values uniformly distributed across the range from 0 to 1. |

**Example**

```
double v;
v = drand();
```



### 6.11.15 Builtin dseed

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate seed based random value

The builtin dseed() takes a double in the range 0 to 1 as the seed for the pseudo-random number generator. For a given EDD application implementation, if dseed is called with the same seed value the same pseudo-random number sequence shall be generated.

#### Lexical structure

```
void dseed(double seed)
```

The lexical elements of the builtin dseed are shown in Table 295.

**Table 295 – Builtin dseed**

| Parameter name | Type   | Direction | Usage | Description                                                                      |
|----------------|--------|-----------|-------|----------------------------------------------------------------------------------|
| seed           | double | I         | m     | A double in the range 0 to 1 as the seed for the pseudo-random number generator. |
| <return>       | VOID   | —         | —     | —                                                                                |

#### Example

```
dseed(0.452132);
```

### 6.11.16 Builtin exp

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate exponential

The builtin exp returns the exponential of a floating-point value.

#### Lexical structure

```
exp(x)
```

The lexical elements of the builtin exp are shown in Table 296.

**Table 296 – Builtin exp**

| Parameter name | Type   | Direction | Usage | Description             |
|----------------|--------|-----------|-------|-------------------------|
| x              | double | I         | m     | A floating-point value. |
| <return>       | double | O         | m     | The exponential value.  |

#### Example

```
double v, value;
v = exp(value);
```

### 6.11.17 Builtin FloatToByte

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Calculate bytes from float

The builtin FloatToByte will provide a vector of unsigned char values representing the particular elements of a float value.

**Lexical structure**

```
FloatToByte(in, out1, out2, out3, out4)
```

The lexical element of the builtin FloatToByte is shown in Table 297.

**Table 297 – Builtin FloatToByte**

| Parameter name | Type          | Direction | Usage | Description                                                 |
|----------------|---------------|-----------|-------|-------------------------------------------------------------|
| in             | float         | I         | m     | The float value to convert.                                 |
| out1           | unsigned char | O         | m     | First element of the float value (most significant byte).   |
| out2           | unsigned char | O         | m     | Second element of the float value.                          |
| out3           | unsigned char | O         | m     | Third element of the float value.                           |
| out4           | unsigned char | O         | m     | Fourth element of the float value (least significant byte). |
| <return>       | VOID          | —         | —     | —                                                           |

**6.11.18 Builtin floor**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate next lower integer

The builtin floor returns the largest integral value not greater than a specified floating-point value (next lower integer).

**Lexical structure**

```
floor(x)
```

The lexical elements of the builtin floor are shown in Table 298.

**Table 298 – Builtin floor**

| Parameter name | Type   | Direction | Usage | Description             |
|----------------|--------|-----------|-------|-------------------------|
| x              | double | I         | m     | A floating-point value. |
| <return>       | double | O         | m     | The floor value.        |

**Example**

```
double v, value;
v = floor(value);
```

**6.11.19 Builtin fmod**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate remainder

The builtin fmod returns the floating-point remainder of the division of two floating-point values.

**Lexical structure**

```
fmod(x, y)
```

The lexical elements of the builtin fmod are shown in Table 299.

**Table 299 – Builtin fmod**

| Parameter name | Type   | Direction | Usage | Description      |
|----------------|--------|-----------|-------|------------------|
| x              | double | I         | m     | The numerator.   |
| y              | double | I         | m     | The denominator. |
| <return>       | double | O         | m     | The remainder.   |

**Example**

```
double r, n, d;
r = fmod(n, d);
```

**6.11.20 Builtin fpclassify**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Provides information about a floating point number

The builtin fpclassify classifies a floating-point value as either not a number, infinite, zero, subnormal, or normal.

NOTE This builtin is implemented as a macro that generates a call to either fpclassifyf or fpclassifyd depending on whether its input parameter is a float or double, respectively.

**Lexical structure**

```
fpclassify(value)
```

The lexical elements of the builtin fpclassify are shown in Table 300.

**Table 300 – Builtin fpclassify**

| Parameter name | Type            | Direction | Usage | Description                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------|-----------------|-----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| value          | float or double | I         | m     | The floating-point value to be classified.                                                                                                                                                                                                                                                                                                                                                                               |
| <return>       | int             | O         | m     | FP_NAN when the parameter value is 'Not a Number'. FP_INFINITE when the parameter value is either plus or minus infinity. FP_ZERO when the parameter value is positive or negative zero. FP_SUBNORMAL when the parameter value is denormalized. Denormalized numbers have values that are too small (i.e., values very close to zero) to be represented otherwise. FP_NORMAL is returned for all other parameter values. |

**Example**

```
int classification;
double value;
classification = fpclassify(value);
```

### 6.11.21 Builtin is\_NaN

**Communication profiles:** CS, FF, GPE, ISA100, PB, PN

**Purpose:** Checks whether double value is not a number

The builtin is\_NaN checks whether a double floating-point value is not a number. Not a number is specified by the IEEE 754 standard as an invalid double value (0x7FF8000000000000). This builtin is used to check if a double floating-point value has been initialized or if it has been set to a proper floating-point value.

#### Lexical structure

is\_NaN(dvalue)

The lexical elements of the builtin is\_NaN are shown in Table 301.

**Table 301 – Builtin is\_NaN**

| Parameter name | Type   | Direction | Usage | Description                                        |
|----------------|--------|-----------|-------|----------------------------------------------------|
| dvalue         | double | I         | m     | The name of the variable.                          |
| <return>       | long   | O         | m     | One if the dvalue is equal to NaN, zero otherwise. |

#### Example

```
long status;
double d;
status = display_message ((is_NaN(d) ? "|en|Value of \"d\": BAD":
"|en|Value of \"d\": %{d}"), 0, 0, 0);
```

### 6.11.22 Builtin log

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate natural logarithm

The builtin log returns the natural logarithm of a floating-point value.

#### Lexical structure

log(x)

The lexical elements of the builtin log are shown in Table 302.

**Table 302 – Builtin log**

| Parameter name | Type   | Direction | Usage | Description             |
|----------------|--------|-----------|-------|-------------------------|
| x              | double | I         | m     | A floating-point value. |
| <return>       | double | O         | m     | The natural logarithm.  |

### 6.11.23 Builtin log10

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate base 10 logarithm

The builtin exp returns the base 10 logarithm of a floating-point value.

**Lexical structure**

`log10(x)`

The lexical elements of the builtin `log10` are shown in Table 303.

**Table 303 – Builtin `log10`**

| Parameter name              | Type   | Direction | Usage | Description             |
|-----------------------------|--------|-----------|-------|-------------------------|
| <code>x</code>              | double | I         | m     | A floating-point value. |
| <code>&lt;return&gt;</code> | double | O         | m     | The base 10 logarithm.  |

**6.11.24 Builtin `log2`**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate base 2 logarithm

The builtin `log2` returns the base 2 logarithm of a floating-point value.

**Lexical structure**

`log2(x)`

The lexical elements of the builtin `log2` are shown in Table 304.

**Table 304 – Builtin `log2`**

| Parameter name              | Type   | Direction | Usage | Description             |
|-----------------------------|--------|-----------|-------|-------------------------|
| <code>x</code>              | double | I         | m     | A floating-point value. |
| <code>&lt;return&gt;</code> | double | O         | m     | The base 2 logarithm.   |

**6.11.25 Builtin `LongToByte`**

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Calculate long from bytes

The builtin `LongToByte` will provide a vector of unsigned char values representing the particular elements of a long value.

**Lexical structure**

`LongToByte(in, out1, out2, out3, out4)`

The lexical element of the builtin `LongToByte` is shown in Table 305.

**Table 305 – Builtin LongToByte**

| Parameter name | Type          | Direction | Usage | Description                                                |
|----------------|---------------|-----------|-------|------------------------------------------------------------|
| in             | long          | I         | m     | The long value to convert.                                 |
| out1           | unsigned char | O         | m     | First element of the long value (most significant byte).   |
| out2           | unsigned char | O         | m     | Second element of the long value.                          |
| out3           | unsigned char | O         | m     | Third element of the long value.                           |
| out4           | unsigned char | O         | m     | Fourth element of the long value (least significant byte). |
| <return>       | VOID          | —         | —     | —                                                          |

**6.11.26 Builtin nan**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Return a "not a number" value

The builtin nan returns a "not a number" value as a double with a fractional bit pattern based on a string in the value parameter. If the character sequence begins with a quiet or signaling NaN prefix letter, then any following hex digits in the character sequence shall be valid for that type of NaN.

The string can be:

- "" (an empty string) generates the default NaN 0x7FF4000000000000.
- "Q" or "q" equals the default quiet NaN.
- "S" or "s" equals the default signaling NaN.
- "I\_xxxxx" equals where I is either a "Q", "q", "S", or "s" followed by an underscore and the most significant hex digits of the fraction. Trailing zeros may be omitted.

Parsing of value string stops at the first improper character detected and a NaN whose fraction bits have been described by the string argument up to the point of the improper character is returned.

**Lexical structure**

nan(value)

The lexical elements of the builtin nan are shown in Table 306.

**Table 306 – Builtin nan**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                        |
|----------------|-----------|-----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| value          | DD_STRING | I         | m     | The "not a number" value to be returned. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | double    | O         | m     | The specified value. Should an error occur in parsing nan_string then the NaN generated up to that point is returned.                                              |

**Example**

```
double nanval;
nanval = nan("");
```

**6.11.27 Builtin NaN\_value**

**Communication profiles:** CS, FF, GPE, ISA100, PB, PN

**Purpose:** Return a "not a number" value

The builtin NaN\_value returns the value of "not a number".

**Lexical structure**

```
NaN_value(value)
```

The lexical elements of the builtin NaN\_value are shown in Table 307.

**Table 307 – Builtin NaN\_value**

| Parameter name | Type   | Direction | Usage | Description                                    |
|----------------|--------|-----------|-------|------------------------------------------------|
| value          | double | O         | m     | A pointer through which the value is returned. |
| <return>       | long   | O         | m     | The specified value.                           |

**Example**

```
long status;
double nanval;
status = NaN_value(&nanval);
```

**6.11.28 Builtin nanf**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Return a "not a number" value

The builtin nanf returns a "not a number" value as a float with a fractional bit pattern based on a string. If the character sequence begins with a quiet or signaling NaN prefix letter, then any following hex digits in the character sequence shall be valid for that type of NaN.

The string can be:

- "" (an empty string), generates the default NaN 0x7FA00000.
- "Q" or "q" equals the default quiet NaN.
- "S" or "s" equals the default signaling NaN.
- "I\_XXXXXX" equals where I is either a "Q", "q", "S", or "s" followed by an underscore and the most significant hex digits of the fraction. Trailing zeros maybe omitted.

Parsing of value string stops at the first improper character detected and a NaN whose fraction bits have been described by the string argument up to the point of the improper character is returned.

**Lexical structure**

```
nanf(value)
```

The lexical elements of the builtin nanf are shown in Table 308.

**Table 308 – Builtin nanf**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                        |
|----------------|-----------|-----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| value          | DD_STRING | I         | m     | The "not a number" value to be returned. String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | float     | O         | m     | The specified value. Should an error occur in parsing nan_string then the NaN generated up to that point is returned.                                              |

**Example**

```
float nanval;
nanval = nanf("");
```

**6.11.29 Builtin pow**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate power

The builtin pow returns the power function of two floating-point values.

**Lexical structure**

```
pow(x, y)
```

The lexical elements of the builtin pow are shown in Table 309.

**Table 309 – Builtin pow**

| Parameter name | Type   | Direction | Usage | Description                           |
|----------------|--------|-----------|-------|---------------------------------------|
| x              | double | I         | m     | The base.                             |
| y              | double | I         | m     | The exponent.                         |
| <return>       | double | O         | m     | The value of x raised to the y power. |

**6.11.30 Builtin round**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate nearest Integer

The builtin round rounds a floating-point value to the nearest integer.

**Lexical structure**

```
round(x)
```

The lexical elements of the builtin round are shown in Table 310.

**Table 310 – Builtin round**

| Parameter name | Type   | Direction | Usage | Description             |
|----------------|--------|-----------|-------|-------------------------|
| x              | double | I         | m     | A floating-point value. |
| <return>       | double | O         | m     | The rounded value.      |



### Example

```
double v, value;
v = round(value);
```

### 6.11.31 Builtin ShortToByte

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Calculate short from byte

The builtin ShortToByte will provide a vector of unsigned char values representing the particular elements of a short value.

#### Lexical structure

```
ShortToByte(in, out1, out2)
```

The lexical elements of the builtin ShortToByte are shown in Table 311.

**Table 311 – Builtin ShortToByte**

| Parameter name | Type          | Direction | Usage | Description                                                 |
|----------------|---------------|-----------|-------|-------------------------------------------------------------|
| in             | short         | I         | m     | The short value to convert.                                 |
| out1           | unsigned char | O         | m     | First element of the short value (most significant byte).   |
| out2           | unsigned char | O         | m     | Second element of the short value (least significant byte). |
| <return>       | VOID          | —         | —     | —                                                           |

### 6.11.32 Builtin sin

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate sine

The builtin sin returns the sine a floating-point value (measured in radians).

#### Lexical structure

```
sin(x)
```

The lexical elements of the builtin sin are shown in Table 312.

**Table 312 – Builtin sin**

| Parameter name | Type   | Direction | Usage | Description             |
|----------------|--------|-----------|-------|-------------------------|
| x              | double | I         | m     | A floating-point value. |
| <return>       | double | O         | m     | The sine.               |

### Example

```
double v, value;
v = sin(value);
```

**6.11.33 Builtin sinh****Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN**Purpose:** Calculate hyperbolic sine

The builtin sinh returns the hyperbolic sine of a floating-point value.

**Lexical structure**`sinh(x)`

The lexical elements of the builtin sinh are shown in Table 313.

**Table 313 – Builtin sinh**

| Parameter name | Type   | Direction | Usage | Description             |
|----------------|--------|-----------|-------|-------------------------|
| x              | double | I         | m     | A floating-point value. |
| <return>       | double | O         | m     | The hyperbolic sine.    |

**Example**

```
double v, value;
v = sinh(value);
```

**6.11.34 Builtin sqrt****Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN**Purpose:** Calculate square root

The builtin sqrt returns the square root of a floating-point value.

**Lexical structure**`sqrt(x)`

The lexical elements of the builtin sqrt are shown in Table 314.

**Table 314 – Builtin sqrt**

| Parameter name | Type   | Direction | Usage | Description             |
|----------------|--------|-----------|-------|-------------------------|
| x              | double | I         | m     | A floating-point value. |
| <return>       | double | O         | m     | The square root.        |

**Example**

```
double v, value;
v = sqrt(value);
```

**6.11.35 Builtin tan****Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN**Purpose:** Calculate tangent

The builtin tan returns the tangent of a floating-point value (measured in radians).

**Lexical structure**

`tan(x)`

The lexical elements of the builtin `tan` are shown in Table 315.

**Table 315 – Builtin `tan`**

| Parameter name              | Type   | Direction | Usage | Description             |
|-----------------------------|--------|-----------|-------|-------------------------|
| <code>x</code>              | double | I         | m     | A floating-point value. |
| <code>&lt;return&gt;</code> | double | O         | m     | The tangent.            |

**Example**

```
double v, value;
v = tan(value);
```

**6.11.36 Builtin `tanh`**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Calculate hyperbolic tangent

The builtin `tanh` returns the hyperbolic tangent of a floating-point value.

**Lexical structure**

`tanh(x)`

The lexical elements of the builtin `tanh` are shown in Table 316.

**Table 316 – Builtin `tanh`**

| Parameter name              | Type   | Direction | Usage | Description             |
|-----------------------------|--------|-----------|-------|-------------------------|
| <code>x</code>              | double | I         | m     | A floating-point value. |
| <code>&lt;return&gt;</code> | double | O         | m     | The hyperbolic tangent. |

**Example**

```
double v, value;
v = tanh(value);
```

**6.12 List builtins****6.12.1 Builtin `get_date_lelem`**

**Communication profiles:** FF, ISA100

**Purpose:** Extracts a date value from a list

The builtin `get_date_lelem` extracts a date value from a LIST.

The `list_id` parameter specifies the item id of the list to be accessed, while the `index` parameter specifies the index of the list to be accessed.

If the `element_id` parameter references a simple variable, the `subelement_id` parameter is ignored. If the `element_id` parameter references a record, the `subelement_id` parameter specifies a member of the record. If the `element_id` parameter references an array parameter, the `subelement_id` parameter specifies an element of the array.

The value is returned via the data and size output parameters.

### Lexical structure

```
get_date_lelem(list_id, index, element_id, subelement_id, data, size)
```

The lexical elements of the builtin `get_date_lelem` are shown in Table 317.

**Table 317 – Builtin `get_date_lelem`**

| Parameter name             | Type          | Direction | Usage | Description                                                |
|----------------------------|---------------|-----------|-------|------------------------------------------------------------|
| <code>list_id</code>       | unsigned long | I         | m     | The item id of the list.                                   |
| <code>index</code>         | int           | I         | m     | The index of the list containing the item to be extracted. |
| <code>element_id</code>    | unsigned long | I         | m     | The item id of the element to be extracted.                |
| <code>subelement_id</code> | unsigned long | I         | m     | The member id of the element to be extracted.              |
| <code>data</code>          | char *        | O         | m     | The buffer in which the data is to be returned.            |
| <code>size</code>          | int *         | O         | m     | The size of the data returned.                             |
| <return>                   | long          | O         | m     | One of the return codes specified in Table 376.            |

### Example

```
long status;
int size;
char buf[8];
```

```
status = get_date_lelem(ITEM_ID(list), 0, ITEM_ID(var), 0, buf, &size);
```

### 6.12.2 Builtin `get_date_lelem2`

**Communication profiles:** FF, ISA100

**Purpose:** Extracts a date value from an embedded list

The builtin `get_date_lelem2` extracts a date value from a list that is embedded within another list.

The `list_id` parameter specifies the item id of the list to be accessed, while the `index` parameter specifies the index of the list to be accessed. The `embedded_list_id` parameter specifies the item id of the embedded list to be accessed, while the `embedded_list_index` parameter specifies the index of the embedded list to be accessed.

If the `element_id` parameter references a simple variable, the `subelement_id` parameter is ignored. If the `element_id` parameter references a record, the `subelement_id` parameter specifies a member of the record. If the `element_id` parameter references an array parameter, the `subelement_id` parameter specifies an element of the array.

The value is returned via the data and size output parameters.

## Lexical structure

```
get_date_lelem2(list_id, index, embedded_list_id, embedded_list_index,
element_id, subelement_id, data, size)
```

The lexical elements of the builtin `get_date_lelem2` are shown in Table 318.

**Table 318 – Builtin `get_date_lelem2`**

| Parameter name      | Type          | Direction | Usage | Description                                                         |
|---------------------|---------------|-----------|-------|---------------------------------------------------------------------|
| list_id             | unsigned long | I         | m     | The item id of the list.                                            |
| index               | int           | I         | m     | The index of the list containing the item to be extracted.          |
| embedded_list_id    | unsigned long | I         | m     | The item id of the embedded list.                                   |
| embedded_list_index | int           | I         | m     | The index of the embedded list containing the item to be extracted. |
| element_id          | unsigned long | I         | m     | The item id of the element to be extracted.                         |
| subelement_id       | unsigned long | I         | m     | The member id of the element to be extracted.                       |
| data                | char *        | O         | m     | The buffer in which the data is to be returned.                     |
| size                | int *         | O         | m     | The size of the data returned.                                      |
| <return>            | long          | O         | m     | One of the return codes specified in Table 376.                     |

## Example

```
long status;
int size;
char buf[8];
```

```
status = get_date_lelem2(ITEM_ID(top_list), 0, ITEM_ID(embedded_list), 12,
ITEM_ID(var), 0, buf, &size);
```

## 6.12.3 Builtin `get_double_lelem`

**Communication profiles:** FF, ISA100

**Purpose:** Extracts a double value from a list

The builtin `get_double_lelem` extracts a double value from a LIST.

The `list_id` parameter specifies the item id of the list to be accessed, while the `index` parameter specifies the index of the list to be accessed.

If the `element_id` parameter references a simple variable, the `subelement_id` parameter is ignored. If the `element_id` parameter references a record, the `subelement_id` parameter specifies a member of the record. If the `element_id` parameter references an array parameter, the `subelement_id` parameter specifies an element of the array.

## Lexical structure

```
get_double_lelem(list_id, index, element_id, subelement_id)
```

The lexical element of the builtin `get_double_lelem` is shown in Table 319.

**Table 319 – Builtin get\_double\_lelem**

| Parameter name | Type          | Direction | Usage | Description                                                |
|----------------|---------------|-----------|-------|------------------------------------------------------------|
| list_id        | unsigned long | I         | m     | The item id of the list.                                   |
| index          | int           | I         | m     | The index of the list containing the item to be extracted. |
| element_id     | unsigned long | I         | m     | The item id of the element to be extracted.                |
| subelement_id  | unsigned long | I         | m     | The member id of the element to be extracted.              |
| <return>       | double        | O         | m     | The specified value.                                       |

**Example**

```
double value;
value = get_double_lelem(ITEM_ID(list), 0, ITEM_ID(var), 0);
```

**6.12.4 Builtin get\_double\_lelem2****Communication profiles: FF, ISA100****Purpose: Extracts a double value from an embedded list**

The builtin get\_double\_lelem2 extracts a double value from a list that is embedded within an another list.

The list\_id parameter specifies the item id of the list to be accessed, while the index parameter specifies the index of the list to be accessed. The embedded\_list\_id parameter specifies the item id of the embedded list to be accessed, while the embedded\_list\_index parameter specifies the index of the embedded list to be accessed.

If the element\_id parameter references a simple variable, the subelement\_id parameter is ignored. If the element\_id parameter references a record, the subelement\_id parameter specifies a member of the record. If the element\_id parameter references an array parameter, the subelement\_id parameter specifies an element of the array.

**Lexical structure**

```
get_double_lelem2(list_id, index, embedded_list_id, embedded_list_index,
element_id, subelement_id)
```

The lexical elements of the builtin get\_double\_lelem2 are shown in Table 320.

**Table 320 – Builtin get\_double\_lelem2**

| Parameter name      | Type          | Direction | Usage | Description                                                         |
|---------------------|---------------|-----------|-------|---------------------------------------------------------------------|
| list_id             | unsigned long | I         | m     | The item id of the list.                                            |
| index               | int           | I         | m     | The index of the list containing the item to be extracted.          |
| embedded_list_id    | unsigned long | I         | m     | The item id of the embedded list.                                   |
| embedded_list_index | int           | I         | m     | The index of the embedded list containing the item to be extracted. |
| element_id          | unsigned long | I         | m     | The item id of the element to be extracted.                         |
| subelement_id       | unsigned long | I         | m     | The member id of the element to be extracted.                       |
| <return>            | double        | O         | m     | The specified value.                                                |

**Example**

```
double value;
status = get_double_lelem2(ITEM_ID(top_list), 0, ITEM_ID(embedded_list),
12, ITEM_ID(var), 0);
```

**6.12.5 Builtin get\_float\_lelem****Communication profiles: FF, ISA100****Purpose: Extracts a float value from a list**

The builtin get\_float\_lelem extracts a float value from a LIST.

The list\_id parameter specifies the item id of the list to be accessed, while the index parameter specifies the index of the list to be accessed.

If the element\_id parameter references a simple variable, the subelement\_id parameter is ignored. If the element\_id parameter references a record, the subelement\_id parameter specifies a member of the record. If the element\_id parameter references an array parameter, the subelement\_id parameter specifies an element of the array.

**Lexical structure**

```
get_float_lelem(list_id, index, element_id, subelement_id)
```

The lexical elements of the builtin get\_float\_lelem are shown in Table 321.

**Table 321 – Builtin get\_float\_lelem**

| Parameter name | Type          | Direction | Usage | Description                                                |
|----------------|---------------|-----------|-------|------------------------------------------------------------|
| list_id        | unsigned long | I         | m     | The item id of the list.                                   |
| index          | int           | I         | m     | The index of the list containing the item to be extracted. |
| element_id     | unsigned long | I         | m     | The item id of the element to be extracted.                |
| subelement_id  | unsigned long | I         | m     | The member id of the element to be extracted.              |
| <return>       | float         | O         | m     | The specified value.                                       |

**Example**

```
float value;
value = get_float_lelem2(ITEM_ID(list), 0, ITEM_ID(var), 0);
```

**6.12.6 Builtin get\_float\_lelem2****Communication profiles: FF, ISA100****Purpose: Extracts a float value from an embedded list**

The builtin `get_float_lelem2` extracts a float value from a list that is embedded within another list.

The `list_id` parameter specifies the item id of the list to be accessed, while the `index` parameter specifies the index of the list to be accessed. The `embedded_list_id` parameter specifies the item id of the embedded list to be accessed, while the `embedded_list_index` parameter specifies the index of the embedded list to be accessed.

If the `element_id` parameter references a simple variable, the `subelement_id` parameter is ignored. If the `element_id` parameter references a record, the `subelement_id` parameter specifies a member of the record. If the `element_id` parameter references an array parameter, the `subelement_id` parameter specifies an element of the array.

**Lexical structure**

```
get_float_lelem2(list_id, index, embedded_list_id, embedded_list_index,
element_id, subelement_id)
```

The lexical elements of the builtin `get_float_lelem2` are shown in Table 322.

**Table 322 – Builtin get\_float\_lelem2**

| Parameter name                   | Type          | Direction | Usage | Description                                                         |
|----------------------------------|---------------|-----------|-------|---------------------------------------------------------------------|
| <code>list_id</code>             | unsigned long | I         | m     | The item id of the list.                                            |
| <code>index</code>               | int           | I         | m     | The index of the list containing the item to be extracted.          |
| <code>embedded_list_id</code>    | unsigned long | I         | m     | The item id of the embedded list.                                   |
| <code>embedded_list_index</code> | int           | I         | m     | The index of the embedded list containing the item to be extracted. |
| <code>element_id</code>          | unsigned long | I         | m     | The item id of the element to be extracted.                         |
| <code>subelement_id</code>       | unsigned long | I         | m     | The member id of the element to be extracted.                       |
| <return>                         | float         | O         | m     | The specified value.                                                |

**Example**

```
float value;
status = get_float_lelem2(ITEM_ID(top_list), 0, ITEM_ID(embedded_list), 12,
ITEM_ID(var), 0);
```



### 6.12.7 Builtin get\_signed\_lelem

**Communication profiles:** FF, ISA100

**Purpose:** Extracts a signed integer value from a list

The builtin get\_signed\_lelem extracts a signed value from a LIST.

The list\_id parameter specifies the item id of the list to be accessed, while the index parameter specifies the index of the list to be accessed.

If the element\_id parameter references a simple variable, the subelement\_id parameter is ignored. If the element\_id parameter references a record, the subelement\_id parameter specifies a member of the record. If the element\_id parameter references an array parameter, the subelement\_id parameter specifies an element of the array.

#### Lexical structure

get\_signed\_lelem(list\_id, index, element\_id, subelement\_id)

The lexical elements of the builtin get\_signed\_lelem are shown in Table 323.

**Table 323 – Builtin get\_signed\_lelem**

| Parameter name | Type          | Direction | Usage | Description                                                |
|----------------|---------------|-----------|-------|------------------------------------------------------------|
| list_id        | unsigned long | l         | m     | The item id of the list.                                   |
| index          | int           | l         | m     | The index of the list containing the item to be extracted. |
| element_id     | unsigned long | l         | m     | The item id of the element to be extracted.                |
| subelement_id  | unsigned long | l         | m     | The member id of the element to be extracted.              |
| <return>       | long          | o         | m     | The specified value.                                       |

#### Example

```
long value;
value = get_signed_lelem(ITEM_ID(list), 0, ITEM_ID(var), 0);
```

### 6.12.8 Builtin get\_signed\_lelem2

**Communication profiles:** FF, ISA100

**Purpose:** Extracts a signed integer value from an embedded list

The builtin get\_signed\_lelem2 extracts a signed value from a list that is embedded within another list.

The list\_id parameter specifies the item id of the list to be accessed, while the index parameter specifies the index of the list to be accessed. The embedded\_list\_id parameter specifies the item id of the embedded list to be accessed, while the embedded\_list\_index parameter specifies the index of the embedded list to be accessed.

If the element\_id parameter references a simple variable, the subelement\_id parameter is ignored. If the element\_id parameter references a record, the subelement\_id parameter specifies a member of the record. If the element\_id parameter references an array parameter, the subelement\_id parameter specifies an element of the array.

### Lexical structure

```
get_signed_lelem2(list_id, index, embedded_list_id, embedded_list_index,
element_id, subelement_id)
```

The lexical elements of the builtin `get_signed_lelem2` are shown in Table 324.

**Table 324 – Builtin `get_signed_lelem2`**

| Parameter name      | Type          | Direction | Usage | Description                                                         |
|---------------------|---------------|-----------|-------|---------------------------------------------------------------------|
| list_id             | unsigned long | I         | m     | The item id of the list.                                            |
| index               | int           | I         | m     | The index of the list containing the item to be extracted.          |
| embedded_list_id    | unsigned long | I         | m     | The item id of the embedded list.                                   |
| embedded_list_index | int           | I         | m     | The index of the embedded list containing the item to be extracted. |
| element_id          | unsigned long | I         | m     | The item id of the element to be extracted.                         |
| subelement_id       | unsigned long | I         | m     | The member id of the element to be extracted.                       |
| <return>            | long          | O         | m     | The specified value.                                                |

### Example

```
long value;
value = get_signed_lelem2(ITEM_ID(top_list), 0, ITEM_ID(embedded_list), 12,
ITEM_ID(var), 0);
```

### 6.12.9 Builtin `get_string_lelem`

**Communication profiles: FF, ISA100**

**Purpose: Extracts a string value from a list**

The builtin `get_string_lelem` extracts a string from a LIST.

The `list_id` parameter specifies the item id of the list to be accessed, while the `index` parameter specifies the index of the list to be accessed.

If the `element_id` parameter references a simple variable, the `subelement_id` parameter is ignored. If the `element_id` parameter references a record, the `subelement_id` parameter specifies a member of the record. If the `element_id` parameter references an array parameter, the `subelement_id` parameter specifies an element of the array.

The value is returned via the string and length output parameters.

### Lexical structure

```
get_string_lelem(list_id, index, element_id, subelement_id, string, length)
```

The lexical elements of the builtin `get_string_lelem` are shown in Table 325.

**Table 325 – Builtin get\_string\_lelem**

| Parameter name | Type          | Direction | Usage | Description                                                |
|----------------|---------------|-----------|-------|------------------------------------------------------------|
| list_id        | unsigned long | I         | m     | The item id of the list.                                   |
| index          | int           | I         | m     | The index of the list containing the item to be extracted. |
| element_id     | unsigned long | I         | m     | The item id of the element to be extracted.                |
| subelement_id  | unsigned long | I         | m     | The member id of the element to be extracted.              |
| string         | char *        | O         | m     | The buffer in which the data is to be returned.            |
| length         | int *         | O         | m     | The size of the data returned.                             |
| <return>       | long          | O         | m     | The specified value.                                       |

**Example**

```

long status;
int size;
char buf[256];
size = 256;
status = get_string_lelem(ITEM_ID(list), 0, ITEM_ID(var), 0, buf, &size);

```

**6.12.10 Builtin get\_string\_lelem2****Communication profiles: FF, ISA100****Purpose: Extracts a string value from an embedded list**

The builtin get\_string\_lelem2 extracts a string from list that is embedded within another list.

The list\_id parameter specifies the item id of the list to be accessed, while the index parameter specifies the index of the list to be accessed. The embedded\_list\_id parameter specifies the item id of the embedded list to be accessed, while the embedded\_list\_index parameter specifies the index of the embedded list to be accessed.

If the element\_id parameter references a simple variable, the subelement\_id parameter is ignored. If the element\_id parameter references a record, the subelement\_id parameter specifies a member of the record. If the element\_id parameter references an array parameter, the subelement\_id parameter specifies an element of the array.

The value is returned via the string and length output parameters.

**Lexical structure**

```

get_string_lelem2(list_id, index, embedded_list_id, embedded_list_index,
element_id, subelement_id, string, length)

```

The lexical elements of the builtin get\_string\_lelem2 are shown in Table 326.

**Table 326 – Builtin get\_string\_lelem2**

| Parameter name      | Type          | Direction | Usage | Description                                                         |
|---------------------|---------------|-----------|-------|---------------------------------------------------------------------|
| list_id             | unsigned long | I         | m     | The item id of the list.                                            |
| index               | int           | I         | m     | The index of the list containing the item to be extracted.          |
| embedded_list_id    | unsigned long | I         | m     | The item id of the embedded list.                                   |
| embedded_list_index | int           | I         | m     | The index of the embedded list containing the item to be extracted. |
| element_id          | unsigned long | I         | m     | The item id of the element to be extracted.                         |
| subelement_id       | unsigned long | I         | m     | The member id of the element to be extracted.                       |
| string              | char*         | O         | m     | The buffer in which the data is to be returned.                     |
| length              | int*          | O         | m     | The size of the data returned.                                      |
| <return>            | long          | O         | m     | The specified value.                                                |

**Example**

```

long status;
int size;
char buf[256];
size = 256;
status = get_string_lelem2(ITEM_ID(top_list), 0, ITEM_ID(embedded_list), 12
ITEM_ID(var), 0, buf, &size);

```

**6.12.11 Builtin get\_unsigned\_lelem****Communication profiles: FF, ISA100****Purpose: Extracts a unsigned integer value from a list**

The builtin get\_unsigned\_lelem extracts an unsigned value from a LIST.

The list\_id parameter specifies the item id of the list to be accessed, while the index parameter specifies the index of the list to be accessed.

If the element\_id parameter references a simple variable, the subelement\_id parameter is ignored. If the element\_id parameter references a record, the subelement\_id parameter specifies a member of the record. If the element\_id parameter references an array parameter, the subelement\_id parameter specifies an element of the array.

**Lexical structure**

```
get_unsigned_lelem(list_id, index, element_id, subelement_id)
```

The lexical elements of the builtin get\_unsigned\_lelem are shown in Table 327.

**Table 327 – Builtin get\_unsigned\_lelem**

| Parameter name | Type          | Direction | Usage | Description                                                |
|----------------|---------------|-----------|-------|------------------------------------------------------------|
| list_id        | unsigned long | I         | m     | The item id of the list.                                   |
| index          | int           | I         | m     | The index of the list containing the item to be extracted. |
| element_id     | unsigned long | I         | m     | The item id of the element to be extracted.                |
| subelement_id  | unsigned long | I         | m     | The member id of the element to be extracted.              |
| <return>       | unsigned long | O         | m     | The specified value.                                       |

**Example**

```
unsigned long value;
value = get_unsigned_lelem(ITEM_ID(list), 0, ITEM_ID(var), 0);
```

**6.12.12 Builtin get\_unsigned\_lelem2****Communication profiles: FF, ISA100****Purpose: Extracts a unsigned integer value from an embedded list**

The builtin get\_unsigned\_lelem2 extracts an unsigned value from a list that is embedded within another list.

The list\_id parameter specifies the item id of the list to be accessed, while the index parameter specifies the index of the list to be accessed. The embedded\_list\_id parameter specifies the item id of the embedded list to be accessed, while the embedded\_list\_index parameter specifies the index of the embedded list to be accessed.

If the element\_id parameter references a simple variable, the subelement\_id parameter is ignored. If the element\_id parameter references a record, the subelement\_id parameter specifies a member of the record. If the element\_id parameter references an array parameter, the subelement\_id parameter specifies an element of the array.

**Lexical structure**

```
get_unsigned_lelem2(list_id, index, embedded_list_id, embedded_list_index,
element_id, subelement_id)
```

The lexical elements of the builtin get\_unsigned\_lelem2 are shown in Table 328.

**Table 328 – Builtin get\_unsigned\_lelem2**

| Parameter name      | Type          | Direction | Usage | Description                                                         |
|---------------------|---------------|-----------|-------|---------------------------------------------------------------------|
| list_id             | unsigned long | I         | m     | The item id of the list.                                            |
| index               | int           | I         | m     | The index of the list containing the item to be extracted.          |
| embedded_list_id    | unsigned long | I         | m     | The item id of the embedded list.                                   |
| embedded_list_index | int           | I         | m     | The index of the embedded list containing the item to be extracted. |
| element_id          | unsigned long | I         | m     | The item id of the element to be extracted.                         |
| subelement_id       | unsigned long | I         | m     | The member id of the element to be extracted.                       |
| <return>            | unsigned long | O         | m     | Returns the specified value.                                        |

**Example**

```
unsigned long value;
status = get_unsigned_lelem2 (ITEM_ID(top_list), 0, ITEM_ID(embedded_list),
12, ITEM_ID(var), 0);
```

**6.12.13 Builtin ListDeleteElementAt (version A)****Communication profiles: CS, GPE, HART, PB, PN****Purpose: Delete an element from a list.**

The builtin ListDeleteElementAt will delete an element from a list. If the list is a member of a FILE, the specified element will be removed from the persistent store.

Execution of ListDeleteElementAt causes the VARIABLE referenced by the COUNT attribute to be updated to match to the current number of elements in the LIST.

If the COUNT attribute resolves to an expression, then none of the VARIABLES referenced in the expression will be updated as a result of ListDeleteElementAt.

If the index parameter is less than zero or greater than the number of elements in the list, an error will be returned. If the list parameter does not refer to a LIST instance, an error will be returned.

**Lexical structure**

```
ListDeleteElementAt(list, index)
```

The lexical elements of the builtin ListDeleteElementAt are shown in Table 329.

**Table 329 – Builtin ListDeleteElementAt**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                       |
|----------------|-----------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| list           | reference | I         | m     | The name of a LIST instance.                                                                                                                      |
| index          | int       | I         | m     | The index of the element to be deleted.                                                                                                           |
| <return>       | long      | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the item was successfully removed from the list, and BI_ERROR if an error occurred. |

**6.12.14 Builtin ListDeleteElementAt (version B)****Communication profiles: FF, ISA100****Purpose: Delete an element from a list**

The builtin ListDeleteElementAt will delete an element from a list. If the list is a member of a FILE, the specified element will be removed from the persistent store.

Execution of ListDeleteElementAt causes the variable referenced by the COUNT attribute to be updated to match to the current number of elements in the LIST.

If the COUNT attribute resolves to an expression, then none of the variables referenced in the expression will be updated as a result of ListDeleteElementAt.

If the index parameter is less than zero or greater than the number of elements in the list, an error will be returned. If the list parameter does not refer to a LIST instance, an error will be returned.

**Lexical structure**

```
ListDeleteElementAt(list, index)
```

The lexical elements of the builtin ListDeleteElementAt are shown in Table 330.

**Table 330 – Builtin ListDeleteElementAt**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| list           | unsigned long | I         | m     | The item id of a LIST instance.                 |
| index          | int           | I         | m     | The index of the element to be deleted.         |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

**Example**

```
long status;
status = ListDeleteElementAt(ITEM_ID(floatlist), 12);
```

**6.12.15 Builtin ListDeleteElementAt2****Communication profiles: FF, ISA100****Purpose: Delete an element from an embedded list**

The builtin ListDeleteElementAt2 deletes elements from an embedded list. If the list is a member of a FILE, the specified element will be removed from the persistent store.

If the `list_id` parameter does not refer to a list, an error will be returned. If the `embedded_list_id` does not refer to a list embedded in the top-level list, an error will be returned. If the `index` parameter does not denote a valid element in the top-level list, an error will be returned. If the `embedded_index` and `embedded_count` parameters do not denote a valid range of elements of the embedded list, an error will be returned.

Only elements of the specified embedded list are removed. The top-level list is otherwise unaffected.

### Lexical structure

```
ListDeleteElementAt2(list_id, list_index, embedded_list_id, embedded_index,
embedded_count)
```

The lexical elements of the builtin `ListDeleteElementAt2` are shown in Table 331.

**Table 331 – Builtin ListDeleteElementAt2**

| Parameter name                | Type          | Direction | Usage | Description                                         |
|-------------------------------|---------------|-----------|-------|-----------------------------------------------------|
| <code>list_id</code>          | unsigned long | I         | m     | The item of the list.                               |
| <code>list_index</code>       | int           | I         | m     | The index of the list containing the embedded list. |
| <code>embedded_list_id</code> | unsigned long | I         | m     | The item id of the embedded_list.                   |
| <code>embedded_index</code>   | int           | I         | m     | The index of the first element to delete.           |
| <code>embedded_count</code>   | int           | I         | m     | The number of elements to delete.                   |
| <return>                      | long          | O         | m     | One of the return codes specified in Table 376.     |

### Example

```
long status;
status = ListDeleteElementAt2(ITEM_ID(top_list), 0, ITEM_ID(embedded_list),
12, 3);
```

### 6.12.16 Builtin ListInsert (version A)

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Insert element into a list

The builtin `ListInsert` will insert an element to a list. If the list is a member of a `FILE`, the specified element will be added to the persistent store.

Execution of `ListInsert` causes the `VARIABLE` referenced by the `COUNT` attribute to be updated to match to the current number of elements in the `LIST`.

If the `COUNT` attribute resolves to an expression, then none of the `VARIABLEs` referenced in the expression will be updated as a result of `ListInsert`.

If the `index` parameter is less than zero or greater than the capacity of the list, an error will be returned. If the `list` parameter does not refer to a `LIST` instance, an error will be returned.

### Lexical structure

```
ListInsert(list, index, item)
```

The lexical elements of the builtin `ListInsert` are shown in Table 332.



**Table 332 – Builtin ListInsert**

| Parameter name | Type      | Direction | Usage | Description                                     |
|----------------|-----------|-----------|-------|-------------------------------------------------|
| list           | reference | I         | m     | The name of a LIST instance.                    |
| index          | int       | I         | m     | The index of the requested element.             |
| item           | reference | I         | m     | The name of the item to be inserted.            |
| <return>       | long      | O         | m     | One of the return codes specified in Table 377. |

**6.12.17 Builtin ListInsert (version B)****Communication profiles: FF, ISA100****Purpose: Insert element into a list**

The builtin ListInsert will insert an element to a list. If the list is a member of a FILE, the specified element will be added to the persistent store.

Execution of ListInsert causes the variable referenced by the COUNT attribute to be updated to match to the current number of elements in the LIST.

If the COUNT attribute resolves to an expression, then none of the variables referenced in the expression will be updated as a result of ListInsert.

If the index parameter is less than zero or greater than the capacity of the list, an error will be returned. If the list parameter does not refer to a LIST instance, an error will be returned.

**Lexical structure**

```
ListInsert(list, index, item)
```

The lexical elements of the builtin ListInsert are shown in Table 333.

**Table 333 – Builtin ListInsert**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| list           | unsigned long | I         | m     | The item id of a LIST instance.                 |
| index          | int           | I         | m     | The index of the requested element.             |
| item           | unsigned long | I         | m     | The item id of the item to be inserted.         |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376. |

**Example**

```
long status;
status = ListInsert(ITEM_ID(floatlist), 12, ITEM_ID(floatvar));
```

**6.12.18 Builtin ListInsert2****Communication profiles: FF, ISA100****Purpose: Insert element into an embedded list**

The builtin ListInsert2 inserts an element into a list that is embedded within another list. If the list is a member of a FILE, the specified element will be added to the persistent store.

If the `list_id` parameter does not refer to a list, an error will be returned. If the `embedded_list_id` does not refer to a list embedded in the top-level list, an error will be returned. If the `list_index` parameter does not denote a valid element in the top-level list, an error will be returned. If the `embedded_index` and `embedded_count` parameters do not denote a valid range of elements of the embedded list, an error will be returned.

Only elements of the specified embedded list are removed. The top-level list is otherwise unaffected.

### Lexical structure

`ListInsert2(list_id, list_index, embedded_list_id, embedded_index, item_id)`

The lexical elements of the builtin `ListInsert2` are shown in Table 334.

**Table 334 – Builtin ListInsert2**

| Parameter name                | Type          | Direction | Usage | Description                                         |
|-------------------------------|---------------|-----------|-------|-----------------------------------------------------|
| <code>list_id</code>          | unsigned long | I         | m     | The item of the list.                               |
| <code>list_index</code>       | int           | I         | m     | The index of the list containing the embedded list. |
| <code>embedded_list_id</code> | unsigned long | I         | m     | The item id of the embedded list.                   |
| <code>embedded_index</code>   | int           | I         | m     | The index where the item should be inserted.        |
| <code>item_id</code>          | unsigned long | I         | m     | The item id of the item to be inserted.             |
| <return>                      | long          | O         | m     | One of the return codes specified in Table 376.     |

### Example

```
long status;
status = ListDeleteElementAt2(ITEM_ID(top_list), 0, ITEM_ID(embedded_list),
12, 3);
```

## 6.13 Translation builtins

### 6.13.1 Builtin DICT\_ID

**Communication profiles:** FF, ISA100

**Purpose:** Convert a standard text dictionary name into a standard text dictionary id

The builtin `DICT_ID` can be used to specify a text dictionary id for calls to `get_stddict_string`. It converts a text dictionary name into a text dictionary id.

A text dictionary entry consists of three parts: a unique id, a name, and a multilingual description. This function retrieves the unique id using the text dictionary name.

### Lexical structure

`DICT_ID(name)`

The lexical elements of the builtin `DICT_ID` are shown in Table 335.

**Table 335 – Builtin DICT\_ID**

| Parameter name | Type      | Direction | Usage | Description                             |
|----------------|-----------|-----------|-------|-----------------------------------------|
| name           | reference | I         | m     | The name of the dictionary string.      |
| <return>       | long      | O         | m     | The dictionary id for the named string. |

**Example:**

```

long status;
char msg[256];
int len;
status = get_stddict_string(DICT_ID(square_root), msg, len);

```

**6.13.2 Builtin get\_block\_instance\_by\_object\_index**

**Communication profiles:** FF, ISA100

**Purpose:** Return occurrence number of the BLOCK\_A instance at the specified object index

The builtin `get_block_instance_by_object_index` returns the occurrence number of the BLOCK\_A instance at the specified object index. The object index parameter specifies the object index of one of the device's block objects.

**Lexical structure**

```
get_block_instance_by_object_index(obj_idx, blk_num)
```

The lexical elements of the builtin `get_block_instance_by_object_index` are shown in Table 336.

**Table 336 – Builtin get\_block\_instance\_by\_object\_index**

| Parameter name | Type          | Direction | Usage | Description                                              |
|----------------|---------------|-----------|-------|----------------------------------------------------------|
| obj_idx        | unsigned long | I         | m     | The object index of the BLOCK_A instance to be returned. |
| blk_num        | unsigned long | O         | m     | The occurrence number of the specified BLOCK_A instance. |
| <return>       | long          | O         | m     | One of the return codes specified in Table 376.          |

**Example**

```

long status;
unsigned long index;
unsigned long blockIds[1];
unsigned long blockInstances[1];
unsigned long paramIds[1];
unsigned long memberIds[1];

status = get_block_instance_by_object_index(1500, &index);

blockIds[0] = ITEM_ID(transducer_block);
blockInstances[0] = index;
paramIds[0] = ITEM_ID(PARAM.MODE_BLK);
memberIds[0] = MEMBER_ID(ACTUAL);

status = display_message2("TRANSDUCER MODE = %{0}", blockIds,
blockInstances, paramIds, memberIds, 1);

```

### 6.13.3 Builtin get\_block\_instance\_by\_tag

**Communication profiles: FF, ISA100**

**Purpose: Return occurrence number of the BLOCK\_A instance with the specified tag**

The builtin `get_block_instance_by_tag` returns the occurrence number of the `BLOCK_A` instance with the specified tag. The `blockId` and `blockTag` parameters specify the DD item id and block tag elements of one of the device's block objects, respectively. If the `blockId` parameter is zero, the occurrence number of the block whose block tag matches the `blockTag` parameter will be returned. Otherwise, the occurrence number of the block whose DD item id matches the `blockId` parameter and whose block tag matches the `blockTag` parameter will be returned. If multiple blocks meet the specified criteria, the occurrence number of the block with the smallest object index will be returned.

#### Lexical structure

`get_block_instance_by_tag(blockId, blockTag, blk_num)`

The lexical elements of the builtin `get_block_instance_by_tag` are shown in Table 337.

**Table 337 – Builtin get\_block\_instance\_by\_tag**

| Parameter name              | Type          | Direction | Usage | Description                                                           |
|-----------------------------|---------------|-----------|-------|-----------------------------------------------------------------------|
| <code>blockId</code>        | unsigned long | I         | m     | The item id of the <code>BLOCK_A</code> instance to be returned.      |
| <code>blockTag</code>       | char[]        | I         | m     | The tag of the <code>BLOCK_A</code> instance to be returned.          |
| <code>blk_num</code>        | unsigned long | O         | m     | The occurrence number of the specified <code>BLOCK_A</code> instance. |
| <code>&lt;return&gt;</code> | long          | O         | m     | One of the return codes specified in Table 376.                       |

#### Example

```
long status;
unsigned long index;
unsigned long blockIds[1];
unsigned long blockInstances[1];
unsigned long paramIds[1];
unsigned long memberIds[1];

status = get_block_instance_tag(ITEM_ID(__analog_input_block), "AI1",
&index);

blockIds[0] = ITEM_ID(__analog_input_block);
blockInstances[0] = index;
paramIds[0] = ITEM_ID(PARAM.MODE_BLK);
memberIds[0] = MEMBER_ID(ACTUAL);

status = display_message2("AI1 MODE = %{0}", blockIds, blockInstances,
paramIds, memberIds, 1);
```

#### 6.13.4 Builtin `get_block_instance_count`

**Communication profiles:** FF, ISA100

**Purpose:** Return number of blocks instantiated in the device

The builtin `get_block_instance_count` returns the number of BLOCK\_A instances that are instantiated in the device. The `blockId` parameter specifies the DD item id element of one or more of the device's block objects. If the `blockId` parameter is zero, the total number of blocks currently instantiated in the device will be returned. Otherwise, the number of blocks whose DD item id matches the `blockId` parameter will be returned.

##### Lexical structure

`get_block_instance_count(blockId, count)`

The lexical elements of the builtin `get_block_instance_count` are shown in Table 338.

**Table 338 – Builtin `get_block_instance_count`**

| Parameter name              | Type          | Direction | Usage | Description                                                                                |
|-----------------------------|---------------|-----------|-------|--------------------------------------------------------------------------------------------|
| <code>blockId</code>        | unsigned long | I         | m     | The item id of the BLOCK_A instances to be counted.                                        |
| <code>count</code>          | unsigned long | O         | m     | The number of BLOCK_A instances of the specified type that are instantiated in the device. |
| <code>&lt;return&gt;</code> | long          | O         | m     | One of the return codes specified in Table 376.                                            |

##### Example

```
long status;
unsigned long aiBlockCount;
int i;
status = get_block_instance_count(ITEM_ID(__analog_input_block),
&aiBlockCount);
for (i = 0; i < aiBlockCount; ++i)
{
    /* do something each to AI block */
}
```

#### 6.13.5 Builtin `get_resolve_status`

**Communication profiles:** FF, ISA100

**Purpose:** Get most recent error codes

The builtin `get_resolve_status` returns the codes for errors generated by the most recent call of builtin `resolve_array_ref`, `resolve_block_ref`, `resolve_parm_ref`, `resolve_param_list_ref` or `resolve_record_ref`.

The reference resolution builtins, those starting with “resolve\_”, resolve the possibly dynamic id of an element of a BLOCK\_A, PARAMETER, PARAMETER\_LIST, VALUE\_ARRAY, REFERENCE\_ARRAY, COLLECTION, or RECORD. If any of these resolve reference builtins encounters an error, it returns a zero for the id.

If the calling method wants to know what the error was, then it calls the builtin `get_resolve_status` to get the error number. This builtin is used for debugging purposes when creating methods.

**Lexical structure**

```
get_resolve_status(VOID)
```

The lexical element of the builtin `get_resolve_status` is shown in Table 339.

**Table 339 – Builtin `get_resolve_status`**

| Parameter name | Type          | Direction | Usage | Description                                     |
|----------------|---------------|-----------|-------|-------------------------------------------------|
| <return>       | unsigned long | O         | m     | One of the return codes specified in Table 376. |

**Example**

```
long status;
status = get_resolve_status();
```

**6.13.6 Builtin `ITEM_ID`**

**Communication profiles:** FF, ISA100

**Purpose:** Specify the item ID of a VARIABLE

The builtin `ITEM_ID` can be used in methods to specify the item id of a variable for calls to other.

**Lexical structure**

```
ITEM_ID(name)
```

The lexical elements of the builtin `ITEM_ID` are shown in Table 340.

**Table 340 – Builtin `ITEM_ID`**

| Parameter name | Type          | Direction | Usage | Description               |
|----------------|---------------|-----------|-------|---------------------------|
| name           | reference     | I         | m     | The name of the variable. |
| <return>       | unsigned long | O         | m     | The VARIABLE's item id.   |

**Example**

```
long duration_size, status;
char duration_value[6];

status = put_date_value(ITEM_ID(PARAM.CALIBRATION), MEMBER_ID(DURATION),
duration_value, duration_size);
```

**6.13.7 Builtin `MEMBER_ID`**

**Communication profiles:** FF, ISA100

**Purpose:** Specify member id of a VARIABLE

The builtin `MEMBER_ID` can be used in methods to specify the member id of a VARIABLE for calls to other builtins. It returns the member id of a BLOCK PARAMETER, PARAMETER\_LIST, RECORD, REFERENCE\_ARRAY, or COLLECTION.

**Lexical structure**

```
MEMBER_ID(name)
```

The lexical elements of the builtin MEMBER\_ID are shown in Table 341.

**Table 341 – Builtin MEMBER\_ID**

| Parameter name | Type          | Direction | Usage | Description                 |
|----------------|---------------|-----------|-------|-----------------------------|
| name           | reference     | I         | m     | The name of an item member. |
| <return>       | unsigned long | O         | m     | The referenced member id.   |

### Example

```
long duration_size, status;
char duration_value[6];
```

```
status = put_date_value(ITEM_ID(PARAM.CALIBRATION), MEMBER_ID(DURATION),
duration_value, duration_size);
```

### 6.13.8 Builtin ObjectReference

**Communication profiles: CS, GPE, PB, PN**

**Purpose: Get reference to a COMPONENT instance**

The builtin ObjectReference returns a reference to a COMPONENT instance. The return value can be used to access data objects and methods of other COMPONENT instances.

NOTE For example, in an EDD of a remote I/O head station, it is possible to make a consistency check with the modules using ObjectReference(CHILD).

### Lexical structure

ObjectReference(navigation)

The lexical elements of the builtin ObjectReference are shown in Table 342.

**Table 342 – Builtin ObjectReference**

| Parameter name | Type                                                                                     | Direction | Usage | Description                                      |
|----------------|------------------------------------------------------------------------------------------|-----------|-------|--------------------------------------------------|
| navigation     | One of the following values:<br>SELF<br>CHILD<br>FIRST<br>LAST<br>PARENT<br>NEXT<br>PREV | I         | m     | See IEC 61804-3 for the direction of navigation. |
| <return>       | OBJECT_REFERENCE                                                                         | O         | m     | A reference to a COMPONENT instance.             |

### 6.13.9 Builtin resolve\_array\_ref

**Purpose:** Gets the item id of an array or list element

**Communication profiles:** HART

The builtin `resolve_array_ref` is used internally to specify a reference to an array or list element. Method developers shall not call `resolve_array_ref` directly, but rather any reference by a method developer to `name[x]` may be translated into `resolve_array_ref(name, x)` internally.

The builtin `resolve_array_ref` takes the name of the array or list and an index and resolves them into the item id of the indexed element referenced. This builtin can be used to resolve array references that are passed to builtins.

If an element of the array or list has a conditional dependency (that is, the definition of an element is dependent on another value), the dependencies are taken into account during the resolution.

**Communication profiles:** FF, ISA100

The builtin `resolve_array_ref` is used by method developers when parsing things such as `item_array_name`.

The builtin `resolve_array_ref` takes the item id of the `REFERENCE_ARRAY` and an index and resolves them into the item id of the `REFERENCE_ARRAY` element referenced. This builtin can be used to fill arrays that are passed to display builtins.

The parameters `id` and `member_id` are specified using the builtins `ITEM_ID` and `MEMBER_ID`.

If a member of a `REFERENCE_ARRAY` has a conditional dependency (that is, the definition of an element is dependent on another value), the dependencies are taken into account during the resolution.

#### Lexical structure

`resolve_array_ref(id, member_id)`

The lexical elements of the builtin `resolve_array_ref` are shown in Table 343.

**Table 343 – Builtin resolve\_array\_ref**

| Parameter name              | Type          | Direction | Usage | Description                                                                                                                                                                |
|-----------------------------|---------------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>id</code>             | unsigned long | I         | m     | The item id of the array or list.                                                                                                                                          |
| <code>member_id</code>      | unsigned long | I         | m     | The index of the requested element.                                                                                                                                        |
| <code>&lt;return&gt;</code> | unsigned long | O         | m     | The item id of the resolved reference, or zero for an error. In the case of an error, builtin <code>get_resolve_status</code> may be used to access the actual error code. |

#### Example

```
long status;
unsigned long ids[1];
ids[0] = resolve_array_ref(ITEM_ID(trend_item_array), LAST_SECOND);
status = display_message("|en|Last second: %[d]{0}\n", ids, 0, 1);
```



### 6.13.10 Builtin resolve\_array\_ref2

**Communication profiles:** FF, ISA100

**Purpose:** Gets the item id of a reference\_array element

The builtin resolve\_array\_ref2 is used by method developers when parsing things such as BLOCK\_A[blk\_num].array[index]. The builtin resolve\_array\_ref2 takes the item id of the REFERENCE\_ARRAY and an index and resolves them into the item id of the VALUE\_ARRAY element referenced. This builtin can be used to fill arrays that are passed to display builtins.

The parameters id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID and the name or reference of the variable in question.

If a member of a VALUE\_ARRAY has a conditional dependency (that is, the definition of an element is dependent on another value), the dependencies are taken into account during the resolution.

#### Lexical structure

resolve\_array\_ref2(blk\_id, blk\_num, id, member\_id)

The lexical elements of the builtin resolve\_array\_ref2 are shown in Table 344

**Table 344 – Builtin resolve\_array\_ref2**

| Parameter name | Type          | Direction | Usage | Description                                                                                                                                                   |
|----------------|---------------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the BLOCK_A being resolved.                                                                                                                    |
| blk_num        | unsigned long | I         | m     | The occurrence number of the BLOCK_A being resolved.                                                                                                          |
| id             | unsigned long | I         | m     | The item id of the VALUE_ARRAY.                                                                                                                               |
| member_id      | unsigned long | I         | m     | The index of the requested VALUE_ARRAY element.                                                                                                               |
| <return>       | unsigned long | O         | m     | The item id of the resolved reference, or zero for an error. In the case of an error, builtin get_resolve_status may be used to access the actual error code. |

#### Example

```
long status;
unsigned long ids[1];
ids[0] = resolve_array_ref2(ITEM_ID(block_name), 0,
ITEM_ID(trend_item_array), LAST_SECOND);
status = display_message("|en|Last second: %[d]{0}\n", ids, 0, 1);
```

### 6.13.11 Builtin resolve\_block\_ref

**Communication profiles:** FF

**Purpose:** Gets item id for BLOCK\_A record member

The builtin resolve\_block\_ref is used by method developers when parsing things such as BLOCK\_A.name. The builtin resolve\_block\_ref takes the member id of a member of a block's characteristic record and returns the item id for the resolved element.

The parameter `member_id` is specified using the `MEMBER_ID` builtin and the name or reference of the variable in question.

If a member of the characteristic record has a conditional dependency (that is, the definition of an element is dependent on another value), the dependencies are taken into account during the resolution.

### Lexical structure

```
resolve_block_ref(member_id)
```

The lexical elements of the builtin `resolve_block_ref` are shown in Table 345.

**Table 345 – Builtin `resolve_block_ref`**

| Parameter name              | Type          | Direction | Usage | Description                                                                                                                                                                |
|-----------------------------|---------------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>member_id</code>      | unsigned long | I         | m     | The member id of <code>BLOCK_A</code> .                                                                                                                                    |
| <code>&lt;return&gt;</code> | unsigned long | O         | m     | The item id of the resolved reference, or zero for an error. In the case of an error, builtin <code>get_resolve_status</code> may be used to access the actual error code. |

### Example

```
unsigned long id;
id = resolve_block_ref(MEMBER_ID(BLK_CLASS));
```

### 6.13.12 Builtin `resolve_block_ref2`

**Communication profiles:** FF

**Purpose:** Gets item id for specific `BLOCK_A` record member

The builtin `resolve_block_ref2` is used by method developers when parsing things such as `BLOCK_A[blk_num].name`. The builtin `resolve_block_ref2` takes item id of a block, the occurrence number of the block within the device, and the member id of a member of a block's characteristic record and returns the item id for the resolved element.

The parameter `member_id` is specified using the `MEMBER_ID` builtin and the name or reference of the variable in question.

If a member of the characteristic record has a conditional dependency (that is, the definition of an element is dependent on another value), the dependencies are taken into account during the resolution.

### Lexical structure

```
resolve_block_ref2(blk_id, blk_num, member_id)
```

The lexical elements of the builtin `resolve_block_ref2` are shown in Table 346.

**Table 346 – Builtin resolve\_block\_ref2**

| Parameter name | Type          | Direction | Usage | Description                                                                                                                                                   |
|----------------|---------------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the BLOCK_A being resolved.                                                                                                                    |
| blk_num        | unsigned long | I         | m     | The occurrence number of the BLOCK_A being resolved.                                                                                                          |
| member_id      | unsigned long | I         | m     | The member id of BLOCK_A.                                                                                                                                     |
| <return>       | unsigned long | O         | m     | The item id of the resolved reference, or zero for an error. In the case of an error, builtin get_resolve_status may be used to access the actual error code. |

**Example**

```
unsigned long id;
id = resolve_block_ref2(ITEM_ID(block_name), 0, MEMBER_ID(BLK_CLASS));
```

**6.13.13 Builtin resolve\_list\_ref****Communication profiles: FF, ISA100****Purpose: Return the type of a list**

The builtin resolve\_list\_ref returns the type of a LIST.

**Lexical structure**

```
resolve_list_ref(list_id)
```

The lexical elements of the builtin resolve\_list\_ref are shown in Table 347.

**Table 347 – Builtin resolve\_list\_ref**

| Parameter name | Type          | Direction | Usage | Description                                                                                                                                                   |
|----------------|---------------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| list_id        | unsigned long | I         | m     | The member id of the LIST.                                                                                                                                    |
| <return>       | unsigned long | O         | m     | The item id of the resolved reference, or zero for an error. In the case of an error, builtin get_resolve_status may be used to access the actual error code. |

**Example**

```
unsigned long id;
id = resolve_list_ref(ITEM_ID(list_name));
```

**6.13.14 Builtin resolve\_local\_ref****Communication profiles: FF, ISA100****Purpose: Returns the item id of a local parameter**

The builtin resolve\_local\_ref is used by method developers when parsing things such as LOCAL\_PARAM.name. It takes the member id of a LOCAL\_PARAMETERS element and returns the item id of the completely resolved element.

The parameter `member_id` is specified using the `MEMBER_ID` builtin and the name or reference of the variable in question.

### Lexical structure

```
resolve_local_ref(member_id)
```

The lexical elements of the builtin `resolve_local_ref` are shown in Table 348.

**Table 348 – Builtin `resolve_local_ref`**

| Parameter name         | Type          | Direction | Usage | Description                                                                                                                                                                |
|------------------------|---------------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>member_id</code> | unsigned long | I         | m     | The member id of the local parameter.                                                                                                                                      |
| <return>               | unsigned long | O         | m     | The item id of the resolved reference, or zero for an error. In the case of an error, builtin <code>get_resolve_status</code> may be used to access the actual error code. |

### Example

```
unsigned long id;
id = resolve_local_ref(MEMBER_ID(LOCAL_PARAM.LOCAL1));
```

### 6.13.15 Builtin `resolve_local_ref2`

**Communication profiles:** FF, ISA100

**Purpose:** Returns the item id of a local parameter of a specific block

The builtin `resolve_local_ref2` is used by method developers when parsing things such as `BLOCK_A[blk_num].LOCAL_PARAM.name`. It takes the member id of a `BLOCK_A`, the occurrence number of a `BLOCK_A`, the member id of a `LOCAL_PARAMETERS` element and returns the item id of the completely resolved element.

The parameters `blk_id` and `member_id` are specified using the `MEMBER_ID` builtin.

### Lexical structure

```
resolve_local_ref2(blk_id, blk_num, member_id)
```

The lexical elements of the builtin `resolve_local_ref2` are shown in Table 349.

**Table 349 – Builtin `resolve_local_ref2`**

| Parameter name         | Type          | Direction | Usage | Description                                                                                                                                                                |
|------------------------|---------------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>blk_id</code>    | unsigned long | I         | m     | The item id of the <code>BLOCK_A</code> being resolved.                                                                                                                    |
| <code>blk_num</code>   | unsigned long | I         | m     | The occurrence number of the <code>BLOCK_A</code> being resolved.                                                                                                          |
| <code>member_id</code> | unsigned long | I         | m     | The member id of the local parameter.                                                                                                                                      |
| <return>               | unsigned long | O         | m     | The item id of the resolved reference, or zero for an error. In the case of an error, builtin <code>get_resolve_status</code> may be used to access the actual error code. |

**Example**

```
unsigned long id;
id = resolve_local_ref2(ITEM_ID(block_name), 0,
MEMBER_ID(LOCAL_PARAM.LOCAL1));
```

**6.13.16 Builtin resolve\_param\_list\_ref****Communication profiles: FF, ISA100****Purpose: Resolve member id to item id**

The builtin `resolve_param_list_ref` resolves the `member_id` reference generated for a `PARAMETER_LIST` element into an item id, which is then used in builtin calls.

The builtin `resolve_param_list_ref` is used by method developers when parsing things such as a `PARAM_LIST` name. It takes the member id of a `PARAMETER_LIST` element and returns the item id of the completely resolved element.

The parameter `member_id` is specified using the `MEMBER_ID` builtin and the name or reference of the variable in question. If a member of the parameter list has a conditional dependency (the definition of an element is dependent on another value), the dependencies are taken into account during the resolution.

**Lexical structure**

```
resolve_param_list_ref(member_id)
```

The lexical elements of the builtin `resolve_param_list_ref` are shown in Table 350.

**Table 350 – Builtin resolve\_param\_list\_ref**

| Parameter name              | Type          | Direction | Usage | Description                                                                                                                                                                |
|-----------------------------|---------------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>member_id</code>      | unsigned long |           | m     | The member id of the parameter list.                                                                                                                                       |
| <code>&lt;return&gt;</code> | unsigned long | O         | m     | The item id of the resolved reference, or zero for an error. In the case of an error, builtin <code>get_resolve_status</code> may be used to access the actual error code. |

**Example**

```
unsigned long id;
id = resolve_param_list_ref(MEMBER_ID(PARAM_LIST.DIS1.VL_PV));
```

**6.13.17 Builtin resolve\_param\_ref****Communication profiles: FF, ISA100****Purpose: Gets the item id of a parameter**

The builtin `resolve_param_ref` is used by method developers when parsing things such as `PARAM.name`. It takes the member id of a `PARAMETER` element and returns the item id of the completely resolved element.

The parameter `member_id` is specified using the `MEMBER_ID` builtin.

**Lexical structure**

```
resolve_param_ref(member_id)
```

The lexical elements of the builtin `resolve_param_ref` are shown in Table 351.

**Table 351 – Builtin `resolve_param_ref`**

| Parameter name         | Type          | Direction | Usage | Description                                                                                                                                                                |
|------------------------|---------------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>member_id</code> | unsigned long | I         | m     | The member id of the parameter.                                                                                                                                            |
| <return>               | unsigned long | O         | m     | The item id of the resolved reference, or zero for an error. In the case of an error, builtin <code>get_resolve_status</code> may be used to access the actual error code. |

### Example

```
unsigned long id;
id = resolve_param_ref(MEMBER_ID(PARAM.OUT_STATE));
```

### 6.13.18 Builtin `resolve_param_ref2`

**Communication profiles:** FF, ISA100

**Purpose:** Gets the item id of a parameter of a specific block

The builtin `resolve_param_ref2` is used by method developers when parsing things such as `BLOCK_A[blk_num].PARAM.name`. It takes the member id of a `BLOCK_A`, an occurrence number, and a `PARAMETER` element and returns the item id of the completely resolved element.

The block name and parameter `member_id` are specified using the `MEMBER_ID`.

### Lexical structure

```
resolve_param_ref2(blk_id, blk_num, member_id)
```

The lexical elements of the builtin `resolve_param_ref2` are shown in Table 352.

**Table 352 – Builtin `resolve_param_ref2`**

| Parameter name         | Type          | Direction | Usage | Description                                                                                                                                                                |
|------------------------|---------------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>blk_id</code>    | unsigned long | I         | m     | The item id of the <code>BLOCK_A</code> being resolved.                                                                                                                    |
| <code>blk_num</code>   | unsigned long | I         | m     | The occurrence number of the <code>BLOCK_A</code> being resolved.                                                                                                          |
| <code>member_id</code> | unsigned long | I         | m     | The member id of the parameter.                                                                                                                                            |
| <return>               | unsigned long | O         | m     | The item id of the resolved reference, or zero for an error. In the case of an error, builtin <code>get_resolve_status</code> may be used to access the actual error code. |

### Example

```
unsigned long id;
id = resolve_param_ref2(ITEM_ID(block_name), 0, MEMBER_ID(PARAM.LOCAL1));
```

### 6.13.19 Builtin resolve\_record\_ref

**Communication profiles:** FF, ISA100

**Purpose:** Returns the item id of a parameter

The builtin resolve\_record\_ref is used by method developers when parsing things such as record\_name.member\_name. It takes the item id of a record and the member id of a record element or member and returns the item id of the completely resolved element.

If a member of a record has a conditional dependency (that is, the definition of an element is dependent on another value), the dependencies are taken into account during the resolution.

The parameters id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID.

#### Lexical structure

```
resolve_record_ref(id, member_id)
```

The lexical elements of the builtin resolve\_record\_ref are shown in Table 353.

**Table 353 – Builtin resolve\_record\_ref**

| Parameter name | Type          | Direction | Usage | Description                                                                                                                                                   |
|----------------|---------------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| id             | unsigned long | I         | m     | The item id of the RECORD being resolved.                                                                                                                     |
| member_id      | unsigned long | I         | m     | The member id of the record member.                                                                                                                           |
| <return>       | unsigned long | O         | m     | The item id of the resolved reference, or zero for an error. In the case of an error, builtin get_resolve_status may be used to access the actual error code. |

#### Example

```
unsigned long id;
id = resolve_record_ref(ITEM_ID(PARAM.PV), MEMBER_ID(VALUE));
```

### 6.13.20 Builtin resolve\_record\_ref2

**Communication profiles:** FF, ISA100

**Purpose:** Returns the item id of a parameter of a specific block

The builtin resolve\_record\_ref2 is used by method developers when parsing things such as BLOCK\_A[blk\_num].record\_name.member\_name. It takes the item id of a block, the occurrence number of a block, the item id of a record and the member id of a record element or member and returns the item id of the completely resolved element.

If a member of a record has a conditional dependency (that is, the definition of an element is dependent on another value), the dependencies are taken into account during the resolution.

The parameters blk\_id, id and member\_id are specified using the builtins ITEM\_ID and MEMBER\_ID.

#### Lexical structure

```
resolve_record_ref2(blk_id, blk_num, id, member_id)
```

The lexical elements of the builtin resolve\_record\_ref2 are shown in Table 354.

**Table 354 – Builtin resolve\_record\_ref2**

| Parameter name | Type          | Direction | Usage | Description                                                                                                                                                   |
|----------------|---------------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| blk_id         | unsigned long | I         | m     | The item id of the BLOCK_A being resolved.                                                                                                                    |
| blk-num        | unsigned long | I         | m     | The occurrence number of the BLOCK_A being resolved.                                                                                                          |
| id             | unsigned long | I         | m     | The item id of the RECORD being resolved.                                                                                                                     |
| member_id      | unsigned long | I         | m     | The member id of the record member.                                                                                                                           |
| <return>       | unsigned long | O         | m     | The item id of the resolved reference, or zero for an error. In the case of an error, builtin get_resolve_status may be used to access the actual error code. |

**Example**

```
unsigned long id;
id = resolve_record_ref2(ITEM_ID(block_name), 0, ITEM_ID(record_name),
MEMBER_ID(REC_MEM_NAME));
```

**6.13.21 Builtin VARID**

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Return numeric identifier for VARIABLE

The builtin VARID will return the numeric identifier for the variable specified. A valid variable name shall be provided. Each variable in the device description is assigned a unique numeric identifier. This function is to be used when the identifier of a variable either needs to be stored in a temporary buffer, or needs to be sent as a parameter to another builtin.

**Lexical structure**

```
VARID(variable_name)
```

The lexical elements of the builtin VARID are shown in Table 355.

**Table 355 – Builtin VARID**

| Parameter name | Type      | Direction | Usage | Description                     |
|----------------|-----------|-----------|-------|---------------------------------|
| variable_name  | reference | I         | m     | The identifier of the VARIABLE. |
| <return>       | int       | O         | m     | The variable identifier.        |

**6.14 Block transfer builtins****6.14.1 Builtin abortTransferPort**

**Communication profiles:** HART

**Purpose:** Stop block transfer

The abortTransferPort stops the Block Data Transfer indicated by the handle.

**Lexical structure**

```
abortTransferPort(handle)
```



The lexical elements of the builtin abortTransferPort are shown in Table 356.

**Table 356 – Builtin abortTransferPort**

| Parameter name | Type         | Direction | Usage | Description                                                                                                                                                                        |
|----------------|--------------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| handle         | unsigned int | I         | m     | The handle for the block transfer.                                                                                                                                                 |
| <return>       | int          | O         | m     | One of the return codes specified in Table 377. Returns BI_SUCCESS when the transfer aborts or BI_ERROR if a transfer could not be aborted (e.g., the port was not actually open). |

#### 6.14.2 Builtin closeTransferPort

**Communication profiles:** HART

**Purpose:** Close port for block transfer

The closeTransferPort function closes the block transfer indicated by the handle.

##### Lexical structure

closeTransferPort(handle)

The lexical elements of the builtin closeTransferPort are shown in Table 357.

**Table 357 – Builtin closeTransferPort**

| Parameter name | Type         | Direction | Usage | Description                                                                                                                                                                                                |
|----------------|--------------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| handle         | unsigned int | I         | m     | The handle for the block transfer.                                                                                                                                                                         |
| <return>       | int          | O         | m     | One of the return codes specified in Table 377. Returns BI_SUCCESS if successful, BI_PORT_IN_USE if a transfer is in process, or BI_ERROR if another problem is encountered (e.g., the port was not open). |

#### 6.14.3 Builtin fGetByte

**Communication profiles:** HART

**Purpose:** Access BLOB content

The builtin fGetByte allows access to BLOB contents for validation purposes only. It allows to access specified bytes in the BLOB to perform basic verification of the BLOB prior to its transmission, via block transfer, to the field device.

##### Lexical structure

fGetByte(blob\_item, position, value\_read)

The lexical elements of the builtin fGetByte are shown in Table 358.

**Table 358 – Builtin fGetByte**

| Parameter name | Type               | Direction | Usage | Description                                                                                                                                                                                                                                                                       |
|----------------|--------------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| blob_item      | DD_ITEM &          | I         | m     | The BLOB from which the byte shall be retrieved.                                                                                                                                                                                                                                  |
| position       | unsigned long long | I         | m     | The position relative to the start from which to read.                                                                                                                                                                                                                            |
| value_read     | unsigned char &    | O         | m     | Value from the BLOB.                                                                                                                                                                                                                                                              |
| <return>       | int                | O         | m     | One of the return codes specified in Table 377. Returns BI_SUCCESS if the byte was successfully retrieved from the BLOB or BI_ERROR otherwise. If the return code is BI_SUCCESS then value_read shall contain a copy of the byte the blob_item located at the position parameter. |

**6.14.4 Builtin get\_transfer\_status****Communication profiles: HART****Purpose: Get status for ongoing block transfer**

The builtin get\_transfer\_status function is used to poll for completion of the DD\_ITEM currently being transferred. It gets the latest information pertaining to the data transfer on the specified port and in the specified direction. The transfer\_status array contains the response code, function code, master-byte-count, and device-byte-count from the latest Command 112 or 111 transaction.

**Lexical structure**

```
get_transfer_status(handle, direction, transfer_status)
```

The lexical elements of the builtin get\_transfer\_status are shown in Table 359.

**Table 359 – Builtin get\_transfer\_status**

| Parameter name  | Type            | Direction | Usage | Description                                                                                                                                                                                                                                                                                                                                   |
|-----------------|-----------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| handle          | unsigned int    | I         | m     | The handle for the block transfer                                                                                                                                                                                                                                                                                                             |
| direction       | unsigned char   | I         | m     | Specifies the direction being polled:<br>0x01 for read<br>0x02 for write<br>0x03 for read and write                                                                                                                                                                                                                                           |
| transfer_status | unsigned int[4] | O         | m     | The returned transfer status containing the following information: <ul style="list-style-type: none"> <li>• response code;</li> <li>• function code;</li> <li>• master-bytecount;</li> <li>• device-byte-count.</li> </ul>                                                                                                                    |
| <return>        | int             | O         | m     | One of the return codes specified in Table 377. Returns BI_SUCCESS if the function was successful, and BI_ERROR if the function fails (e.g., if the port is not open). BI_CONTINUE will be returned when transfer has been started and is occurring. BI_RETRY is returned if the same DD_ITEM is already in the process of being transferred. |

### 6.14.5 Builtin openTransferPort

**Communication profiles:** HART

**Purpose:** Open port for block transfer

The builtin openTransferPort opens the block transfer port using Command 111.

#### Lexical structure

`openTransferPort(port, handle)`

The lexical elements of the builtin openTransferPort are shown in Table 360.

**Table 360 – Builtin openTransferPort**

| Parameter name | Type          | Direction | Usage | Description                                                                                                                 |
|----------------|---------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------|
| port           | unsigned char | I         | m     | The block transfer port number.                                                                                             |
| handle         | unsigned int  | O         | m     | The resulting handle. Only valid if this builtin returns BI_SUCCESS.                                                        |
| <return>       | int           | O         | m     | One of the return codes specified in Table 377. Returns BI_SUCCESS if the port successfully opened, and BI_ERROR otherwise. |

### 6.14.6 Builtin readItemFromDevice

**Communication profiles:** HART

**Purpose:** Read DD\_ITEM from device via block transfer

This builtin reads an item from an open block transfer indicated by the handle.

The DD\_ITEM may be a compound item but shall contain only data.

As data is received from the field device it is buffered. When readItemFromDevice is called, the data is copied into the DD\_Item. Upon completing the read, any excess data is retained in the buffer and is the first data consumed in the next read.

The PRE\_READ\_ACTIONS and POST\_READ\_ACTIONS attributes on the data items to be read from the device shall be ignored.

#### Lexical structure

`readItemFromDevice(handle, dd_item)`

The lexical elements of the builtin readItemFromDevice are shown in Table 361.

**Table 361 – Builtin readItemFromDevice**

| Parameter name | Type         | Direction | Usage | Description                                                                                                                                                                                                                                                                                                                                   |
|----------------|--------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| handle         | unsigned int | I         | m     | The handle of the block transfer.                                                                                                                                                                                                                                                                                                             |
| dd_item        | DD_ITEM &    | O         | m     | The DD item to read.                                                                                                                                                                                                                                                                                                                          |
| <return>       | int          | O         | m     | One of the return codes specified in Table 377. Returns BI_SUCCESS if the function was successful, and BI_ERROR if the function fails (e.g., if the port is not open). BI_CONTINUE will be returned when transfer has been started and is occurring. BI_RETRY is returned if the same DD-Item is already in the process of being transferred. |

### 6.14.7 Builtin writeItemToDevice

**Communication profiles:** HART

**Purpose:** Write DD\_ITEM to device via block transfer

The builtin writeItemToDevice writes an item from an open block transfer indicated by the handle. The DD\_ITEM may be a compound item but shall contain only data. If the DD\_ITEM is transferred in a single command 112 transaction, the builtin writeItemToDevice shall return BI\_SUCCESS.

The PRE\_WRITE\_ACTIONS and POST\_WRITE\_ACTIONS attributes on the data items to be written to the device shall be ignored.

#### Lexical structure

```
writeItemToDevice(handle, dd_item)
```

The lexical elements of the builtin writeItemToDevice are shown in Table 362.

**Table 362 – Builtin writeItemToDevice**

| Parameter name | Type         | Direction | Usage | Description                                                                                                                                                                                                                                                                                                                           |
|----------------|--------------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| handle         | unsigned int | I         | m     | The handle of the block transfer.                                                                                                                                                                                                                                                                                                     |
| dd_item        | DD_ITEM &    | I         | m     | The DD item to write.                                                                                                                                                                                                                                                                                                                 |
| <return>       | int          | O         | m     | One of the return codes specified in Table 377. BI_SUCCESS if the function was successful, and BI_ERROR if the function fails (e.g., if the port is not open). BI_CONTINUE will be returned when transfer has been started and is occurring. BI_RETRY is returned if the same DD-Item is already in the process of being transferred. |

## 6.15 File builtins

### 6.15.1 Builtin browseIdentity

**Communication profiles:** HART

**Purpose:** Select BLOB

The BLOB declaration may not have a declared IDENTITY. The browseIdentity function allows the user to select the BLOB using a EDD application specific mechanism.

#### Lexical structure

```
browseIdentity(blob_item)
```

The lexical elements of the builtin browseIdentity are shown in Table 363.

**Table 363 – Builtin browseIdentity**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                                            |
|----------------|-----------|-----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| blob_item      | DD_ITEM & | I         | m     | The BLOB for which the identity is browsed.                                                                                                                                                            |
| <return>       | int       | O         | m     | One of the return codes specified in Table 377. Returns BI_SUCCESS if the BLOB was identified by the user or BI_ERROR otherwise. (e.g., the user canceled the browse, the file could not be accessed). |

### 6.15.2 Builtin re\_read\_file

**Communication profiles:** HART

**Purpose:** Force reread of FILE

The builtin re\_read\_file causes the FILE's persistent storage area to be reread and update the values for all of the data items in the FILE members list.

#### Lexical structure

re\_read\_file(file\_item)

The lexical elements of the builtin re\_read\_file are shown in Table 364.

**Table 364 – Builtin re\_read\_file**

| Parameter name | Type         | Direction | Usage | Description                                                                                                                                                                       |
|----------------|--------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| file_item      | DD_ITEM<br>& | I         | m     | The FILE to read.                                                                                                                                                                 |
| <return>       | int          | O         | m     | One of the return codes specified in Table 377. Returns BI_SUCCESS if the execution is successful. BI_ERROR if the DD_ITEM was not of type FILE or another error was encountered. |

### 6.15.3 Builtin re\_write\_file

**Communication profiles:** HART

**Purpose:** Force rewrite of FILE

The builtin re\_write\_file causes the values from the data items in the FILE members list to be rewritten to the FILE's persistent storage area.

A FILE that has a both a UPDATE ACTIONS and a METHOD using Building re\_write\_file() will have the actions executed before the builtin re\_write\_file() function returns.

#### Lexical structure

re\_write\_file(file\_item)

The lexical elements of the builtin re\_write\_file are shown in Table 365.

**Table 365 – Builtin re\_write\_file**

| Parameter name | Type         | Direction | Usage | Description                                                                                                                                                                       |
|----------------|--------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| file_item      | DD_ITEM<br>& | I         | m     | The FILE to write.                                                                                                                                                                |
| <return>       | int          | O         | m     | One of the return codes specified in Table 377. Returns BI_SUCCESS if the execution is successful. BI_ERROR if the DD_ITEM was not of type FILE or another error was encountered. |

## 6.16 Identification builtins

### 6.16.1 Builtin GET\_DD\_REVISION

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Get DD revision from identification

The builtin GET\_DD\_REVISION gets the DD\_REVISION from the currently used device description as stated in the identification of the device description with the keyword DD\_REVISION.

#### Lexical structure

GET\_DD\_REVISION (VOID)

The lexical element of the builtin GET\_DD\_REVISION is shown in Table 366.

**Table 366 – Builtin GET\_DD\_REVISION**

| Parameter name | Type | Direction | Usage | Description              |
|----------------|------|-----------|-------|--------------------------|
| <return>       | int  | O         | m     | The current DD_REVISION. |

### 6.16.2 Builtin GET\_DEVICE\_REVISION

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Get DEVICE\_REVISION from identification

The builtin GET\_DEVICE\_REVISION gets the DEVICE\_REVISION from the currently used device description as stated in the identification of the device description with the keyword DEVICE\_REVISION.

#### Lexical structure

GET\_DEVICE\_REVISION (VOID)

The lexical element of the builtin GET\_DEVICE\_REVISION is shown in Table 367.

**Table 367 – Builtin GET\_DEVICE\_REVISION**

| Parameter name | Type | Direction | Usage | Description                  |
|----------------|------|-----------|-------|------------------------------|
| <return>       | int  | O         | m     | The current DEVICE_REVISION. |

### 6.16.3 Builtin GET\_DEVICE\_TYPE

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Get DEVICE\_TYPE from identification

The builtin GET\_DEVICE\_TYPE gets the numerical equivalent of the DEVICE\_TYPE from the currently used device description as stated in the identification of the device description with the keyword DEVICE\_TYPE.

#### Lexical structure

GET\_DEVICE\_TYPE (VOID)

The lexical element of the builtin GET\_DEVICE\_TYPE is shown in Table 368.

**Table 368 – Builtin GET\_DEVICE\_TYPE**

| Parameter name | Type | Direction | Usage | Description              |
|----------------|------|-----------|-------|--------------------------|
| <return>       | int  | O         | m     | The current DEVICE_TYPE. |

**6.16.4 Builtin GET\_MANUFACTURER**

**Communication profiles:** CS, GPE, PB, PN

**Purpose:** Get MANUFACTURER from identification

The builtin GET\_MANUFACTURER gets the numerical equivalent of the MANUFACTURER from the currently used device description as stated in the identification of the device description with the keyword MANUFACTURER.

**Lexical structure**

GET\_MANUFACTURER (VOID)

The lexical element of the builtin GET\_MANUFACTURER is shown in Table 369.

**Table 369 – Builtin GET\_MANUFACTURER**

| Parameter name | Type | Direction | Usage | Description               |
|----------------|------|-----------|-------|---------------------------|
| <return>       | int  | O         | m     | The current MANUFACTURER. |

**6.17 Development support builtins****6.17.1 Builtin \_ERROR**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Logs error messages

The builtin \_ERROR puts a textual information in a log. This information is put into the category error. The implementation is specific to the EDD application. Depending on the EDD application, the message may be piped to one or more files or even a diagnostic screen.

Any variable reference contained in the format string will be expanded to the current value. Method-variables and VARIABLES can be referenced in the message parameter. For more information, refer to 6.2.40.

In no case shall invocation of these functions result in the dispatching commands or other device communication.

**Lexical structure**

\_ERROR(text)

The lexical elements of the builtin \_ERROR are shown in Table 370.

**Table 370 – Builtin \_ERROR**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                                       |
|----------------|-----------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| text           | DD_STRING | I         | m     | The textual information to be put into the log (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | VOID      | —         | —     | —                                                                                                                                                                                                 |

**6.17.2 Builtin \_TRACE**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Logs trace point messages

The builtin \_TRACE puts a textual information in a log. This information is put into the category trace. The implementation is specific to the EDD application. Depending on the EDD application, the message may be piped to one or more files or even a diagnostic screen.

Any variable reference contained in the format string will be expanded to the current value. Method-variables and VARIABLES can be referenced in the message parameter. For more information, refer to 6.2.40.

In no case shall invocation of these functions result in the dispatching commands or other device communication.

**Lexical structure**

\_TRACE (text)

The lexical elements of the builtin \_TRACE are shown in Table 371.

**Table 371 – Builtin \_TRACE**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                                       |
|----------------|-----------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| text           | DD_STRING | I         | m     | The textual information to be put into the log (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | VOID      | —         | —     | —                                                                                                                                                                                                 |

**6.17.3 Builtin \_WARNING**

**Communication profiles:** CS, FF, GPE, HART, ISA100, PB, PN

**Purpose:** Logs warning messages

The builtin \_WARNING puts a textual information in a log. This information is put into the category warning. The implementation is specific to the EDD application. Depending on the EDD application, the message may be piped to one or more files or even a diagnostic screen.

Any variable reference contained in the format string will be expanded to the current value. Method-variables and VARIABLES can be referenced in the message parameter. For more information, refer to 6.2.40.

In no case shall invocation of these functions result in the dispatching commands or other device communication.



### Lexical structure

`_WARNING(text)`

The lexical elements of the builtin `_WARNING` are shown in Table 372.

**Table 372 – Builtin `_WARNING`**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                                       |
|----------------|-----------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| text           | DD_STRING | I         | m     | The textual information to be put into the log (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | VOID      | —         | —     | —                                                                                                                                                                                                 |

### 6.17.4 Builtin LOG\_MESSAGE

**Communication profiles:** CS, GPE, HART, PB, PN

**Purpose:** Log a message in the EDD application

The builtin LOG\_MESSAGE inserts a message into a logging protocol. This builtin shall only be used as a result of a METHOD encountering a field device anomaly. This builtin shall not be used to assist in method debugging.

While implementation of the builtin LOG\_MESSAGE is EDD application-specific, in general, the message parameter is used to forward a string to the EDD application's error manager. The message string may contain method-variable and/or VARIABLE values (see 6.2.40 for syntax). In no case shall invocation of these functions result in the dispatching commands or other device communication.

### Lexical structure

`LOG_MESSAGE(priority, message)`

The lexical elements of the builtin LOG\_MESSAGE are shown in Table 373.

**Table 373 – Builtin LOG\_MESSAGE**

| Parameter name | Type      | Direction | Usage | Description                                                                                                                                                                                               |
|----------------|-----------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| priority       | int       | I         | m     | The priority of the message (0 = error, 1 = warning, 2 = low).                                                                                                                                            |
| message        | DD_STRING | I         | m     | The message string to insert into the logging protocol (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3). |
| <return>       | VOID      | —         | —     | —                                                                                                                                                                                                         |

## 6.18 DDL references

### 6.18.1 Direct referencing of VARIABLES

All EDD-VARIABLES are treated as external global variables from within a method. Any VARIABLE may be directly referenced from a METHOD DEFINITION in the same manner as a local automatic C-variable. For example:

```
ddVariable = ddVariable + 1
```

The legacy technique of accessing VARIABLES using library functions is still supported ensuring existing EDDs remain compliant and fully functional. In other words, referencing a VARIABLE using techniques like the following remains supported.

```
float loc_var;
loc_var = fvar_value(ddVariable) + 1;
fassign(ddVariable, loc_var);
```

VARIABLES may also be directly referenced in library functions like those supporting the user interface. For example,

```
result = SELECT_FROM_LIST("Units =%{pressure_units}", "YES;NO");
```

With direct VARIABLE referencing, the lower case version of functions like SELECT\_FROM\_LIST are no longer needed. Of course, to maintain backwards compatibility, the lower case functions are still supported. These lower case versions of user interface functions display a string and allow references to local variables and VARIABLES (referenced through an array of VARIABLE id's). For example, the lower case, select\_from\_list access a VARIABLE in the following manner:

```
long ids[1];
int result;
ids[0] = VARID(pressure_units);
result = select_from_list ("Units =%{0}", ids, "YES;NO");
```

Of course, direct VARIABLE references can also be used as the index value in an array. Consequently, the following syntax can be used:

```
GET_DEV_VAR_VALUE("Enter Units",
    dynamic_variables[analog_output_code].ANALOG_UNITS);
```

### 6.18.2 Accessing standard dictionary strings

Strings in the Standard Dictionary may be directly referenced using the dictionary\_string builtin function. That means, any string literal like:

```
ACKNOWLEDGE ( "WARNING Remove Loop from automatic control" );
```

can be directly converted to using a string from the Standard Dictionary as follows;

```
ACKNOWLEDGE ( dictionary_string ( remove_loop_from_auto ) );
```

The legacy technique for accessing the Standard Dictionary using a character array to hold the string, and calling the method function get\_dictionary\_string, is still supported. For example, the following technique is still available:

```
char disp_string1[60]; /* an array to hold the string */
int slen1;
slen1 = 60;           /* the size of the string */

get_dictionary_string(remove_loop_from_auto, disp_string1, slen1);
ACKNOWLEDGE(disp_string1);
```

### 6.18.3 String support using DD\_STRING

The method-variable type DD\_STRING is an auto-sizing method-variable string type. Method variables of this type can be set using =, and concatenated using +. For example:

```
DD_STRING String1, String2, String3;
String1 = "This is fun";
String2= " isn't it?";
String3 = String1 + String2;
```

String3 would have the value of "This is fun, isn't it?".

NOTE 1 EDD developers need to carefully control the length of the DD\_STRING they require. Some EDD applications (particularly the handhelds) can have memory constraints that limit available string space.

DD\_STRINGs also support promotion. Many builtin functions in this specification list a DD\_STRING as a parameter. In these cases, a DD\_STRING or any string reference listed in IEC 61804-3 may be used. When string reference is the parameter, a temporary DD\_STRING is created and passed to the method-function.

NOTE 2 A string reference promoted to a DD\_STRING function parameter is not affected by modifications performed in the method-function.

A string VARIABLE (see IEC 61804-3) and a DD\_STRING may be freely assigned on to the other. When a string VARIABLE (ASCII, PACKED\_ASCII, PASSWORD) is assigned to a DD\_STRING, the resulting string may be used to manipulate the value of that string variable. When a DD\_STRING is assigned to a string VARIABLE some loss of information may occur. For example, a DD\_STRING can represent a wider variety of character glyphs than possible when using a string VARIABLE of type PACKED\_ASCII.

### 6.18.4 Referencing DD item attributes

Attributes of EDD Items may be directly referenced in EDD METHOD DEFINITIONS. The attribute that can be referenced depends on the type of the EDD Item, as illustrated in Table 374.

**Table 374 – Referencable EDD item attributes**

| EDD item type       | Type                            |
|---------------------|---------------------------------|
| EDD Item            | Item.LABEL                      |
|                     | Item.HELP                       |
| VARIABLE            | VARIABLE.DEFAULT_VALUE          |
| Arithmetic VARIABLE | VARIABLE.MIN_VALUE              |
|                     | VARIABLE.MAX_VALUE <sub>n</sub> |
|                     | VARIABLE.MIN_VALUE              |
|                     | VARIABLE.MAX_VALUE <sub>n</sub> |
| AXIS                | AXIS.VIEW_MIN                   |
|                     | AXIS.VIEW_MAX                   |
| LIST                | LIST.CAPACITY                   |
|                     | LIST.COUNT                      |
|                     | LIST.FIRST                      |
|                     | LIST.LAST                       |

### 6.19 Method functions

Methods are allowed to call other methods defined within the EDD (see IEC 61804-3). A METHOD can specify parameters and a return value:

```
METHOD identifier ( [methods-parameter-list]? )
{
    [TYPE method-type-specifier;]?
    ...
}
```

METHODS are called using the same syntax as calling a ANSI C function and may be used in the same way as an ANSI C-function. The invocation of a METHOD takes the form:

```
method-identifier ([methods-parameter-list]? );
```

where method-identifier is the identifier of another METHOD and the parameters are the arguments to be passed to the method-function. Parameters may be passed value or by reference and DD\_STRING and DD\_ITEM types are always passed by reference (see IEC 61804-3). The parameter-list shall not contain a variable number of arguments (i.e. the "..." notation is not supported). Recursive method-functions are supported.

The METHOD can also have a return value, specified by the TYPE attribute in the METHOD. All methods defined without a TYPE construct are assumed to return void.

METHODS and abort-methods run in the same environment as the original METHOD and use the same secondary data cache. Consequently, modifications made to a VARIABLE by any METHOD are available to all methods running in the same execution sequence. Method-variables are automatic ANSI C-variables and have the same scope as they would in an ANSI C-function.

Communication profiles: HART

Retry and abort masks, as well as retry count reset to default values at the start of each method running in the same execution sequence.

Any abort-methods added by a METHOD persist for the duration of the method-function's (and its subroutines) execution. The METHOD abort-methods are discarded when the METHOD returns to the calling METHOD.

Should an abort occur while the METHOD is executing, its abort-methods are executed followed by the execution of the calling METHOD's abort-methods (and then the abort-methods for its calling METHOD, etc.). Of course, VARIABLES remain global in scope, and, consequently, any changes to a VARIABLE remain in the secondary cache until all abort-methods have executed and the method execution environment is closed.

As an example of a method-function, consider a method "Multiply", that takes two integers as input and multiplies them together and returns an integer (see Figure 1):

```

METHOD Multiply(int A, int B)
{
    LABEL "Multiply";
    HELP "Multiplies integers";
    TYPE int;
    DEFINITION
    {
        return A*B;
    }
}

METHOD Caller
{
    DEFINITION
    {
        int A, B, C;
        A = 120;
        B = 2;
        C = Multiply(A, B);
    }
}

```

**Figure 1 – A sample METHOD**

The return value of a method can also be a string (see Figure 2):

```

METHOD Stringreverse(DD_STRING & string)
{
    TYPE DD_STRING;
    DEFINITION
    {
        DD_STRING reverse_string;
        int i, k;
        reverse_string = "";
        i = STRLEN(string);
        for ( k = 0; i; i--, k++ )
        {
            reverse_string[k] = string[i-1];
        }
        return reverse_string;
    }
}

METHOD Caller
{
    DEFINITION
    {
        send(20);

        // Note the conversion from DD-Variable long_tag to DD_STRING

        long_tag = Stringreverse ( long_tag );
        send(22);
    }
}

```

**Figure 2 – DD\_STRING parameters passed by reference**

In Figure 2, a DD\_STRING is a parameter to the METHOD Stringreverse and the VARIABLE long\_tag is the designated parameter. If Stringreverse was to modify string, long\_tag would be unaffected even though DD\_STRING types are always passed by reference. This is because long\_tag is promoted to a DD\_STRING when Stringreverse is called (and a temporary DD\_STRING is created in the process initialized with the value of long\_tag).

## 7 Builtins return codes

Some builtins have specific return codes. These return codes are specified in Table 376 and Table 377. The description of Table 376 and Table 377 is in Table 375.

**Table 375 – Contents of the return codes description table**

| Column      | Meaning                                                 |
|-------------|---------------------------------------------------------|
| Value       | Specifies a long integer returned from the builtin.     |
| Identifier  | Specifies a reference to a returned long integer value. |
| Description | Specifies a description for the return code.            |

**Table 376 – Return code descriptions**

| Value | Identifier                 | Description                                                        |
|-------|----------------------------|--------------------------------------------------------------------|
| 0     | BLTIN_SUCCESS              | Success.                                                           |
| 1801  | BLTIN_NO_MEMORY            | Out of memory.                                                     |
| 1802  | BLTIN_VAR_NOT_FOUND        | Cannot find variable.                                              |
| 1803  | BLTIN_BAD_ID               | Specified item or member ID does not exist.                        |
| 1804  | BLTIN_NO_DATA_TO_SEND      | No value to send to device.                                        |
| 1805  | BLTIN_WRONG_DATA_TYPE      | Wrong variable type for builtin.                                   |
| 1806  | BLTIN_NO_RESP_CODES        | Item does not have response codes.                                 |
| 1807  | BLTIN_BAD_METHOD_ID        | Invalid method ID.                                                 |
| 1808  | BLTIN_BUFFER_TOO_SMALL     | Supplied buffer for starting string is too small.                  |
| 1809  | BLTIN_CANNOT_READ_VARIABLE | Cannot read the specified variable.                                |
| 1810  | BLTIN_INVALID_PROMPT       | Bad prompt string.                                                 |
| 1811  | BLTIN_NO_LANGUAGE_STRING   | No valid string for current language.                              |
| 1812  | BLTIN_DDS_ERROR            | A DDS error occurred.                                              |
| 1813  | BLTIN_FAIL_RESPONSE_CODE   | Response code received from the device caused builtin to fail.     |
| 1814  | BLTIN_FAIL_COMM_ERROR      | Communication error caused builtin to fail.                        |
| 1815  | BLTIN_NOT_IMPLEMENTED      | Builtin function not yet implemented.                              |
| 1816  | BLTIN_BAD_ITEM_TYPE        | Wrong item type for builtin.                                       |
| 1817  | BLTIN_VALUE_NOT_SET        | A CLASS LOCAL variable has not been initialized before being used. |
| 1818  | BLTIN_BLOCK_NOT_FOUND      | Specified block does not exist within the device.                  |

**Table 377 – Return code descriptions**

| Value | Identifier     | Description                                                                |
|-------|----------------|----------------------------------------------------------------------------|
| 0     | BI_SUCCESS     | The builtin completed successfully.                                        |
| -1    | BI_ERROR       | An error occurred during the execution of the builtin.                     |
| -2    | BI_ABORT       | The user aborted the task during the execution of the builtin.             |
| -3    | BI_NO_DEVICE   | There was no response from the device during the execution of the builtin. |
| -4    | BI_COMM_ERR    | A communications error occurred during the execution of the builtin.       |
| -5    | BI_CONTINUE    | The transfer has been started and is occurring.                            |
| -6    | BI_RETRY       | The same EDD-Item is already in the process of being transferred.          |
| -7    | BI_PORT_IN_USE | The port is in use (i.e. a transfer is in process).                        |

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**LES DISPOSITIFS ET LEUR INTÉGRATION DANS LES  
SYSTÈMES DE L'ENTREPRISE – BLOCS FONCTIONNELS (FB)  
POUR LES PROCÉDÉS INDUSTRIELS ET LE LANGAGE  
DE DESCRIPTION ÉLECTRONIQUE DE PRODUIT (EDDL) –****Partie 5: Bibliothèque de Builtin EDDL****AVANT-PROPOS**

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La Norme internationale IEC 61804-5 a été établie par le sous-comité 65E: Les dispositifs et leur intégration dans les systèmes de l'entreprise, du comité d'études 65 de l'IEC: Mesure, commande et automation dans les processus industriels.

Cette deuxième édition annule et remplace la première édition parue en 2015. Cette édition constitue une révision technique.

La présente édition a été élaborée en fusionnant le contenu de plusieurs variantes des spécifications de l'EDDL existantes, y compris celles du FieldComm Group (Foundation™ Fieldbus<sup>1</sup>, HART®<sup>2</sup>), du PROFIBUS™<sup>3</sup> Nutzerorganisation e.V. (PNO), et de l'ISA100\_Wireless™<sup>4</sup> Compliance Institute (ISA100 WCI). Par conséquent, le formatage et la numérotation de la présente édition peuvent différer des spécifications individuelles desquelles elle est issue.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- ajout des profils de communication ISA100 et GPE;
- les builtins suivants ne sont plus conseillés:
  - ABORT\_ON\_NO\_DEVICE
  - IGNORE\_NO\_DEVICE
  - RETRY\_ON\_NO\_DEVICE
  - XMTR\_ABORT\_ON\_NO\_DEVICE
  - XMTR\_IGNORE\_NO\_DEVICE
  - XMTR\_RETRY\_ON\_NO\_DEVICE
  - get\_status\_code\_string

Le texte de cette Norme internationale est issu des documents suivants:

| CDV         | Rapport de vote |
|-------------|-----------------|
| 65E/634/CDV | 65E/691/RVC     |

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Cette publication a été rédigée selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 61804, publiées sous le titre général *Les dispositifs et leur intégration dans les systèmes de l'entreprise – Blocs fonctionnels (FB) pour les procédés industriels et le langage de description électronique de produit (EDDL)*, peut être consultée sur le site web de l'IEC.

Les futures normes de cette série porteront dorénavant le nouveau titre général cité ci-dessus. Le titre des normes existant déjà dans cette série sera mis à jour lors de la prochaine édition.

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- reconduite,
- supprimée,
- remplacée par une édition révisée, ou
- amendée.

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## INTRODUCTION

La présente partie de l'IEC 61804

- contient une liste des builtins qui peuvent être utilisés dans des méthodes EDDL;
- définit la fonctionnalité et les paramètres de chaque builtin;
- décrit comment des variables EDDL peuvent être référencées à partir de méthodes EDDL.

Les fonctions EDDL dépendent du profil de chacune des technologies de communication. Les descriptions que contient la présente partie de l'IEC 61804 renvoient à ces fonctions d'une manière générale et les technologies de communication ne prennent pas toutes en charge l'ensemble des fonctions décrites. Les définitions de profils indiquées dans la présentation de cette partie et dans l'IEC 61804-3 sont mentionnées de manière à comprendre les fonctions prises en charge par chaque technologie de communication.

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# LES DISPOSITIFS ET LEUR INTÉGRATION DANS LES SYSTÈMES DE L'ENTREPRISE – BLOCS FONCTIONNELS (FB) POUR LES PROCÉDÉS INDUSTRIELS ET LE LANGAGE DE DESCRIPTION ÉLECTRONIQUE DE PRODUIT (EDDL) –

## Partie 5: Bibliothèque de Builtin EDDL

### 1 Domaine d'application

La présente partie de l'IEC 61804 spécifie la bibliothèque de builtin EDDL et fournit les profils des différents bus de terrain.

### 2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 61804-3 :2020, *Les dispositifs et leur intégration dans les systèmes de l'entreprise – Blocs fonctionnels (FB) pour les procédés industriels et le langage de description électronique de produit (EDDL) – Partie 3: Sémantique et syntaxe EDDL*

ISO/IEC 9899, *Information technology – Programming Languages – C* (disponible en anglais seulement)

IEEE 754, *IEEE Standard for Binary Floating-Point Arithmetic* (disponible en anglais seulement)

### 3 Termes, définitions, acronymes et abréviations

#### 3.1 Termes et définitions

Pour les besoins du présent document, les termes et définitions donnés dans l'IEC 61804-3 ainsi que les suivants s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse <http://www.electropedia.org/>
- ISO Online browsing platform: disponible à l'adresse <http://www.iso.org/obp>

##### 3.1.1

##### **variable de méthode**

variable à champ d'application dans une méthode

#### 3.2 Acronymes et abréviations

|     |                                                                    |
|-----|--------------------------------------------------------------------|
| CP  | Communication Profile (Profil de communication)                    |
| CPF | Communication Profile Family (Famille de profils de communication) |
| CS  | Communication Server (Serveur de communication)                    |
| DD  | Device Description (Description de produit)                        |

|        |                                                                                         |
|--------|-----------------------------------------------------------------------------------------|
| EDD    | Electronic Device Description (Description électronique de produit)                     |
| EDDL   | Electronic Device Description Language (Langage de description électronique de produit) |
| FF     | Foundation Fieldbus                                                                     |
| GPE    | Generic Protocol Extension (Extension du protocole générique)                           |
| HART   | HART® Communication Foundation                                                          |
| I/O    | Input/output (Entrée/sortie)                                                            |
| ID     | Identifiant                                                                             |
| ISA100 | ISA100_Wireless™                                                                        |
| PB     | PROFIBUS                                                                                |
| PI     | PROFIBUS & PROFINET <sup>3</sup> International                                          |
| PN     | PROFINET                                                                                |
| PNO    | PROFIBUS Nutzerorganisation                                                             |

#### 4 Conventions pour les descriptions de builtin

Les conventions suivantes s'appliquent pour la vue d'ensemble de builtin.

- Le Tableau 1 définit le format du tableau de vue d'ensemble de builtin.
- Le Tableau 2 définit le contenu des colonnes du Tableau 1.
- Les constructions et les attributs de base EDDL référencés dans le présent document sont écrits en majuscules.

**Tableau 1 – Format du tableau de vue d'ensemble de builtin**

| Référence | Builtin | Profils de communication |
|-----------|---------|--------------------------|
|           |         |                          |

**Tableau 2 – Contenu du tableau de vue d'ensemble de builtin**

| Colonne                  | Texte | Signification                                                                     |
|--------------------------|-------|-----------------------------------------------------------------------------------|
| Référence                |       | Référence au paragraphe qui spécifie le builtin.                                  |
| Builtin                  |       | Nom du builtin.                                                                   |
| Profils de communication | ✓     | Le builtin est pris en charge par le profil de communication correspondant.       |
|                          | x     | Le builtin n'est pas pris en charge par le profil de communication correspondant. |
|                          | d     | L'utilisation du builtin n'est plus conseillée.                                   |

Les conventions suivantes s'appliquent pour les définitions de builtin.

- Le Tableau 3 définit le format des tableaux d'éléments lexicaux des builtins.
- Le Tableau 4 définit le contenu des colonnes du Tableau 3.
- Les constructions et les attributs de base EDDL référencés dans le présent document sont écrits en majuscules.

**Tableau 3 – Format des tableaux d'éléments lexicaux des builtins**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
|                  |      |           |             |             |

**Tableau 4 – Contenu du tableau d'éléments lexicaux**

| Colonne          | Texte      | Signification                                                                                                                                                                                                        |
|------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nom du paramètre | <name>     | Nom du paramètre formel.                                                                                                                                                                                             |
|                  | "<return>" | Valeur de retour du builtin.                                                                                                                                                                                         |
| Type             | data type  | Type de données abstrait (de base ou dérivé) du paramètre formel.                                                                                                                                                    |
| Direction        | I          | Paramètre d'entrée.                                                                                                                                                                                                  |
|                  | O          | Un paramètre de sortie est transmis de manière implicite par la référence de sorte que la fonction builtin peut modifier la valeur.<br>La valeur de retour d'un builtin est transmise par la valeur, le cas échéant. |
|                  | I/O        | Un paramètre d'entrée/sortie est transmis de manière implicite par la référence de sorte que la fonction builtin peut modifier la valeur.                                                                            |
|                  | —          | Aucune valeur n'est retournée (VOID).                                                                                                                                                                                |
| Utilisation      | m          | Le paramètre formel est obligatoire.                                                                                                                                                                                 |
|                  | o          | Le paramètre formel est facultatif.                                                                                                                                                                                  |
|                  | c          | Le paramètre formel est conditionnel.                                                                                                                                                                                |
|                  | —          | Aucune valeur n'est retournée (VOID).                                                                                                                                                                                |
| Description      | <text>     | Texte descriptif pour le paramètre.                                                                                                                                                                                  |
|                  | —          | Aucune valeur n'est retournée (VOID).                                                                                                                                                                                |

## 5 Catégories de builtins

### 5.1 Vue d'ensemble

Le Tableau 5 donne une présentation alphabétique de la bibliothèque de builtin EDDL et indique le profil par technologie de communication.

**Tableau 5 – Vue d'ensemble de builtin**

| Référence | Builtin                     | Profils de communication |    |     |      |        |    |    |
|-----------|-----------------------------|--------------------------|----|-----|------|--------|----|----|
|           |                             | CS                       | FF | GPE | HART | ISA100 | PB | PN |
| 6.17.1    | _ERROR                      | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.17.2    | _TRACE                      | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.17.3    | _WARNING                    | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.7.1     | abort                       | ✓                        | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.3.1     | abort_on_all_comm_errors    | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.3.2     | ABORT_ON_ALL_COMM_STATUS    | ✗                        | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.3.3     | ABORT_ON_ALL_DEVICE_STATUS  | ✗                        | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.3.4     | ABORT_ON_ALL_RESPONSE_CODES | ✗                        | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |

| Référence | Builtin                          | Profils de communication |    |     |      |        |    |    |
|-----------|----------------------------------|--------------------------|----|-----|------|--------|----|----|
|           |                                  | CS                       | FF | GPE | HART | ISA100 | PB | PN |
| 6.3.5     | abort_on_all_response_codes      | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.6     | ABORT_ON_COMM_ERROR              | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.7     | abort_on_comm_error              | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.8     | ABORT_ON_COMM_STATUS             | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.9     | ABORT_ON_DEVICE_STATUS           | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.10    | ABORT_ON_NO_DEVICE (déconseillé) | x                        | x  | x   | d    | x      | x  | x  |
| 6.3.11    | ABORT_ON_RESPONSE_CODE           | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.12    | abort_on_response_code           | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.14.1    | abortTransferPort                | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.11.1    | abs                              | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.2.1     | ACKNOWLEDGE                      | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.2     | acknowledge                      | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.11.2    | acos                             | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.7.2     | add_abort_method (version A)     | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.7.3     | add_abort_method (version B)     | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.9.1     | AddTime                          | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.3    | asin                             | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.5.1     | assign                           | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.2     | assign_double                    | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.5.3     | assign_float                     | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.5.4     | assign_int                       | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.5.5     | assign_var                       | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.5.6     | assign2                          | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.11.4    | atan                             | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.1     | atof                             | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.8.2     | atoi                             | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.15.1    | browseIdentity                   | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.8.3     | BUILD_MESSAGE                    | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.5    | ByteToDouble                     | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.11.6    | ByteToFloat                      | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.11.7    | ByteToLong                       | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.11.8    | ByteToShort                      | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.11.9    | cbrt                             | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.10   | ceil                             | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.14.2    | closeTransferPort                | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.11.11   | cos                              | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.12   | cosh                             | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.5.7     | dassign                          | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.2     | DATE_AND_TIME_VALUE_to_string    | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.3     | Date_to_DayOfMonth               | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |



| Référence | Builtin                 | Profils de communication |    |     |      |        |    |    |
|-----------|-------------------------|--------------------------|----|-----|------|--------|----|----|
|           |                         | CS                       | FF | GPE | HART | ISA100 | PB | PN |
| 6.9.4     | DATE_to_days            | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.5     | Date_to_Month           | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.6     | DATE_to_string          | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.7     | Date_To_Time            | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.8     | Date_to_Year            | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.9     | days_to_DATE            | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.3     | DELAY                   | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.4     | delay                   | ✓                        | x  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.10    | DELAY_TIME              | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.5     | delayfor                | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.6     | delayfor2               | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.1    | DICT_ID                 | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.8.4     | dictionary_string       | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.11    | DiffTime                | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.6.1     | discard_on_exit         | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.2.7     | DISPLAY                 | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.8     | display                 | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.9     | display_bitenum         | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.2.10    | display_builtin_error   | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.11    | display_comm_error      | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.12    | display_comm_status     | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.2.13    | display_device_status   | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.2.14    | display_dynamics        | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.15    | display_dynamics2       | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.16    | display_message         | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.17    | display_message2        | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.18    | display_response_code   | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.19    | display_response_status | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.2.20    | display_xmtr_status     | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.11.13   | DoubleToByte            | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.11.14   | drand                   | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.15   | dseed                   | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.2.21    | edit_device_value       | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.22    | edit_device_value2      | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.23    | edit_local_value        | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.24    | edit_local_value2       | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.11.16   | exp                     | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.3.13    | ext_send_command        | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.14    | ext_send_command_trans  | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.15    | fail_on_all_comm_errors | x                        | ✓  | x   | x    | ✓      | x  | x  |

| Référence | Builtin                            | Profils de communication |    |     |      |        |    |    |
|-----------|------------------------------------|--------------------------|----|-----|------|--------|----|----|
|           |                                    | CS                       | FF | GPE | HART | ISA100 | PB | PN |
| 6.3.16    | fail_on_all_response_codes         | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.17    | fail_on_comm_error                 | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.18    | fail_on_response_code              | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.8     | fassign                            | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.14.2    | fGetByte                           | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.4.1     | fgetval                            | ✓                        | x  | ✓   | ✓    | x      |    | ✓  |
| 6.5.9     | float_value                        | ✓                        | x  | ✓   | ✓    | x      |    | ✓  |
| 6.11.17   | FloatToByte                        | ✓                        | x  | ✓   | x    |        | ✓  | ✓  |
| 6.11.18   | floor                              | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.19   | fmod                               | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.20   | fpclassify                         | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.12    | From_DATE_AND_TIME_VALUE           | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.13    | From_TIME_VALUE                    | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.4.2     | fsetval                            | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.8.5     | ftoa                               | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.5.10    | fvar_value                         | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.25    | get_acknowledgement                | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.26    | get_acknowledgement2               | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.2    | get_block_instance_by_object_index | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.3    | get_block_instance_by_tag          | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.4    | get_block_instance_count           | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.10.1    | get_comm_error                     | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.8.6     | get_comm_error_string              | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.4.3     | get_date                           | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.1    | get_date_lelem                     | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.2    | get_date_lelem2                    | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.11    | get_date_value                     | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.12    | get_date_value2                    | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.16.1    | GET_DD_REVISION                    | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.10.2    | get_dds_error                      | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.27    | GET_DEV_VAR_VALUE                  | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.28    | get_dev_var_value                  | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.16.2    | GET_DEVICE_REVISION                | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.16.3    | GET_DEVICE_TYPE                    | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.8.7     | get_dictionary_string              | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.4.4     | get_double                         | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.3    | get_double_lelem                   | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.4    | get_double_lelem2                  | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.13    | get_double_value                   | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.14    | get_double_value2                  | x                        | ✓  | x   | x    | ✓      | x  | x  |

| Référence | Builtin                              | Profils de communication |    |     |      |        |    |    |
|-----------|--------------------------------------|--------------------------|----|-----|------|--------|----|----|
|           |                                      | CS                       | FF | GPE | HART | ISA100 | PB | PN |
| 6.8.8     | get_enum_string                      | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.4.5     | get_float                            | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.5    | get_float_lelem                      | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.6    | get_float_lelem2                     | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.15    | get_float_value                      | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.16    | get_float_value2                     | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.29    | GET_LOCAL_VAR_VALUE                  | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.30    | get_local_var_value                  | ✓                        | x  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.16.4    | GET_MANUFACTURER                     | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.3.19    | get_more_status                      | x                        | x  | x   | x    | x      | x  | x  |
| 6.13.5    | get_resolve_status                   | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.10.3    | get_response_code                    | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.8.9     | get_response_code_string             | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.8.10    | get_rspcode_string                   | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.8.11    | get_rspcode_string_by_id             | x                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.4.6     | get_signed                           | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.7    | get_signed_lelem                     | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.8    | get_signed_lelem2                    | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.17    | get_signed_value                     | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.18    | get_signed_value2                    | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.8.12    | get_status_code_string (déconseillé) | x                        | x  | x   | d    | x      | x  | x  |
| 6.8.13    | get_status_string                    | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.8.14    | get_stddict_string                   | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.4.7     | get_string                           | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.9    | get_string_lelem                     | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.10   | get_string_lelem2                    | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.19    | get_string_value                     | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.20    | get_string_value2                    | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.9.17    | GET_TICK_COUNT                       | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.14.4    | get_transfer_status                  | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.4.8     | get_unsigned                         | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.11   | get_unsigned_lelem                   | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.12   | get_unsigned_lelem2                  | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.21    | get_unsigned_value                   | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.22    | get_unsigned_value2                  | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.8.15    | get_variable_string                  | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.9.14    | GetCurrentDate                       | ✓                        | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.9.15    | GetCurrentDateAndTime                | ✓                        | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.9.16    | GetCurrentTime                       | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.5.23    | iassign                              | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |

| Référence | Builtin                         | Profils de communication |    |     |      |        |    |    |
|-----------|---------------------------------|--------------------------|----|-----|------|--------|----|----|
|           |                                 | CS                       | FF | GPE | HART | ISA100 | PB | PN |
| 6.4.9     | igetval                         | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.3.20    | IGNORE_ALL_COMM_STATUS          | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.21    | IGNORE_ALL_DEVICE_STATUS        | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.22    | IGNORE_ALL_RESPONSE_CODES       | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.23    | IGNORE_COMM_ERROR               | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.24    | IGNORE_COMM_STATUS              | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.25    | IGNORE_DEVICE_STATUS            | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.26    | IGNORE_NO_DEVICE (déconseillé)  | x                        | x  | x   | d    | x      | x  | x  |
| 6.3.27    | IGNORE_RESPONSE_CODE            | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.5.24    | int_value                       | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.11.21   | is_NaN                          | ✓                        | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.4.10    | isetval                         | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.4.11    | isOffline                       | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.13.6    | ITEM_ID                         | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.8.16    | itoa (version A)                | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.8.17    | itoa (version B)                | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.5.25    | ivar_value                      | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.5.26    | lassign                         | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.4.12    | lgetval                         | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.12.13   | ListDeleteElementAt (version A) | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.12.14   | ListDeleteElementAt (version B) | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.15   | ListDeleteElementAt2            | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.16   | ListInsert (version A)          | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.12.17   | ListInsert (version B)          | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.12.18   | ListInsert2                     | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.11.22   | log                             | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.17.4    | LOG_MESSAGE                     | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.11.23   | log10                           | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.24   | log2                            | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.5.27    | long_value                      | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.11.25   | LongToByte                      | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.4.13    | lsetval                         | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.5.28    | lvar_value                      | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.9.18    | Make_Time                       | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.13.7    | MEMBER_ID                       | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.31    | Menu                            | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.32    | MenuDisplay (version A)         | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.33    | MenuDisplay (version B)         | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.7.4     | method_abort                    | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.11.26   | nan                             | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |

| Référence | Builtin                         | Profils de communication |    |     |      |        |    |    |
|-----------|---------------------------------|--------------------------|----|-----|------|--------|----|----|
|           |                                 | CS                       | FF | GPE | HART | ISA100 | PB | PN |
| 6.11.27   | NaN_value                       | ✓                        | ✓  | ✓   | ✗    | ✓      | ✓  | ✓  |
| 6.11.28   | nanf                            | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.13.8    | ObjectReference                 | ✓                        | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.14.5    | openTransferPort                | ✗                        | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.7.5     | pop_abort_method                | ✓                        | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.11.29   | pow                             | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.7.6     | process_abort                   | ✓                        | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.7.7     | push_abort_method               | ✓                        | ✗  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.4.14    | put_date                        | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.29    | put_date_value                  | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.30    | put_date_value2                 | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.4.15    | put_double                      | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.31    | put_double_value                | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.32    | put_double_value2               | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.4.16    | put_float                       | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.33    | put_float_value                 | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.34    | put_float_value2                | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.2.34    | PUT_MESSAGE                     | ✓                        | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.2.35    | put_message                     | ✓                        | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.4.17    | put_signed                      | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.35    | put_signed_value                | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.36    | put_signed_value2               | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.4.18    | put_string                      | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.37    | put_string_value                | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.38    | put_string_value2               | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.4.19    | put_unsigned                    | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.39    | put_unsigned_value              | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.5.40    | put_unsigned_value2             | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.15.2    | re_read_file                    | ✗                        | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.15.3    | re_write_file                   | ✗                        | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.3.28    | read_value                      | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.3.29    | read_value2                     | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.3.30    | ReadCommand                     | ✓                        | ✗  | ✓   | ✗    | ✗      | ✓  | ✓  |
| 6.14.6    | readItemFromDevice              | ✗                        | ✗  | ✗   | ✓    | ✗      | ✗  | ✗  |
| 6.7.8     | remove_abort_method (version A) | ✓                        | ✗  | ✓   | ✓    | ✗      | ✓  | ✓  |
| 6.7.9     | remove_abort_method (version B) | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.7.10    | remove_all_abort_methods        | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.13.9    | resolve_array_ref               | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.10   | resolve_array_ref2              | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |
| 6.13.11   | resolve_block_ref               | ✗                        | ✓  | ✗   | ✗    | ✓      | ✗  | ✗  |

| Référence | Builtin                          | Profils de communication |    |     |      |        |    |    |
|-----------|----------------------------------|--------------------------|----|-----|------|--------|----|----|
|           |                                  | CS                       | FF | GPE | HART | ISA100 | PB | PN |
| 6.13.12   | resolve_block_ref2               | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.13   | resolve_list_ref                 | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.14   | resolve_local_ref                | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.15   | resolve_local_ref2               | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.16   | resolve_param_list_ref           | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.17   | resolve_param_ref                | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.18   | resolve_param_ref2               | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.19   | resolve_record_ref               | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.13.20   | resolve_record_ref2              | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.41    | ret_double_value                 | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.42    | ret_double_value2                | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.43    | ret_float_value                  | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.44    | ret_float_value2                 | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.45    | ret_signed_value                 | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.46    | ret_signed_value2                | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.47    | ret_unsigned_value               | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.5.48    | ret_unsigned_value2              | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.31    | retry_on_all_comm_errors         | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.32    | RETRY_ON_ALL_COMM_STATUS         | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.33    | RETRY_ON_ALL_DEVICE_STATUS       | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.34    | RETRY_ON_ALL_RESPONSE_CODES      | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.35    | retry_on_all_response_codes      | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.36    | RETRY_ON_COMM_ERROR              | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.37    | retry_on_comm_error              | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.38    | RETRY_ON_COMM_STATUS             | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.39    | RETRY_ON_DEVICE_STATUS           | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.40    | RETRY_ON_NO_DEVICE (déconseillé) | d                        | x  | d   | d    | x      | d  | d  |
| 6.3.41    | RETRY_ON_RESPONSE_CODE           | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.42    | retry_on_response_code           | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.11.30   | round                            | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.6.2     | save_on_exit                     | ✓                        | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.6.3     | save_values                      | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.19    | seconds_to_TIME_VALUE            | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.20    | seconds_to_TIME_VALUE8           | ✓                        | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.2.36    | SELECT_FROM_LIST                 | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.37    | select_from_list                 | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.2.38    | select_from_menu                 | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.2.39    | select_from_menu2                | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.43    | send                             | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.44    | send_all_values                  | x                        | ✓  | x   | x    | ✓      | x  | x  |

| Référence | Builtin               | Profils de communication |    |     |      |        |    |    |
|-----------|-----------------------|--------------------------|----|-----|------|--------|----|----|
|           |                       | CS                       | FF | GPE | HART | ISA100 | PB | PN |
| 6.3.45    | send_command          | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.46    | send_command_trans    | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.6.4     | send_on_exit          | ✓                        | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.3.47    | send_trans            | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.48    | send_value            | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.49    | send_value2           | x                        | ✓  | x   | x    | ✓      | x  | x  |
| 6.3.50    | SET_NUMBER_OF_RETRIES | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.4.20    | sgetval               | ✓                        | x  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.31   | ShortToByte           | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.11.32   | sin                   | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.33   | sinh                  | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.34   | sqrt                  | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.4.21    | ssetval               | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.8.19    | strcmp                | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.18    | strleft               | ✓                        | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.8.20    | strlen                | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.21    | strlwr                | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.22    | strmid                | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.23    | strright              | ✓                        | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.8.24    | strstr                | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.25    | strtrim               | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.8.26    | strupr                | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.35   | tan                   | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.11.36   | tanh                  | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.21    | Time_To_Date          | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.22    | TIME_VALUE_to_Hour    | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.23    | TIME_VALUE_to_Minute  | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.24    | TIME_VALUE_to_Second  | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.25    | TIME_VALUE_to_seconds | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.26    | TIME_VALUE_to_string  | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.27    | timet_to_string       | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |
| 6.9.28    | timet_to_TIME_VALUE   | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.9.29    | timet_To_TIME_VALUE   | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.9.30    | timet_to_TIME_VALUE8  | ✓                        | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.9.31    | To_Date               | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.32    | To_Date_and_Time      | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.9.33    | To_Time               | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.34    | To_TIME_VALUE         | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.9.35    | To_TIME_VALUE8        | ✓                        | ✓  | ✓   | x    | ✓      | ✓  | ✓  |
| 6.8.27    | trunc                 | ✓                        | ✓  | ✓   | ✓    | ✓      | ✓  | ✓  |

| Référence | Builtin                               | Profils de communication |    |     |      |        |    |    |
|-----------|---------------------------------------|--------------------------|----|-----|------|--------|----|----|
|           |                                       | CS                       | FF | GPE | HART | ISA100 | PB | PN |
| 6.13.21   | VARID                                 | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.5.49    | vassign                               | ✓                        | x  | ✓   | ✓    | x      | ✓  | ✓  |
| 6.3.51    | WriteCommand                          | ✓                        | x  | ✓   | x    | x      | ✓  | ✓  |
| 6.14.7    | writelnToDevice                       | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.52    | XMTR_ABORT_ON_ALL_COMM_STATUS         | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.53    | XMTR_ABORT_ON_ALL_DATA                | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.54    | XMTR_ABORT_ON_ALL_DEVICE_STATUS       | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.55    | XMTR_ABORT_ON_ALL_RESPONSE_CODES      | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.56    | XMTR_ABORT_ON_COMM_ERROR              | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.57    | XMTR_ABORT_ON_COMM_STATUS             | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.58    | XMTR_ABORT_ON_DATA                    | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.59    | XMTR_ABORT_ON_DEVICE_STATUS           | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.60    | XMTR_ABORT_ON_NO_DEVICE (déconseillé) | x                        | x  | x   | d    | x      | x  | x  |
| 6.3.61    | XMTR_ABORT_ON_RESPONSE_CODE           | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.62    | XMTR_IGNORE_ALL_COMM_STATUS           | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.63    | XMTR_IGNORE_ALL_DATA                  | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.64    | XMTR_IGNORE_ALL_DEVICE_STATUS         | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.65    | XMTR_IGNORE_ALL_RESPONSE_CODES        | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.66    | XMTR_IGNORE_COMM_ERROR                | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.67    | XMTR_IGNORE_COMM_STATUS               | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.68    | XMTR_IGNORE_DATA                      | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.69    | XMTR_IGNORE_DEVICE_STATUS             | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.70    | XMTR_IGNORE_NO_DEVICE (déconseillé)   | x                        | x  | x   | d    | x      | x  | x  |
| 6.3.71    | XMTR_IGNORE_RESPONSE_CODE             | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.72    | XMTR_RETRY_ON_ALL_COMM_STATUS         | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.73    | XMTR_RETRY_ON_ALL_DATA                | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.74    | XMTR_RETRY_ON_ALL_DEVICE_STATUS       | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.75    | XMTR_RETRY_ON_ALL_RESPONSE_CODES      | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.76    | XMTR_RETRY_ON_COMM_ERROR              | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.77    | XMTR_RETRY_ON_COMM_STATUS             | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.78    | XMTR_RETRY_ON_DATA                    | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.79    | XMTR_RETRY_ON_DEVICE_STATUS           | x                        | x  | x   | ✓    | x      | x  | x  |
| 6.3.80    | XMTR_RETRY_ON_NO_DEVICE (déconseillé) | x                        | x  | x   | d    | x      | x  | x  |
| 6.3.81    | XMTR_RETRY_ON_RESPONSE_CODE           | x                        | x  | x   | ✓    | x      | x  | x  |

Les catégories de builtins spéciales sont les suivantes:

- builtins de l'interface utilisateur;
- builtins de communication;
- builtins d'action.



Le Tableau 6 présente les restrictions qui s'appliquent à l'usage des builtins, selon leur catégorie.

**Tableau 6 – Usage des builtins**

| Usage des builtins                                                                        | Builtins de l'interface utilisateur | Builtins de communication                        | Builtins d'action  |
|-------------------------------------------------------------------------------------------|-------------------------------------|--------------------------------------------------|--------------------|
| Méthodes référencées dans les menus de l'interface utilisateur                            | Admis                               | Admis                                            | Non admis          |
| PRE_EDIT_ACTIONS                                                                          | Admis                               | Non recommandés                                  | Admis <sup>a</sup> |
| POST_EDIT_ACTIONS                                                                         | Admis                               | Non recommandés                                  | Admis <sup>a</sup> |
| REFRESH_ACTIONS                                                                           | Non recommandés                     | GRAPH et CHART: admis<br>Autres: non recommandés | Admis <sup>a</sup> |
| PRE_READ_ACTIONS                                                                          | Non recommandés                     | Admis                                            | Admis <sup>a</sup> |
| POST_READ_ACTIONS                                                                         | Non recommandés                     | Admis                                            | Admis <sup>a</sup> |
| PRE_WRITE_ACTIONS                                                                         | Non recommandés                     | Admis                                            | Admis <sup>a</sup> |
| POST_WRITE_ACTIONS                                                                        | Non recommandés                     | Admis                                            | Admis <sup>a</sup> |
| INIT_ACTIONS                                                                              | Non recommandés                     | Admis                                            | Non admis          |
| EXIT_ACTIONS                                                                              | Non recommandés                     | Admis                                            | Non admis          |
| <sup>a</sup> Doivent être utilisés uniquement pour les actions appelées par une VARIABLE. |                                     |                                                  |                    |

## 5.2 Builtins de l'interface utilisateur

Les builtins de l'interface utilisateur affichent les informations et certains d'entre eux exigent en outre une interaction de l'utilisateur. Le Tableau 7 donne la liste des builtins de l'interface utilisateur.

**Tableau 7 – Builtins de l'interface utilisateur**

| Nom du builtin        |
|-----------------------|
| ACKNOWLEDGE           |
| acknowledge           |
| DELAY                 |
| delay                 |
| delayfor              |
| delayfor2             |
| DISPLAY               |
| display               |
| display_bitenum       |
| display_builtin_error |
| display_comm_error    |
| display_comm_status   |
| display_device_status |
| display_dynamics      |
| display_dynamics2     |
| display_message       |
| display_message2      |

| Nom du builtin          |
|-------------------------|
| display_response_code   |
| display_response_status |
| display_xmtr_status     |
| edit_device_value       |
| edit_device_value2      |
| edit_local_value        |
| edit_local_value2       |
| get_acknowledgement2    |
| get_acknowledgement     |
| GET_DEV_VAR_VALUE       |
| get_dev_var_value       |
| GET_LOCAL_VAR_VALUE     |
| get_local_var_value     |
| Menu                    |
| MenuDisplay (version A) |
| MenuDisplay (version B) |
| PUT_MESSAGE             |
| put_message             |
| SELECT_FROM_LIST        |
| select_from_list        |
| select_from_menu        |
| select_from_menu2       |

### 5.3 Builtins de communication

Les builtins de communication permettent aux méthodes de communiquer avec le dispositif ou de contrôler la communication avec ce dernier. Le Tableau 8 donne la liste des builtins de communication.

**Tableau 8 – Builtins de communication**

| Nom du builtin              |
|-----------------------------|
| abort_on_all_comm_errors    |
| ABORT_ON_ALL_COMM_STATUS    |
| ABORT_ON_ALL_DEVICE_STATUS  |
| ABORT_ON_ALL_RESPONSE_CODES |
| abort_on_all_response_codes |
| ABORT_ON_COMM_ERROR         |
| abort_on_comm_error         |
| ABORT_ON_COMM_STATUS        |
| ABORT_ON_DEVICE_STATUS      |
| ABORT_ON_NO_DEVICE          |
| ABORT_ON_RESPONSE_CODE      |
| abort_on_response_code      |
| ext_send_command            |
| ext_send_command_trans      |

| Nom du builtin                   |
|----------------------------------|
| fail_on_all_comm_errors          |
| fail_on_all_response_codes       |
| fail_on_comm_error               |
| fail_on_response_code            |
| get_more_status                  |
| IGNORE_ALL_COMM_STATUS           |
| IGNORE_ALL_DEVICE_STATUS         |
| IGNORE_ALL_RESPONSE_CODES        |
| IGNORE_COMM_ERROR                |
| IGNORE_COMM_STATUS               |
| IGNORE_DEVICE_STATUS             |
| IGNORE_NO_DEVICE                 |
| IGNORE_RESPONSE_CODE             |
| read_value                       |
| read_value2                      |
| ReadCommand                      |
| retry_on_all_comm_errors         |
| RETRY_ON_ALL_COMM_STATUS         |
| RETRY_ON_ALL_DEVICE_STATUS       |
| RETRY_ON_ALL_RESPONSE_CODES      |
| retry_on_all_response_codes      |
| RETRY_ON_COMM_ERROR              |
| retry_on_comm_error              |
| RETRY_ON_COMM_STATUS             |
| RETRY_ON_DEVICE_STATUS           |
| RETRY_ON_NO_DEVICE               |
| RETRY_ON_RESPONSE_CODE           |
| retry_on_response_code           |
| send                             |
| send_all_values                  |
| send_command                     |
| send_command_trans               |
| send_trans                       |
| send_value                       |
| send_value2                      |
| SET_NUMBER_OF_RETRIES            |
| WriteCommand                     |
| XMTR_ABORT_ON_ALL_COMM_STATUS    |
| XMTR_ABORT_ON_ALL_DATA           |
| XMTR_ABORT_ON_ALL_DEVICE_STATUS  |
| XMTR_ABORT_ON_ALL_RESPONSE_CODES |
| XMTR_ABORT_ON_COMM_ERROR         |
| XMTR_ABORT_ON_COMM_STATUS        |
| XMTR_ABORT_ON_DATA               |

| Nom du builtin                   |
|----------------------------------|
| XMTR_ABORT_ON_DEVICE_STATUS      |
| XMTR_ABORT_ON_NO_DEVICE          |
| XMTR_ABORT_ON_RESPONSE_CODE      |
| XMTR_IGNORE_ALL_COMM_STATUS      |
| XMTR_IGNORE_ALL_DATA             |
| XMTR_IGNORE_ALL_DEVICE_STATUS    |
| XMTR_IGNORE_ALL_RESPONSE_CODES   |
| XMTR_IGNORE_COMM_ERROR           |
| XMTR_IGNORE_COMM_STATUS          |
| XMTR_IGNORE_DATA                 |
| XMTR_IGNORE_DEVICE_STATUS        |
| XMTR_IGNORE_NO_DEVICE            |
| XMTR_IGNORE_RESPONSE_CODE        |
| XMTR_RETRY_ON_ALL_COMM_STATUS    |
| XMTR_RETRY_ON_ALL_DATA           |
| XMTR_RETRY_ON_ALL_DEVICE_STATUS  |
| XMTR_RETRY_ON_ALL_RESPONSE_CODE  |
| XMTR_RETRY_ON_ALL_RESPONSE_CODES |
| XMTR_RETRY_ON_COMM_ERROR         |
| XMTR_RETRY_ON_COMM_STATUS        |
| XMTR_RETRY_ON_DATA               |
| XMTR_RETRY_ON_DEVICE_STATUS      |
| XMTR_RETRY_ON_NO_DEVICE          |
| XMTR_RETRY_ON_RESPONSE_CODE      |

#### 5.4 Builtins d'action

Les builtins d'action doivent être utilisés uniquement pour les actions appelées par une VARIABLE. Ils permettent d'accéder à la valeur de la variable qui a appelé l'action. Le Tableau 9 donne la liste des builtins d'action.

**Tableau 9 – Builtins d'action**

| Référence | Nom du builtin | Types de données admis pour la variable d'action | Actions admises à partir desquelles le builtin peut être appelé                                                                                                                                    |
|-----------|----------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.4.1     | fgetval        | FLOAT, DOUBLE                                    | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS<br>POST_RQSTUPDATE_ACTIONS<br>POST_USERCHANGE_ACTIONS |

| Référence | Nom du built-in | Types de données admis pour la variable d'action                                              | Actions admises à partir desquelles le built-in peut être appelé                                                                                                                                   |
|-----------|-----------------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.4.2     | fsetval         | FLOAT, DOUBLE                                                                                 | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS<br>POST_RQSTUPDATE_ACTIONS<br>POST_USERCHANGE_ACTIONS |
| 6.4.3     | get_date        | DATE_AND_TIME,<br>TIME_VALUE                                                                  | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.4     | get_double      | DOUBLE                                                                                        | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.5     | get_float       | FLOAT                                                                                         | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.6     | get_signed      | INTEGER                                                                                       | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.7     | get_string      | ASCII, BITSTRING,<br>BIT_ENUMERATED,<br>ENUMERATED, EUC, INDEX,<br>PASSWORD, VISIBLE          | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.8     | get_unsigned    | BIT_ENUMERATED,<br>BOOLEAN, ENUMERATED,<br>INDEX,<br>UNSIGNED_INTEGER                         | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.9     | igetval         | BIT_ENUMERATED,<br>BOOLEAN, ENUMERATED,<br>INDEX, INTEGER,<br>UNSIGNED_INTEGER,<br>TIME_VALUE | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS<br>POST_RQSTUPDATE_ACTIONS<br>POST_USERCHANGE_ACTIONS |

| Référence | Nom du built-in | Types de données admis pour la variable d'action                                              | Actions admises à partir desquelles le built-in peut être appelé                                                                                                                                   |
|-----------|-----------------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.4.10    | isetval         | BIT_ENUMERATED,<br>BOOLEAN, ENUMERATED,<br>INDEX, INTEGER,<br>UNSIGNED_INTEGER,<br>TIME_VALUE | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS<br>POST_RQSTUPDATE_ACTIONS<br>POST_USERCHANGE_ACTIONS |
| 6.4.12    | lgetval         | BIT_ENUMERATED,<br>BOOLEAN, ENUMERATED,<br>INDEX, INTEGER,<br>UNSIGNED_INTEGER,<br>TIME_VALUE | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS                                                       |
| 6.4.13    | lsetval         | BIT_ENUMERATED,<br>BOOLEAN, ENUMERATED,<br>INDEX, INTEGER,<br>UNSIGNED_INTEGER,<br>TIME_VALUE | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS                                                       |
| 6.4.14    | put_date        | DATE_AND_TIME,<br>TIME_VALUE                                                                  | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.15    | put_double      | DOUBLE                                                                                        | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.16    | put_float       | FLOAT                                                                                         | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.17    | put_signed      | INTEGER                                                                                       | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.18    | put_string      | ASCII, BITSTRING,<br>BIT_ENUMERATED,<br>ENUMERATED, EUC, INDEX,<br>PASSWORD, VISIBLE          | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |

| Référence | Nom du builtin | Types de données admis pour la variable d'action             | Actions admises à partir desquelles le builtin peut être appelé                                                                                                                                    |
|-----------|----------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.4.19    | put_unsigned   | BIT_ENUMERATED, BOOLEAN, ENUMERATED, INDEX, UNSIGNED_INTEGER | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS                                                                                                                    |
| 6.4.20    | sgetval        | ASCII, BITSTRING, EUC, PACKED_ASCII, PASSWORD, VISIBLE       | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS<br>POST_RQSTUPDATE_ACTIONS<br>POST_USERCHANGE_ACTIONS |
| 6.4.21    | ssetval        | ASCII, BITSTRING, EUC, PACKED_ASCII, PASSWORD, VISIBLE       | PRE_EDIT_ACTIONS<br>POST_EDIT_ACTIONS<br>PRE_READ_ACTIONS<br>POST_READ_ACTIONS<br>PRE_WRITE_ACTIONS<br>POST_WRITE_ACTIONS<br>REFRESH_ACTIONS<br>POST_RQSTUPDATE_ACTIONS<br>POST_USERCHANGE_ACTIONS |

## 6 Bibliothèque de builtin EDDL

### 6.1 Généralités

L'Article 6 décrit les sous-programmes builtin, qui peuvent être utilisés dans une EDD. Les builtins prennent en charge les interactions avec l'utilisateur ou le dispositif. Des interactions types avec l'utilisateur sont, par exemple, des entrées de valeurs de VARIABLE par l'utilisateur ou des accusés de réception. Des interactions types avec le dispositif sont, par exemple, l'envoi de commandes au dispositif ou l'interprétation des codes de réponse et des octets de statut. Le présent Article 6 contient la bibliothèque des builtins.

Aucune autre fonction builtin n'est disponible et une EDD conforme doit utiliser uniquement les fonctions de la bibliothèque définies dans la présente spécification. La présente spécification définit les exigences que toutes les applications EDD conformes doivent respecter. Une application EDD conforme doit prendre en charge toutes les fonctions de la bibliothèque indiquées dans la présente spécification qui sont applicables aux profils de communication correspondants. Une application EDD doit prendre en charge toutes les EDD conformes sans exiger de modification de l'EDD conforme et sans informations autres que celles indiquées dans l'EDD conforme.

## 6.2 Builtins de l'interface utilisateur

### 6.2.1 Builtin ACKNOWLEDGE

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Afficher un message et attendre l'activation d'une touche

Le builtin ACKNOWLEDGE affiche l'invite et attend l'accusé de réception de l'utilisateur.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

#### Structure lexicale

ACKNOWLEDGE(prompt)

Les éléments lexicaux du builtin ACKNOWLEDGE sont présentés dans le Tableau 10.

**Tableau 10 – Builtin ACKNOWLEDGE**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                                               |
|------------------|-----------|-----------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING | I         | m           | Message à afficher (voir 6.2.40 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| <return>         | int       | O         | m           | Un des codes de retour spécifiés dans le Tableau 377.                                                                                                                                     |

### 6.2.2 Builtin acknowledge

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Afficher un message et attendre l'activation d'une touche

Le builtin acknowledge affiche l'invite et attend l'accusé de réception de l'utilisateur.

NOTE 1 Les nouvelles descriptions de produits peuvent utiliser le builtin ACKNOWLEDGE, qui prend en charge le référencement direct des VARIABLES. La version en minuscules de cette fonction est conservée à des fins de rétrocompatibilité uniquement.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

NOTE 2 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 3 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

#### Structure lexicale

acknowledge(prompt, global\_var\_ids)

Les éléments lexicaux du builtin acknowledge sont présentés dans le Tableau 11.



**Tableau 11 – Builtin acknowledge**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                                               |
|------------------|-----------|-----------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING | I         | m           | Message à afficher (voir 6.2.35 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| global_var_ids   | Int[]     | I         | m           | Matrice qui contient des identifiants uniques d'instances de VARIABLE.                                                                                                                    |
| <return>         | int       | O         | m           | Un des codes de retour spécifiés dans le Tableau 377.                                                                                                                                     |

### 6.2.3 Builtin DELAY

**Profils de communication: CS, GPE, HART, PB, PN**

**Objet: Afficher un message et un délai**

Le builtin DELAY affiche un message d'invite et met en pause pendant le nombre spécifié de secondes. Le délai doit être un nombre positif.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

#### Structure lexicale

DELAY(delay\_time, prompt)

Les éléments lexicaux du builtin DELAY sont présentés dans le Tableau 12.

**Tableau 12 – Builtin DELAY**

| Nom du paramètre | Type             | Direction | Utilisation | Description                                                                                                                                                                                  |
|------------------|------------------|-----------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| delay_time       | unsigned integer | I         | m           | Délai en nombre de secondes.                                                                                                                                                                 |
| prompt           | DD_STRING        | I         | m           | Un message à afficher (voir 6.2.40 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| <return>         | VOID             | —         | —           | —                                                                                                                                                                                            |

### 6.2.4 Builtin delay

**Profils de communication: CS, GPE, HART, PB, PN**

**Objet: Afficher un message et un délai**

Le builtin delay affiche un message d'invite et met en pause pendant le nombre spécifié de secondes. Le délai doit être un nombre positif.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

NOTE 3 Les nouvelles descriptions de produits peuvent utiliser DELAY, qui prend en charge le référencement direct des VARIABLES. La version en minuscules de cette fonction est conservée à des fins de rétrocompatibilité uniquement.

### Structure lexicale

`delay(delay_time, prompt, global_var_ids)`

Les éléments lexicaux du builtin delay sont présentés dans le Tableau 13.

**Tableau 13 – Builtin delay**

| Nom du paramètre | Type             | Direction | Utilisation | Description                                                                                                                                                                                  |
|------------------|------------------|-----------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| delay_time       | unsigned integer | I         | m           | Délai en nombre de secondes.                                                                                                                                                                 |
| prompt           | DD_STRING        | I         | m           | Un message à afficher (voir 6.2.35 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| global_var_ids   | Int[]            | I         | m           | Matrice qui contient des identifiants uniques d'instances de VARIABLE.                                                                                                                       |
| <return>         | VOID             | —         | —           | —                                                                                                                                                                                            |

### 6.2.5 Builtin delayfor

**Profils de communication: FF, ISA100**

**Objet: Afficher un message et attendre le temps spécifié**

Le builtin delayfor imprime une chaîne sur l'écran d'application et attend que la durée allouée expire.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

`delayfor(duration, prompt, ids, indices, id_count)`

Les éléments lexicaux du builtin delayfor sont présentés dans le Tableau 14.

**Tableau 14 – Builtin delayfor**

| Nom du paramètre | Type            | Direction | Utilisation | Description                                                                                                                                                                                 |
|------------------|-----------------|-----------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| duration         | long            | I         | m           | Délai en nombre de secondes. Il doit s'agir d'un nombre positif.                                                                                                                            |
| prompt           | DD_STRING       | I         | m           | Un message à afficher (voir 6.2.6 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| ids              | unsigned long[] | I         | m           | ID d'éléments d'une instance de VARIABLE utilisée dans le message d'invite.                                                                                                                 |
| indices          | unsigned long[] | I         | m           | ID de membres ou indices de matrice des VARIABLES utilisées dans le message d'invite. Défini sur zéro s'il n'y a pas d'ID de membre ou d'index de matrice.                                  |
| id_count         | long            | I         | m           | Nombre d'éléments de matrice dans les matrices pour les ids et les indices. Défini sur zéro si les matrices pour les ids et les indices sont NULL.                                          |

| Nom du paramètre | Type | Direction | Utilisation | Description                                           |
|------------------|------|-----------|-------------|-------------------------------------------------------|
| <return>         | long | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

### Exemple

```
long status;
unsigned long ids[2];
unsigned long indices[2];
ids[0] = ids[1] = ITEM_ID(PARAM.OPERATING_TEMP);
indices[0] = MEMBER_ID(HI_LIM);
indices[1] = MEMBER_ID(LO_LIM);
status = delayfor(5, "|en|Operating temperature limits - HI: %{0}
LO: %{1}\n", ids, indices, 2);
```

### 6.2.6 Builtin delayfor2

#### Profils de communication: FF, ISA100

#### Objet: Afficher un message et attendre le temps spécifié

Le builtin delayfor2 imprime une chaîne sur l'écran d'application et attend que la durée allouée expire.

Les valeurs de VARIABLE, les variables de méthode et les libellés pour les VARIABLEs peuvent être incorporés dans la chaîne d'invite avec des informations de formatage. Les paramètres blk\_ids, blk\_nums, ids, indices et id\_count spécifient collectivement les valeurs à incorporer dans l'invite.

Le paramètre prompt peut contenir plusieurs traductions linguistiques comme indiqué ci-dessous.

```
"|en|Is limit correct?|de|Grenze richtig?"
```

Chaque élément de la matrice des blk\_ids, block\_nums, ids et indices spécifie une valeur à incorporer dans l'invite. Par exemple, dans le cas où trois valeurs sont incorporées dans une invite, les valeurs sont spécifiées comme suit:

```
blk_ids[0], blk_nums[0], ids[0], indices[0]
```

spécifie la première valeur incorporée dans l'invite

```
blk_ids[1], blk_nums [1], ids[1], indices [1]
```

spécifie la deuxième valeur incorporée dans l'invite

```
blk_ids[2], blk_nums [2], ids[2], indices [2]
```

spécifie la troisième valeur incorporée dans l'invite

Certaines des fonctions builtin n'utilisent pas les paramètres blk\_ids et blk\_nums, tandis que d'autres les utilisent. Lorsque ces paramètres sont utilisés, la fonction builtin extrait les valeurs du bloc spécifié. Lorsqu'ils ne sont pas utilisés, la fonction builtin extrait les valeurs du bloc mis à la portée de la méthode appelante.

Les chaînes d'invite peuvent inclure des spécificateurs de format qui indiquent les valeurs à incorporer dans l'invite. Un spécificateur de format prend l'une des formes suivantes:

```
%format-spezifier{array-index}
```

ou

```
%L{array-index}
```

ou

```
%format-spezifier{local-variable-name}
```

où le spécificateur de format indique un spécificateur de format printf optionnel, tel que défini dans l'ISO/IEC 9899, plus les ajouts présentés dans le Tableau 49. Si aucun spécificateur de format n'est indiqué, l'attribut DISPLAY\_FORMAT de la valeur est utilisé. Si aucun attribut DISPLAY\_FORMAT n'est spécifié, un format par défaut est utilisé, en fonction du type de la valeur. array-index spécifie un index dans la matrice des blk\_ids, blk\_nums, ids et indices, utilisée pour spécifier la valeur à incorporer dans l'invite. local-variable-name spécifie le nom de la variable locale à incorporer dans l'invite. La forme %L incorpore le libellé d'une variable, d'un membre d'enregistrement ou d'un élément de matrice dans l'invite, au lieu d'une valeur.

Le paramètre blk\_ids spécifie les ID d'éléments des blocs auxquels accéder, tandis que le paramètre blk\_nums spécifie les indices relatifs des blocs auxquels accéder.

Si un élément du paramètre ids fait référence à une variable, l'élément correspondant du paramètre indices est ignoré. Si un élément du paramètre ids fait référence à un enregistrement, l'élément correspondant du paramètre indices spécifie un membre de l'enregistrement. Si un élément du paramètre ids fait référence à une matrice, l'élément correspondant du paramètre indices spécifie un élément de la matrice.

Les éléments des paramètres blk\_ids, ids et indices sont généralement spécifiés à l'aide des fonctions builtin ITEM\_ID() et MEMBER\_ID(). Les éléments du paramètre blk\_nums sont généralement spécifiés à l'aide des fonctions builtin get\_block\_instance\_by\_object\_index() et get\_block\_instance\_by\_block\_tag().

Les paramètres blk\_ids, blk\_nums et ids peuvent être transmis en tant que valeur NULL si aucune valeur n'est incorporée dans l'invite. Si l'un de ces paramètres est transmis en tant que valeur NULL, ils doivent tous être transmis en tant que valeur NULL.

Le paramètre indices peut être transmis en tant que valeur NULL si le paramètre ids référence uniquement des variables, c'est-à-dire s'il ne référence ni enregistrements ni matrices.

Le paramètre id\_count doit être transmis en tant que valeur zéro lorsque les paramètres blk\_ids, blk\_nums et ids sont transmis en tant que valeur NULL.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

```
delayfor2(duration, prompt, blk_ids, blk_nums, ids, indices, id_count)
```

Les éléments lexicaux du builtin delayfor2 sont présentés dans le Tableau 15.

**Tableau 15 – Builtin delayfor2**

| Nom du paramètre | Type            | Direction | Utilisation | Description                                                                                                                                                        |
|------------------|-----------------|-----------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| duration         | long            | I         | m           | Délai en nombre de secondes. Il doit s'agir d'un nombre positif.                                                                                                   |
| prompt           | DD_STRING       | I         | m           | Message à afficher. Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3).        |
| blk_ids          | unsigned long[] | I         | m           | ID d'éléments des instances de BLOCK_A utilisées dans le message d'invite.                                                                                         |
| blk_nums         | unsigned long[] | I         | m           | Numéros d'occurrence des instances de BLOCK_A utilisées dans le message d'invite.                                                                                  |
| ids              | unsigned long[] | I         | m           | ID d'éléments des VARIABLES, RECORDs ou ARRAYs utilisés dans l'invite.                                                                                             |
| indices          | unsigned long[] | I         | m           | ID de membres des RECORDs ou indices de matrice des ARRAYs utilisés dans le message d'invite. Défini sur zéro s'il n'y a pas d>ID de membre ou d'index de matrice. |
| id_count         | long            | I         | m           | Nombre d'éléments de matrice dans les matrices pour les ID et les indices. Défini sur zéro si les matrices pour les ID et les indices sont NULL.                   |
| <return>         | long            | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                              |

### Exemple

```
long status;
unsigned long blk_ids[2];
unsigned long blk_nums [2];
unsigned long ids[2];
unsigned long indices[2];
blk_ids[0] = blk_ids[1] = ITEM_ID(transducer_block);
blk_nums [0] = blk_nums[1] = 0;
ids[0] = ids[1] = MEMBER_ID(OPERATING_TEMP);
indices[0] = MEMBER_ID(HI_LIM);
indices[1] = MEMBER_ID(LO_LIM);
status = delayfor2(5, "|en|Operating temperature limits - HI: %{0}
LO: %{1}\n", blk_ids, blk_nums, ids, indices, 2);
```

### 6.2.7 Builtin DISPLAY

**Profils de communication: CS, GPE, HART, PB, PN**

**Objet: Afficher le message spécifié à l'écran**

Le builtin DISPLAY affiche le message spécifié à l'écran, en mettant à jour en continu les valeurs de variable dynamiques utilisées dans la chaîne. La valeur de variable continue d'être mise à jour jusqu'à ce que l'opérateur effectue l'accusé de réception.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

DISPLAY(prompt)

Les éléments lexicaux du builtin DISPLAY sont présentés dans le Tableau 16.

**Tableau 16 – Builtin DISPLAY**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                                                  |
|------------------|-----------|-----------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING | I         | m           | Un message à afficher (voir 6.2.40 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| <return>         | VOID      | —         | —           | —                                                                                                                                                                                            |

## 6.2.8 Builtin display

**Profils de communication: CS, GPE, HART, PB, PN**

**Objet: Afficher le message spécifié à l'écran**

Le builtin display affiche le message spécifié à l'écran, en mettant à jour en continu les valeurs de VARIABLE dynamiques utilisées dans la chaîne. La valeur de VARIABLE continue d'être mise à jour jusqu'à ce que l'opérateur effectue l'accusé de réception.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

NOTE 3 Les nouvelles descriptions de produits peuvent utiliser DISPLAY, qui prend en charge le référencement direct des variables de méthode et des VARIABLES. La version en minuscules de cette fonction est conservée à des fins de rétrocompatibilité uniquement.

### Structure lexicale

display(prompt, global\_var\_ids)

Les éléments lexicaux du builtin display sont présentés dans le Tableau 17.

**Tableau 17 – Builtin display**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                                                  |
|------------------|-----------|-----------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING | I         | m           | Un message à afficher (voir 6.2.35 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| global_var_ids   | Int[]     | I         | m           | Matrice qui contient des identifiants uniques d'instances de VARIABLE.                                                                                                                       |
| <return>         | VOID      | —         | —           | —                                                                                                                                                                                            |

## 6.2.9 Builtin display\_bitenum

**Profils de communication: CS, GPE, PB, PN**

**Objet: Afficher la chaîne d'énumération**

Le builtin display\_bitenum affiche une représentation textuelle d'une VARIABLE BIT\_ENUMERATED et attend l'accusé de réception de l'utilisateur.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

## Structure lexicale

`display_bitenum(bitenum_variable)`

Les éléments lexicaux du builtin `display_bitenum` sont présentés dans le Tableau 18.

**Tableau 18 – Builtin `display_bitenum`**

| Nom du paramètre              | Type      | Direction | Utilisation | Description                                     |
|-------------------------------|-----------|-----------|-------------|-------------------------------------------------|
| <code>bitenum_variable</code> | Reference | I         | m           | VARIABLE BIT_ENUMERATED qui doit être affichée. |
| <return>                      | VOID      | —         | —           | —                                               |

## 6.2.10 Builtin `display_builtin_error`

**Profils de communication:** FF, ISA100

**Objet:** Afficher la description de l'erreur builtin et attendre l'accusé de réception

Le builtin `display_builtin_error` affiche sur le dispositif d'affichage de l'application le texte associé à une erreur builtin spécifiée. Le builtin `display` ne retourne pas le contrôle à la méthode tant que l'utilisateur n'accuse pas réception du message.

Les codes d'erreur et leurs descriptions textuelles sont spécifiés dans le Tableau 376.

Ce builtin constitue un moyen de débogage des appels de programmes builtin qui retournent une erreur. Il convient de ne jamais l'utiliser dans une méthode de production finale, car il convient que les types des erreurs retournées par les builtins ne soient jamais reçus dans une méthode totalement déboguée.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

## Structure lexicale

`display_builtin_error(error)`

Les éléments lexicaux du builtin `display_builtin_error` sont présentés dans le Tableau 19.

**Tableau 19 – Builtin `display_builtin_error`**

| Nom du paramètre   | Type | Direction | Utilisation | Description                                           |
|--------------------|------|-----------|-------------|-------------------------------------------------------|
| <code>error</code> | long | I         | m           | Code pour une erreur builtin.                         |
| <return>           | long | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

## Exemple

```
long status;
if (status != BLTIN_SUCCESS)
{
    display_builtin_error(status);
}
```

### 6.2.11 Builtin display\_comm\_error

**Profils de communication:** FF, ISA100

**Objet:** Afficher la description de l'erreur de communication et attendre l'accusé de réception

Le builtin display\_comm\_error affiche la chaîne de texte associée à une erreur de communication sur le dispositif d'affichage de l'application.

NOTE 1 Une erreur de communication égale à zéro n'est pas assimilée à une erreur de communication.

NOTE 2 Le builtin ne retourne pas le contrôle à la méthode tant que l'utilisateur n'accuse pas réception du message.

En interne, ce builtin appelle le builtin get\_comm\_error\_string pour obtenir la chaîne de texte associée et le builtin get\_acknowledgement pour afficher la chaîne de texte associée et attendre l'accusé de réception de l'utilisateur.

Les codes d'erreur de communication sont définis par les consortiums. Leurs chaînes associées peuvent être définies dans un dictionnaire de texte.

NOTE 3 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 4 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

#### Structure lexicale

```
display_comm_error(error)
```

Les éléments lexicaux du builtin display\_comm\_error sont présentés dans le Tableau 20.

**Tableau 20 – Builtin display\_comm\_error**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| error            | unsigned long | I         | m           | Code pour une erreur de communication.                |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

#### Exemple

```
long status;
if (status == BLTIN_FAIL_COMM_ERROR)
{
    status = display_comm_error(get_comm_error());
}
```

L'exemple utilise le builtin get\_comm\_error() pour obtenir le code d'erreur de communication utilisé comme argument de ce builtin.

### 6.2.12 Builtin display\_comm\_status

**Profils de communication:** HART

**Objet:** Afficher la chaîne de statut de communication

Le builtin display\_comm\_status affiche la ou les chaînes de description de la VARIABLE de statut de communication désignée par le paramètre comm\_status\_value. La chaîne affichée reste à l'écran jusqu'à ce que l'opérateur effectue l'accusé de réception.



L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

`display_comm_status(comm_status_value)`

Les éléments lexicaux du builtin `display_comm_status` sont présentés dans le Tableau 21.

**Tableau 21 – Builtin `display_comm_status`**

| Nom du paramètre               | Type | Direction | Utilisation | Description                            |
|--------------------------------|------|-----------|-------------|----------------------------------------|
| <code>comm_status_value</code> | int  | l         | m           | Code pour une erreur de communication. |
| <return>                       | VOID | —         | —           | —                                      |

### 6.2.13 Builtin `display_device_status`

**Profils de communication: HART**

**Objet: Afficher la chaîne de statut du dispositif**

Le builtin `display_device_status` affiche la ou les chaînes de description de la VARIABLE de statut du dispositif désignée par le paramètre `device_status_value`. La chaîne affichée reste à l'écran jusqu'à ce que l'opérateur effectue l'accusé de réception.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

`display_device_status(device_status_value)`

Les éléments lexicaux du builtin `display_device_status` sont présentés dans le Tableau 22.

**Tableau 22 – Builtin `display_device_status`**

| Nom du paramètre                 | Type | Direction | Utilisation | Description                        |
|----------------------------------|------|-----------|-------------|------------------------------------|
| <code>device_status_value</code> | int  | l         | m           | Code pour le statut du dispositif. |
| <return>                         | VOID | —         | —           | —                                  |

### 6.2.14 Builtin `display_dynamics`

**Profils de communication: FF, ISA100**

**Objet: Afficher et mettre à jour les valeurs de VARIABLE**

Le builtin `display_dynamics` affiche un message en continu sur le dispositif de sortie de l'application. Le builtin met à jour les valeurs spécifiées dans le message jusqu'à ce qu'il soit interrompu par l'utilisateur. Le contrôle n'est pas retourné à la méthode tant qu'il n'est pas interrompu par l'utilisateur.

Le principal objectif de l'appel est d'afficher des informations de valeur du dispositif que l'utilisateur souhaite examiner pendant une période.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

`display_dynamics(prompt, ids, indices, id_count)`

Les éléments lexicaux du builtin `display_dynamics` sont présentés dans le Tableau 23.

**Tableau 23 – Builtin `display_dynamics`**

| Nom du paramètre | Type            | Direction | Utilisation | Description                                                                                                                                                                                 |
|------------------|-----------------|-----------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING       | I         | m           | Un message à afficher (voir 6.2.6 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| ids              | unsigned long[] | I         | m           | ID d'éléments des VARIABLES utilisées dans le message d'invite.                                                                                                                             |
| indices          | unsigned long[] | I         | m           | ID de membres ou index de matrice des VARIABLES utilisées dans le message d'invite. Défini sur zéro s'il n'y a pas d'ID de membre ou d'index de matrice.                                    |
| id_count         | long            | I         | m           | Nombre d'éléments de matrice dans les matrices pour les ID et les indices. Défini sur zéro si les matrices pour les ID et les indices sont NULL.                                            |
| <return>         | long            | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                       |

### Exemple

```
long status;
unsigned long ids[2];
unsigned long indices[2];
ids[0] = ITEM_ID(PARAM.OUT);
ids[1] = ITEM_ID(PARAM.BKCAL_IN);
indices[0] = indices[1] = MEMBER_ID(VALUE);
status = display_dynamics("|en|PID.OUT: %{0} PID.BKCAL_IN: %{1}, ids,
indices, 2);
```

## 6.2.15 Builtin `display_dynamics2`

**Profils de communication: FF, ISA100**

**Objet: Afficher et mettre à jour les valeurs de VARIABLE**

Le builtin `display_dynamics2` affiche un message en continu sur le dispositif de sortie de l'application. Le builtin met à jour les valeurs spécifiées dans le message jusqu'à ce qu'il soit interrompu par l'utilisateur. Le contrôle n'est pas retourné à la méthode tant qu'il n'est pas interrompu par l'utilisateur. Le principal objectif de l'appel est d'afficher des informations de valeur du dispositif que l'utilisateur souhaite examiner pendant une période.

Les paramètres `blk_ids`, `blk_nums`, `ids`, `indices` et `id_count` spécifient collectivement les valeurs à incorporer dans l'invite. Le paramètre `blk_ids` spécifie les ID d'éléments des blocs auxquels accéder, tandis que le paramètre `blk_nums` spécifie les indices relatifs des blocs auxquels accéder.

Si un élément du paramètre `ids` fait référence à une variable, l'élément correspondant du paramètre `indices` est ignoré. Si un élément du paramètre `ids` fait référence à un enregistrement, l'élément correspondant du paramètre `indices` spécifie un membre de l'enregistrement. Si un élément du paramètre `ids` fait référence à une matrice, l'élément correspondant du paramètre `indices` spécifie un élément de la matrice.

Les éléments des paramètres `blk_ids`, `ids` et `indices` sont généralement spécifiés à l'aide des fonctions builtin `ITEM_ID()` et `MEMBER_ID()`. Les éléments du paramètre `blk_nums` sont généralement spécifiés à l'aide des fonctions builtin `get_block_instance_by_object_index()` et `get_block_instance_by_block_tag()`.

Les paramètres `blk_ids`, `blk_nums` et `ids` peuvent être transmis en tant que valeur NULL si aucune valeur n'est incorporée dans l'invite. Si l'un de ces paramètres est transmis en tant que valeur NULL, ils doivent tous être transmis en tant que valeur NULL.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

`display_dynamics2(prompt, blk_ids, blk_nums, ids, indices, id_count)`

Les éléments lexicaux du builtin `display_dynamics2` sont présentés dans le Tableau 24.

**Tableau 24 – Builtin `display_dynamics2`**

| Nom du paramètre            | Type                         | Direction | Utilisation | Description                                                                                                                                                                                                           |
|-----------------------------|------------------------------|-----------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>prompt</code>         | <code>DD_STRING</code>       | I         | m           | Un message à afficher (voir 6.2.6 pour la syntaxe). Des types de chaînes autres que <code>DD_STRING</code> peuvent également être utilisés et sont automatiquement convertis en <code>DD_STRING</code> (voir 6.18.3). |
| <code>blk_ids</code>        | <code>unsigned long[]</code> | I         | m           | ID d'éléments des instances de <code>BLOCK_A</code> utilisées dans le message d'invite.                                                                                                                               |
| <code>blk_nums</code>       | <code>unsigned long[]</code> | I         | m           | Numéros d'occurrence des instances de <code>BLOCK_A</code> utilisées dans le message d'invite.                                                                                                                        |
| <code>ids</code>            | <code>unsigned long[]</code> | I         | m           | ID d'éléments des <code>VARIABLEs</code> , <code>RECORDs</code> ou <code>ARRAYs</code> utilisés dans l'invite.                                                                                                        |
| <code>indices</code>        | <code>unsigned long[]</code> | I         | m           | ID de membres des <code>RECORDs</code> ou indices de matrice des <code>ARRAYs</code> utilisés dans le message d'invite. Défini sur zéro s'il n'y a pas d>ID de membre ou d'index de matrice.                          |
| <code>id_count</code>       | <code>long</code>            | I         | m           | Nombre d'éléments de matrice dans les matrices pour les ID et les indices. Défini sur zéro si les matrices pour les ID et les indices sont NULL.                                                                      |
| <code>&lt;return&gt;</code> | <code>long</code>            | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                                                 |

**Exemple**

```

long status;
unsigned long blk_ids[2];
unsigned long blk_nums [2];
unsigned long ids[2];
unsigned long indices[2];
blk_ids[0] = blk_ids[1] =
ITEM_ID(__proportional_integral_derivative_block);
blk_nums[0] = blk_nums[1] = 0;
ids[0] = MEMBER_ID(OUT);
ids[1] = MEMBER_ID(BKCAL_IN);
indices[0] = indices[1] = MEMBER_ID(VALUE);
status = display_dynamics2("|en|PID.OUT: %{0} PID.BKCAL_IN: %{1}, blk_ids,
blk_nums, ids, indices, 2);

```

**6.2.16 Builtin display\_message****Profils de communication: FF, ISA100****Objet: Afficher un message qui n'exige pas d'accusé de réception de l'utilisateur**

Le builtin display\_message affiche un message sur le dispositif de sortie de l'application. Il retourne le contrôle à la méthode sans exiger d'accusé de réception de l'utilisateur.

Cet appel est utilisé pour informer l'utilisateur de changements de statut du système qui n'exigent aucune action. Il convient que le message reste disponible pour examen au moins jusqu'à ce qu'un appel ultérieur remplace potentiellement le message par un nouveau message ou que la méthode se termine.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

**Structure lexicale**

```
display_message(prompt, ids, indices, id_count)
```

Les éléments lexicaux du builtin display\_message sont présentés dans le Tableau 25.

**Tableau 25 – Builtin display\_message**

| Nom du paramètre | Type            | Direction | Utilisation | Description                                                                                                                                                                                 |
|------------------|-----------------|-----------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING       | I         | m           | Un message à afficher (voir 6.2.6 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| ids              | unsigned long[] | I         | m           | ID d'éléments des VARIABLES utilisées dans le message d'invite.                                                                                                                             |
| indices          | unsigned long[] | I         | m           | ID de membres ou index de matrice des VARIABLES utilisées dans le message d'invite. Défini sur zéro s'il n'y a pas d>ID de membre ou d'index de matrice.                                    |
| id_count         | long            | I         | m           | Nombre d'éléments de matrice dans les matrices pour les ID et les indices. Défini sur zéro si les matrices pour les ID et les indices sont NULL.                                            |
| <return>         | long            | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                       |

**Exemple**

```
long status;
unsigned long ids[1];
unsigned long indices[1];
status = display_message("|en|All clear\n", ids, indices, 0);
```

**6.2.17 Builtin display\_message2****Profils de communication: FF, ISA100****Objet: Afficher un message qui n'exige pas d'accusé de réception de l'utilisateur**

Le builtin `display_message2` affiche un message sur le dispositif de sortie de l'application. Il retourne le contrôle à la méthode sans exiger d'accusé de réception de l'utilisateur. Cet appel est utilisé pour informer l'utilisateur de changements de statut du système qui n'exigent aucune action. Il convient que le message reste disponible pour examen au moins jusqu'à ce qu'un appel ultérieur remplace potentiellement le message par un nouveau message ou que la méthode se termine.

Le paramètre `blk_ids` spécifie les ID d'éléments des blocs auxquels accéder, tandis que le paramètre `blockInstances` spécifie les indices relatifs des blocs auxquels accéder.

Si un élément du paramètre `ids` fait référence à une variable, l'élément correspondant du paramètre `indices` est ignoré. Si un élément du paramètre `ids` fait référence à un enregistrement, l'élément correspondant du paramètre `indices` spécifie un membre de l'enregistrement. Si un élément du paramètre `ids` fait référence à une matrice, l'élément correspondant du paramètre `indices` spécifie un élément de la matrice.

Les éléments des paramètres `blk_ids`, `ids` et `indices` sont généralement spécifiés à l'aide des builtins `ITEM_ID` et `MEMBER_ID`. Les éléments du paramètre `blk_nums` sont généralement spécifiés à l'aide des builtins `get_block_instance_by_object_index` et `get_block_instance_by_block_tag`.

Les paramètres `blk_ids`, `blk_nums` et `ids` peuvent être transmis en tant que valeur NULL si aucune valeur n'est incorporée dans l'invite. Si l'un de ces paramètres est transmis en tant que valeur NULL, ils doivent tous être transmis en tant que valeur NULL.

Le paramètre `indices` peut être transmis en tant que valeur NULL si le paramètre `ids` référence uniquement des variables, c'est-à-dire s'il ne référence ni enregistrements ni matrices.

Le paramètre `count` doit être transmis en tant que valeur zéro lorsque les paramètres `blk_ids`, `blk_nums` et `indices` sont transmis en tant que valeur NULL.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

**Structure lexicale**

```
display_message2(prompt, blk_ids, blk_nums, ids, indices, id_count)
```

Les éléments lexicaux du builtin `display_message2` sont présentés dans le Tableau 26.

**Tableau 26 – Builtin display\_message2**

| Nom du paramètre | Type            | Direction | Utilisation | Description                                                                                                                                                                                 |
|------------------|-----------------|-----------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING       | I         | m           | Un message à afficher (voir 6.2.6 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| blk_ids          | unsigned long[] | I         | m           | ID d'éléments des instances de BLOCK_A utilisées dans le message d'invite.                                                                                                                  |
| blk_nums         | unsigned long[] | I         | m           | Numéros d'occurrence des instances de BLOCK_A utilisées dans le message d'invite.                                                                                                           |
| ids              | unsigned long[] | I         | m           | ID d'éléments des VARIABLES, RECORDs ou ARRAYs utilisés dans le message d'invite.                                                                                                           |
| indices          | unsigned long[] | I         | m           | ID de membres ou index de matrice des VARIABLES utilisées dans le message d'invite. Défini sur zéro s'il n'y a pas d'ID de membre ou d'index de matrice.                                    |
| id_count         | long            | I         | m           | Nombre d'éléments de matrice dans les matrices pour les ID et les indices. Défini sur zéro si les matrices pour les ID et les indices sont NULL.                                            |
| <return>         | long            | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                       |

**Exemple**

```

long status;
unsigned long blk_ids[1];
unsigned long blk_nums[1];
unsigned long ids[1];
unsigned long indices[1];
blk_ids[0] = ITEM_ID(__analog_input_block);
blk_nums[0] = 0;
ids[0] = MEMBER_ID(MODE_BLK);
indices[0] = MEMBER_ID(TARGET);
status = display_message2("|en|Target Mode is %{0}\n", blk_ids, blk_nums,
ids, indices, 1);

```

**6.2.18 Builtin display\_response\_code****Profils de communication: FF, ISA100****Objet: Afficher la description d'un code de réponse et attendre un accusé de réception**

Le builtin display\_response\_code affiche la description d'un code de réponse pour un élément. Le builtin display ne retourne pas le contrôle à la méthode tant que l'utilisateur n'accuse pas réception du message.

En interne, ce builtin appelle le builtin get\_response\_code\_string pour obtenir la chaîne de texte associée et le builtin get\_acknowledgement pour afficher la chaîne de texte associée et attendre l'accusé de réception de l'utilisateur.

Un code de réponse est une valeur représentant une condition d'erreur spécifique à une application. Une valeur de code de réponse égale à zéro n'est pas assimilée à un code de réponse d'erreur. Chaque code de réponse et type de code de réponse est défini dans l'EDD.

L'ID de paramètre et le member\_id désignent un paramètre auquel peut être associé un code de réponse après sa dernière lecture ou écriture. L'ID de paramètre et le member\_id sont spécifiés en utilisant les builtins ITEM\_ID et MEMBER\_ID et le nom ou la référence de la variable en question.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

```
display_response_code(id, member_id, code)
```

Les éléments lexicaux du builtin display\_response\_code sont présentés dans le Tableau 27.

**Tableau 27 – Builtin display\_response\_code**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                |
|------------------|---------------|-----------|-------------|------------------------------------------------------------|
| id               | unsigned long | I         | m           | ID d'élément de l'élément qui a généré le code de réponse. |
| member_id        | unsigned long | I         | m           | ID de membre de l'élément qui a généré le code de réponse. |
| code             | unsigned long | I         | m           | Code de réponse reçu du builtin get_response_code.         |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.      |

### Exemple

```
long status;
unsigned long id;
unsigned long member;
unsigned long code;
if (status == BLTIN_FAIL_RESPONSE_CODE)
{
    get_response_code(&code, &id, &member);
    status = display_response_code(id, member, code);
}
```

L'exemple utilise le builtin get\_response\_code() pour obtenir le code de réponse retourné lors de la précédente demande de communication.

## 6.2.19 Builtin display\_response\_status

### Profils de communication: HART

#### Objet: Afficher la chaîne de statut de réponse

Le builtin display\_response\_status affiche la chaîne associée à la valeur spécifiée de l'octet response\_code reçu du COMMAND NUMBER spécifié. La chaîne affichée reste à l'écran jusqu'à ce que l'opérateur effectue l'accusé de réception.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

`display_response_status(command_num, response_code_value)`

Les éléments lexicaux du builtin `display_response_status` sont présentés dans le Tableau 28.

**Tableau 28 – Builtin `display_response_status`**

| Nom du paramètre    | Type | Direction | Utilisation | Description                                             |
|---------------------|------|-----------|-------------|---------------------------------------------------------|
| Command_name        | Int  | I         | m           | NUMBER de la COMMAND ayant envoyé le statut de réponse. |
| response_code_value | int  | I         | m           | Code de réponse à afficher dans une invite.             |
| <return>            | VOID | —         | —           | —                                                       |

### 6.2.20 Builtin `display_xmtr_status`

**Profils de communication: HART**

**Objet: Afficher la chaîne de statut du transmetteur**

Le builtin `display_xmtr_status` affiche une chaîne de description associée au bit indiqué par le paramètre `status_mask` dans la VARIABLE désignée par le paramètre `bit_enum_var_name`. La chaîne s'affiche, que le bit indiqué par le paramètre `status_mask` soit défini ou non. La chaîne affichée reste à l'écran jusqu'à ce que l'opérateur effectue l'accusé de réception.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

`display_xmtr_status(bit_enum_var_name, status_mask)`

Les éléments lexicaux du builtin `display_xmtr_status` sont présentés dans le Tableau 29.

**Tableau 29 – Builtin `display_xmtr_status`**

| Nom du paramètre  | Type | Direction | Utilisation | Description                                                  |
|-------------------|------|-----------|-------------|--------------------------------------------------------------|
| bit_enum_var_name | int  | I         | m           | Référence à une instance de VARIABLE de type BIT_ENUMERATED. |
| status_mask       | int  | I         | m           | Masque de bits qui indique le bit à afficher.                |
| <return>          | VOID | —         | —           | —                                                            |

### 6.2.21 Builtin `edit_device_value`

**Profils de communication: FF, ISA100**

**Objet: Afficher une valeur de dispositif définie dans EDDL et laisser l'utilisateur la modifier**

Le builtin `edit_device_value` affiche une invite avec une valeur du dispositif spécifiée par le param `id` et le param `member_id`. L'utilisateur peut éditer la valeur affichée.

Une valeur du dispositif peut résider dans la mémoire cache d'une application EDD en mémoire cache, et la valeur ne doit pas être écrite dans le dispositif tant qu'une méthode n'est pas terminée ou que la valeur n'est pas explicitement envoyée au dispositif par la méthode.



L'application édite et vérifie les valeurs entrées pour la valeur du dispositif. Cette édition est fondée sur des types arithmétiques de VARIABLE définis dans l'EDD d'origine pour chaque VARIABLE. Les attributs EDDL associés aux VARIABLEs peuvent comprendre:

- HANDLING
- DISPLAY\_FORMAT
- EDIT\_FORMAT
- MIN\_VALUE
- MAX\_VALUE

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

edit\_device\_value(prompt, ids, indices, id\_count, param\_id, param\_member\_id)

Les éléments lexicaux du builtin edit\_device\_value sont présentés dans le Tableau 30.

**Tableau 30 – Builtin edit\_device\_value**

| Nom du paramètre | Type            | Direction | Utilisation | Description                                                                                                                                                                                 |
|------------------|-----------------|-----------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING       | I         | m           | Un message à afficher (voir 6.2.6 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| ids              | unsigned long[] | I         | m           | ID d'éléments des VARIABLEs utilisées dans le message d'invite.                                                                                                                             |
| indices          | unsigned long[] | I         | m           | ID de membres ou index de matrice des VARIABLEs utilisées dans le message d'invite. Défini sur zéro s'il n'y a pas d>ID de membre ou d'index de matrice.                                    |
| id_count         | long            | I         | m           | Nombre d'éléments de matrice dans les matrices pour les ID et les indices. Défini sur zéro si les matrices pour les ID et les indices sont NULL.                                            |
| param_id         | unsigned long   | I         | m           | ID d'élément de la VARIABLE à modifier.                                                                                                                                                     |
| param_member_id  | unsigned long   | I         | m           | ID de membre de la VARIABLE à modifier.                                                                                                                                                     |
| <return>         | long            | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                       |

### Exemple

```
long status;
unsigned long id;
unsigned long ids[1];
unsigned long indices[1];
id = ITEM_ID(PARAM.HI_LIM);
status = edit_device_value("|en|Enter new HI_LIM value:\n", ids, indices,
0, id, 0);
status = send_value(id, 0);
```

### 6.2.22 Builtin edit\_device\_value2

**Profils de communication: FF, ISA100**

**Objet: Afficher une valeur de dispositif définie dans EDDL et laisser l'utilisateur la modifier**

Le builtin edit\_device\_value2 affiche une invite et permet à l'utilisateur de modifier la variable, le membre d'enregistrement ou l'élément de matrice spécifié par les paramètres blk\_id, blk\_num, param\_id et param\_member\_id.

Une valeur du dispositif peut résider dans la mémoire cache d'une application EDD en mémoire cache, et la valeur ne doit pas être écrite dans le dispositif tant qu'une méthode n'est pas terminée ou que la valeur n'est pas explicitement envoyée au dispositif par la méthode.

Les paramètres blk\_ids, blk\_nums, ids, indices et count spécifient collectivement les valeurs à incorporer dans l'invite.

L'application édite et vérifie les valeurs entrées pour la valeur du dispositif. Cette édition est fondée sur des attributs de variable, de membre d'enregistrement ou d'élément de matrice définis dans l'EDD d'origine pour chaque VARIABLE. Les attributs EDDL associés aux VARIABLES peuvent comprendre:

- HANDLING
- DISPLAY\_FORMAT
- EDIT\_FORMAT
- MIN\_VALUE
- MAX\_VALUE

Le paramètre blk\_ids spécifie les ID d'éléments des blocs auxquels accéder, tandis que le paramètre blk\_nums spécifie les indices relatifs des blocs auxquels accéder.

Si un élément du paramètre ids fait référence à une variable, l'élément correspondant du paramètre indices est ignoré. Si un élément du paramètre ids fait référence à un enregistrement, l'élément correspondant du paramètre indices spécifie un membre de l'enregistrement. Si un élément du paramètre ids fait référence à une matrice, l'élément correspondant du paramètre indices spécifie un élément de la matrice.

Les éléments des paramètres blk\_ids, ids et indices sont généralement spécifiés à l'aide des builtins ITEM\_ID et MEMBER\_ID. Les éléments du paramètre blk\_nums sont généralement spécifiés à l'aide des builtins get\_block\_instance\_by\_object\_index et get\_block\_instance\_by\_block\_tag.

Les paramètres blk\_ids, blk\_nums et ids peuvent être transmis en tant que valeur NULL si aucune valeur n'est incorporée dans l'invite. Si l'un de ces paramètres est transmis en tant que valeur NULL, ils doivent tous être transmis en tant que valeur NULL.

Le paramètre indices peut être transmis en tant que valeur NULL si le paramètre ids référence uniquement des variables, c'est-à-dire s'il ne référence ni enregistrements ni matrices.

Le paramètre count doit être transmis en tant que valeur zéro lorsque les paramètres blk\_ids, blk\_nums et ids sont transmis en tant que valeur NULL.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

## Structure lexicale

`edit_device_value2(prompt, blk_ids, blk_nums, ids, indices, id_count, blk_id, blk_num, param_id, param_member_id)`

Les éléments lexicaux du builtin `edit_device_value2` sont présentés dans le Tableau 31.

**Tableau 31 – Builtin `edit_device_value2`**

| Nom du paramètre             | Type            | Direction | Utilisation | Description                                                                                                                                                                                          |
|------------------------------|-----------------|-----------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>prompt</code>          | DD_STRING       | I         | m           | Un message à afficher (voir 6.2.6 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3).          |
| <code>blk_ids</code>         | unsigned long[] | I         | m           | ID d'éléments des instances de BLOCK_A utilisées dans le message d'invite.                                                                                                                           |
| <code>blk_nums</code>        | unsigned long[] | I         | m           | Numéros d'occurrence des instances de BLOCK_A utilisées dans le message d'invite.                                                                                                                    |
| <code>ids</code>             | unsigned long[] | I         | m           | ID d'éléments des VARIABLES, RECORDs ou ARRAYS utilisés dans le message d'invite.                                                                                                                    |
| <code>indices</code>         | unsigned long[] | I         | m           | ID de membres ou index de matrice des membres d'enregistrement et/ou des éléments de matrice utilisés dans le message d'invite. Défini sur zéro s'il n'y a pas d>ID de membre ou d'index de matrice. |
| <code>id_count</code>        | long            | I         | m           | Nombre d'éléments dans les matrices <code>blk_ids</code> , <code>blk_nums</code> , <code>ids</code> et <code>indices</code> . Défini sur zéro si les matrices pour les ID et les indices sont NULL.  |
| <code>blk_id</code>          | unsigned long   | I         | m           | ID d'élément de l'instance de BLOCK_A à modifier.                                                                                                                                                    |
| <code>blk_num</code>         | unsigned long   | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à modifier.                                                                                                                                             |
| <code>param_id</code>        | unsigned long   | I         | m           | ID d'élément de la VARIABLE à modifier.                                                                                                                                                              |
| <code>param_member_id</code> | unsigned long   | I         | m           | ID de membre de la VARIABLE à modifier.                                                                                                                                                              |
| <code>&lt;return&gt;</code>  | long            | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                                |

## Exemple

```
long status;
unsigned long blk_ids[1];
unsigned long blk_nums[1];
unsigned long ids[1];
unsigned long indices[1];
unsigned long blk_id;
unsigned long blk_num;
unsigned long param_id;
blk_id = ITEM_ID(__analog_input_block);
blk_num = 0;
param_id = MEMBER_ID(HI_LIM);
status = edit_device_value2("|en|Enter new HI_LIM value:\n", blk_ids,
blk_nums, ids, indices, 0, blk_id, blk_num, param_id, 0);
```

### 6.2.23 Builtin edit\_local\_value

**Profils de communication: FF, ISA100**

**Objet: Afficher une variable de méthode et laisser l'utilisateur la modifier**

Le builtin edit\_local\_value affiche une invite avec le nom de la variable de méthode spécifié par le paramètre local\_var. Le paramètre local\_var est une chaîne de caractères C à terminaison null. L'utilisateur peut éditer la valeur affichée de la variable de méthode.

L'application EDD est responsable de la prévention du retour de valeurs non valides en effectuant des vérifications fondées sur le type de variable de méthode uniquement. La méthode doit effectuer une vérification d'intervalle sur les valeurs retournées.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

#### Structure lexicale

edit\_local\_value(prompt, ids, indices, id\_count, local\_var)

Les éléments lexicaux du builtin edit\_local\_value sont présentés dans le Tableau 32.

**Tableau 32 – Builtin edit\_local\_value**

| Nom du paramètre | Type            | Direction | Utilisation | Description                                                                                                                                                                                 |
|------------------|-----------------|-----------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING       | I         | m           | Un message à afficher (voir 6.2.6 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| ids              | unsigned long[] | I         | m           | ID d'éléments des VARIABLES utilisées dans le message d'invite.                                                                                                                             |
| indices          | unsigned long[] | I         | m           | ID de membres ou index de matrice des VARIABLES utilisées dans le message d'invite. Défini sur zéro s'il n'y a pas d>ID de membre ou d'index de matrice.                                    |
| id_count         | long            | I         | m           | Nombre d'éléments de matrice dans les matrices pour les ID et les indices. Défini sur zéro si les matrices pour les ID et les indices sont NULL.                                            |
| local_var        | char[]          | I         | m           | Nom de la VARIABLE locale qui peut être modifiée.                                                                                                                                           |
| <return>         | long            | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                       |

#### Exemple

```
long status;
unsigned long ids[1];
unsigned long indices[1];
float offset;
offset = 1.0;
status = edit_local_value("|en|Please enter offset...\n", ids, indices, 0,
"offset");
```

## 6.2.24 Builtin edit\_local\_value2

**Profils de communication: FF, ISA100**

**Objet: Afficher une variable de méthode et laisser l'utilisateur la modifier**

Le builtin edit\_local\_value2 affiche une invite avec le nom de la variable de méthode spécifié par le paramètre local\_var. Le paramètre local\_var est une chaîne de caractères C à terminaison null. L'utilisateur peut éditer la valeur affichée de la variable de méthode.

Les paramètres blk\_ids, blk\_nums, ids, indices et count spécifient collectivement les valeurs à incorporer dans l'invite.

L'application EDD est responsable de la prévention du retour de valeurs non valides en effectuant des vérifications fondées sur le type de variable de méthode uniquement. La méthode doit effectuer une vérification d'intervalle sur les valeurs retournées.

Le paramètre blk\_ids spécifie les ID d'éléments des blocs auxquels accéder, tandis que le paramètre blk\_nums spécifie les indices relatifs des blocs auxquels accéder.

Si un élément du paramètre ids fait référence à une variable, l'élément correspondant du paramètre indices est ignoré. Si un élément du paramètre ids fait référence à un enregistrement, l'élément correspondant du paramètre indices spécifie un membre de l'enregistrement. Si un élément du paramètre ids fait référence à une matrice, l'élément correspondant du paramètre indices spécifie un élément de la matrice.

Les éléments des paramètres blk\_ids, ids et indices sont généralement spécifiés à l'aide des builtins ITEM\_ID et MEMBER\_ID. Les éléments du paramètre blk\_nums sont généralement spécifiés à l'aide des builtins get\_block\_instance\_by\_object\_index et get\_block\_instance\_by\_block\_tag.

Les paramètres blk\_ids, blk\_nums et ids peuvent être transmis en tant que valeur NULL si aucune valeur n'est incorporée dans l'invite. Si l'un de ces paramètres est transmis en tant que valeur NULL, ils doivent tous être transmis en tant que valeur NULL.

Le paramètre indices peut être transmis en tant que valeur NULL si le paramètre ids référence uniquement des variables, c'est-à-dire s'il ne référence ni enregistrements ni matrices.

Le paramètre count doit être transmis en tant que valeur zéro lorsque les paramètres blk\_ids, blk\_nums et ids sont transmis en tant que valeur NULL.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

```
edit_local_value2(prompt, blk_ids, blk_nums, ids, indices, id_count,
local_var)
```

Les éléments lexicaux du builtin edit\_local\_value2 sont présentés dans le Tableau 33.

**Tableau 33 – Builtin edit\_local\_value2**

| Nom du paramètre | Type            | Direction | Utilisation | Description                                                                                                                                                                                 |
|------------------|-----------------|-----------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING       | I         | m           | Un message à afficher (voir 6.2.6 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| blk_ids          | unsigned long[] | I         | m           | ID d'éléments des instances de BLOCK_A utilisées dans le message d'invite.                                                                                                                  |
| blk_nums         | unsigned long[] | I         | m           | Numéros d'occurrence des instances de BLOCK_A utilisées dans le message d'invite.                                                                                                           |
| ids              | unsigned long[] | I         | m           | ID d'éléments des VARIABLES utilisées dans le message d'invite.                                                                                                                             |
| indices          | unsigned long[] | I         | m           | ID de membres ou index de matrice des VARIABLES utilisées dans le message d'invite. Défini sur zéro s'il n'y a pas d>ID de membre ou d'index de matrice.                                    |
| id_count         | long            | I         | m           | Nombre d'éléments de matrice dans les matrices pour les ID et les indices. Défini sur zéro si les matrices pour les ID et les indices sont NULL.                                            |
| local_var        | char[]          | I         | m           | Nom de la VARIABLE locale qui peut être modifiée.                                                                                                                                           |
| <return>         | long            | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                       |

**Exemple**

```

long status;
float offset;
unsigned long blk_ids[2];
unsigned long blk_nums[2];
unsigned long ids[2];
unsigned long indices[0];
offset = 1.0;
blk_ids[0] = blk_ids[1] = ITEM_ID(transducer_block);
blk_nums[0] = blk_nums[1] = 0;
ids[0] = MEMBER_ID(LOW_LIMIT);
ids[1] = MEMBER_ID(HIGH_LIMIT);
indices[0] = indices[1] = 0;
status = edit_local_value2("|en|Please enter offset between %{0}
and %{1}\n", blk_ids, blk_nums, ids, indices, 2, "offset");

```

**6.2.25 Builtin get\_acknowledgement****Profils de communication: FF, ISA100****Objet: Afficher un message qui exige un accusé de réception de l'utilisateur**

Le builtin get\_acknowledgement affiche le message d'invite fourni sur le dispositif d'affichage de l'application et retourne à la méthode lorsque l'utilisateur a accusé réception du message.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

**Structure lexicale**

```
get_acknowledgement(prompt, ids, indices, id_count)
```

Les éléments lexicaux du builtin `get_acknowledgement` sont présentés dans le Tableau 34.

**Tableau 34 – Builtin `get_acknowledgement`**

| Nom du paramètre | Type            | Direction | Utilisation | Description                                                                                                                                                                                 |
|------------------|-----------------|-----------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING       | I         | m           | Un message à afficher (voir 6.2.6 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| ids              | unsigned long[] | I         | m           | ID d'éléments des VARIABLES utilisées dans le message d'invite.                                                                                                                             |
| indices          | unsigned long[] | I         | m           | ID de membres ou indices de matrice des VARIABLES utilisées dans le message d'invite. Défini sur zéro s'il n'y a pas d>ID de membre ou d'indice de matrice.                                 |
| id_count         | long            | I         | m           | Nombre d'éléments de matrice dans les matrices pour les ID et les indices. Défini sur zéro si les matrices pour les ID et les indices sont NULL.                                            |
| <return>         | long            | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                       |

### Exemple

```
long status;
unsigned long ids[1];
unsigned long indices[1];
status = get_acknowledgement("|en|W A R N\n loop should be removed from
auto mode\n", ids, indices, 0,);
```

## 6.2.26 Builtin `get_acknowledgement2`

**Profils de communication: FF, ISA100**

**Objet: Afficher un message qui exige un accusé de réception de l'utilisateur**

Le builtin `get_acknowledgement2` affiche le message d'invite fourni sur le dispositif d'affichage de l'application et retourne à la méthode lorsque l'utilisateur a accusé réception du message. Les paramètres `blk_ids`, `blk_nums`, `ids`, `indices` et `count` spécifient collectivement les valeurs à incorporer dans l'invite.

Le paramètre `blk_ids` spécifie les ID d'éléments des blocs auxquels accéder, tandis que le paramètre `blk_nums` spécifie les indices relatifs des blocs auxquels accéder.

Si un élément du paramètre `ids` fait référence à une variable, l'élément correspondant du paramètre `indices` est ignoré. Si un élément du paramètre `ids` fait référence à un enregistrement, l'élément correspondant du paramètre `indices` spécifie un membre de l'enregistrement. Si un élément du paramètre `ids` fait référence à une matrice, l'élément correspondant du paramètre `indices` spécifie un élément de la matrice.

Les éléments des paramètres `blk_ids`, `ids` et `indices` sont généralement spécifiés à l'aide des builtins `ITEM_ID` et `MEMBER_ID`. Les éléments du paramètre `blk_nums` sont généralement spécifiés à l'aide des builtins `get_block_instance_by_object_index` et `get_block_instance_by_block_tag`.

Les paramètres `blk_ids`, `blk_nums` et `ids` peuvent être transmis en tant que valeur NULL si aucune valeur n'est incorporée dans l'invite. Si l'un de ces paramètres est transmis en tant que valeur NULL, ils doivent tous être transmis en tant que valeur NULL.

Le paramètre indices peut être transmis en tant que valeur NULL si le paramètre ids référence uniquement des variables, c'est-à-dire s'il ne référence ni enregistrements ni matrices.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

```
get_acknowledgement2(prompt, blk_ids, blk_nums, ids, indices, id_count)
```

Les éléments lexicaux du builtin get\_acknowledgement2 sont présentés dans le Tableau 35.

**Tableau 35 – Builtin get\_acknowledgement2**

| Nom du paramètre | Type            | Direction | Utilisation | Description                                                                                                                                                                                 |
|------------------|-----------------|-----------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING       | l         | m           | Un message à afficher (voir 6.2.6 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| blk_ids          | unsigned long[] | l         | m           | ID d'éléments des instances de BLOCK_A utilisées dans le message d'invite.                                                                                                                  |
| blk_nums         | unsigned long[] | l         | m           | Numéros d'occurrence des instances de BLOCK_A utilisées dans le message d'invite.                                                                                                           |
| ids              | unsigned long[] | l         | m           | ID d'éléments des VARIABLES, RECORD ou ARRAYs utilisés dans le message d'invite.                                                                                                            |
| indices          | unsigned long[] | l         | m           | ID de membres ou indices de matrice des membres et/ou des éléments de matrice utilisés dans le message d'invite. Défini sur zéro s'il n'y a pas d>ID de membre ou d'indice de matrice.      |
| id_count         | long            | l         | m           | Nombre d'éléments de matrice dans les matrices pour les ID et les indices. Défini sur zéro si les matrices pour les ID et les indices sont NULL.                                            |
| <return>         | long            | o         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                       |

### Exemple

```
long status;
unsigned long blk_ids[2];
unsigned long blk_nums[2];
unsigned long ids[2];
unsigned long indices[2];
blk_ids[0] = blk_ids[1] = ITEM_ID(transducer_block);
blk_nums[0] = blk_nums[1] = 0;
ids[0] = MEMBER_ID(LOW_LIMIT);
ids[1] = MEMBER_ID(HIGH_LIMIT);
indices[0] = indices[1] = 0;
status = get_acknowledgement2("Setting LOW = %{0} and HIGH = %{1}\n",
blk_ids, blk_nums, ids, indices, 2);
```



### 6.2.27 Builtin GET\_DEV\_VAR\_VALUE

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Afficher le message d'invite spécifié et permettre à l'utilisateur d'éditer la valeur d'une VARIABLE

Le builtin GET\_DEV\_VAR\_VALUE affiche le message d'invite spécifié et permet à l'utilisateur d'éditer la valeur d'une VARIABLE. La copie éditée de la valeur de la VARIABLE est mise à jour lorsque la nouvelle valeur est entrée, mais n'est pas envoyée au dispositif. Cela doit être effectué de manière explicite en utilisant une des fonctions de commande d'envoi.

PRE\_EDIT\_ACTIONS de la VARIABLE est appelé avant invite de la nouvelle valeur. POST\_EDIT\_ACTIONS est appelé après l'entrée d'une nouvelle valeur.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

#### Structure lexicale

GET\_DEV\_VAR\_VALUE(prompt, device\_var\_name)

Les éléments lexicaux du builtin GET\_DEV\_VAR\_VALUE sont présentés dans le Tableau 36.

**Tableau 36 – Builtin GET\_DEV\_VAR\_VALUE**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                                                                                        |
|------------------|-----------|-----------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING | I         | m           | Un message à afficher (voir 6.2.40 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3).                                       |
| device_var_name  | reference | I         | m           | Nom référencé de la VARIABLE, qui peut être édité.                                                                                                                                                                                 |
| <return>         | int       | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. BI_SUCCESS si la modification de la variable a abouti ou BI_ERROR si une erreur s'est produite lors de l'entrée de la nouvelle valeur ou de l'accès à la variable spécifiée. |

### 6.2.28 Builtin get\_dev\_var\_value

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Afficher le message d'invite spécifié et permettre à l'utilisateur d'éditer<sup>5</sup> la valeur d'une VARIABLE

Le builtin get\_dev\_var\_value affiche le message d'invite spécifié et permet à l'utilisateur d'éditer la valeur d'une VARIABLE. La copie éditée de la valeur de la VARIABLE est mise à jour lorsque la nouvelle valeur est entrée, mais n'est pas envoyée au dispositif. Cela doit être effectué de manière explicite en utilisant une des fonctions de commande d'envoi.

<sup>5</sup> L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

PRE\_EDIT\_ACTIONS de la VARIABLE est appelé avant invite de la nouvelle valeur. POST\_EDIT\_ACTIONS est appelé après l'entrée d'une nouvelle valeur.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

NOTE 3 Les nouvelles descriptions de produits peuvent utiliser GET\_DEV\_VAR\_VALUE, qui prend en charge le référencement direct des variables de méthode et des VARIABLES. La version en minuscules de cette fonction est conservée à des fins de rétrocompatibilité uniquement.

### Structure lexicale

get\_dev\_var\_value(prompt, global\_var\_ids, device\_var\_name)

Les éléments lexicaux du builtin get\_dev\_var\_value sont présentés dans le Tableau 37.

**Tableau 37 – Builtin get\_dev\_var\_value**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                                                                                        |
|------------------|-----------|-----------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING | I         | m           | Un message à afficher (voir 6.2.35 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3).                                       |
| global_var_ids   | Int[]     | I         | m           | Matrice qui contient des identifiants uniques d'instance de VARIABLE.                                                                                                                                                              |
| device_var_name  | reference | I         | m           | Nom de la VARIABLE, qui peut être édité.                                                                                                                                                                                           |
| <return>         | int       | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. BI_SUCCESS si la modification de la variable a abouti ou BI_ERROR si une erreur s'est produite lors de l'entrée de la nouvelle valeur ou de l'accès à la variable spécifiée. |

### 6.2.29 Builtin GET\_LOCAL\_VAR\_VALUE

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Afficher le message d'invite spécifié et permettre à l'utilisateur d'éditer la valeur d'une variable de méthode

Le builtin GET\_LOCAL\_VAR\_VALUE affiche le message d'invite spécifié et permet à l'utilisateur d'éditer la valeur d'une variable de méthode.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

GET\_LOCAL\_VAR\_VALUE(prompt, local\_var\_name)

Les éléments lexicaux du builtin GET\_LOCAL\_VAR\_VALUE sont présentés dans le Tableau 38.

**Tableau 38 – Builtin GET\_LOCAL\_VAR\_VALUE**

| Nom du paramètre | Type       | Direction | Utilisation | Description                                                                                                                                                                                                                        |
|------------------|------------|-----------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING  | I         | m           | Un message à afficher (voir 6.2.40 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3).                                       |
| local_var_name   | referenced | I         | m           | Nom de la variable de méthode à éditer.                                                                                                                                                                                            |
| <return>         | int        | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. BI_SUCCESS si la modification de la variable a abouti et BI_ERROR si une erreur s'est produite lors de l'entrée de la nouvelle valeur ou de l'accès à la variable spécifiée. |

### 6.2.30 Builtin get\_local\_var\_value

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Afficher le message d'invite spécifié et permettre à l'utilisateur d'éditer la valeur d'une variable de méthode

Le builtin get\_local\_var\_value affiche le message d'invite spécifié et permet à l'utilisateur d'éditer la valeur d'une variable de méthode.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

NOTE 3 Les nouvelles descriptions de produits peuvent utiliser GET\_LOCAL\_VAR\_VALUE, qui prend en charge le référencement direct des variables de méthode et des VARIABLES. La version en minuscules de cette fonction est conservée à des fins de rétrocompatibilité uniquement.

#### Structure lexicale

get\_local\_var\_value(prompt, global\_var\_ids, local\_var\_name)

Les éléments lexicaux du builtin get\_local\_var\_value sont présentés dans le Tableau 39.

**Tableau 39 – Builtin get\_local\_var\_value**

| Nom du paramètre | Type       | Direction | Utilisation | Description                                                                                                                                                                                                                        |
|------------------|------------|-----------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING  | I         | m           | Un message à afficher (voir 6.2.35 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3).                                       |
| global_var_ids   | Int[]      | I         | o           | Matrice qui contient des identifiants uniques d'instance de VARIABLE.                                                                                                                                                              |
| local_var_name   | referenced | I         | o           | Nom de la VARIABLE locale à éditer.                                                                                                                                                                                                |
| <return>         | int        | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. BI_SUCCESS si la modification de la variable a abouti et BI_ERROR si une erreur s'est produite lors de l'entrée de la nouvelle valeur ou de l'accès à la variable spécifiée. |

### 6.2.31 Builtin Menu

**Profils de communication: CS, GPE, HART, PB, PN**

**Objet: Afficher un menu à l'utilisateur**

Le builtin Menu affiche un MENU et attend que l'utilisateur en accuse réception à l'aide d'une seule option (par exemple, "OK").

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

**Profils de communication: HART**

Le MENU référencé depuis ce builtin ne doit pas contenir d'autres méthodes ni d'édérations d'affichages en tant qu'éléments de menus.

Le MENU doit être traité comme un MENU avec STYLE DIALOG quel que soit le STYLE réel du MENU et tous les éléments de sous-menu de type MENU doivent être de style GROUP.

**Profils de communication: CS, GPE, PB, PN**

Le MENU doit être traité comme un MENU avec STYLE DIALOG quel que soit le STYLE réel du MENU.

### Structure lexicale

Menu (menu)

Si l'application EDD est incapable d'afficher le menu, une erreur est retournée.

Les éléments lexicaux du builtin Menu sont présentés dans le Tableau 40.

**Tableau 40 – Builtin Menu**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                                   |
|------------------|-----------|-----------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| menu             | reference | I         | m           | MENU à afficher.                                                                                                                                                              |
| <return>         | long      | O         | m           | Profils de communication: CS, GPE, HART, PB, PN<br><br>Un des codes de retour spécifiés dans le Tableau 377. BI_SUCCESS si la fonction a abouti et BI_ERROR si elle a échoué. |

### 6.2.32 Builtin MenuDisplay (version A)

**Profils de communication: CS, GPE, HART, PB, PN**

**Objet: Afficher un menu à l'utilisateur et fournir une liste d'options à choisir par l'utilisateur**

Le builtin MenuDisplay affiche un MENU et attend un accusé de réception de l'utilisateur par le choix d'une option dans la liste d'options fournie. Par ailleurs, pour éviter toute confusion de l'opérateur, il convient qu'option\_list n'utilise pas d'expressions telles que "Abort" et "Cancel". Lorsqu'un choix est effectué, la position de l'option dans la liste d'options est retournée. La position dans la liste est à base zéro. Par exemple, si la liste fournie contient deux éléments et que le premier élément est choisi, cette fonction retourne un 0. Si le deuxième élément est choisi, un 1 est retourné.

Les options sont transmises à la fonction sous la forme d'une chaîne unique délimitée par des points-virgules entre les options. Si aucune option n'est proposée, la fonction retourne une erreur.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction. Le mécanisme d'annulation permettant d'interrompre la méthode doit être fourni par l'application EDD.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

NOTE 3 Certaines applications EDD à affichage limité ne sont capables d'afficher que 4 boutons. Par conséquent, lorsque trois boutons définis par un développeur sont inclus (plus le mécanisme d'interruption normalisé), il est possible que le bouton d'aide (Help) ne soit plus disponible.

**Profils de communication: HART**

Trois options définies par l'utilisateur au plus sont admises, à l'exception du mécanisme d'annulation qui doit être fourni par l'application EDD.

Le MENU doit être traité comme un MENU avec STYLE DIALOG quel que soit le STYLE réel du MENU et tous les éléments de sous-menu de type MENU doivent être de style GROUP. Le MENU référencé depuis ce builtin ne doit pas contenir d'autres méthodes ni d'édérations d'affichages en tant qu'éléments de menus.

**Profils de communication: CS, GPE, PB, PN**

Le MENU doit être traité comme un MENU avec STYLE DIALOG quel que soit le STYLE réel du MENU.

#### Structure lexicale

MenuDisplay(menu, options, selection)

Si l'application EDD est incapable d'afficher le menu, une erreur est retournée.

Les éléments lexicaux du builtin MenuDisplay sont présentés dans le Tableau 41.

**Tableau 41 – Builtin MenuDisplay**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                                                                                                           |
|------------------|-----------|-----------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| menu             | reference | I         | m           | MENU à afficher.                                                                                                                                                                                                                                      |
| options          | DD_STRING | I         | m           | Chaîne d'options, constituée de texte délimité, qui définit un ensemble d'options présentées à l'utilisateur. Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| selection        | long*     | O         | m           | Option base zéro choisie (voir les paramètres d'option).                                                                                                                                                                                              |
| <return>         | long      | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. BI_SUCCESS si la fonction a abouti et BI_ERROR si elle a échoué. Si BI_ERROR est retourné, la valeur de sélection n'est pas définie.                                                            |

### 6.2.33 Builtin MenuDisplay (version B)

**Profils de communication: FF, ISA100**

**Objet: Afficher un menu à l'utilisateur et fournir une liste d'options à choisir par l'utilisateur**

Le builtin MenuDisplay affiche un MENU et attend un accusé de réception de l'utilisateur par le choix d'une option dans la liste d'options fournie. Par ailleurs, pour éviter toute confusion de l'opérateur, il convient qu'option\_list n'utilise pas d'expressions telles que "Abort" et "Cancel". Lorsqu'un choix est effectué, la position de l'option dans la liste d'options est retournée. La position dans la liste est à base zéro. Par exemple, si la liste fournie contient deux éléments et que le premier élément est choisi, cette fonction retourne un 0. Si le deuxième élément est choisi, un 1 est retourné.

Les options sont transmises à la fonction sous la forme d'une chaîne unique délimitée par des points-virgules entre les options. Si aucune option n'est proposée, la fonction retourne une erreur.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

NOTE 3 Certaines applications EDD à affichage limité ne sont capables d'afficher que 4 boutons. Par conséquent, lorsque trois boutons définis par un développeur sont inclus (plus le mécanisme d'interruption normalisé), il est possible que le bouton d'aide (Help) ne soit plus disponible.

Trois options définies par l'utilisateur au plus sont admises, à l'exception du mécanisme d'annulation qui doit être fourni par l'application EDD.

Le MENU doit être traité comme un MENU avec STYLE DIALOG quel que soit le STYLE réel du MENU. Le MENU référencé depuis ce builtin ne doit pas contenir d'autres méthodes ni d'édérations d'affichages en tant qu'éléments de menus.

#### Structure lexicale

MenuDisplay(menu, options, selection)

Si l'application EDD est incapable d'afficher le menu, une erreur est retournée.

Les éléments lexicaux du builtin MenuDisplay sont présentés dans le Tableau 42.

**Tableau 42 – Builtin MenuDisplay**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                                                                                                                                                                                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| menu             | unsigned long | I         | m           | ID d'élément du MENU à afficher.                                                                                                                                                                                                                      |
| options          | DD_STRING     | I         | m           | Chaîne d'options, constituée de texte délimité, qui définit un ensemble d'options présentées à l'utilisateur. Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| selection        | long*         | O         | m           | Option base zéro choisie (voir les paramètres d'option).                                                                                                                                                                                              |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                                                                                 |

**Exemple**

```

long select;
long step;
select = 0;
step = 0;
do
{
    switch (step)
    {
        case 0:
            MenuDisplay(ITEM_ID(wizard_step0), "NEXT", &select);
            step++;
            break;
        case 1:
            MenuDisplay(ITEM_ID(wizard_step1), "BACK;NEXT", &select);
            if (select == 0)
                step = 0;
            if (select == 1)
                step = 2;
            break;
        case 2:
            MenuDisplay(ITEM_ID(wizard_step2), "FINISH", &select);
            step++;
            break;
        default:
            break;
    }
} while (step < 3);

```

**6.2.34 Builtin PUT\_MESSAGE****Profils de communication: CS, GPE, HART, PB, PN****Objet: Afficher le message spécifié à l'écran**

Le builtin put\_message affiche le message spécifié à l'écran. Les éventuelles références de variable incorporées sont développées en valeur actuelle de la variable. Il convient d'afficher les variables ENUMERATED dans leur représentation textuelle lorsqu'elles sont définies. Lorsqu'une valeur ENUMERATED n'est pas définie, il convient qu'elle soit affichée dans sa représentation numérique.

### Profils de communication: HART

Les variables BIT\_ENUMERATED doivent être affichées en tant qu'entiers au format hexadécimal.

### Profils de communication: PB, PN, CS, GPE

Il convient que les variables BIT\_ENUMERATED soient affichées dans leur représentation numérique sous forme d'entier hexadécimal ou dans leur représentation textuelle contenant tous les bits définis sur "1".

PUT\_MESSAGE n'accepte aucune entrée de l'opérateur et l'utilisateur n'a pas la possibilité d'interrompre la méthode.

L'exécution de la méthode se poursuit immédiatement, c'est-à-dire qu'elle n'est pas bloquée. La chaîne de message peut contenir des références incorporées à toute combinaison de variables de méthode et de valeurs de VARIABLE. Il convient que le message reste disponible pour examen au moins jusqu'à ce qu'un appel ultérieur remplace potentiellement le message par un nouveau message ou que la méthode se termine.

Les références aux variables peuvent être incorporées à la chaîne de message, ce qui permet d'afficher leur valeur en utilisant la syntaxe indiquée en 6.2.40.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

PUT\_MESSAGE (message)

Les éléments lexicaux du builtin PUT\_MESSAGE sont présentés dans le Tableau 43.

**Tableau 43 – Builtin PUT\_MESSAGE**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                                                  |
|------------------|-----------|-----------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| message          | DD_STRING | I         | m           | Un message à afficher (voir 6.2.40 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| <return>         | VOID      | —         | —           | —                                                                                                                                                                                            |

### Exemple

```
int sum;
PUT_MESSAGE("The sum is: %[5.2f]{sum}");
```

L'exemple affiche la valeur de la variable "sum".

```
PUT_MESSAGE("The loop current is %[4.2f,D]{loop_current} mA");
```

L'exemple affiche et met constamment à jour la valeur de la variable "loop\_current".

```
PUT_MESSAGE("%[L]{flow_value} = %{flow_value}");
```

L'exemple affiche le libellé et la valeur de la variable "flow\_value".



### 6.2.35 Builtin put\_message

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Afficher le message spécifié à l'écran

Le builtin put\_message affiche le message spécifié à l'écran. Les éventuelles références de variable incorporées sont développées en valeur actuelle de la variable. Il convient d'afficher les variables ENUMERATED dans leur représentation textuelle lorsqu'elles sont définies. Lorsqu'une valeur ENUMERATED n'est pas définie, il convient qu'elle soit affichée dans sa représentation numérique.

Profils de communication: HART

Les variables BIT\_ENUMERATED doivent être affichées en tant qu'entiers au format hexadécimal.

Profils de communication: PB, PN, CS, GPE

Il convient que les variables BIT\_ENUMERATED soient affichées dans leur représentation numérique sous forme d'entier hexadécimal ou dans leur représentation textuelle contenant tous les bits définis sur "1".

put\_message n'accepte aucune entrée de l'opérateur et l'utilisateur n'a pas la possibilité d'interrompre la méthode. L'exécution de la méthode se poursuit immédiatement, c'est-à-dire qu'elle n'est pas bloquée. Il convient que le message reste disponible pour examen au moins jusqu'à ce qu'un appel ultérieur remplace potentiellement le message par un nouveau message ou que la méthode se termine.

La chaîne peut accéder à un nombre quelconque d'identifiants, mais les entrées de matrice ciblées doivent contenir des identifiants de variable valides. La chaîne de message peut contenir des références à toute combinaison de variables de méthode et de valeurs de VARIABLE. Les méthodes de variable doivent être référencées par nom et les VARIABLES doivent être référencées par global\_var\_id.

La syntaxe suivante est utilisée pour référencer une VARIABLE de la liste des VARIABLES donnée dans le paramètre global\_var\_ids:

```
%{global-var-ids-array-index}
```

ou

```
%[format]{global-var-ids-array-index}
```

Le format facultatif prend en charge toutes les chaînes de format fprintf décrites dans le langage de programmation C (voir l'ISO/IEC 9899:1999), plus les ajouts présentés dans le Tableau 49. Si la chaîne de format n'est pas incluse, le formatage par défaut spécifié dans l'IEC 61804-3 doit être utilisé.

NOTE 1 Même si cela n'est pas recommandé pour les nouvelles DDs, put\_message (minuscule) est pris en charge (à des fins de rétrocompatibilité).

NOTE 2 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 3 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

#### Structure lexicale

```
put_message(message, global_var_ids)
```

Les éléments lexicaux du builtin put\_message sont présentés dans le Tableau 44.

**Tableau 44 – Builtin put\_message**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                 |
|------------------|-----------|-----------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| message          | DD_STRING | I         | m           | Message à afficher. Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| global_var_ids   | int[]     | I         | m           | Matrice qui contient des identifiants uniques d'instance de VARIABLE.                                                                                       |
| <return>         | VOID      | —         | —           | —                                                                                                                                                           |

**Exemple**

```
int ids[2];
ids[0] = VARID(pressure_units);
ids[1] = VARID(pressure_value);
put_message("Pressure value = {%1} {%0}",ids);
```

L'exemple obtient l'ID des variables "pressure\_value" et "pressure\_units" et le transmet au builtin put\_message pour affichage.

**6.2.36 Builtin SELECT\_FROM\_LIST**

**Profils de communication: CS, GPE, HART, PB, PN**

**Objet: Permettre à l'utilisateur de choisir l'une des multiples options**

Le builtin SELECT\_FROM\_LIST affiche une invite et une liste d'options fournie pour permettre le choix de l'utilisateur. Les options sont transmises à la fonction sous la forme d'une chaîne unique délimitée par des points-virgules entre les options. Lorsqu'un choix est effectué, la position de cette option dans la liste d'options est retournée. La position dans la liste est à base zéro. Par exemple, si la liste fournie contient deux éléments et que le premier élément est choisi, cette fonction retourne un 0. Si le deuxième élément est choisi, un 1 est retourné. La liste de sélection doit comporter au moins deux options.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

**Structure lexicale**

```
SELECT_FROM_LIST(prompt, option_list)
```

Les éléments lexicaux du builtin SELECT\_FROM\_LIST sont présentés dans le Tableau 45.

**Tableau 45 – Builtin SELECT\_FROM\_LIST**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                                                                              |
|------------------|-----------|-----------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING | I         | m           | Un message à afficher (voir 6.2.40 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3).                             |
| option_list      | DD_STRING | I         | m           | Chaîne d'option, constituée de texte délimité, qui définit les éléments de menu. Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| <return>         | int       | O         | m           | Résultat de la sélection sous forme de position dans la liste d'options (base zéro).                                                                                                                                     |

**Exemple**

```
int result;
result = SELECT_FROM_LIST("Is this correct?", "Yes;No");
if (result == 0) { ... } // user selected "yes"
else { ... }
```

Cette fonction affiche l'invite "Is this correct?" et les deux options "Yes" et "No". Si "Yes" est choisi, un 0 est retourné et le code de l'instruction if est exécuté. Si "No" est choisi, un 1 est retourné et le code de l'instruction else est exécuté.

**6.2.37 Builtin select\_from\_list**

**Profils de communication: CS, GPE, HART, PB, PN**

**Objet: Permettre à l'utilisateur de choisir l'une des multiples options**

Le builtin select\_from\_list affiche une invite et une liste d'options fournie pour permettre le choix de l'utilisateur. Lorsqu'un choix est effectué, la position de cette option dans la liste d'options est retournée. La position dans la liste est à base zéro. Par exemple, si la liste fournie contient deux éléments et que le premier élément est choisi, cette fonction retourne un 0. Si le deuxième élément est choisi, un 1 est retourné.

L'utilisateur a la possibilité d'interrompre la méthode et son exécution est stoppée dans l'attente d'un retour de la fonction.

Les options sont transmises à la fonction sous la forme d'une chaîne unique délimitée par des points-virgules entre les options. La liste de sélection doit comporter au moins deux options.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

NOTE 3 Les nouvelles descriptions de produits peuvent utiliser SELECT\_FROM\_LIST, qui prend en charge le référencement direct des variables de méthode et des VARIABLES. La version en minuscules de cette fonction est conservée à des fins de rétrocompatibilité uniquement.

**Structure lexicale**

```
select_from_list(prompt, global_var_ids, option_list)
```

Les éléments lexicaux du builtin select\_from\_list sont présentés dans le Tableau 46.

**Tableau 46 – Builtin select\_from\_list**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                                                                                                      |
|------------------|-----------|-----------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING | I         | m           | Un message à afficher (voir 6.2.35 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3).                                                     |
| global_var_ids   | Int[]     | I         | m           | Matrice qui contient des identifiants uniques d'instances de VARIABLE.                                                                                                                                                                           |
| option_list      | DD_STRING | I         | m           | Chaîne d'option, constituée de texte délimité par des points-virgules, qui définit les éléments de menu. Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| <return>         | int       | O         | m           | Résultat de la sélection sous forme de position (base zéro).                                                                                                                                                                                     |

### 6.2.38 Builtin select\_from\_menu

**Profils de communication: FF, ISA100**

**Objet: Afficher un menu de choix et permettre à l'utilisateur d'effectuer une sélection**

Le builtin select\_from\_menu affiche une liste d'options ou d'éléments de menu pour permettre le choix de l'utilisateur et extrait le numéro de sélection. Lorsque l'utilisateur a fait un choix, celui-ci est retourné à la méthode appelante. Les numéros de sélection commencent à 1 et augmentent jusqu'au nombre d'options spécifié par les options de paramètre.

La chaîne d'options définit le menu dans lequel l'utilisateur effectue un choix. Il s'agit d'une chaîne constituée des options de sélection, chaque option étant séparée des autres options par un point-virgule. Des codes de langue peuvent être incorporés dans chaque option. Le premier élément de menu doit être celui par défaut, c'est-à-dire présélectionné.

L'application affiche les chaînes conformément aux lignes directrices suivantes:

- les éléments de menu apparaissent à l'écran dans l'ordre dans lequel ils sont répertoriés dans la chaîne;
- la chaîne d'invite apparaît en haut de l'affichage du menu à l'écran;
- la chaîne d'invite n'est pas sélectionnable;
- le menu est présenté verticalement.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

#### Structure lexicale

```
select_from_menu(prompt, ids, indices, id_count, options, selection)
```

Les éléments lexicaux du builtin select\_from\_menu sont présentés dans le Tableau 47.

**Tableau 47 – Builtin select\_from\_menu**

| Nom du paramètre | Type            | Direction | Utilisation | Description                                                                                                                                                                                                              |
|------------------|-----------------|-----------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING       | I         | m           | Un message à afficher (voir 6.2.6 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3).                              |
| ids              | unsigned long[] | I         | m           | ID d'éléments des VARIABLES utilisées dans le message d'invite.                                                                                                                                                          |
| indices          | unsigned long[] | I         | m           | ID de membres ou indices des VARIABLES utilisées dans le message d'invite.                                                                                                                                               |
| id_count         | long            | I         | m           | Nombre d'éléments REFERENCE_ARRAY dans le REFERENCE_ARRAY pour les ID et les indices. Défini sur zéro si le REFERENCE_ARRAY pour les ID et les indices est zéro.                                                         |
| options          | DD_STRING       | I         | m           | Chaîne d'option, constituée de texte délimité, qui définit les éléments de menu. Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| selection        | long            | O         | m           | Résultat de la sélection sous forme de position (base zéro).                                                                                                                                                             |
| <return>         | long            | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                                                    |

### Exemple

```

long status;
unsigned long paramIds[1];
unsigned long memberIds[1];
int choice;
float new_value;

status = select_from_menu("en|Is limit correct?|de|Grenze richtig?",
paramIds, memberIds, 0, "en|Yes|de|Ja;en|No|de|Nein", &choice);

switch (choice)
{
case 1:
    status = put_float_value(MEMBER_ID(HI_LIM), new_value);
    status = send_all_values();
    break;

default:
    break;
}

```

### 6.2.39 Builtin select\_from\_menu2

**Profils de communication: FF, ISA100**

**Objet: Afficher un menu de choix et permettre à l'utilisateur d'effectuer une sélection**

Le builtin select\_from\_menu2 affiche une liste d'options ou d'éléments de menu pour permettre le choix de l'utilisateur et extrait le numéro de sélection. Lorsque l'utilisateur a fait un choix, celui-ci est retourné à la méthode appelante. Les numéros de sélection commencent à 1 et augmentent jusqu'au nombre d'options spécifié par les options de paramètre.

Les paramètres `blkIds`, `blk_nums`, `ids`, `indices` et `id_count` spécifient collectivement les valeurs à incorporer dans l'invite.

Le paramètre `blk_ids` spécifie les ID d'éléments des blocs auxquels accéder, tandis que le paramètre `blk_nums` spécifie les indices relatifs des blocs auxquels accéder.

Si un élément du paramètre `ids` fait référence à une variable, l'élément correspondant du paramètre `indices` est ignoré. Si un élément du paramètre `ids` fait référence à un enregistrement, l'élément correspondant du paramètre `indices` spécifie un membre de l'enregistrement. Si un élément du paramètre `ids` fait référence à une matrice, l'élément correspondant du paramètre `indices` spécifie un élément de la matrice.

Les éléments des paramètres `blk_ids`, `ids` et `indices` sont généralement spécifiés à l'aide des builtins `ITEM_ID` et `MEMBER_ID`. Les éléments du paramètre `blk_nums` sont généralement spécifiés à l'aide des builtins `get_block_instance_by_object_index` et `get_block_instance_by_block_tag`.

Les paramètres `blk_ids`, `blk_nums` et `ids` peuvent être transmis en tant que valeur `NULL` si aucune valeur n'est incorporée dans l'invite. Si l'un de ces paramètres est transmis en tant que valeur `NULL`, ils doivent tous être transmis en tant que valeur `NULL`.

Le paramètre `indices` peut être transmis en tant que valeur `NULL` si le paramètre `ids` référence uniquement des variables, c'est-à-dire s'il ne référence ni enregistrements ni matrices.

Le paramètre `id_count` doit être transmis en tant que valeur zéro lorsque les paramètres `blk_ids`, `blk_nums` et `ids` sont transmis en tant que valeur `NULL`.

La chaîne d'options définit le menu dans lequel l'utilisateur effectue un choix. Il s'agit d'une chaîne constituée des options de sélection, chaque option étant séparée des autres options par un point-virgule. Des codes de langue peuvent être incorporés dans chaque option. Le premier élément de menu doit être celui par défaut, c'est-à-dire présélectionné.

L'application affiche les chaînes conformément aux lignes directrices suivantes:

- les éléments de menu apparaissent à l'écran dans l'ordre dans lequel ils sont répertoriés dans la chaîne;
- la chaîne d'invite apparaît en haut de l'affichage du menu à l'écran;
- la chaîne d'invite n'est pas sélectionnable;
- le menu est présenté verticalement.

NOTE 1 Il n'est pas garanti que les messages précédemment affichés restent à l'écran.

NOTE 2 Certaines applications EDD effacent l'affichage à chaque appel de cette fonction.

### Structure lexicale

```
select_from_menu2(prompt, blk_ids, blk_nums, ids, indices, id_count,  
options, selection)
```

Les éléments lexicaux du builtin `select_from_menu2` sont présentés dans le Tableau 48.

**Tableau 48 – Builtin select\_from\_menu2**

| Nom du paramètre | Type            | Direction | Utilisation | Description                                                                                                                                                                                                              |
|------------------|-----------------|-----------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prompt           | DD_STRING       | I         | m           | Un message à afficher (voir 6.2.6 pour la syntaxe). Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3).                              |
| blk_ids          | unsigned long[] | I         | m           | ID d'éléments des instances de BLOCK_A utilisées dans le message d'invite.                                                                                                                                               |
| blk_nums         | unsigned long[] | I         | m           | Numéros d'occurrence des instances de BLOCK_A utilisées dans le message d'invite.                                                                                                                                        |
| ids              | unsigned long[] | I         | m           | ID d'éléments des VARIABLES utilisées dans le message d'invite.                                                                                                                                                          |
| indices          | unsigned long[] | I         | m           | ID de membres ou indices des VARIABLES utilisées dans le message d'invite.                                                                                                                                               |
| id_count         | long            | I         | m           | Nombre d'éléments REFERENCE_ARRAY dans le REFERENCE_ARRAY pour les ID et les indices. Défini sur zéro si le REFERENCE_ARRAY pour les ID et les indices est zéro.                                                         |
| options          | DD_STRING       | I         | m           | Chaîne d'option, constituée de texte délimité, qui définit les éléments de menu. Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| selection        | long            | O         | m           | Résultat de la sélection sous forme de position (base zéro).                                                                                                                                                             |
| <return>         | long            | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                                                    |

**Exemple**

```

long status;
unsigned long blk_ids[2];
unsigned long blk_nums[2];
unsigned long ids[2];
unsigned long indices[2];
long choice;

blk_ids[0] = ITEM_ID(__analog_input_block);
blk_nums[0] = 0;
ids[0] = MEMBER_ID(MODE_BLK);
indices[0] = MEMBER_ID(ACTUAL);

blk_ids[1] = ITEM_ID(__analog_input_block);
blk_nums[1] = 1;
ids[1] = MEMBER_ID(MODE_BLK);
indices[1] = MEMBER_ID(ACTUAL);

status = select_from_menu2("AI1 Mode: %{0}, AI2 Mode: %{1}\nIs this
correct?", blk_ids, blk_nums, ids, indices, 2, "Yes;No" &choice);

```

### 6.2.40 Formats de chaîne d'invite

Les références à des VARIABLES peuvent être incorporées dans la chaîne d'invite, ce qui permet d'afficher leur valeur en utilisant la syntaxe suivante:

```
%{variable-reference}
```

ou

```
%[format]{variable-reference}
```

La référence de variable est l'identifiant d'une variable de méthode ou d'une VARIABLE. Variable de méthode et VARIABLES peuvent être mélangées dans le même message. Le format facultatif prend en charge toutes les chaînes de format fprintf décrites dans le langage de programmation C (voir l'ISO//IEC 9899:1999), plus les ajouts présentés dans le Tableau 49. Si la chaîne de format n'est pas incluse, le formatage par défaut spécifié dans l'IEC 61804-3 doit être utilisé.

**Tableau 49 – Options de format**

| Format | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D      | L'élément référencé est de CLASS DYNAMIC et l'affichage doit être mis à jour de manière continue tandis que la fonction builtin bloque l'exécution de la méthode. Les éléments de CLASS DYNAMIC référencés sans l'option D ne doivent pas être mis à jour de manière dynamique. Les éléments qui ne sont pas de CLASS DYNAMIC référencés avec l'option D ne doivent pas être affichés de manière dynamique. Les builtins d'interface utilisateur non bloquants (par exemple, PUT_MESSAGE et put_message) affichent une seule fois un instantané de la valeur dynamique. Si un format d'affichage est donné en plus du spécificateur "D", ce dernier doit être séparé du spécificateur de format par une virgule.<br>Exemple: PUT_MESSAGE ("La variable avec le libellé '%L[myVar]' a la valeur dynamique: %[3.1f,D]{myVar}"); |
| L      | Le LABEL de l'élément référencé doit être affiché.<br>Exemple: PUT_MESSAGE ("Le libellé de ma variable est: %[L]{myVar}");                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| U      | L'unité de l'élément référencé doit être affichée.<br>Exemple: PUT_MESSAGE ("Les unités de ma variable sont: %[U]{myVar}");                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## 6.3 Builtins de communication

### 6.3.1 Builtin abort\_on\_all\_comm\_errors

**Profils de communication: FF, ISA100**

**Objet: Définir l'interruption pour toutes les erreurs de communication**

Le builtin abort\_on\_all\_comm\_errors spécifie l'interruption de la méthode en cas de réception d'erreur de communication.

Lorsqu'une méthode est lancée, elle n'est pas interrompue sur une erreur de communication tant qu'abort\_on\_all\_comm\_errors n'est pas appelé. Cela évite à une méthode de devoir gérer des codes d'erreur de communication en interrompant la méthode si elle reçoit une erreur de communication.

Après cet appel, tout appel de builtin qui effectue une demande de communication qui retourne une erreur conduit à une interruption de la méthode et au lancement de l'exécution de sa liste de méthodes d'interruption. Les codes d'erreur de communication sont différents de zéro et dépendent d'une application EDD (chaque application EDD définit ses propres codes).

### Structure lexicale

```
abort_on_all_comm_errors (VOID)
```



L'élément lexical du builtin `abort_on_all_comm_errors` est présenté dans le Tableau 50.

**Tableau 50 – Builtin `abort_on_all_comm_errors`**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### Exemple

```
abort_on_all_comm_errors();
```

## 6.3.2 Builtin `ABORT_ON_ALL_COMM_STATUS`

**Profils de communication: HART**

**Objet: Définir l'interruption pour tous les statuts de communication**

Le builtin `ABORT_ON_ALL_COMM_STATUS` définit tous les bits dans le masque d'interruption de statut de communication. Cela conduit le système à interrompre la méthode actuelle si le dispositif retourne une valeur de statut de communication. Le statut de communication est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est défini sur 1.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

```
ABORT_ON_ALL_COMM_STATUS(VOID)
```

L'élément lexical du builtin `ABORT_ON_ALL_COMM_STATUS` est présenté dans le Tableau 51.

**Tableau 51 – Builtin `ABORT_ON_ALL_COMM_STATUS`**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

## 6.3.3 Builtin `ABORT_ON_ALL_DEVICE_STATUS`

**Profils de communication: HART**

**Objet: Définir l'interruption pour tous les statuts de dispositif**

Le builtin `ABORT_ON_ALL_DEVICE_STATUS` définit tous les bits dans le masque d'interruption de statut du dispositif. Cela conduit le système à interrompre la méthode actuelle si le dispositif retourne une valeur de statut du dispositif différente de zéro. Les deux premiers octets de chaque réponse esclave contiennent des informations de statut. Le premier octet retourné indique un statut de code de réponse lorsque le bit de poids fort (bit 7) a la valeur 0. Le deuxième octet retourné, statut du dispositif, est significatif uniquement si le premier retourne un statut de code de réponse. Le statut du dispositif est défini comme étant le deuxième octet de données retourné dans une transaction.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`ABORT_ON_ALL_DEVICE_STATUS (VOID)`

L'élément lexical du builtin `ABORT_ON_ALL_DEVICE_STATUS` est présenté dans le Tableau 52.

**Tableau 52 – Builtin `ABORT_ON_ALL_DEVICE_STATUS`**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.4 Builtin `ABORT_ON_ALL_RESPONSE_CODES`

**Profils de communication: HART**

**Objet: Définir l'interruption pour tous les codes de réponse**

Le builtin `ABORT_ON_ALL_RESPONSE_CODES` définit tous les bits dans le masque d'interruption de code de réponse. Cela conduit le système à interrompre la méthode actuelle si le dispositif retourne une valeur de code de réponse différente de zéro.

Le code de réponse est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est 0.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction de commande d'envoi pour la mise en œuvre des masques. Voir `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

NOTE Les réponses et activités retardées sont des codes de niveau Data-Link qui ne sont pas retournés aux méthodes, c'est-à-dire que les niveaux inférieurs de la pile de communication ou les I/O distantes gèrent/interagissent avec les codes de réponse. En fonction du dispositif terminal avec lequel la communication est établie, une METHOD peut voir un `DR_DEAD` (échec du DR).

### Structure lexicale

`ABORT_ON_ALL_RESPONSE_CODES (VOID)`

L'élément lexical du builtin `ABORT_ON_ALL_RESPONSE_CODES` est présenté dans le Tableau 53.

**Tableau 53 – Builtin ABORT\_ON\_ALL\_RESPONSE\_CODES**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.5 Builtin abort\_on\_all\_response\_codes

**Profils de communication:** FF, ISA100

**Objet:** Définir l'interruption pour tous les codes de réponse

Le builtin `abort_on_all_response_codes` conduit à l'interruption de la méthode si celle-ci reçoit un code de réponse différent de zéro, après l'appel d'un builtin qui conduit à une demande à un dispositif. Ce builtin évite à une méthode de devoir gérer des codes de réponse d'erreur. Lorsqu'une méthode est lancée, elle n'est pas interrompue sur un code de réponse tant que ce builtin n'est pas appelé. Un code de réponse est une valeur représentant une condition d'erreur spécifique à une application. Une valeur de code de réponse égale à zéro n'est pas assimilée à un code de réponse d'erreur. Chaque code de réponse et type de code de réponse est défini dans l'EDD.

#### Structure lexicale

`abort_on_all_response_codes(VOID)`

L'élément lexical du builtin `abort_on_all_response_codes` est présenté dans le Tableau 54.

**Tableau 54 – Builtin abort\_on\_all\_response\_codes**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

#### Exemple

`abort_on_all_response_codes();`

### 6.3.6 Builtin ABORT\_ON\_COMM\_ERROR

**Profils de communication:** HART

**Objet:** Interrompre si une erreur de communication est détectée par le maître ou l'esclave

Le builtin `ABORT_ON_COMM_ERROR` définit le masque d'interruption sur erreur de communication, de sorte que la méthode soit interrompue si une erreur de communication est détectée dans le dispositif ou l'application EDD lors de l'envoi d'une commande.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

#### Structure lexicale

`ABORT_ON_COMM_ERROR(VOID)`

L'élément lexical du builtin ABORT\_ON\_COMM\_ERROR est présenté dans le Tableau 55.

**Tableau 55 – Builtin ABORT\_ON\_COMM\_ERROR**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.7 Builtin abort\_on\_comm\_error

**Profils de communication:** FF, ISA100

**Objet:** Définir le masque utilisé pour interrompre la méthode lorsqu'une erreur de communication est détectée par le dispositif esclave

Le builtin abort\_on\_comm\_error conduit à l'interruption de la méthode si celle-ci reçoit une erreur de communication spécifique.

Lorsqu'une méthode est lancée, elle n'est pas interrompue sur une erreur de communication spécifique tant que le builtin abort\_on\_comm\_error n'est pas appelé.

NOTE Une erreur de communication égale à zéro n'est pas assimilée à une erreur de communication.

Ce builtin permet à l'auteur de la méthode de choisir les erreurs de communication qu'il convient que la méthode gère, et il évite à une méthode de devoir gérer un code d'erreur de communication spécifique.

Les codes d'erreur de communication sont définis par les consortiums. Leurs chaînes associées peuvent être définies dans un dictionnaire de texte.

#### Structure lexicale

```
abort_on_comm_error(error)
```

Les éléments lexicaux du builtin abort\_on\_comm\_error sont présentés dans le Tableau 56.

**Tableau 56 – Builtin abort\_on\_comm\_error**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| error            | unsigned long | I         | m           | Code d'erreur de communication.                       |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

#### Exemple

```
long status;
status = abort_on_comm_error(E_ACCESS_HARDWARE_FAULT);
```

### 6.3.8 Builtin ABORT\_ON\_COMM\_STATUS

**Profils de communication:** HART

**Objet:** Définir le masque utilisé pour interrompre la méthode lorsqu'une erreur de communication est détectée par le dispositif esclave

Le builtin ABORT\_ON\_COMM\_STATUS définit le ou les bits corrects dans le masque d'interruption de statut de communication, de sorte que la valeur comm\_status spécifiée conduise à l'interruption de la méthode. Le statut de communication est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est défini. La valeur de comm\_status peut être définie sur toute valeur de 0x00 à 0x7F.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`ABORT_ON_COMM_STATUS(comm_status)`

Les éléments lexicaux du builtin `ABORT_ON_COMM_STATUS` sont présentés dans le Tableau 57.

**Tableau 57 – Builtin `ABORT_ON_COMM_STATUS`**

| Nom du paramètre         | Type          | Direction | Utilisation | Description                                     |
|--------------------------|---------------|-----------|-------------|-------------------------------------------------|
| <code>comm_status</code> | unsigned char | l         | m           | Masque binaire pour le statut de communication. |
| <return>                 | VOID          | —         | —           | —                                               |

### 6.3.9 Builtin `ABORT_ON_DEVICE_STATUS`

**Profils de communication: HART**

**Objet: Définir le masque d'interruption de statut du dispositif**

Le builtin `ABORT_ON_DEVICE_STATUS` définit les bits corrects dans le masque d'interruption de statut du dispositif, de sorte que la valeur de statut du dispositif spécifiée conduise à l'interruption de la méthode. Les deux premiers octets de chaque réponse de l'esclave contiennent des informations de statut. Le premier octet retourné indique un statut de code de réponse lorsque le bit de poids fort (bit 7) a la valeur 0. Le deuxième octet retourné, statut du dispositif, est significatif uniquement si un statut de code de réponse est retourné par le premier octet. Le statut du dispositif est défini comme étant le deuxième octet de données retourné dans une transaction. La valeur de `device_status` peut être définie de manière à conduire à l'interruption de la méthode actuelle sur toute combinaison de bits de statut du dispositif. Cela s'obtient en créant un masque associé soumis à un AND sur le statut du dispositif. La valeur de `device_status` peut être définie sur toute valeur de 0x00 à 0x7F.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction de commande d'envoi pour la mise en œuvre des masques. Voir `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`ABORT_ON_DEVICE_STATUS(device_status)`

Les éléments lexicaux du builtin `ABORT_ON_DEVICE_STATUS` sont présentés dans le Tableau 58.

**Tableau 58 – Builtin ABORT\_ON\_DEVICE\_STATUS**

| Nom du paramètre | Type         | Direction | Utilisation | Description                                  |
|------------------|--------------|-----------|-------------|----------------------------------------------|
| device_status    | unsigned int | l         | m           | Masque binaire pour le statut du dispositif. |
| <return>         | VOID         | —         | —           | —                                            |

**6.3.10 Builtin ABORT\_ON\_NO\_DEVICE (déconseillé)****Profils de communication:****Objet: Interrompre si aucun dispositif n'est détecté**

Le builtin ABORT\_ON\_NO\_DEVICE définit le masque d'interruption en l'absence de dispositif, de sorte que la méthode soit interrompue si aucun dispositif n'est détecté lors de l'envoi d'une commande.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction de commande d'envoi pour la mise en œuvre des masques. Voir ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

**Structure lexicale**

ABORT\_ON\_NO\_DEVICE (VOID)

L'élément lexical du builtin ABORT\_ON\_NO\_DEVICE est présenté dans le Tableau 59.

**Tableau 59 – Builtin ABORT\_ON\_NO\_DEVICE**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

**6.3.11 Builtin ABORT\_ON\_RESPONSE\_CODE****Profils de communication: HART****Objet: Définir le masque d'interruption de code de réponse**

Le builtin ABORT\_ON\_RESPONSE\_CODE définit le ou les bits corrects dans le masque d'interruption de code de réponse, de sorte que la valeur de code de réponse spécifiée conduise à l'interruption de la méthode. Les deux premiers octets de chaque réponse esclave contiennent des informations de statut. Le code de réponse est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est 0. La valeur de response\_code peut être définie de manière à conduire à une interruption de la méthode sur tout code de réponse. La valeur de response\_code peut être définie sur toute valeur de 0 à 127.

Pour conduire à l'interruption de la commande HART actuelle sur plusieurs codes de réponse différents, ce builtin doit être appelé une fois pour chaque code de réponse à interrompre.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle.

La liste de tous les masques disponibles, avec leurs valeurs par défaut, est présentée dans le Tableau 60:

**Tableau 60 – Masques d'interruption et de relance disponibles**

| Masques                         | Valeurs par défaut                      |
|---------------------------------|-----------------------------------------|
| response_code_abort_mask        | ACCESS_RESTRICTED   CMD_NOT_IMPLEMENTED |
| response_code_retry_mask        | Tous les bits définis sur 0             |
| cmd_48_response_code_abort_mask | ACCESS_RESTRICTED   CMD_NOT_IMPLEMENTED |
| cmd_48_response_code_retry_mask | Tous les bits définis sur 0             |
| device_status_abort_mask        | DEVICE_MALFUNCTION                      |
| device_status_retry_mask        | Tous les bits définis sur 0             |
| cmd_48_device_status_abort_mask | DEVICE_MALFUNCTION                      |
| cmd_48_device_status_retry_mask | Tous les bits définis sur 0             |
| comm_status_abort_mask          | Tous les bits définis sur 0             |
| comm_status_retry_mask          | Tous les bits définis sur 1             |
| cmd_48_comm_status_abort_mask   | Tous les bits définis sur 0             |
| cmd_48_comm_status_retry_mask   | Tous les bits définis sur 1             |
| no_device_abort_mask            | Tous les bits définis sur 1             |
| comm_error_abort_mask           | Tous les bits définis sur 1             |
| comm_error_retry_mask           | Tous les bits définis sur 0             |
| cmd_48_no_device_abort_mask     | Tous les bits définis sur 1             |
| cmd_48_comm_error_abort_mask    | Tous les bits définis sur 1             |
| cmd_48_comm_error_retry_mask    | Tous les bits définis sur 0             |
| cmd_48_data_abort_mask          | Tous les bits définis sur 0             |
| cmd_48_data_retry_mask          | Tous les bits définis sur 0             |

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

### Structure lexicale

ABORT\_ON\_RESPONSE\_CODE(response\_code)

Les éléments lexicaux du builtin ABORT\_ON\_RESPONSE\_CODE sont présentés dans le Tableau 61.

**Tableau 61 – Builtin ABORT\_ON\_RESPONSE\_CODE**

| Nom du paramètre | Type | Direction | Utilisation | Description                                                        |
|------------------|------|-----------|-------------|--------------------------------------------------------------------|
| response_code    | int  | l         | m           | Code de réponse qu'il convient d'ajouter au masque d'interruption. |
| <return>         | VOID | —         | —           | —                                                                  |

### 6.3.12 Builtin abort\_on\_response\_code

**Profils de communication:** FF, ISA100

**Objet:** Définir le masque d'interruption de code de réponse

Le builtin abort\_on\_response\_code conduit à l'interruption de la méthode après réception du code de réponse différent de zéro spécifié. Ce builtin évite à une méthode de devoir gérer un code de réponse différent de zéro spécifique.

Lorsqu'une méthode est lancée, elle n'est pas interrompue sur un code de réponse spécifique tant que ce builtin n'est pas appelé. Un code de réponse est une valeur représentant une condition d'erreur spécifique à une application.

NOTE Une valeur de code de réponse égale à zéro n'est pas assimilée à un code de réponse d'erreur. Chaque type de code de réponse est défini dans l'EDD.

#### Structure lexicale

abort\_on\_response\_code (code)

Les éléments lexicaux du builtin abort\_on\_response\_code sont présentés dans le Tableau 62.

**Tableau 62 – Builtin abort\_on\_response\_code**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| code             | unsigned long | I         | m           | Masque binaire pour le code de réponse.               |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

#### Exemple

```
long status;
status = abort_on_response_code(RC_INVALID_ENTRY);
```

### 6.3.13 Builtin ext\_send\_command

**Profils de communication:** HART

**Objet:** Commande d'envoi

Le builtin ext\_send\_command a la même fonctionnalité que la fonction send\_command, sauf que le statut de commande et les octets de données retournés par le dispositif avec la commande 48 sont également retournés.

La fonction appelante est responsable de l'allocation des matrices pour les données à retourner. Les VARIABLES cmd\_status et more\_data\_status sont des pointeurs vers des matrices de 3 octets, et la VARIABLE more\_data\_info est un pointeur vers une matrice dont la taille est égale au nombre d'octets de données qui peuvent être retournés par le dispositif dans la commande 48 (25 au plus). Si le bit de statut indiquant que des données supplémentaires sont disponibles est retourné (classe de statut MORE), une commande 48 est automatiquement émise. Si la commande 48 n'a pas été émise, les octets more\_data\_status et more\_data\_info sont définis sur zéro.



Les octets de la matrice `cmd_status` et les octets de statut de la commande 48 (si elle a été envoyée) sont ensuite soumis à un AND logique avec les masques d'interruption appropriés pour déterminer s'il convient d'interrompre la méthode. En cas de correspondance, la méthode est interrompue et les méthodes d'interruption (le cas échéant) sont exécutées. S'il n'existe pas de correspondance pour les masques d'interruption, les mêmes données sont soumises à un AND avec les masques de relance appropriés. S'il existe une correspondance, la commande est relancée (la commande spécifiée ou la commande 48). Cette procédure est répétée jusqu'à ce que la commande aboutisse, qu'une interruption se produise ou que le nombre maximal de relances soit atteint. Lorsqu'une commande 48 est envoyée indirectement en tant que résultat de réponse de statut du dispositif, les valeurs du masque xxx de la commande 48 définies à l'aide des builtins `XMTR_xxx` sont utilisées pour contrôler les interruptions et relances pour la commande 48. Les autres valeurs de masque et builtins associés sont utilisés pour contrôler les interruptions et relances de la commande directement envoyée (y compris la commande 48 si elle a été directement envoyée).

### Structure lexicale

`ext_send_command(cmd_number, cmd_status, more_data_status, more_data_info)`

Les éléments lexicaux du builtin `ext_send_command` sont présentés dans le Tableau 63.

**Tableau 63 – Builtin `ext_send_command`**

| Nom du paramètre              | Type   | Direction | Utilisation | Description                                                                                                                                                                                                                                                              |
|-------------------------------|--------|-----------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>cmd_number</code>       | int    | I         | m           | Numéro de la COMMAND.                                                                                                                                                                                                                                                    |
| <code>cmd_status</code>       | char[] | I         | m           | Statut de la COMMAND.                                                                                                                                                                                                                                                    |
| <code>more_data_status</code> | char[] | I         | m           | Spécifie si des données de statut supplémentaires sont disponibles.                                                                                                                                                                                                      |
| <code>more_data_info</code>   | char[] | I         | m           | Spécifie si des informations supplémentaires sont disponibles.                                                                                                                                                                                                           |
| <return>                      | int    | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. Retourne <code>BI_SUCCESS</code> si la commande a abouti, <code>BI_COMM_ERROR</code> si une erreur s'est produite lors de l'envoi de la commande ou <code>BI_NO_DEVICE</code> si aucun dispositif n'a été détecté. |

### 6.3.14 Builtin `ext_send_command_trans`

#### Profils de communication: HART

#### Objet: Envoyer la transaction de commande spécifiée

Le builtin `ext_send_command_trans` envoie la commande avec la transaction spécifiée au dispositif. Cette fonction doit être utilisée pour envoyer des commandes qui ont été définies avec des transactions multiples.

Le builtin `ext_send_command_trans` a la même fonctionnalité que la fonction `send_command_trans`, sauf que le statut de commande et les octets de données retournés par le dispositif avec la commande 48 sont également retournés.

La fonction appelante est responsable de l'allocation des matrices pour les données à retourner. Les variables `cmd_status` et `more_data_status` sont des pointeurs vers des matrices de 3 octets, et la variable `more_data_info` est un pointeur vers une matrice dont la taille est égale au nombre d'octets de données qui peuvent être retournés par le dispositif dans la commande 48 (25 au plus). Si la commande 48 n'a pas été émise, les octets `more_data_status` et `more_data_info` sont définis sur zéro.

Les octets de la matrice `cmd_status` et les octets de statut de la commande 48 (si elle a été envoyée) sont ensuite soumis à un AND logique avec les masques d'interruption appropriés pour déterminer s'il convient d'interrompre la méthode. En cas de correspondance, la méthode est interrompue et les méthodes d'interruption (le cas échéant) sont exécutées. S'il n'existe pas de correspondance pour les masques d'interruption, les mêmes données sont soumises à un AND avec les masques de relance appropriés. S'il existe une correspondance, la commande est relancée (la commande spécifiée ou la commande 48). Cette procédure est répétée jusqu'à ce que la commande aboutisse, qu'une interruption se produise ou que le nombre maximal de relances soit atteint. Lorsqu'une commande 48 est envoyée indirectement en tant que résultat de réponse de statut du dispositif, les valeurs du masque xxx de la commande 48 définies à l'aide des builtins `XMTR_xxx` sont utilisées pour contrôler les interruptions et relances pour la commande 48. Les autres valeurs de masque et builtins associés sont utilisés pour contrôler les interruptions et relances de la commande directement envoyée (y compris la commande 48 si elle a été directement envoyée).

### Structure lexicale

```
ext_send_command_trans(cmd_number, transaction, cmd_status,
more_data_status, more_data_info)
```

Les éléments lexicaux du builtin `ext_send_command_trans` sont présentés dans le Tableau 64.

**Tableau 64 – Builtin `ext_send_command_trans`**

| Nom du paramètre              | Type   | Direction | Utilisation | Description                                                                                                                                                                                                                                                              |
|-------------------------------|--------|-----------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>cmd_number</code>       | int    | I         | m           | Numéro de la COMMAND.                                                                                                                                                                                                                                                    |
| <code>transaction</code>      | int    | I         | m           | Numéro de la TRANSACTION.                                                                                                                                                                                                                                                |
| <code>cmd_status</code>       | char[] | I         | m           | Statut de la COMMAND.                                                                                                                                                                                                                                                    |
| <code>more_data_status</code> | char[] | I         | m           | Spécifie si des données de statut supplémentaires sont disponibles.                                                                                                                                                                                                      |
| <code>more_data_info</code>   | char[] | I         | m           | Spécifie si des informations supplémentaires sont disponibles.                                                                                                                                                                                                           |
| <code>&lt;return&gt;</code>   | int    | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. Retourne <code>BI_SUCCESS</code> si la commande a abouti, <code>BI_COMM_ERROR</code> si une erreur s'est produite lors de l'envoi de la commande ou <code>BI_NO_DEVICE</code> si aucun dispositif n'a été détecté. |

### 6.3.15 Builtin `fail_on_all_comm_errors`

**Profils de communication: FF, ISA100**

**Objet: Renvoyer le contrôle à la méthode en cas d'erreurs de communication**

Le builtin `fail_on_all_comm_errors` déclenche le retour du contrôle à la méthode appelante lorsqu'une erreur de communication est détectée par le builtin appelé au lieu d'interrompre la méthode ou de relancer la demande de communication.

Au lieu d'interrompre la méthode ou de tenter de relancer une demande de communication en échec lorsqu'une erreur de communication se produit, le builtin `fail_on_all_comm_errors` initialise les builtins pour envoyer un code d'erreur de communication à la méthode.

Lorsqu'une erreur de communication se produit, le builtin effectuant une demande de communication retourne l'erreur `BLTIN_FAIL_COMM_ERROR`. La méthode peut appeler le builtin `get_comm_error` puis `get_comm_error_string` pour obtenir des informations supplémentaires concernant l'erreur et ensuite afficher la chaîne d'erreur, le cas échéant.

### Structure lexicale

`fail_on_all_comm_errors(VOID)`

L'élément lexical du builtin `fail_on_all_comm_errors` est présenté dans le Tableau 65.

**Tableau 65 – Builtin `fail_on_all_comm_errors`**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### Exemple

```
fail_on_all_comm_errors();
```

### 6.3.16 Builtin `fail_on_all_response_codes`

**Profils de communication: FF, ISA100**

**Objet: Renvoyer le contrôle à la méthode en cas de codes de réponse**

Le builtin `fail_on_all_response_codes` déclenche le retour du contrôle à la méthode appelante lorsqu'un code de réponse différent de zéro est détecté par le builtin appelé au lieu d'interrompre la méthode ou de la relancer.

Lorsqu'une erreur de code de réponse se produit, tout builtin effectuant une demande retourne l'erreur `BLTIN_FAIL_RESPONSE_CODE`. La méthode peut appeler le builtin `get_comm_error` puis `get_comm_error_string` pour obtenir des informations supplémentaires concernant l'erreur, le cas échéant.

Un code de réponse est une valeur représentant une condition d'erreur spécifique à une application.

NOTE Une valeur de code de réponse égale à zéro n'est pas assimilée à un code de réponse d'erreur. Chaque code de réponse et type de code de réponse est défini dans l'EDD.

### Structure lexicale

`fail_on_all_response_codes(VOID)`

L'élément lexical du builtin `fail_on_all_response_codes` est présenté dans le Tableau 66.

**Tableau 66 – Builtin `fail_on_all_response_codes`**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### Exemple

```
fail_on_all_response_codes();
```

### 6.3.17 Builtin fail\_on\_comm\_error

**Profils de communication:** FF, ISA100

**Objet:** Renvoyer le contrôle à la méthode en cas d'erreur de communication spécifiée

Le builtin fail\_on\_comm\_error déclenche le retour du contrôle à la méthode appelante lorsqu'une erreur de communication spécifiée est détectée par le builtin appelé au lieu d'interrompre la méthode ou de la relancer.

Lorsque l'erreur de communication spécifiée se produit, tout builtin effectuant une demande de communication retourne l'erreur BLTIN\_FAIL\_COMM\_ERROR. La méthode peut appeler le builtin get\_comm\_error puis get\_comm\_error\_string pour obtenir des informations supplémentaires concernant l'erreur et ensuite les afficher, le cas échéant.

Les codes d'erreur de communication sont définis par les consortiums. Leurs chaînes associées peuvent être définies dans un dictionnaire de texte. Une erreur de communication égale à zéro n'est pas assimilée à une erreur de communication.

#### Structure lexicale

```
fail_on_comm_error(error)
```

Les éléments lexicaux du builtin fail\_on\_comm\_error sont présentés dans le Tableau 67.

**Tableau 67 – Builtin fail\_on\_comm\_error**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| error            | unsigned long | I         | m           | Code d'erreur de communication.                       |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

#### Exemple

```
long status;
status = fail_on_comm_error(E_ACCESS_HARDWARE_FAULT);
```

### 6.3.18 Builtin fail\_on\_response\_code

**Profils de communication:** FF, ISA100

**Objet:** Renvoyer le contrôle à la méthode en cas de code de réponse spécifié

Le builtin fail\_on\_response\_code déclenche le retour du contrôle à la méthode appelante lorsqu'un code de réponse différent de zéro est détecté par le builtin appelé au lieu d'interrompre la méthode ou de la relancer.

Lorsque l'erreur de code de réponse spécifiée se produit, tout builtin effectuant une demande retourne l'erreur BLTIN\_FAIL\_RESPONSE\_CODE. La méthode peut appeler le builtin get\_comm\_error puis get\_comm\_error\_string pour obtenir des informations supplémentaires concernant l'erreur et ensuite les afficher, le cas échéant.

Un code de réponse est une valeur représentant une condition d'erreur spécifique à une application.

**NOTE** Une valeur de code de réponse égale à zéro n'est pas assimilée à un code de réponse d'erreur. Chaque code de réponse et type de code de réponse est défini dans l'EDD.

### Structure lexicale

`fail_on_response_code(code)`

Les éléments lexicaux du builtin `fail_on_response_code` sont présentés dans le Tableau 68.

**Tableau 68 – Builtin `fail_on_response_code`**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| code             | unsigned long | I         | m           | Code de réponse.                                      |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

### Exemple

```
long status;
status = fail_on_response_code(RC_INVALID_ENTRY);
```

### 6.3.19 Builtin `get_more_status`

**Profils de communication: HART**

**Objet: Obtenir les résultats d'une commande 48**

Le builtin `get_more_status` transmet une commande 48 au dispositif et retourne le code de réponse, le statut de communication et les octets de statut de commande dans la matrice de statut fournie. Il retourne également les octets de données retournés dans la matrice `more_data_info`. Cette fonction traite les octets de statut/données de la même façon que la commande d'envoi.

La fonction appelante est responsable de l'allocation des matrices pour les données à retourner. Le paramètre `more_data_status` est une matrice de 3 octets et `more_data_info` est une matrice dont la taille est égale au nombre d'octets de données qui peuvent être retournés par le dispositif dans la commande 48 (25 au plus).

Les octets `more_data_status` de la commande 48 sont soumis à un AND logique avec les masques d'interruption appropriés pour déterminer s'il convient d'interrompre la méthode. En cas de correspondance, la méthode est interrompue et les méthodes d'interruption (le cas échéant) sont exécutées. S'il n'existe pas de correspondance pour les masques d'interruption, les mêmes données sont soumises à un AND avec les masques de relance appropriés. S'il existe une correspondance, la commande est relancée (la commande spécifiée ou la commande 48). Cette procédure est répétée jusqu'à ce que la commande aboutisse, qu'une interruption se produise ou que le nombre maximal de relances soit atteint. Les valeurs du masque xxx de la commande 48 définies à l'aide des builtins `XMTR_xxx` sont utilisées pour contrôler les interruptions et relances pour la commande 48.

### Structure lexicale

`get_more_status(more_data_status, more_data_info)`

Les éléments lexicaux du builtin `get_more_status` sont présentés dans le Tableau 69.

**Tableau 69 – Builtin get\_more\_status**

| Nom du paramètre | Type   | Direction | Utilisation | Description                                                                                                                                                                                                                       |
|------------------|--------|-----------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| more_data_status | char[] | I         | m           | Spécifie si des informations supplémentaires sont disponibles.                                                                                                                                                                    |
| more_data_info   | char[] | I         | m           | Spécifie si des informations supplémentaires sont disponibles.                                                                                                                                                                    |
| <return>         | int    | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. Retourne BI_SUCCESS si la commande a abouti, BI_COMM_ERROR si une erreur s'est produite lors de l'envoi de la commande ou BI_NO_DEVICE si aucun dispositif n'a été détecté. |

### 6.3.20 Builtin IGNORE\_ALL\_COMM\_STATUS

**Profils de communication: HART**

**Objet: Ignorer tous les bits de statut de communication**

Le builtin IGNORE\_ALL\_COMM\_STATUS efface tous les bits dans le masque de relance de statut de communication et le masque d'interruption de statut de communication. Cela conduit le système à ignorer tous les bits dans la valeur de statut de communication. Le statut de communication est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est défini.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir le builtin send\_command pour la mise en œuvre des masques. Voir ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

IGNORE\_ALL\_COMM\_STATUS (VOID)

L'élément lexical du builtin IGNORE\_ALL\_COMM\_STATUS est présenté dans le Tableau 70.

**Tableau 70 – Builtin IGNORE\_ALL\_COMM\_STATUS**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.21 Builtin IGNORE\_ALL\_DEVICE\_STATUS

**Profils de communication: HART**

**Objet: Ignorer tous les bits de statut du dispositif**

Le builtin IGNORE\_ALL\_DEVICE\_STATUS efface tous les bits dans le masque de relance de statut du dispositif et le masque d'interruption de statut du dispositif. Cela conduit le système à ignorer tous les bits dans l'octet de statut du dispositif. Les deux premiers octets de chaque réponse esclave contiennent des informations de statut. Le premier octet retourné indique un statut de code de réponse lorsque le bit de poids fort (bit 7) a la valeur 0. Le deuxième octet retourné, statut du dispositif, est significatif uniquement si le premier retourne un statut de code de réponse. Le statut du dispositif est défini comme étant le deuxième octet de données retourné dans une transaction.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir le builtin send\_command pour la mise en œuvre des masques. Voir ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

IGNORE\_ALL\_DEVICE\_STATUS (VOID)

L'élément lexical du builtin IGNORE\_ALL\_DEVICE\_STATUS est présenté dans le Tableau 71.

**Tableau 71 – Builtin IGNORE\_ALL\_DEVICE\_STATUS**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.22 Builtin IGNORE\_ALL\_RESPONSE\_CODES

**Profils de communication: HART**

**Objet: Ignorer tous les codes de réponse**

Le builtin IGNORE\_ALL\_RESPONSE\_CODES efface tous les bits dans le masque de relance de code de réponse et le masque d'interruption de code de réponse. Cela conduit le système à ignorer toutes les valeurs de code de réponse retournées par le dispositif.

Les deux premiers octets de chaque réponse esclave contiennent des informations de statut. Le code de réponse est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est 0.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir le builtin send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

### Structure lexicale

IGNORE\_ALL\_RESPONSE\_CODES (VOID)

L'élément lexical du builtin IGNORE\_ALL\_RESPONSE\_CODES est présenté dans le Tableau 72.

**Tableau 72 – Builtin IGNORE\_ALL\_RESPONSE\_CODES**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.23 Builtin IGNORE\_COMM\_ERROR

**Profils de communication: HART**

**Objet: Ignorer les erreurs de communication**

Le builtin IGNORE\_COMM\_ERROR définit le masque de relance sur erreur de communication et le masque d'interruption sur erreur de communication, de sorte que toute condition d'erreur de communication dans le dispositif ou l'application EDD soit ignorée lors de l'envoi d'une commande. Les deux premiers octets de chaque réponse esclave contiennent des informations de statut. Le premier octet retourné indique un statut de communication lorsque le bit de poids fort (bit 7) a la valeur 1.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

### Structure lexicale

IGNORE\_COMM\_ERROR (VOID)

L'élément lexical du builtin IGNORE\_COMM\_ERROR est présenté dans le Tableau 73.

**Tableau 73 – Builtin IGNORE\_COMM\_ERROR**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.24 Builtin IGNORE\_COMM\_STATUS

**Profils de communication: HART**

**Objet: Ignorer des bits de statut de communication spécifiques**

Le builtin IGNORE\_COMM\_STATUS efface le ou les bits dans le masque de relance de statut de communication et le masque d'interruption de statut de communication, de sorte que les bits spécifiés dans la valeur comm\_status soient ignorés. comm\_status est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est 1. La valeur de comm\_status peut être définie sur toute valeur de 0x00 à 0x7F, où chaque bit correspond à un statut de communication retourné par le dispositif.



Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`IGNORE_COMM_STATUS(comm_status)`

Les éléments lexicaux du builtin `IGNORE_COMM_STATUS` sont présentés dans le Tableau 74.

**Tableau 74 – Builtin IGNORE\_COMM\_STATUS**

| Nom du paramètre            | Type              | Direction      | Utilisation    | Description                                                           |
|-----------------------------|-------------------|----------------|----------------|-----------------------------------------------------------------------|
| <code>comm_status</code>    | <code>int</code>  | <code>l</code> | <code>m</code> | Nouveau masque de relance et d'interruption pour ignorer les valeurs. |
| <code>&lt;return&gt;</code> | <code>VOID</code> | —              | —              | —                                                                     |

### 6.3.25 Builtin IGNORE\_DEVICE\_STATUS

#### Profils de communication: HART

#### Objet: Ignorer des bits de statut du dispositif spécifiques

Le builtin `IGNORE_DEVICE_STATUS` efface le ou les bits corrects dans le masque de relance de statut du dispositif et le masque d'interruption de statut du dispositif, de sorte que les bits spécifiés dans l'octet de statut du dispositif soient ignorés. Le statut du dispositif est défini comme étant le deuxième octet de données retourné dans une transaction.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`IGNORE_DEVICE_STATUS(device_status)`

Les éléments lexicaux du builtin `IGNORE_DEVICE_STATUS` sont présentés dans le Tableau 75.

**Tableau 75 – Builtin IGNORE\_DEVICE\_STATUS**

| Nom du paramètre            | Type              | Direction      | Utilisation    | Description                                                           |
|-----------------------------|-------------------|----------------|----------------|-----------------------------------------------------------------------|
| <code>device_status</code>  | <code>int</code>  | <code>l</code> | <code>m</code> | Nouveau masque de relance et d'interruption pour ignorer les valeurs. |
| <code>&lt;return&gt;</code> | <code>VOID</code> | —              | —              | —                                                                     |

### 6.3.26 Builtin IGNORE\_NO\_DEVICE (déconseillé)

**Profils de communication: HART**

**Objet: Ignorer si aucun dispositif n'est détecté**

Le builtin IGNORE\_NO\_DEVICE efface les bits corrects dans le masque de relance en l'absence de dispositif et le masque d'interruption en l'absence de dispositif pour indiquer qu'il convient d'ignorer la condition d'absence de dispositif lors de l'envoi d'une commande.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

IGNORE\_NO\_DEVICE (VOID)

L'élément lexical du builtin IGNORE\_NO\_DEVICE est présenté dans le Tableau 76.

**Tableau 76 – Builtin IGNORE\_NO\_DEVICE**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.27 Builtin IGNORE\_RESPONSE\_CODE

**Profils de communication: HART**

**Objet: Ignorer des codes de réponse spécifiques**

Le builtin IGNORE\_RESPONSE\_CODE efface le bit correct dans le masque de relance de code de réponse et le masque d'interruption de code de réponse, de sorte que la valeur de code de réponse spécifiée soit ignorée. Le code de réponse est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est 0. La valeur de response\_code peut être définie sur toute valeur de 0 à 127.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

IGNORE\_RESPONSE\_CODE (response\_code)

Les éléments lexicaux du builtin IGNORE\_RESPONSE\_CODE sont présentés dans le Tableau 77.

**Tableau 77 – Builtin IGNORE\_RESPONSE\_CODE**

| Nom du paramètre | Type | Direction | Utilisation | Description                                                                  |
|------------------|------|-----------|-------------|------------------------------------------------------------------------------|
| response_code    | int  | I         | m           | Code de réponse qu'il convient d'ajouter au masque pour ignorer les valeurs. |
| <return>         | VOID | —         | —           | —                                                                            |

**6.3.28 Builtin read\_value****Profils de communication: FF, ISA100****Objet: Mettre à jour une valeur de paramètre dans la mémoire cache en la lisant depuis le dispositif**

Le builtin read\_value commande la lecture de la valeur du paramètre depuis le dispositif et stocke la valeur dans la mémoire cache.

Le builtin read\_value n'effectue aucune action dans une application EDD non en mémoire cache, car une application EDD non en mémoire cache n'a pas de mémoire cache à mettre à jour.

Le builtin read\_value fait l'objet des mêmes temporisations de lecture et d'écriture qu'une application qui lit ou écrit une valeur.

Les paramètres id et member\_id sont spécifiés en utilisant les builtins ITEM\_ID et MEMBER\_ID et le nom ou la référence de la variable en question.

**Structure lexicale**

```
read_value(id, member_id)
```

Les éléments lexicaux du builtin read\_value sont présentés dans le Tableau 78.

**Tableau 78 – Builtin read\_value**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| id               | unsigned long | I         | o           | ID d'élément de la VARIABLE à laquelle accéder.       |
| member_id        | unsigned long | I         | o           | ID de membre de la VARIABLE à laquelle accéder.       |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

**Exemple**

```
long status;
status = read_value(ITEM_ID(PARAM.PV_SCALE), MEMBER_ID(UNIT_CD));
```

**6.3.29 Builtin read\_value2****Profils de communication: FF, ISA100****Objet: Lire une variable, un membre d'enregistrement ou un élément de matrice depuis le dispositif**

Le builtin read\_value2 commande la lecture de la valeur du paramètre depuis le dispositif et stocke la valeur dans la mémoire cache.

Le builtin `read_value2` n'effectue aucune action dans une application EDD non en mémoire cache, car une application EDD non en mémoire cache n'a pas de mémoire cache à mettre à jour.

Le paramètre `id` spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre `blk_num` spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre `id` référence une variable simple, le paramètre `member_id` est ignoré. Si le paramètre `id` référence un enregistrement, le paramètre `member_id` spécifie un membre de l'enregistrement. Si le paramètre `id` référence un paramètre de matrice, le paramètre `member_id` spécifie un élément de la matrice.

Les paramètres `blk_id`, `id` et `member_id` sont spécifiés à l'aide des builtins `ITEM_ID` et `MEMBER_ID`. Le paramètre `blk_num` est spécifié à l'aide des builtins `get_block_instance_by_object_index` et `get_block_instance_by_block_tag`.

Si le paramètre `id` référence un enregistrement et que le paramètre `member_id` a la valeur zéro, l'ensemble de l'enregistrement est lu depuis le dispositif. De même, si le paramètre `id` référence une matrice et que le paramètre `member_id` a la valeur zéro, l'ensemble de la matrice est lu depuis le dispositif.

### Structure lexicale

```
read_value2(blk_id, blk_num, id, member_id)
```

Les éléments lexicaux du builtin `read_value2` sont présentés dans le Tableau 79.

**Tableau 79 – Builtin `read_value2`**

| Nom du paramètre            | Type          | Direction | Utilisation | Description                                                      |
|-----------------------------|---------------|-----------|-------------|------------------------------------------------------------------|
| <code>blk_id</code>         | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.           |
| <code>blk_num</code>        | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder. |
| <code>id</code>             | unsigned long | I         | o           | ID d'élément de la VARIABLE à laquelle accéder.                  |
| <code>member_id</code>      | unsigned long | I         | o           | ID de membre de la VARIABLE à laquelle accéder.                  |
| <code>&lt;return&gt;</code> | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.            |

### Exemple

```
long status;
status = read_value2(ITEM_ID(__analog_input_block), 0, MEMBER_ID(PV_SCALE),
MEMBER_ID(UNIT_CD));
```

### 6.3.30 Builtin ReadCommand

**Profils de communication:** CS, GPE, PB, PN

**Objet:** Exécuter une commande de lecture

Le builtin `ReadCommand` permet de lire des variables avec une commande spécifiée.

### Structure lexicale

```
ReadCommand(command_identifieur)
```

Les éléments lexicaux du builtin ReadCommand sont présentés dans le Tableau 80.

**Tableau 80 – Builtin ReadCommand**

| Nom du paramètre   | Type      | Direction | Utilisation | Description                                                                                                   |
|--------------------|-----------|-----------|-------------|---------------------------------------------------------------------------------------------------------------|
| command_identifier | reference | I         | m           | ID de la commande à exécuter.                                                                                 |
| <return>           | long      | O         | m           | Valeur d'erreur spécifique au protocole, dont le codage est défini par le protocole ou dispositif spécifique. |

### 6.3.31 Builtin retry\_on\_all\_comm\_errors

**Profils de communication:** FF, ISA100

**Objet:** Builtin de relance en cas d'erreurs de communication

Le builtin `retry_on_all_comm_errors` commande la relance de la dernière demande effectuée par une méthode après une erreur de communication. Une demande est relancée trois fois avant qu'elle n'échoue et qu'un retour d'erreur ne soit retourné.

Ce builtin évite à une méthode de devoir relancer explicitement une demande après une erreur de communication.

Les codes d'erreur de communication sont définis dans les profils normalisés et leurs chaînes associées sont définies dans le dictionnaire de texte.

NOTE Une erreur de communication égale à zéro n'est pas assimilée à une erreur de communication.

#### Structure lexicale

`retry_on_all_comm_errors(VOID)`

L'élément lexical du builtin `retry_on_all_comm_errors` est présenté dans le Tableau 81.

**Tableau 81 – Builtin retry\_on\_all\_comm\_errors**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

#### Exemple

```
retry_on_all_comm_errors();
```

### 6.3.32 Builtin RETRY\_ON\_ALL\_COMM\_STATUS

**Profils de communication:** HART

**Objet:** Définir la relance pour tous les statuts de communication

Le builtin `RETRY_ON_ALL_COMM_STATUS` définit tous les bits dans le masque de relance de statut de communication. Cela conduit le système à relancer la commande actuelle si le dispositif retourne une valeur de statut de communication. Le statut de communication est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est défini.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`RETRY_ON_ALL_COMM_STATUS (VOID)`

L'élément lexical du builtin `RETRY_ON_ALL_COMM_STATUS` est présenté dans le Tableau 82.

**Tableau 82 – Builtin `RETRY_ON_ALL_COMM_STATUS`**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.33 Builtin `RETRY_ON_ALL_DEVICE_STATUS`

**Profils de communication: HART**

**Objet: Définir la relance pour tous les statuts du dispositif**

Le builtin `RETRY_ON_ALL_DEVICE_STATUS` définit tous les bits dans le masque de relance de statut du dispositif. Cela conduit le système à relancer la commande actuelle si le dispositif retourne une valeur de statut du dispositif. Les deux premiers octets de chaque réponse esclave contiennent des informations de statut. Le premier octet retourné indique un statut de code de réponse lorsque le bit de poids fort (bit 7) a la valeur 0. Le deuxième octet retourné, statut du dispositif, est significatif uniquement si le premier retourne un statut de code de réponse. Le statut du dispositif est défini comme étant le deuxième octet de données retourné dans une transaction.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`RETRY_ON_ALL_DEVICE_STATUS (VOID)`

L'élément lexical du builtin `RETRY_ON_ALL_DEVICE_STATUS` est présenté dans le Tableau 83.

**Tableau 83 – Builtin `RETRY_ON_ALL_DEVICE_STATUS`**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.34 Builtin RETRY\_ON\_ALL\_RESPONSE\_CODES

**Profils de communication:** HART

**Objet:** Définir la relance pour tous les codes de réponse

Le builtin RETRY\_ON\_ALL\_RESPONSE\_CODES définit tous les bits dans le masque de relance de code de réponse. Cela conduit le système à relancer la commande actuelle si le dispositif retourne une valeur de code de réponse différente de zéro.

Les deux premiers octets de chaque réponse esclave contiennent des informations de statut. Le code de réponse est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est 0.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

RETRY\_ON\_ALL\_RESPONSE\_CODES (VOID)

L'élément lexical du builtin RETRY\_ON\_ALL\_RESPONSE\_CODES est présenté dans le Tableau 84.

**Tableau 84 – Builtin RETRY\_ON\_ALL\_RESPONSE\_CODES**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.35 Builtin retry\_on\_all\_response\_codes

**Profils de communication:** FF, ISA100

**Objet:** Définir la relance pour tous les codes de réponse

Le builtin retry\_on\_all\_response\_codes commande la relance de la dernière demande effectuée par une méthode après un code de réponse quelconque. Une demande est relancée trois fois avant qu'elle n'échoue et qu'un retour d'erreur ne soit retourné. Il s'agit de l'action par défaut effectuée par les builtins lorsqu'une méthode vient d'être lancée.

Ce builtin évite à une méthode de devoir relancer explicitement une demande après un code de réponse quelconque.

Un code de réponse est une valeur entière représentant une condition d'erreur spécifique à une application.

NOTE Une valeur de code de réponse égale à zéro n'est pas assimilée à un code de réponse d'erreur. Chaque code de réponse et type de code de réponse est défini dans l'EDD.

#### Structure lexicale

retry\_on\_all\_response\_codes(void)

L'élément lexical du builtin retry\_on\_all\_response\_codes est présenté dans le Tableau 85.

**Tableau 85 – Builtin retry\_on\_all\_response\_codes**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

**Exemple**

```
retry_on_all_response_codes();
```

**6.3.36 Builtin RETRY\_ON\_COMM\_ERROR****Profils de communication: HART****Objet: Relancer si une erreur de communication est détectée**

Le builtin RETRY\_ON\_COMM\_ERROR définit le masque de relance sur erreur de communication, de sorte que la commande actuelle soit relancée si une erreur de communication est détectée dans le dispositif ou l'application EDD lors de l'envoi de la commande. Les deux premiers octets de chaque réponse esclave contiennent des informations de statut.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

**Structure lexicale**

```
RETRY_ON_COMM_ERROR(VOID)
```

L'élément lexical du builtin RETRY\_ON\_COMM\_ERROR est présenté dans le Tableau 86.

**Tableau 86 – Builtin RETRY\_ON\_COMM\_ERROR**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

**6.3.37 Builtin retry\_on\_comm\_error****Profils de communication: FF, ISA100****Objet: Relancer si une erreur de communication est détectée**

Le builtin retry\_on\_comm\_error commande la relance de la dernière demande effectuée par une méthode après une erreur de communication spécifiée. Une demande est relancée trois fois avant qu'elle n'échoue et qu'un retour d'erreur ne soit retourné.

Ce builtin évite à une méthode de devoir relancer explicitement une demande après réception d'une erreur de communication spécifiée.

Les codes d'erreur de communication sont définis par les consortiums. Leurs chaînes associées peuvent être définies dans un dictionnaire de texte. Une erreur de communication égale à zéro n'est pas assimilée à une erreur de communication.



### Structure lexicale

```
retry_on_comm_error(error)
```

Les éléments lexicaux du builtin `retry_on_comm_error` sont présentés dans le Tableau 87.

**Tableau 87 – Builtin `retry_on_comm_error`**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| error            | unsigned long | I         | m           | Erreurs de communication.                             |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

### Exemple

```
long status;
status = retry_on_comm_error(E_ACCESS_HARDWARE_FAULT);
```

### 6.3.38 Builtin `RETRY_ON_COMM_STATUS`

**Profils de communication: HART**

**Objet: Définir le masque de relance de statut de communication**

Le builtin `RETRY_ON_COMM_STATUS` définit le ou les bits corrects dans le masque de relance de statut de communication, de sorte que tout bit défini correspondant du statut de communication déclenche la relance de la commande actuelle. Le statut de communication est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est 1.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_method` pour la mise en œuvre des masques. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins `send`, `send_trans`, `send_command`, `send_command_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

```
RETRY_ON_COMM_STATUS(comm_status)
```

Les éléments lexicaux du builtin `RETRY_ON_COMM_STATUS` sont présentés dans le Tableau 88.

**Tableau 88 – Builtin `RETRY_ON_COMM_STATUS`**

| Nom du paramètre | Type | Direction | Utilisation | Description                                           |
|------------------|------|-----------|-------------|-------------------------------------------------------|
| comm_status      | int  | I         | m           | Nouveau masque de relance de statut de communication. |
| <return>         | VOID | —         | —           | —                                                     |

### 6.3.39 Builtin RETRY\_ON\_DEVICE\_STATUS

**Profils de communication:** HART

**Objet:** Définir le masque de relance de statut du dispositif

Le builtin RETRY\_ON\_DEVICE\_STATUS définit le ou les bits corrects dans le masque de relance de statut du dispositif, de sorte que tout bit défini correspondant du statut du dispositif déclenche la relance de la commande actuelle. Les deux premiers octets de chaque réponse esclave contiennent des informations de statut. Le premier octet retourné indique un statut de code de réponse lorsque le bit de poids fort (bit 7) a la valeur 0. Le deuxième octet retourné, statut du dispositif, est significatif uniquement si le premier retourne un statut de code de réponse. Le statut du dispositif est défini comme étant le deuxième octet de données retourné dans une transaction. La valeur de device\_status peut être définie de manière à conduire le système à relancer la commande HART actuelle sur toute combinaison de bits de statut du dispositif. La valeur de device\_status peut être définie sur toute valeur de 0x00 à 0x7F, où chaque bit correspond à un statut de dispositif retourné par le dispositif.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

RETRY\_ON\_DEVICE\_STATUS(device\_status)

Les éléments lexicaux du builtin RETRY\_ON\_DEVICE\_STATUS sont présentés dans le Tableau 89.

**Tableau 89 – Builtin RETRY\_ON\_DEVICE\_STATUS**

| Nom du paramètre | Type | Direction | Utilisation | Description                                           |
|------------------|------|-----------|-------------|-------------------------------------------------------|
| device_status    | int  | I         | m           | Nouveau masque de relance de statut de communication. |
| <return>         | VOID | —         | —           | —                                                     |

### 6.3.40 Builtin RETRY\_ON\_NO\_DEVICE (déconseillé)

**Profils de communication:** CS, GPE, HART

**Objet:** Relancer si aucun dispositif n'est détecté

Le builtin RETRY\_ON\_NO\_DEVICE définit le masque de relance en l'absence de dispositif, de sorte que la commande actuelle soit relancée si aucun dispositif n'est détecté lors de l'envoi d'une commande.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

### Structure lexicale

RETRY\_ON\_NO\_DEVICE (VOID)

L'élément lexical du builtin RETRY\_ON\_NO\_DEVICE est présenté dans le Tableau 90.

**Tableau 90 – Builtin RETRY\_ON\_NO\_DEVICE**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.41 Builtin RETRY\_ON\_RESPONSE\_CODE

**Profils de communication: HART**

**Objet: Définir le masque de relance de code de réponse**

Le builtin RETRY\_ON\_RESPONSE\_CODE définit le bit correct dans le masque de relance de code de réponse, de sorte que la valeur de code de réponse spécifiée déclenche la relance de la commande actuelle. Les deux premiers octets de chaque réponse esclave contiennent des informations de statut. Le code de réponse est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est 0. La valeur de response\_code peut être définie de manière à conduire le système à relancer la commande HART actuelle sur tout code de réponse. La valeur de response\_code peut être définie sur toute valeur de 0 à 127.

Pour conduire à la relance de la commande HART actuelle sur plusieurs codes de réponse différents, ce builtin doit être appelé une fois pour chaque code de réponse à relancer.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les builtins send, send\_trans, send\_command, send\_command\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

### Structure lexicale

RETRY\_ON\_RESPONSE\_CODE (response\_code)

Les éléments lexicaux du builtin RETRY\_ON\_RESPONSE\_CODE sont présentés dans le Tableau 91.

**Tableau 91 – Builtin RETRY\_ON\_RESPONSE\_CODE**

| Nom du paramètre | Type | Direction | Utilisation | Description                                                    |
|------------------|------|-----------|-------------|----------------------------------------------------------------|
| response_code    | int  | I         | m           | Code de réponse qu'il convient d'ajouter au masque de relance. |
| <return>         | VOID | —         | —           | —                                                              |

### 6.3.42 Builtin `retry_on_response_code`

**Profils de communication:** FF, ISA100

**Objet:** Définir le masque de relance de code de réponse

Le builtin `retry_on_response_code` commande la relance de la dernière demande effectuée par une méthode trois fois après réception d'un code de réponse spécifique.

Ce builtin évite à une méthode de devoir relancer explicitement une demande après réception d'un code de réponse spécifié.

Un code de réponse est une valeur représentant une condition d'erreur spécifique à une application.

NOTE Une valeur de code de réponse égale à zéro n'est pas assimilée à un code de réponse d'erreur. Chaque code de réponse et type de code de réponse est défini dans l'EDD.

Ce builtin relance la dernière demande de la méthode après réception du code de réponse spécifié.

#### Structure lexicale

```
retry_on_response_code (code)
```

Les éléments lexicaux du builtin `retry_on_response_code` sont présentés dans le Tableau 92.

**Tableau 92 – Builtin `retry_on_response_code`**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| code             | unsigned long | I         | m           | Code de réponse en cours de résolution.               |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

#### Exemple

```
long status;
status = retry_on_response_code(RC_INVALID_ENTRY);
```

### 6.3.43 Builtin `send`

**Profils de communication:** HART

**Objet:** Envoyer la commande spécifiée

Le builtin `send` envoie la commande spécifiée et retourne le code de réponse, le statut de communication et le statut de commande respectivement dans la matrice `cmd_status`. L'octet de statut du dispositif de la réponse du dispositif de terrain doit être examiné. Tout bit ayant une classe de statut "MORE" définie (1) dans le statut du dispositif doit déclencher l'émission automatique de la commande 48.

Les octets de la matrice `cmd_status` et les octets de statut de la commande 48 (si elle a été envoyée) sont ensuite soumis à un AND logique avec les masques d'interruption appropriés pour déterminer s'il convient d'interrompre la méthode. En cas de correspondance, la méthode est interrompue et les méthodes d'interruption (le cas échéant) sont exécutées. S'il n'existe pas de correspondance pour les masques d'interruption, les mêmes données sont soumises à un AND avec les masques de relance appropriés. S'il existe une correspondance, la commande est relancée (la commande spécifiée ou la commande 48). Cette procédure est répétée jusqu'à ce que la commande aboutisse, qu'une interruption se produise ou que le nombre maximal de relances soit atteint. Lorsqu'une commande 48 est envoyée indirectement en tant que résultat de réponse de statut du dispositif, les valeurs du masque xxx de la commande 48 définies à l'aide des builtins `XMTR_xxx` sont utilisées pour contrôler les interruptions et relances pour la commande 48. Les autres valeurs de masque et builtins associés sont utilisés pour contrôler les interruptions et relances de la commande directement envoyée (y compris la commande 48 si elle a été directement envoyée).

Les octets de statut pour la commande sont retournés dans le paramètre `cmd_status`, un pointeur vers une matrice de 3 octets de caractère non signé, qui est alloué dans la méthode appelante.

### Structure lexicale

```
send(cmd_number, cmd_status)
```

Les éléments lexicaux du builtin `send` sont présentés dans le Tableau 93.

**Tableau 93 – Builtin `send`**

| Nom du paramètre        | Type  | Direction | Utilisation | Description                                                                                                                                                                                                                                                     |
|-------------------------|-------|-----------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>cmd_number</code> | int   | I         | m           | Numéro de la commande à envoyer.                                                                                                                                                                                                                                |
| <code>cmd_status</code> | char* | O         | m           | Octets de statut de la commande d'envoi.                                                                                                                                                                                                                        |
| <return>                | int   | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. <code>BI_SUCCESS</code> si la commande a abouti, <code>BI_COMM_ERROR</code> si une erreur s'est produite lors de l'envoi de la commande ou <code>BI_NO_DEVICE</code> si aucun dispositif n'a été détecté. |

### Exemple

```
int result;
char cmd_status[STATUS_SIZE];
result = send(40, cmd_status);
```

Dans l'exemple ci-dessus, si l'un des bits de la classe de statut "MORE" définis dans `cmd_status[STATUS_DEVICE_STATUS]` est défini, la commande 48 est automatiquement envoyée avant le retour de la fonction d'envoi.

#### 6.3.44 Builtin `send_all_values`

**Profils de communication: FF, ISA100**

**Objet: Envoyer les valeurs modifiées au dispositif**

Le builtin `send_all_values` envoie toutes les valeurs de la table des variables que la méthode a modifiées, mais qui n'ont pas été précédemment envoyées au dispositif. Cette action modifie les valeurs du dispositif de manière à correspondre aux valeurs définies par la méthode.

Ce builtin n'effectue aucune action pour une application EDD non en mémoire cache, car elle n'a pas de table de variables.

### Structure lexicale

`send_all_values(VOID)`

L'élément lexical du builtin `send_all_values` est présenté dans le Tableau 94.

**Tableau 94 – Builtin `send_all_values`**

| Nom du paramètre | Type | Direction | Utilisation | Description                                           |
|------------------|------|-----------|-------------|-------------------------------------------------------|
| <return>         | long | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

### Exemple

```
long status;
status = send_all_values();
```

### 6.3.45 Builtin `send_command`

**Profils de communication: HART**

**Objet: Envoyer la commande spécifiée**

Le builtin `send_command` envoie la commande spécifiée. Les octets de statut/données de la commande sont ensuite soumis à un AND logique avec les masques d'interruption appropriés pour déterminer s'il convient d'interrompre la méthode. En cas de correspondance, la méthode est interrompue et les méthodes d'interruption (le cas échéant) sont exécutées. S'il n'existe pas de correspondance pour les masques d'interruption, les mêmes données sont soumises à un AND avec les masques de relance appropriés. En cas de correspondance, la commande est relancée. Cette procédure est répétée jusqu'à ce que la commande aboutisse, qu'une interruption se produise ou que le nombre maximal de relances soit atteint. Aucun octet de statut ou de données n'est retourné avec cette fonction. Les valeurs du masque xxx de la commande 48 définies à l'aide des builtins `XMTR_xxx` n'affectent pas les interruptions ou les relances pour le builtin `send_command`.

### Structure lexicale

`send_command(cmd_number)`

Les éléments lexicaux du builtin `send_command` sont présentés dans le Tableau 95.

**Tableau 95 – Builtin `send_command`**

| Nom du paramètre        | Type | Direction | Utilisation | Description                                                                                                                                                                                                                                                     |
|-------------------------|------|-----------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>cmd_number</code> | int  | I         | m           | Numéro de la commande à envoyer.                                                                                                                                                                                                                                |
| <return>                | int  | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. <code>BI_SUCCESS</code> si la fonction a abouti, <code>BI_COMM_ERROR</code> si une erreur s'est produite lors de l'envoi de la commande ou <code>BI_NO_DEVICE</code> si aucun dispositif n'a été détecté. |

### 6.3.46 Builtin `send_command_trans`

**Profils de communication: HART**

**Objet: Envoyer la commande avec la transaction spécifiée**

Le builtin `send_command_trans` envoie la commande avec la transaction spécifiée au dispositif. Cette fonction doit être utilisée pour envoyer des commandes qui ont été définies avec des transactions multiples.

Le bultin `send_command_trans` envoie la commande spécifiée. Les octets de statut/données de la commande sont ensuite soumis à un AND logique avec les masques d'interruption appropriés pour déterminer s'il convient d'interrompre la méthode. En cas de correspondance, la méthode est interrompue et les méthodes d'interruption (le cas échéant) sont exécutées. S'il n'existe pas de correspondance pour les masques d'interruption, les mêmes données sont soumises à un AND avec les masques de relance appropriés. En cas de correspondance, la commande est relancée. Cette procédure est répétée jusqu'à ce que la commande aboutisse, qu'une interruption se produise ou que le nombre maximal de relances soit atteint. Aucun octet de statut ou de données n'est retourné avec cette commande. Les valeurs du masque xxx de la commande 48 définies à l'aide des bultins `XMTR_xxx` n'affectent pas les interruptions ou les relances pour le bultin `send_command`.

### Structure lexicale

`send_command_trans(cmd_number, transaction)`

Les éléments lexicaux du bultin `send_command_trans` sont présentés dans le Tableau 96.

**Tableau 96 – Bultin `send_command_trans`**

| Nom du paramètre            | Type | Direction | Utilisation | Description                                                                                                                                                                                                                                                     |
|-----------------------------|------|-----------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>cmd_number</code>     | int  | I         | m           | Numéro de la commande à envoyer.                                                                                                                                                                                                                                |
| <code>transaction</code>    | int  | I         | m           | Numéro de la TRANSACTION.                                                                                                                                                                                                                                       |
| <code>&lt;return&gt;</code> | int  | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. <code>BI_SUCCESS</code> si la fonction a abouti, <code>BI_COMM_ERROR</code> si une erreur s'est produite lors de l'envoi de la commande ou <code>BI_NO_DEVICE</code> si aucun dispositif n'a été détecté. |

### 6.3.47 Bultin `send_trans`

#### Profils de communication: HART

#### Objet: Envoyer la commande avec la transaction spécifiée

Le bultin `send_trans` envoie une commande avec la transaction spécifiée au dispositif. Cette fonction doit être utilisée pour envoyer des commandes qui ont été définies avec des transactions multiples.

Le bultin `send_trans` envoie la commande spécifiée et retourne le code de réponse, le statut de communication et le statut du dispositif dans la matrice `cmd_status`. L'octet de statut du dispositif de la réponse du dispositif de terrain doit être examiné. Tout bit ayant une classe de statut "MORE" définie (1) dans le statut du dispositif doit déclencher l'émission automatique de la commande 48.

Les octets de la matrice `cmd_status` et les octets de statut de la commande 48 (si elle a été envoyée) sont ensuite soumis à un AND logique avec les masques d'interruption appropriés pour déterminer s'il convient d'interrompre la méthode. En cas de correspondance, la méthode est interrompue et les méthodes d'interruption (le cas échéant) sont exécutées. S'il n'existe pas de correspondance pour les masques d'interruption, les mêmes données sont soumises à un AND avec les masques de relance appropriés. S'il existe une correspondance, la commande est relancée (la commande spécifiée ou la commande 48). Cette procédure est répétée jusqu'à ce que la commande aboutisse, qu'une interruption se produise ou que le nombre maximal de relances soit atteint. Lorsqu'une commande 48 est envoyée indirectement en tant que résultat de réponse de statut du dispositif, les valeurs du masque xxx de la commande 48 définies à l'aide des bultins `XMTR_xxx` sont utilisées pour contrôler les interruptions et relances pour la commande 48. Les autres valeurs de masque et bultins associés sont utilisés pour contrôler les interruptions et relances de la commande directement envoyée (y compris la commande 48 si elle a été directement envoyée).

Les octets de statut pour la commande sont retournés dans le paramètre `cmd_status`, une matrice de 3 octets, alloué dans la méthode appelante.

### Structure lexicale

```
send_trans(cmd_number, transaction, cmd_status)
```

Les éléments lexicaux du builtin `send_trans` sont présentés dans le Tableau 97.

**Tableau 97 – Builtin `send_trans`**

| Nom du paramètre         | Type  | Direction | Utilisation | Description                                                                                                                                                                                                                                                     |
|--------------------------|-------|-----------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>cmd_number</code>  | int   | I         | m           | Numéro de la commande à envoyer.                                                                                                                                                                                                                                |
| <code>transaction</code> | int   | I         | m           | Numéro de la TRANSACTION.                                                                                                                                                                                                                                       |
| <code>cmd_status</code>  | char* | O         | m           | Octets de statut de la commande d'envoi.                                                                                                                                                                                                                        |
| <return>                 | int   | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. <code>BI_SUCCESS</code> si la commande a abouti, <code>BI_COMM_ERROR</code> si une erreur s'est produite lors de l'envoi de la commande ou <code>BI_NO_DEVICE</code> si aucun dispositif n'a été détecté. |

### 6.3.48 Builtin `send_value`

**Profils de communication: FF, ISA100**

**Objet: Envoyer une valeur de table de variables au dispositif**

Le builtin `send_value` commande l'envoi de la valeur de la variable spécifiée dans la mémoire cache au dispositif, de manière à mettre à jour la valeur du dispositif. Ce builtin n'effectue aucune action dans une application EDD non en mémoire cache, car une application EDD non en mémoire cache ne comporte pas de mémoire cache.

Certaines valeurs sont `READ_ONLY` dans le dispositif et ne peuvent pas être écrites. Toute tentative d'une telle écriture provoque le retour d'une erreur de builtin.

Les paramètres `id` et `member_id` sont spécifiés en utilisant les builtins `ITEM_ID` et `MEMBER_ID` et le nom ou la référence de la variable en question.

### Structure lexicale

```
send_value(id, member_id)
```

Les éléments lexicaux du builtin `send_value` sont présentés dans le Tableau 98.

**Tableau 98 – Builtin `send_value`**

| Nom du paramètre       | Type          | Direction | Utilisation | Description                                           |
|------------------------|---------------|-----------|-------------|-------------------------------------------------------|
| <code>id</code>        | unsigned long | I         | m           | ID d'élément de la VARIABLE à lire.                   |
| <code>member_id</code> | unsigned long | I         | m           | ID de membre de la VARIABLE à lire.                   |
| <return>               | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |



**Exemple**

```

long status;
unsigned long id;
id = ITEM_ID(PARAM.HI_LIM);
status = edit_device_value ("|en|Enter new HI_LIM value:\n", 0, 0, 0, id,
0); status = send_value(id, 0);

```

**6.3.49 Builtin send\_value2****Profils de communication: FF, ISA100**

**Objet: Envoyer la valeur d'une variable, d'un membre d'enregistrement ou d'un élément de matrice au dispositif**

Le builtin `send_value2` commande l'envoi de la valeur de la variable, du membre d'enregistrement ou de l'élément de matrice spécifié dans la mémoire cache au dispositif, de manière à mettre à jour la valeur du dispositif. Ce builtin n'effectue aucune action dans une application EDD non en mémoire cache, car une application EDD non en mémoire cache ne comporte pas de mémoire cache.

Certaines valeurs sont `READ_ONLY` dans le dispositif et ne peuvent pas être écrites. Toute tentative d'une telle écriture provoque le retour d'une erreur de builtin.

Le paramètre `blk_id` spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre `blk_num` spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre `id` référence une variable simple, le paramètre `member_id` est ignoré. Si le paramètre `id` référence un enregistrement, le paramètre `member_id` spécifie un membre de l'enregistrement. Si le paramètre `id` référence un paramètre de matrice, le paramètre `member_id` spécifie un élément de la matrice.

Les paramètres `blk_id`, `id` et `member_id` sont spécifiés à l'aide des builtins `ITEM_ID` et `MEMBER_ID`. Le paramètre `blk_num` est spécifié à l'aide des builtins `get_block_instance_by_object_index` et `get_block_instance_by_block_tag`.

Si le paramètre `id` référence un enregistrement et que le paramètre `member_id` a la valeur zéro, l'ensemble de l'enregistrement est écrit dans le dispositif.

De même, si le paramètre `id` référence une matrice et que le paramètre `member_id` a la valeur zéro, l'ensemble de la matrice est écrit dans le dispositif.

**Structure lexicale**

```
send_value2(blk_id, blk_num, id, member_id)
```

Les éléments lexicaux du builtin `send_value2` sont présentés dans le Tableau 99.

**Tableau 99 – Builtin send\_value2**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                      |
|------------------|---------------|-----------|-------------|------------------------------------------------------------------|
| blk_id           | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.           |
| blk_num          | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder. |
| id               | unsigned long | I         | m           | ID d'élément de la VARIABLE à lire.                              |
| member_id        | unsigned long | I         | m           | ID de membre de la VARIABLE à lire.                              |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.            |

**Exemple**

```
long status;
unsigned long aiBlock;
unsigned long id;
```

```
aiBlock = ITEM_ID(__analog_input_block);
id = MEMBER_ID(HI_LIM);
```

```
status = edit_device_value2("|en|Enter new HI_LIM value:\n", 0, 0, 0, 0, 0,
aiBlock, 0, id, 0);
status = send_value2(aiBlock, 0, id, 0);
```

**6.3.50 Builtin SET\_NUMBER\_OF\_RETRIES****Profils de communication: CS, GPE, HART****Objet: Définir le nombre de relances d'une commande**

Le builtin SET\_NUMBER\_OF\_RETRIES spécifie le nombre de relances d'une commande en fonction des masques de relance appropriés. Cette valeur est définie par défaut sur 0 au début de chaque méthode.

**Structure lexicale**

```
SET_NUMBER_OF_RETRIES(n)
```

Les éléments lexicaux du builtin SET\_NUMBER\_OF\_RETRIES sont présentés dans le Tableau 100.

**Tableau 100 – Builtin SET\_NUMBER\_OF\_RETRIES**

| Nom du paramètre | Type | Direction | Utilisation | Description                                           |
|------------------|------|-----------|-------------|-------------------------------------------------------|
| n                | int  | I         | m           | Nombre de relances d'une commande.                    |
| <return>         | int  | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. |

**6.3.51 Builtin WriteCommand****Profils de communication: CS, GPE, PB, PN****Objet: Exécuter une commande d'écriture**

Le builtin WriteCommand permet d'écrire des variables avec une commande spécifiée.

### Structure lexicale

WriteCommand(command\_identifiant)

Les éléments lexicaux du builtin WriteCommand sont présentés dans le Tableau 101.

**Tableau 101 – Builtin WriteCommand**

| Nom du paramètre    | Type      | Direction | Utilisation | Description                                                                                                   |
|---------------------|-----------|-----------|-------------|---------------------------------------------------------------------------------------------------------------|
| command_identifiant | reference | I         | m           | Identifiant de la COMMAND à exécuter.                                                                         |
| <return>            | long      | O         | m           | Valeur d'erreur spécifique au protocole, dont le codage est défini par le protocole ou dispositif spécifique. |

### 6.3.52 Builtin XMTR\_ABORT\_ON\_ALL\_COMM\_STATUS

**Profils de communication: HART**

**Objet: Définir l'interruption pour tous les statuts de communication de commande 48**

Le builtin XMTR\_ABORT\_ON\_ALL\_COMM\_STATUS définit tous les bits dans le masque d'interruption de statut de communication d'une commande 48. Cela conduit le système à interrompre la méthode actuelle si le dispositif retourne une valeur de statut de communication d'une commande 48. Le statut de communication est défini comme étant le premier octet retourné dans une transaction, lorsque le bit 7 de cet octet est défini. Le statut de communication peut être défini sur toute valeur de 0x00 à 0x7F, où chaque bit correspond à une erreur de communication reçue par le dispositif.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

### Structure lexicale

XMTR\_ABORT\_ON\_ALL\_COMM\_STATUS (VOID)

L'élément lexical du builtin XMTR\_ABORT\_ON\_ALL\_COMM\_STATUS est présenté dans le Tableau 102.

**Tableau 102 – Builtin XMTR\_ABORT\_ON\_ALL\_COMM\_STATUS**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.53 Builtin XMTR\_ABORT\_ON\_ALL\_DATA

**Profils de communication: HART**

**Objet: Définir l'interruption pour toutes les données de commande 48**

Le builtin XMTR\_ABORT\_ON\_ALL\_DATA définit tous les bits dans les masques d'interruption de données de la commande 48. Cela conduit le système à interrompre si un bit quelconque de la commande 48 est défini.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir `send_command` pour la mise en œuvre des masques. Voir `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les fonctions `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY` des builtins.

### Structure lexicale

`XMTR_ABORT_ON_ALL_DATA(VOID)`

L'élément lexical du builtin `XMTR_ABORT_ON_ALL_DATA` est présenté dans le Tableau 103.

**Tableau 103 – Builtin `XMTR_ABORT_ON_ALL_DATA`**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.54 Builtin `XMTR_ABORT_ON_ALL_DEVICE_STATUS`

**Profils de communication: HART**

**Objet: Définir l'interruption pour tous les statuts de communication de commande 48**

Le builtin `XMTR_ABORT_ON_ALL_DEVICE_STATUS` définit tous les bits dans le masque d'interruption de statut du dispositif d'une commande 48. Cela conduit le système à interrompre la méthode actuelle si le dispositif retourne une valeur de statut du dispositif d'une commande 48. Le statut du dispositif est défini comme étant le deuxième octet de données retourné dans une transaction.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`XMTR_ABORT_ON_ALL_DEVICE_STATUS(VOID)`

L'élément lexical du builtin `XMTR_ABORT_ON_ALL_DEVICE_STATUS` est présenté dans le Tableau 104.

**Tableau 104 – Builtin `XMTR_ABORT_ON_ALL_DEVICE_STATUS`**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.55 Builtin XMTR\_ABORT\_ON\_ALL\_RESPONSE\_CODES

**Profils de communication: HART**

**Objet: Définir l'interruption pour tous les codes de réponse de commande 48**

Le builtin XMTR\_ABORT\_ON\_ALL\_RESPONSE\_CODES définit tous les bits dans le masque d'interruption de code de réponse d'une commande 48. Cela conduit le système à interrompre la méthode actuelle si le dispositif retourne une valeur de code de réponse d'une commande 48.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

XMTR\_ABORT\_ON\_ALL\_RESPONSE\_CODES (VOID)

L'élément lexical du builtin XMTR\_ABORT\_ON\_ALL\_RESPONSE\_CODES est présenté dans le Tableau 105.

**Tableau 105 – Builtin XMTR\_ABORT\_ON\_ALL\_RESPONSE\_CODES**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.56 Builtin XMTR\_ABORT\_ON\_COMM\_ERROR

**Profils de communication: HART**

**Objet: Interrompre si une erreur de communication est détectée pendant la commande 48**

Le builtin XMTR\_ABORT\_ON\_COMM\_ERROR définit le masque d'interruption sur erreur de communication d'une commande 48, de sorte que la méthode soit interrompue si une erreur de communication est détectée lors de l'envoi d'une commande 48.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

XMTR\_ABORT\_ON\_COMM\_ERROR (VOID)

L'élément lexical du builtin XMTR\_ABORT\_ON\_COMM\_ERROR est présenté dans le Tableau 106.

**Tableau 106 – Builtin XMTR\_ABORT\_ON\_COMM\_ERROR**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

**6.3.57 Builtin XMTR\_ABORT\_ON\_COMM\_STATUS****Profils de communication: HART****Objet: Ajouter un masque d'interruption de statut à la commande 48**

Le builtin XMTR\_ABORT\_ON\_COMM\_STATUS définit le ou les bits corrects dans le masque d'interruption de statut de communication d'une commande 48, de sorte que la valeur spécifiée de statut de communication d'une commande 48 conduise à l'interruption de la méthode. Le statut de communication est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est 1. La valeur `comm_status_value` peut être définie sur toute valeur de 0 à 127, où chaque bit correspond à une erreur de communication reçue par le dispositif.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

**Structure lexicale**

`XMTR_ABORT_ON_COMM_STATUS(comm_status)`

Les éléments lexicaux du builtin XMTR\_ABORT\_ON\_COMM\_STATUS sont présentés dans le Tableau 107.

**Tableau 107 – Builtin XMTR\_ABORT\_ON\_COMM\_STATUS**

| Nom du paramètre         | Type             | Direction      | Utilisation    | Description                                               |
|--------------------------|------------------|----------------|----------------|-----------------------------------------------------------|
| <code>comm_status</code> | <code>int</code> | <code>l</code> | <code>m</code> | Nouveau masque d'interruption de statut de communication. |
| <return>                 | VOID             | —              | —              | —                                                         |

**6.3.58 Builtin XMTR\_ABORT\_ON\_DATA****Profils de communication: HART****Objet: Interrompre si un bit de données spécifié dans la commande 48 est défini**

Le builtin XMTR\_ABORT\_ON\_DATA définit le ou les bits corrects dans le masque d'interruption d'une commande 48, de sorte que la méthode soit interrompue si le bit spécifié est défini dans le champ de données retourné par la commande 48.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`XMTR_ABORT_ON_DATA(data, bit)`

Les éléments lexicaux du builtin `XMTR_ABORT_ON_DATA` sont présentés dans le Tableau 108.

**Tableau 108 – Builtin XMTR\_ABORT\_ON\_DATA**

| Nom du paramètre            | Type              | Direction      | Utilisation    | Description                                                 |
|-----------------------------|-------------------|----------------|----------------|-------------------------------------------------------------|
| <code>data</code>           | <code>int</code>  | <code>l</code> | <code>m</code> | Index base zéro dans le champ de données d'une commande 48. |
| <code>bit</code>            | <code>int</code>  | <code>l</code> | <code>m</code> | Numéro de bit (0 à 7). Le bit 0 est le bit de poids faible. |
| <code>&lt;return&gt;</code> | <code>VOID</code> | —              | —              | —                                                           |

### 6.3.59 Builtin XMTR\_ABORT\_ON\_DEVICE\_STATUS

**Profils de communication: HART**

**Objet: Ajouter un masque d'interruption de statut à la commande 48**

Le builtin `XMTR_ABORT_ON_DEVICE_STATUS` définit le ou les bits corrects dans le masque d'interruption de statut du dispositif d'une commande 48, de sorte que tout bit défini correspondant de la commande 48 conduise à l'interruption de la méthode. Le statut du dispositif est défini comme étant le deuxième octet de données retourné dans une transaction. La valeur `device_status` peut être définie à toute valeur de 0 à 127, où chaque bit correspond à un statut du dispositif retourné par le dispositif.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les fonctions `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`XMTR_ABORT_ON_DEVICE_STATUS(device_status)`

Les éléments lexicaux du builtin `XMTR_ABORT_ON_DEVICE_STATUS` sont présentés dans le Tableau 109.

**Tableau 109 – Builtin XMTR\_ABORT\_ON\_DEVICE\_STATUS**

| Nom du paramètre            | Type              | Direction      | Utilisation    | Description                                            |
|-----------------------------|-------------------|----------------|----------------|--------------------------------------------------------|
| <code>device_status</code>  | <code>int</code>  | <code>l</code> | <code>m</code> | Nouveau masque d'interruption de statut du dispositif. |
| <code>&lt;return&gt;</code> | <code>VOID</code> | —              | —              | —                                                      |

### 6.3.60 Builtin XMTR\_ABORT\_ON\_NO\_DEVICE (déconseillé)

#### Profils de communication:

**Objet:** Interrompre si aucun dispositif n'est détecté pendant la commande 48

Le builtin XMTR\_ABORT\_ON\_NO\_DEVICE définit le masque d'absence de dispositif d'une commande 48, de sorte que la méthode soit interrompue si aucun dispositif n'est détecté lors de l'envoi d'une commande 48.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

XMTR\_ABORT\_ON\_NO\_DEVICE (VOID)

L'élément lexical du builtin XMTR\_ABORT\_ON\_NO\_DEVICE est présenté dans le Tableau 110.

**Tableau 110 – Builtin XMTR\_ABORT\_ON\_NO\_DEVICE**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.61 Builtin XMTR\_ABORT\_ON\_RESPONSE\_CODE

#### Profils de communication: HART

**Objet:** Ajouter un masque d'interruption de code de réponse à la commande 48

Le builtin XMTR\_ABORT\_ON\_RESPONSE\_CODE définit le bit correct dans le masque d'interruption de code de réponse d'une commande 48, de sorte que la valeur spécifiée du code de réponse d'une commande 48 conduise à l'interruption de la méthode. Le code de réponse est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est 0.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

XMTR\_ABORT\_ON\_RESPONSE\_CODE (response\_code)

Les éléments lexicaux du builtin XMTR\_ABORT\_ON\_RESPONSE\_CODE sont présentés dans le Tableau 111.



**Tableau 111 – Builtin XMTR\_ABORT\_ON\_RESPONSE\_CODE**

| Nom du paramètre | Type | Direction | Utilisation | Description                                       |
|------------------|------|-----------|-------------|---------------------------------------------------|
| response_code    | int  | l         | m           | Nouveau masque d'interruption de code de réponse. |
| <return>         | VOID | —         | —           | —                                                 |

**6.3.62 Builtin XMTR\_IGNORE\_ALL\_COMM\_STATUS****Profils de communication: HART****Objet: Ignorer tous les bits de statut de commande 48**

Le builtin XMTR\_IGNORE\_ALL\_COMM\_STATUS efface tous les bits dans le masque de relance de statut de communication et le masque d'interruption de statut de communication d'une commande 48. Cela conduit le système à ignorer tous les bits dans la valeur de statut de communication. Le statut de communication est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est défini.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

**Structure lexicale**

XMTR\_IGNORE\_ALL\_COMM\_STATUS (VOID)

L'élément lexical du builtin XMTR\_IGNORE\_ALL\_COMM\_STATUS est présenté dans le Tableau 112.

**Tableau 112 – Builtin XMTR\_IGNORE\_ALL\_COMM\_STATUS**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

**6.3.63 Builtin XMTR\_IGNORE\_ALL\_DATA****Profils de communication: HART****Objet: Ignorer tous les bits de statut du dispositif de commande 48**

Le builtin XMTR\_IGNORE\_ALL\_DATA efface tous les bits dans le masque de relance de données et le masque d'interruption de données d'une commande 48. Cela conduit le système à ignorer toutes les données dans le message de réponse d'une commande 48.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir send\_command pour la mise en œuvre des masques. Voir ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par cette fonction est utilisé par les fonctions send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

### Structure lexicale

XMTR\_IGNORE\_ALL\_DATA (VOID)

L'élément lexical du builtin XMTR\_IGNORE\_ALL\_DATA est présenté dans le Tableau 113.

**Tableau 113 – Builtin XMTR\_IGNORE\_ALL\_DATA**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.64 Builtin XMTR\_IGNORE\_ALL\_DEVICE\_STATUS

**Profils de communication: HART**

**Objet: Ignorer tous les bits de statut du dispositif de commande 48**

Le builtin XMTR\_IGNORE\_ALL\_DEVICE\_STATUS efface tous les bits dans le masque de relance de statut du dispositif et le masque d'interruption de statut du dispositif d'une commande 48. Cela conduit le système à ignorer tous les bits dans l'octet de statut du dispositif d'une commande 48. Le statut du dispositif est défini comme étant le deuxième octet de données retourné dans une transaction.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

### Structure lexicale

XMTR\_IGNORE\_ALL\_DEVICE\_STATUS (VOID)

L'élément lexical du builtin XMTR\_IGNORE\_ALL\_DEVICE\_STATUS est présenté dans le Tableau 114.

**Tableau 114 – Builtin XMTR\_IGNORE\_ALL\_DEVICE\_STATUS**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.65 Builtin XMTR\_IGNORE\_ALL\_RESPONSE\_CODES

**Profils de communication: HART**

**Objet: Ignorer tous les codes de réponse de commande 48**

Le builtin XMTR\_IGNORE\_ALL\_RESPONSE\_CODES efface tous les bits dans le masque de relance de code de réponse et le masque d'interruption de code de réponse d'une commande 48. Cela conduit le système à ignorer toutes les valeurs de code de réponse retournées par le dispositif.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`XMTR_IGNORE_ALL_RESPONSE_CODES(VOID)`

L'élément lexical du builtin `XMTR_IGNORE_ALL_RESPONSE_CODES` est présenté dans le Tableau 115.

**Tableau 115 – Builtin XMTR\_IGNORE\_ALL\_RESPONSE\_CODES**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.66 Builtin XMTR\_IGNORE\_COMM\_ERROR

**Profils de communication: HART**

**Objet: Ignorer si une erreur de communication est détectée pendant la commande 48**

Le builtin `XMTR_IGNORE_COMM_ERROR` efface tous les bits dans le masque de relance sur erreur de communication et le masque d'interruption sur erreur de communication d'une commande 48, de sorte qu'une condition d'erreur de communication soit ignorée lors de l'envoi d'une commande 48.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`XMTR_IGNORE_COMM_ERROR(VOID)`

L'élément lexical du builtin `XMTR_IGNORE_COMM_ERROR` est présenté dans le Tableau 116.

**Tableau 116 – Builtin XMTR\_IGNORE\_COMM\_ERROR**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.67 Builtin XMTR\_IGNORE\_COMM\_STATUS

**Profils de communication: HART**

**Objet: Ignorer des bits de statut de communication de commande 48 spécifiques**

Le builtin XMTR\_IGNORE\_COMM\_STATUS efface le ou les bits corrects dans le masque de relance de statut de communication et le masque d'interruption de statut de communication d'une commande 48, de sorte que les bits spécifiés dans la valeur du statut de communication d'une commande 48 soient ignorés. Le statut de communication est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est défini.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

XMTR\_IGNORE\_COMM\_STATUS(comm\_status)

Les éléments lexicaux du builtin XMTR\_IGNORE\_COMM\_STATUS sont présentés dans le Tableau 117.

**Tableau 117 – Builtin XMTR\_IGNORE\_COMM\_STATUS**

| Nom du paramètre | Type | Direction | Utilisation | Description                                                             |
|------------------|------|-----------|-------------|-------------------------------------------------------------------------|
| comm_status      | int  | l         | m           | Nouveau masque d'interruption et de relance de statut de communication. |
| <return>         | VOID | —         | —           | —                                                                       |

### 6.3.68 Builtin XMTR\_IGNORE\_DATA

**Profils de communication: HART**

**Objet: Ignorer des bits de données de commande 48 spécifiques**

Le builtin XMTR\_IGNORE\_DATA doit réinitialiser le bit spécifié, dans l'octet spécifié, dans le masque de relance des données et le masque d'interruption des données de la commande 48, de sorte que la méthode ignore le bit spécifié dans le champ de données retourné par la commande 48.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir send\_command pour la mise en œuvre des masques.

Voir ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les fonctions send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display and DISPLAY des builtins.

#### Structure lexicale

XMTR\_IGNORE\_DATA(data, bit)

Les éléments lexicaux du builtin XMTR\_IGNORE\_DATA sont présentés dans le Tableau 118.

**Tableau 118 – Builtin XMTR\_IGNORE\_DATA**

| Nom du paramètre | Type | Direction | Utilisation | Description                                                 |
|------------------|------|-----------|-------------|-------------------------------------------------------------|
| Data             | int  | I         | m           | Index base zéro dans le champ de données d'une commande 48. |
| Bit              | int  | I         | m           | Numéro de bit (0 à 7). Le bit 0 est le bit de poids faible. |
| <return>         | VOID | —         | —           | —                                                           |

### 6.3.69 Builtin XMTR\_IGNORE\_DEVICE\_STATUS

**Profils de communication: HART**

**Objet: Ignorer des bits de statut de commande 48 spécifiques**

Le builtin XMTR\_IGNORE\_DEVICE\_STATUS efface le ou les bits corrects dans le masque de relance de statut du dispositif et le masque d'interruption de statut du dispositif d'une commande 48, de sorte que les bits spécifiés dans l'octet de statut du dispositif d'une commande 48 soient ignorés. Le statut du dispositif est défini comme étant le deuxième octet de données retourné dans une transaction.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

XMTR\_IGNORE\_DEVICE\_STATUS(device\_status)

Les éléments lexicaux du builtin XMTR\_IGNORE\_DEVICE\_STATUS sont présentés dans le Tableau 119.

**Tableau 119 – Builtin XMTR\_IGNORE\_DEVICE\_STATUS**

| Nom du paramètre | Type | Direction | Utilisation | Description                                                 |
|------------------|------|-----------|-------------|-------------------------------------------------------------|
| device_status    | int  | I         | m           | Bits à effacer dans le masque d'interruption et de relance. |
| <return>         | VOID | —         | —           | —                                                           |

### 6.3.70 Builtin XMTR\_IGNORE\_NO\_DEVICE (déconseillé)

**Profils de communication: HART**

**Objet: Ignorer si aucun dispositif n'est détecté pendant la commande 48**

Le builtin XMTR\_IGNORE\_NO\_DEVICE définit le masque de relance en l'absence de dispositif et le masque d'interruption en l'absence de dispositif d'une commande 48 pour indiquer qu'il convient d'ignorer la condition d'absence de dispositif lors de l'envoi d'une commande 48.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`XMTR_IGNORE_NO_DEVICE (VOID)`

L'élément lexical du builtin `XMTR_IGNORE_NO_DEVICE` est présenté dans le Tableau 120.

**Tableau 120 – Builtin XMTR\_IGNORE\_NO\_DEVICE**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.71 Builtin XMTR\_IGNORE\_RESPONSE\_CODE

**Profils de communication: HART**

**Objet: Ignorer des codes de réponse de commande 48 spécifiques**

Le builtin `XMTR_IGNORE_RESPONSE_CODE` efface le bit correct dans le masque de relance de code de réponse et le masque d'interruption de code de réponse d'une commande 48, de sorte que la valeur spécifiée de code de réponse d'une commande 48 soit ignorée. Le code de réponse est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est 0.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`XMTR_IGNORE_RESPONSE_CODE (response_code)`

Les éléments lexicaux du builtin `XMTR_IGNORE_RESPONSE_CODE` sont présentés dans le Tableau 121.

**Tableau 121 – Builtin XMTR\_IGNORE\_RESPONSE\_CODE**

| Nom du paramètre           | Type | Direction | Utilisation | Description                        |
|----------------------------|------|-----------|-------------|------------------------------------|
| <code>response_code</code> | int  | l         | m           | Nouveau masque de code de réponse. |
| <return>                   | VOID | —         | —           | —                                  |

### 6.3.72 Builtin XMTR\_RETRY\_ON\_ALL\_COMM\_STATUS

#### Profils de communication: HART

**Objet:** Définir la relance pour tous les statuts de communication de commande 48

Le builtin XMTR\_RETRY\_ON\_ALL\_COMM\_STATUS définit tous les bits dans le masque de relance de statut de communication de la commande 48. Cela conduit le système à relancer la commande 48 si le dispositif retourne une valeur de statut de communication d'une commande 48. Le statut de communication est défini comme étant le premier octet de données retourné dans une transaction HART, lorsque le bit 7 de cet octet est défini.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir `send_command` pour la mise en œuvre des masques. Voir `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les fonctions `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY` des builtins.

#### Structure lexicale

`XMTR_RETRY_ON_ALL_COMM_STATUS(VOID)`

L'élément lexical du builtin XMTR\_RETRY\_ON\_ALL\_COMM\_STATUS est présenté dans le Tableau 122.

**Tableau 122 – Builtin XMTR\_RETRY\_ON\_ALL\_COMM\_STATUS**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.73 Builtin XMTR\_RETRY\_ON\_ALL\_DATA

#### Profils de communication: HART

**Objet:** Définir la relance pour tous les statuts du dispositif de commande 48

Le builtin XMTR\_RETRY\_ON\_ALL\_DATA définit tous les bits dans le masque de relance de données d'une commande 48. Cela conduit le système à relancer si un bit quelconque dans la commande 48 est défini.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir `send_command` pour la mise en œuvre des masques. Voir `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les fonctions `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` and `DISPLAY` des builtins.

#### Structure lexicale

`XMTR_RETRY_ON_ALL_DATA(VOID)`

L'élément lexical du builtin XMTR\_RETRY\_ON\_ALL\_DATA est présenté dans le Tableau 123.

**Tableau 123 – Builtin XMTR\_RETRY\_ON\_ALL\_DATA**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

**6.3.74 Builtin XMTR\_RETRY\_ON\_ALL\_DEVICE\_STATUS****Profils de communication: HART****Objet: Définir la relance pour tous les statuts du dispositif de commande 48**

Le builtin XMTR\_RETRY\_ON\_ALL\_DEVICE\_STATUS définit tous les bits dans le masque de relance de statut du dispositif d'une commande 48. Cela conduit le système à relancer la commande 48 si le dispositif retourne une valeur de statut du dispositif d'une commande 48. Le statut du dispositif est défini comme étant le deuxième octet de données retourné dans une transaction.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

**Structure lexicale**

XMTR\_RETRY\_ON\_ALL\_DEVICE\_STATUS (VOID)

L'élément lexical du builtin XMTR\_RETRY\_ON\_ALL\_DEVICE\_STATUS est présenté dans le Tableau 124.

**Tableau 124 – Builtin XMTR\_RETRY\_ON\_ALL\_DEVICE\_STATUS**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

**6.3.75 Builtin XMTR\_RETRY\_ON\_ALL\_RESPONSE\_CODES****Profils de communication: HART****Objet: Définir la relance pour tous les codes de réponse de commande 48**

Le builtin XMTR\_RETRY\_ON\_ALL\_RESPONSE\_CODES définit tous les bits dans le masque de relance de code de réponse d'une commande 48. Cela conduit le système à relancer la commande 48 du système si le dispositif retourne une valeur de code de réponse d'une commande 48.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.



### Structure lexicale

XMTR\_RETRY\_ON\_ALL\_RESPONSE\_CODES (VOID)

L'élément lexical du builtin XMTR\_RETRY\_ON\_ALL\_RESPONSE\_CODES est présenté dans le Tableau 125.

**Tableau 125 – Builtin XMTR\_RETRY\_ON\_ALL\_RESPONSE\_CODES**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.76 Builtin XMTR\_RETRY\_ON\_COMM\_ERROR

**Profils de communication: HART**

**Objet: Relancer si une erreur de communication est détectée pendant la commande 48**

Le builtin XMTR\_RETRY\_ON\_COMM\_ERROR définit le masque de relance sur erreur de communication d'une commande 48, de sorte que la commande 48 soit relancée si une erreur de communication est détectée lors de l'envoi d'une commande 48.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

### Structure lexicale

XMTR\_RETRY\_ON\_COMM\_ERROR (VOID)

L'élément lexical du builtin XMTR\_RETRY\_ON\_COMM\_ERROR est présenté dans le Tableau 126.

**Tableau 126 – Builtin XMTR\_RETRY\_ON\_COMM\_ERROR**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

### 6.3.77 Builtin XMTR\_RETRY\_ON\_COMM\_STATUS

**Profils de communication: HART**

**Objet: Ajouter un masque de relance de statut à la commande 48**

Le builtin XMTR\_RETRY\_ON\_COMM\_STATUS définit le ou les bits corrects dans le masque de relance de statut de communication d'une commande 48, de sorte que la valeur spécifiée de statut de communication d'une commande 48 conduise à la relance de la commande 48. Le statut de communication est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est 1.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`XMTR_RETRY_ON_COMM_STATUS(comm_status)`

Les éléments lexicaux du builtin `XMTR_RETRY_ON_COMM_STATUS` sont présentés dans le Tableau 127.

**Tableau 127 – Builtin XMTR\_RETRY\_ON\_COMM\_STATUS**

| Nom du paramètre            | Type              | Direction      | Utilisation    | Description                                           |
|-----------------------------|-------------------|----------------|----------------|-------------------------------------------------------|
| <code>comm_status</code>    | <code>int</code>  | <code>l</code> | <code>m</code> | Nouveau masque de relance de statut de communication. |
| <code>&lt;return&gt;</code> | <code>VOID</code> | —              | —              | —                                                     |

### 6.3.78 Builtin XMTR\_RETRY\_ON\_DATA

#### Profils de communication: HART

**Objet: Relancer si un bit de données spécifié dans la commande 48 est défini**

Le builtin `XMTR_RETRY_ON_DATA` définit le ou les bits spécifiés dans le masque de relance de données d'une commande 48, de sorte que la commande 48 soit relancée si le bit spécifié est défini dans le champ de données retourné par la commande 48.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction `send_command` pour la mise en œuvre des masques. Voir le builtin `ABORT_ON_RESPONSE_CODE` pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins `send`, `send_trans`, `ext_send_command`, `ext_send_command_trans`, `get_more_status`, `display` et `DISPLAY`.

### Structure lexicale

`XMTR_RETRY_ON_DATA(data, bit)`

Les éléments lexicaux du builtin `XMTR_RETRY_ON_DATA` sont présentés dans le Tableau 128.

**Tableau 128 – Builtin XMTR\_RETRY\_ON\_DATA**

| Nom du paramètre            | Type              | Direction      | Utilisation    | Description                                                 |
|-----------------------------|-------------------|----------------|----------------|-------------------------------------------------------------|
| <code>data</code>           | <code>int</code>  | <code>l</code> | <code>m</code> | Index base zéro dans le champ de données d'une commande 48. |
| <code>bit</code>            | <code>int</code>  | <code>l</code> | <code>m</code> | Numéro de bit (0 à 7). Le bit 0 est le bit de poids faible. |
| <code>&lt;return&gt;</code> | <code>VOID</code> | —              | —              | —                                                           |

### 6.3.79 Builtin XMTR\_RETRY\_ON\_DEVICE\_STATUS

**Profils de communication:** HART

**Objet:** Ajouter un masque de relance de statut à la commande 48

Le builtin XMTR\_RETRY\_ON\_DEVICE\_STATUS définit le ou les bits corrects dans le masque de relance de statut du dispositif d'une commande 48, de sorte que tout bit défini correspondant du statut du dispositif d'une commande 48 conduise à la relance de la commande 48. Le statut du dispositif est défini comme étant le deuxième octet de données retourné dans une transaction.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

XMTR\_RETRY\_ON\_DEVICE\_STATUS(device\_status)

Les éléments lexicaux du builtin XMTR\_RETRY\_ON\_DEVICE\_STATUS sont présentés dans le Tableau 129.

**Tableau 129 – Builtin XMTR\_RETRY\_ON\_DEVICE\_STATUS**

| Nom du paramètre | Type | Direction | Utilisation | Description                                        |
|------------------|------|-----------|-------------|----------------------------------------------------|
| device_status    | INT4 | I         | m           | Nouveau masque de relance de statut du dispositif. |
| <return>         | VOID | —         | —           | —                                                  |

### 6.3.80 Builtin XMTR\_RETRY\_ON\_NO\_DEVICE (déconseillé)

**Profils de communication:** HART

**Objet:** Relancer si aucun dispositif n'est détecté pendant la commande 48

Le builtin XMTR\_RETRY\_ON\_NO\_DEVICE définit le masque de relance en l'absence de dispositif d'une commande 48, de sorte que la commande 48 soit relancée si aucun dispositif n'est détecté lors de l'envoi d'une commande 48.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

#### Structure lexicale

XMTR\_RETRY\_ON\_NO\_DEVICE(VOID)

L'élément lexical du builtin XMTR\_RETRY\_ON\_NO\_DEVICE est présenté dans le Tableau 130.

**Tableau 130 – Builtin XMTR\_RETRY\_ON\_NO\_DEVICE**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

**6.3.81 Builtin XMTR\_RETRY\_ON\_RESPONSE\_CODE****Profils de communication: HART****Objet: Ajouter un masque de relance de code de réponse à la commande 48**

Le builtin XMTR\_RETRY\_ON\_RESPONSE\_CODE définit le bit correct dans le masque de relance de code de réponse d'une commande 48, de sorte que la valeur de code de réponse spécifiée d'une commande 48 conduise à la relance de la commande 48. Le code de réponse est défini comme étant le premier octet de données retourné dans une transaction, lorsque le bit 7 de cet octet est 0.

Les masques de relance et d'interruption sont réinitialisés à leurs valeurs par défaut au début de chaque méthode, de sorte que la nouvelle valeur du masque est valide uniquement pendant la méthode actuelle. Voir la fonction send\_command pour la mise en œuvre des masques. Voir le builtin ABORT\_ON\_RESPONSE\_CODE pour obtenir une liste des masques disponibles et leurs valeurs par défaut.

Le masque affecté par ce builtin est utilisé par les builtins send, send\_trans, ext\_send\_command, ext\_send\_command\_trans, get\_more\_status, display et DISPLAY.

**Structure lexicale**

```
XMTR_RETRY_ON_RESPONSE_CODE(response_code)
```

L'élément lexical du builtin XMTR\_RETRY\_ON\_RESPONSE\_CODE est présenté dans le Tableau 131.

**Tableau 131 – Builtin XMTR\_RETRY\_ON\_RESPONSE\_CODE**

| Nom du paramètre | Type | Direction | Utilisation | Description |
|------------------|------|-----------|-------------|-------------|
| <return>         | VOID | —         | —           | —           |

**6.4 Builtins d'action****6.4.1 Builtin fgetval****Profils de communication: CS, GPE, HART, PB, PN****Objet: Obtenir une valeur de VARIABLE**

Le builtin fgetval est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin retourne la valeur d'une VARIABLE telle qu'elle a été reçue par le dispositif connecté. Des calculs personnalisés peuvent ensuite être effectués sur la valeur de la VARIABLE avant qu'elle ne soit stockée dans l'application EDD. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être récupérée ou si la variable n'est pas du type approprié défini dans le Tableau 9.

**Structure lexicale**

```
fgetval(VOID)
```

L'élément lexical du builtin fgetval est présenté dans le Tableau 132.

**Tableau 132 – Builtin fgetval**

| Nom du paramètre | Type   | Direction | Utilisation | Description            |
|------------------|--------|-----------|-------------|------------------------|
| <return>         | double | O         | m           | Valeur de la VARIABLE. |

**Exemple**

```
double fval;
fval = fgetval();
fval = fval + 10;
```

**6.4.2 Builtin fsetval**

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Définir une valeur de VARIABLE

Le builtin fsetval est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin définit la valeur d'une VARIABLE sur la valeur spécifiée. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être définie ou si la VARIABLE n'est pas du type approprié défini dans le Tableau 9.

**Structure lexicale**

```
fsetval(value)
```

Les éléments lexicaux du builtin fsetval sont présentés dans le Tableau 133.

**Tableau 133 – Builtin fsetval**

| Nom du paramètre | Type   | Direction | Utilisation | Description                       |
|------------------|--------|-----------|-------------|-----------------------------------|
| value            | double | I         | m           | Nouvelle valeur pour la VARIABLE. |
| <return>         | double | O         | m           | Valeur de la VARIABLE.            |

**6.4.3 Builtin get\_date**

**Profils de communication:** FF, ISA100

**Objet:** Obtenir la valeur actuelle d'une VARIABLE de date

Le builtin get\_date est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin retourne la valeur d'une VARIABLE telle qu'elle a été reçue par le dispositif connecté. Des calculs personnalisés peuvent ensuite être effectués sur la VARIABLE avant qu'elle ne soit stockée dans l'application EDD. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être récupérée ou si la variable n'est pas du type approprié défini dans le Tableau 9.

Les méthodes associées aux actions préédition, postédition, postlecture ou préécriture sont exécutées lorsqu'une VARIABLE pour laquelle une de ces actions est définie en tant qu'attribut est lue ou écrite par une application, une méthode utilisateur ou une méthode d'édition.

**Structure lexicale**

```
get_date(data, size)
```

Les éléments lexicaux du builtin `get_date` sont présentés dans le Tableau 134.

**Tableau 134 – Builtin `get_date`**

| Nom du paramètre | Type   | Direction | Utilisation | Description                                                                                                                   |
|------------------|--------|-----------|-------------|-------------------------------------------------------------------------------------------------------------------------------|
| data             | char[] | O         | m           | Valeur retournée de la VARIABLE. La structure de cette mémoire tampon d'octet est définie à l'Annexe B de l'IEC 61804-3: __6. |
| size             | long   | I/O       | m           | Longueur retournée de la VARIABLE.                                                                                            |
| <return>         | long   | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                         |

### Exemple

```
long status, date_size;
char date_value[8];

date_size = 8;
status = get_date(date_value, &date_size);
```

### 6.4.4 Builtin `get_double`

**Profils de communication: FF, ISA100**

**Objet: Obtenir d'une VARIABLE une valeur double précision**

Le builtin `get_double` est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin retourne la valeur de la VARIABLE telle qu'elle a été reçue par le dispositif connecté. Des calculs personnalisés peuvent ensuite être effectués sur la valeur de la VARIABLE avant qu'elle ne soit stockée dans l'application EDD. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être récupérée ou si la variable n'est pas du type approprié défini dans le Tableau 9.

Les méthodes associées aux actions prédiction, postédition, postlecture ou préécriture sont exécutées lorsqu'une VARIABLE pour laquelle une de ces actions est définie en tant qu'attribut est lue par une application ou une autre méthode.

### Structure lexicale

```
get_double(value)
```

Les éléments lexicaux du builtin `get_double` sont présentés dans le Tableau 135.

**Tableau 135 – Builtin `get_double`**

| Nom du paramètre | Type   | Direction | Utilisation | Description                                           |
|------------------|--------|-----------|-------------|-------------------------------------------------------|
| value            | double | O         | m           | Valeur retournée de la VARIABLE.                      |
| <return>         | long   | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

### Exemple

```
long status;
```

<sup>6</sup> En cours d'élaboration. Stade au moment de la publication: IEC RPUB 61804-3:2020.

```
double value;
status = get_double(&value);
```

#### 6.4.5 Builtin get\_float

**Profils de communication:** FF, ISA100

**Objet:** Obtenir d'une VARIABLE une valeur à virgule flottante

Le builtin get\_float est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin retourne la valeur d'une VARIABLE telle qu'elle a été reçue par un dispositif connecté. Des calculs personnalisés peuvent ensuite être effectués sur la valeur de la VARIABLE avant qu'elle ne soit stockée dans l'application EDD. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être récupérée ou si la variable n'est pas du type approprié défini dans le Tableau 9.

Les méthodes associées aux actions préédition, postédition, postlecture ou préécriture sont exécutées lorsqu'une VARIABLE pour laquelle une de ces actions est définie en tant qu'attribut est lue par une application, une méthode utilisateur ou une méthode d'édition.

#### Structure lexicale

```
get_float(value)
```

Les éléments lexicaux du builtin get\_float sont présentés dans le Tableau 136.

**Tableau 136 – Builtin get\_float**

| Nom du paramètre | Type  | Direction | Utilisation | Description                                           |
|------------------|-------|-----------|-------------|-------------------------------------------------------|
| value            | float | O         | m           | Valeur retournée de la VARIABLE.                      |
| <return>         | long  | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

#### Exemple

```
long status;
float value;
status = get_float(&value);
```

#### 6.4.6 Builtin get\_signed

**Profils de communication:** FF, ISA100

**Objet:** Obtenir la valeur signée mise à l'échelle d'une VARIABLE

Le builtin get\_signed est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin retourne la valeur d'une VARIABLE telle qu'elle a été reçue par le dispositif connecté. Des calculs personnalisés peuvent ensuite être effectués sur la valeur de la VARIABLE avant qu'elle ne soit stockée dans l'application EDD. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être récupérée ou si la variable n'est pas du type approprié défini dans le Tableau 9.

Les méthodes associées aux actions préédition, postédition, postlecture ou préécriture sont exécutées lorsqu'une VARIABLE pour laquelle une de ces actions est définie en tant qu'attribut est lue par une application, une méthode utilisateur ou une méthode d'édition.

### Structure lexicale

```
get_signed(value)
```

Les éléments lexicaux du builtin get\_signed sont présentés dans le Tableau 137.

**Tableau 137 – Builtin get\_signed**

| Nom du paramètre | Type | Direction | Utilisation | Description                                           |
|------------------|------|-----------|-------------|-------------------------------------------------------|
| value            | long | O         | m           | Valeur retournée de la VARIABLE signée.               |
| <return>         | long | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

### Exemple

```
long status;
long value;
status = get_signed(&value);
```

### 6.4.7 Builtin get\_string

**Profils de communication: FF, ISA100**

**Objet: Obtenir la valeur de chaîne d'une VARIABLE**

Le builtin get\_string est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin retourne la valeur d'une VARIABLE telle qu'elle a été reçue par un dispositif connecté. Des calculs personnalisés peuvent ensuite être effectués sur la valeur de la VARIABLE avant qu'elle ne soit sauvegardée dans l'application EDD.

Les VARIABLES de ces types de données doivent être gérées par la méthode, car elles ne sont pas prises en charge par le langage de programmation C. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être récupérée ou si la VARIABLE n'est pas du type approprié défini dans le Tableau 9.

Les méthodes associées aux actions préédition, postédition, postlecture ou postécriture sont exécutées lorsqu'une VARIABLE pour laquelle une de ces actions est définie en tant qu'attribut est lue par une application, une méthode utilisateur ou une méthode d'édition.

### Structure lexicale

```
get_string(string, len)
```

Les éléments lexicaux du builtin get\_string sont présentés dans le Tableau 138.

**Tableau 138 – Builtin get\_string**

| Nom du paramètre | Type  | Direction | Utilisation | Description                                                    |
|------------------|-------|-----------|-------------|----------------------------------------------------------------|
| string           | char* | O         | m           | Mémoire tampon pour la chaîne retournée.                       |
| len              | long* | I/O       | m           | Taille maximale de la chaîne. Longueur retournée de la chaîne. |
| <return>         | int   | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.          |



### Exemple

```
long status;
long len;
char buf[256];
status = get_string(buf, &len);
```

### 6.4.8 Builtin get\_unsigned

**Profils de communication: FF, ISA100**

**Objet: Obtenir d'une VARIABLE une valeur non signée**

Le builtin get\_unsigned est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin retourne la valeur d'une VARIABLE telle qu'elle a été reçue par le dispositif connecté. Des calculs personnalisés peuvent ensuite être effectués sur la valeur de la VARIABLE avant qu'elle ne soit stockée dans l'application EDD. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être récupérée ou si la variable n'est pas du type approprié défini dans le Tableau 9.

Les méthodes associées aux actions préédition, postédition, postlecture ou préécriture sont exécutées lorsqu'une VARIABLE pour laquelle une de ces actions est définie en tant qu'attribut est lue par une application, une méthode utilisateur ou une méthode d'édition.

### Structure lexicale

```
get_unsigned(value)
```

Les éléments lexicaux du builtin get\_unsigned sont présentés dans le Tableau 139.

**Tableau 139 – Builtin get\_unsigned**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| value            | unsigned long | O         | m           | Valeur retournée.                                     |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

### Exemple

```
long status;
unsigned long value;
status = get_unsigned(&value);
```

### 6.4.9 Builtin igetval

**Profils de communication: CS, GPE, HART, PB, PN**

**Objet: Obtenir la valeur d'une VARIABLE**

Le builtin igetval est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin retourne la valeur d'une VARIABLE telle qu'elle a été reçue par le dispositif connecté. Des calculs personnalisés peuvent ensuite être effectués sur la valeur de la VARIABLE avant qu'elle ne soit stockée dans l'application EDD. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être récupérée ou si la variable n'est pas du type approprié défini dans le Tableau 9.

### Structure lexicale

`igetval (VOID)`

L'élément lexical du builtin `igetval` est présenté dans le Tableau 140.

**Tableau 140 – Builtin `igetval`**

| Nom du paramètre | Type      | Direction | Utilisation | Description            |
|------------------|-----------|-----------|-------------|------------------------|
| <return>         | long long | O         | m           | Valeur de la VARIABLE. |

### 6.4.10 Builtin `isetval`

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Définir une valeur de VARIABLE

Le builtin `isetval` est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin définit la valeur d'une VARIABLE sur la valeur spécifiée. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être définie ou si la VARIABLE n'est pas du type approprié défini dans le Tableau 9.

### Structure lexicale

`isetval (value)`

Les éléments lexicaux du builtin `isetval` sont présentés dans le Tableau 141.

**Tableau 141 – Builtin `isetval`**

| Nom du paramètre | Type      | Direction | Utilisation | Description                     |
|------------------|-----------|-----------|-------------|---------------------------------|
| value            | long long | I         | m           | Nouvelle valeur de la VARIABLE. |
| <return>         | long long | O         | m           | Valeur de la VARIABLE.          |

### 6.4.11 Builtin `isOffline`

**Profils de communication:** CS, FF, GPE, HART, ISA100, PB, PN

**Objet:** Déterminer si l'application EDD peut actuellement communiquer avec le dispositif de terrain

Le builtin `isOffline` retourne une valeur différente de zéro, lorsque l'état actuel de l'application EDD (dans le contexte de la méthode appelante) est "Offline".

### Structure lexicale

`isOffline()`

L'élément lexical du builtin `isOffline` est présenté dans le Tableau 142.

**Tableau 142 – Builtin isOffline**

| Nom du paramètre | Type | Direction | Utilisation | Description                                                                                                                                                              |
|------------------|------|-----------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <return>         | int  | O         | m           | Valeur différente de zéro si l'application EDD est hors ligne et ne peut pas communiquer avec le dispositif, 0 si l'application EDD peut communiquer avec le dispositif. |

### Exemple

```
int offline;
offline = isOffline();
```

### 6.4.12 Builtin lgetval

**Profils de communication: CS, GPE, PB, PN**

#### Objet

Le builtin lgetval est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin retourne la valeur d'une VARIABLE telle qu'elle a été reçue par le dispositif connecté. Des calculs personnalisés peuvent ensuite être effectués sur la valeur de la VARIABLE avant qu'elle ne soit stockée dans l'application EDD. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être récupérée ou si la variable n'est pas du type approprié défini dans le Tableau 9.

#### Structure lexicale

```
lgetval (VOID)
```

L'élément lexical du builtin lgetval est présenté dans le Tableau 143.

**Tableau 143 – Builtin lgetval**

| Nom du paramètre | Type | Direction | Utilisation | Description            |
|------------------|------|-----------|-------------|------------------------|
| <return>         | int  | O         | m           | Valeur de la VARIABLE. |

### 6.4.13 Builtin lsetval

**Profils de communication: CS, GPE, PB, PN**

#### Objet: Définir une valeur longue

Le builtin lsetval est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin définit la valeur d'une VARIABLE sur la valeur spécifiée. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être définie ou si la VARIABLE n'est pas du type approprié défini dans le Tableau 9.

#### Structure lexicale

```
lsetval (value)
```

Les éléments lexicaux du builtin lsetval sont présentés dans le Tableau 144.

**Tableau 144 – Builtin lsetval**

| Nom du paramètre | Type | Direction | Utilisation | Description                     |
|------------------|------|-----------|-------------|---------------------------------|
| value            | int  | I         | m           | Nouvelle valeur de la VARIABLE. |
| <return>         | int  | O         | m           | Valeur de la VARIABLE.          |

**6.4.14 Builtin put\_date****Profils de communication: FF, ISA100****Objet: Stocker une valeur de date dans la VARIABLE**

Le builtin put\_date est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin définit la valeur d'une VARIABLE sur la valeur spécifiée. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être définie ou si la VARIABLE n'est pas du type approprié défini dans le Tableau 9.

**Structure lexicale**

```
put_date(data, size)
```

Les éléments lexicaux du builtin put\_date sont présentés dans le Tableau 145.

**Tableau 145 – Builtin put\_date**

| Nom du paramètre | Type   | Direction | Utilisation | Description                                           |
|------------------|--------|-----------|-------------|-------------------------------------------------------|
| data             | char[] | I         | m           | Nouvelle valeur de la VARIABLE.                       |
| size             | long   | I         | m           | Longueur de la nouvelle valeur.                       |
| <return>         | long   | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

**Exemple**

```
long date_size, status;
char date_value[7];

/* set DATE_AND_TIME to August 19, 2016 14:30:03 */

date_size = 7;
date_value[0]=0x0B;      /* 3 seconds = 3000 ms = 0xBB8 */
date_value[1]=0xB8;
date_value[2]= 30;       /* 30 minutes */
date_value[3]= 14;       /* 14 hours */
date_value[4]=0xB3;      /* 0xB3 = (5 (Friday) << 5) + 19 (day of month) */
date_value[5]= 8;        /* August = 8 */
date_value[6]= 116;      /* year of 2016 = 116 + 1900 */

status = put_date(date_value, date_size);
```

### 6.4.15 Builtin put\_double

**Profils de communication:** FF, ISA100

**Objet:** Stocker une valeur double précision dans la VARIABLE

Le builtin put\_double est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin définit la valeur d'une VARIABLE sur la valeur spécifiée. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être définie ou si la VARIABLE n'est pas du type approprié défini dans le Tableau 9.

#### Structure lexicale

put\_double(value)

Les éléments lexicaux du builtin put\_double sont présentés dans le Tableau 146.

**Tableau 146 – Builtin put\_double**

| Nom du paramètre | Type   | Direction | Utilisation | Description                                           |
|------------------|--------|-----------|-------------|-------------------------------------------------------|
| value            | double | I         | m           | Nouvelle valeur de la VARIABLE.                       |
| <return>         | long   | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

#### Exemple

```
long status;
double value;
value = 3.14159;
status = put_double(value);
```

### 6.4.16 Builtin put\_float

**Profils de communication:** FF, ISA100

**Objet:** Stocker une valeur à virgule flottante dans la VARIABLE

Le builtin put\_float est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin définit la valeur d'une VARIABLE sur la valeur spécifiée. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être définie ou si la VARIABLE n'est pas du type approprié défini dans le Tableau 9.

#### Structure lexicale

put\_float(value)

Les éléments lexicaux du builtin put\_float sont présentés dans le Tableau 147.

**Tableau 147 – Builtin put\_float**

| Nom du paramètre | Type   | Direction | Utilisation | Description                                                                                                                                                                                                                                                            |
|------------------|--------|-----------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| value            | double | I         | m           | Nouvelle valeur de la VARIABLE.<br><br>La valeur est transmise en tant que valeur double précision pour permettre de transmettre une expression.<br><br>De nombreux compilateurs réalisent une conversion de simple à double précision avant d'évaluer les expressions |
| <return>         | long   | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                                                                                                  |

**Exemple**

```
long status;
float value;
value = 279.55025;
status = put_float((double) value);
```

**6.4.17 Builtin put\_signed****Profils de communication: FF, ISA100****Objet: Stocker une valeur signée dans la VARIABLE**

Le builtin put\_signed est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin définit la valeur d'une VARIABLE sur la valeur spécifiée. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être définie ou si la VARIABLE n'est pas du type approprié spécifié dans le Tableau 9.

**Structure lexicale**

```
put_signed(value)
```

Les éléments lexicaux du builtin put\_signed sont présentés dans le Tableau 148.

**Tableau 148 – Builtin put\_signed**

| Nom du paramètre | Type | Direction | Utilisation | Description                                           |
|------------------|------|-----------|-------------|-------------------------------------------------------|
| value            | long | I         | m           | Nouvelle valeur de la VARIABLE.                       |
| <return>         | long | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

**Exemple**

```
long status;
long value;
value = -3592;
status = put_signed(value);
```

#### 6.4.18 Builtin put\_string

**Profils de communication:** FF, ISA100

**Objet:** Stocker une valeur de chaîne dans la VARIABLE

Le builtin put\_string est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin définit la valeur d'une VARIABLE sur la valeur spécifiée. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être définie ou si la VARIABLE n'est pas du type approprié défini dans le Tableau 9.

Les VARIABLES avec les types de données enumerated, bit\_enumerated et index doivent être gérées par la méthode, car elles ne sont pas prises en charge par le langage de programmation C.

##### Structure lexicale

```
put_string(string, len)
```

Les éléments lexicaux du builtin put\_string sont présentés dans le Tableau 149.

**Tableau 149 – Builtin put\_string**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                             |
|------------------|-----------|-----------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| string           | DD_STRING | I         | m           | Nouvelle valeur de la VARIABLE. Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| len              | long      | I         | m           | Longueur de la nouvelle valeur.                                                                                                                                         |
| <return>         | long      | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                   |

##### Exemple

```
long status;
status = put_string("xyz", 3);
```

#### 6.4.19 Builtin put\_unsigned

**Profils de communication:** FF, ISA100

**Objet:** Stocker une valeur non signée dans la VARIABLE

Le builtin put\_unsigned est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin définit la valeur d'une VARIABLE sur la valeur spécifiée. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être définie ou si la VARIABLE n'est pas du type approprié défini dans le Tableau 9.

##### Structure lexicale

```
put_unsigned(value)
```

Les éléments lexicaux du builtin put\_unsigned sont présentés dans le Tableau 150.

**Tableau 150 – Builtin put\_unsigned**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| value            | unsigned long | I         | o           | Nouvelle valeur de la VARIABLE.                       |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

**Exemple**

```
long status;
unsigned long value;
value = 123;
status = put_unsigned(value);
```

**6.4.20 Builtin sgetval**

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Obtenir la valeur d'une VARIABLE de type chaîne

Le builtin sgetval est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin retourne la valeur d'une VARIABLE telle qu'elle a été reçue par le dispositif connecté. Des calculs personnalisés peuvent ensuite être effectués sur la valeur de la VARIABLE avant qu'elle ne soit stockée dans l'application EDD. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être récupérée ou si la variable n'est pas du type approprié défini dans le Tableau 9.

**Structure lexicale**

```
sgetval (value)
```

Les éléments lexicaux du builtin sgetval sont présentés dans le Tableau 151.

**Tableau 151 – Builtin sgetval**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                    |
|------------------|-----------|-----------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| value            | DD_STRING | O         | m           | Valeur de la VARIABLE. Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| <return>         | int       | O         | m           | BI_SUCCESS si l'assignation a abouti.                                                                                                                          |

**Exemple**

```
DD_STRING sval;
sgetval (sval);
```

Dans l'exemple ci-dessus (en prenant pour hypothèse qu'il s'agit d'une méthode de prédiction sur la VARIABLE "tag", une variable de 8 caractères), sval est défini sur la valeur actuelle de la VARIABLE "tag".



### 6.4.21 Builtin ssetval

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Définir la valeur d'une VARIABLE de type chaîne

Le builtin ssetval est spécifiquement conçu pour être utilisé dans des actions de VARIABLE. Voir le Tableau 9 pour la liste des types d'actions pouvant appeler ce builtin.

Ce builtin définit la valeur d'une VARIABLE sur la valeur spécifiée. Si la chaîne transmise est plus longue que la taille spécifiée pour la VARIABLE, elle est tronquée de façon à l'adapter. Si la chaîne transmise est plus courte que la taille spécifiée pour la VARIABLE, elle est complétée avec des espaces. La méthode est interrompue s'il ne s'agit pas d'une action appelée depuis une VARIABLE, si la valeur de la VARIABLE ne peut pas être définie ou si la VARIABLE n'est pas du type approprié défini dans le Tableau 9.

#### Structure lexicale

ssetval (value)

Les éléments lexicaux du builtin ssetval sont présentés dans le Tableau 152.

**Tableau 152 – Builtin ssetval**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                    |
|------------------|-----------|-----------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| value            | DD_STRING | I         | m           | Valeur de la VARIABLE. Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| <return>         | DD_STRING | O         | m           | Valeur de la VARIABLE.                                                                                                                                         |

## 6.5 Builtins d'accès aux variables

### 6.5.1 Builtin assign

**Profils de communication:** FF, ISA100

**Objet:** Définir la valeur d'un paramètre

Le builtin assign définit la valeur d'une VARIABLE sur la valeur d'une autre VARIABLE. Il lit la valeur de la VARIABLE source (depuis le dispositif ou la table des variables) et définit la valeur de la VARIABLE de destination (dans le dispositif ou la table des variables) sur la valeur de la VARIABLE source.

**NOTE** Le builtin est un raccourci pour effectuer un get\_<type>\_value suivi d'un put\_<type>\_value où <type> est l'un des types de valeurs suivants: date, float, double, signed, string, unsigned.

Les paramètres dst\_id, src\_id, dst\_member\_id et src\_member\_id sont spécifiés à l'aide des builtins ITEM\_ID et MEMBER ID et de la référence de la VARIABLE. La VARIABLE source et la VARIABLE de destination doivent être du même type.

#### Structure lexicale

assign(dst\_id, dst\_member\_id, src\_id, src\_member\_id)

Les éléments lexicaux du builtin assign sont présentés dans le Tableau 153.

**Tableau 153 – Builtin assign**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| dst_id           | unsigned long | I         | m           | ID d'élément de la VARIABLE de destination.           |
| dst_member_id    | unsigned long | I         | m           | ID de membre de la VARIABLE de destination.           |
| src_id           | unsigned long | I         | m           | ID d'élément de la VARIABLE source.                   |
| src_member_id    | unsigned long | I         | m           | ID de membre de la VARIABLE source.                   |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

**Exemple**

```
long status;
status = assign(ITEM_ID(PARAM.OUT), MEMBER_ID(VALUE),
```

**6.5.2 Builtin assign\_double****Profils de communication: CS, GPE, HART, PB, PN****Objet: Assigner une valeur à une VARIABLE de type double**

Le builtin assign\_double assigne une valeur à une VARIABLE. La VARIABLE référencée doit être une VARIABLE de type DOUBLE.

**Structure lexicale**

```
assign_double(device_var, new_value)
```

Les éléments lexicaux du builtin assign\_double sont présentés dans le Tableau 154.

**Tableau 154 – Builtin assign\_double**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                           |
|------------------|-----------|-----------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| device_var       | reference | I         | m           | Nom de la VARIABLE.                                                                                                                                                   |
| new_value        | double    | I         | m           | Nouvelle valeur de la VARIABLE référencée.                                                                                                                            |
| <return>         | int       | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. BI_SUCCESS si l'assignation a abouti et BI_ERROR si l'identifiant de la VARIABLE était non valide ou incorrect. |

**Exemple**

```
assign_double(pressure_upper_range_value, 1.2345678);
```

Dans cet exemple, la VARIABLE pressure\_upper\_range\_value est définie sur la valeur à virgule flottante 1,2345678.

### 6.5.3 Builtin assign\_float

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Assigner une valeur à une VARIABLE de type à virgule flottante

Le builtin assign\_float assigne une valeur à une VARIABLE. La VARIABLE référencée doit être une VARIABLE de type FLOAT.

#### Structure lexicale

```
assign_float(device_var, new_value)
```

Les éléments lexicaux du builtin assign\_float sont présentés dans le Tableau 155.

**Tableau 155 – Builtin assign\_float**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                           |
|------------------|-----------|-----------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| device_var       | reference | I         | m           | Nom de la VARIABLE.                                                                                                                                                   |
| new_value        | double    | I         | m           | Nouvelle valeur de la VARIABLE référencée.                                                                                                                            |
| <return>         | int       | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. BI_SUCCESS si l'assignation a abouti et BI_ERROR si l'identifiant de la VARIABLE était non valide ou incorrect. |

#### Exemple

```
assign_float(pressure_upper_range_value, 1.23);
```

Dans cet exemple, la VARIABLE pressure\_upper\_range\_value est définie sur la valeur à virgule flottante 1,23.

### 6.5.4 Builtin assign\_int

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Assigner une valeur à une VARIABLE de type entier

Le builtin assign\_int assigne une valeur à une VARIABLE. La VARIABLE référencée doit être une VARIABLE de type INTEGER.

#### Structure lexicale

```
assign_int(device_var, new_value)
```

Les éléments lexicaux du builtin assign\_int sont présentés dans le Tableau 156.

**Tableau 156 – Builtin assign\_int**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                           |
|------------------|-----------|-----------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| device_var       | reference | I         | m           | Nom de la VARIABLE.                                                                                                                                                   |
| new_value        | int       | I         | m           | Nouvelle valeur de la VARIABLE référencée.                                                                                                                            |
| <return>         | int       | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. BI_SUCCESS si l'assignation a abouti et BI_ERROR si l'identifiant de la VARIABLE était non valide ou incorrect. |

**Exemple**

```
assign_int(pressure_upper_range_value, 1);
```

Dans cet exemple, la VARIABLE `pressure_upper_range_value` est définie sur la valeur entière 1.

**6.5.5 Builtin assign\_var**

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Assigner une valeur d'une VARIABLE à une autre

Le builtin `assign_var` assigne une valeur de la VARIABLE source à la VARIABLE de destination. Les deux VARIABLES doivent être du même type.

**Structure lexicale**

```
assign_var(destination_var, source_var)
```

Les éléments lexicaux du builtin `assign_var` sont présentés dans le Tableau 157.

**Tableau 157 – Builtin assign\_var**

| Nom du paramètre             | Type      | Direction | Utilisation | Description                                                                                                                                                           |
|------------------------------|-----------|-----------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>destination_var</code> | reference | I         | m           | Nom de la VARIABLE de destination.                                                                                                                                    |
| <code>source_var</code>      | reference | I         | m           | Nom de la VARIABLE source.                                                                                                                                            |
| <return>                     | int       | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. BI_SUCCESS si l'assignation a abouti et BI_ERROR si l'identifiant de la VARIABLE était non valide ou incorrect. |

**Exemple**

```
vassign(pressure_units, range_units);
```

Dans cet exemple, la valeur actuelle de `range_units` est stockée dans la valeur actuelle de `pressure_units`.

**6.5.6 Builtin assign2**

**Profils de communication:** FF, ISA100

**Objet:** Définir la valeur d'une VARIABLE, d'un membre d'enregistrement ou d'un élément de matrice

Le builtin `assign2` lit une valeur dans le bloc source et l'écrit dans le bloc de destination. Dans une application EDD en mémoire cache, la valeur source est extraite de la table de variables du bloc source et stockée dans la table de variables du bloc de destination, tandis que dans une application EDD non en mémoire cache, la valeur source est lue depuis le bloc source dans le dispositif et écrite dans le bloc de destination dans le dispositif.

Les paramètres `dst_blk_id`, `dst_blk_num`, `dst_id` et `dst_member_id` spécifient collectivement la VARIABLE, le membre d'enregistrement ou l'élément de matrice de destination, tandis que les paramètres `src_blk_id`, `src_blk_num`, `src_id` et `src_member_id` spécifient collectivement la VARIABLE, le membre d'enregistrement ou l'élément de matrice source.

Les paramètres `dst_blk_id` et `src_blk_id` spécifient l'ID d'élément du bloc auquel accéder, tandis que les paramètres `dst_blk_num` et `src_blk_num` spécifient les indices relatifs du bloc auquel accéder.

Si le paramètre `dst_id` référence une VARIABLE simple, le paramètre `dst_member_id` est ignoré. Si le paramètre `dst_id` référence un enregistrement, le paramètre `dst_member_id` spécifie un membre de l'enregistrement. Si le paramètre `dst_id` référence un paramètre de matrice, le paramètre `dst_member_id` spécifie un élément de la matrice.

Si le paramètre `src_id` référence une VARIABLE simple, le paramètre `src_member_id` est ignoré. Si le paramètre `src_id` référence un enregistrement, le paramètre `src_member_id` spécifie un membre de l'enregistrement. Si le paramètre `src_id` référence un paramètre de matrice, le paramètre `src_member_id` spécifie un élément de la matrice.

Les paramètres `dst_blk_id`, `src_blk_id`, `dst_id`, `src_id`, `dst_member_id` et `src_member_id` sont généralement spécifiés à l'aide des builtins `ITEM_ID` et `MEMBER_ID`. Les paramètres `dst_blk_num` et `src_blk_num` sont généralement spécifiés à l'aide des builtins `get_block_instance_by_object_index` et `get_block_instance_by_block_tag`.

NOTE La fonction intégrée fournit un raccourci pour effectuer un `get_<type>_value2()` suivi d'un `put_<type>_value2()`, où `<typw>` est l'un des types suivants: `date`, `float`, `double`, `signed`, `string`, `unsigned`.

La valeur source et la valeur de destination de destination doivent être du même type.

### Structure lexicale

```
assign2(dst_blk_id, dst_blk_num, dst_id, dst_member_id, src_blk_id,
src_blk_num, src_id, src_member_id)
```

Les éléments lexicaux du builtin `assign2` sont présentés dans le Tableau 158.

**Tableau 158 – Builtin assign2**

| Nom du paramètre            | Type          | Direction | Utilisation | Description                                                                        |
|-----------------------------|---------------|-----------|-------------|------------------------------------------------------------------------------------|
| <code>dst_blk_id</code>     | unsigned long | I         | m           | ID d'élément du bloc de destination.                                               |
| <code>dst_blk_num</code>    | unsigned long | I         | m           | Numéro d'occurrence du bloc de destination.                                        |
| <code>dst_id</code>         | unsigned long | I         | m           | ID d'élément de la VARIABLE, de l'enregistrement ou de la matrice de destination.  |
| <code>dst_member_id</code>  | unsigned long | I         | m           | ID de membre du membre d'enregistrement ou de l'élément de matrice de destination. |
| <code>src_blk_id</code>     | unsigned long | I         | m           | ID d'élément du bloc source.                                                       |
| <code>src_blk_num</code>    | unsigned long | I         | m           | Numéro d'occurrence du bloc source.                                                |
| <code>src_id</code>         | unsigned long | I         | m           | ID d'élément de la VARIABLE, de l'enregistrement ou de la matrice source.          |
| <code>src_member_id</code>  | unsigned long | I         | m           | ID de membre du membre d'enregistrement ou de l'élément de matrice source.         |
| <code>&lt;return&gt;</code> | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                              |

**Exemple**

```
long status;
unsigned long aiBlock;
aiBlock = ITEM_ID(__analog_input_block);
status = assign2(aiBlock, 0, MEMBER_ID(OUT), MEMBER_ID(VALUE),
aiBlock, 0, MEMBER_ID(PV), MEMBER_ID(VALUE));
```

**6.5.7 Builtin dassign****Profils de communication: CS, GPE, HART, PB, PN****Objet: Assigner une valeur à une VARIABLE de type double**

Le builtin dassign assigne une valeur à une VARIABLE. La VARIABLE référencée doit être une VARIABLE de type DOUBLE.

**Structure lexicale**

```
dassign(device_var, new_value)
```

Les éléments lexicaux du builtin dassign sont présentés dans le Tableau 159.

**Tableau 159 – Builtin dassign**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                           |
|------------------|-----------|-----------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| device_var       | reference | I         | m           | Nom de la VARIABLE.                                                                                                                                                   |
| new_value        | double    | I         | m           | Nouvelle valeur de la VARIABLE référencée.                                                                                                                            |
| <return>         | int       | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. BI_SUCCESS si l'assignation a abouti et BI_ERROR si l'identifiant de la VARIABLE était non valide ou incorrect. |

**6.5.8 Builtin fassign****Profils de communication: CS, GPE, HART, PB, PN****Objet: Assigner une valeur à une VARIABLE de type à virgule flottante**

Le builtin fassign assigne une valeur à une VARIABLE. La VARIABLE référencée doit être une VARIABLE de type FLOAT.

**Structure lexicale**

```
fassign(device_var, new_value)
```

Les éléments lexicaux du builtin fassign sont présentés dans le Tableau 160.

**Tableau 160 – Builtin fassign**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                           |
|------------------|-----------|-----------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| device_var       | reference | I         | m           | Nom de la VARIABLE.                                                                                                                                                   |
| new_value        | double    | I         | m           | Nouvelle valeur de la VARIABLE référencée.                                                                                                                            |
| <return>         | int       | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. BI_SUCCESS si l'assignation a abouti et BI_ERROR si l'identifiant de la VARIABLE était non valide ou incorrect. |

### 6.5.9 Builtin float\_value

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Obtenir la valeur d'une VARIABLE de type à virgule flottante

Le builtin float\_value retourne la valeur de la VARIABLE spécifiée. La VARIABLE référencée doit être de type FLOAT.

#### Structure lexicale

```
float_value(source_var_name)
```

Les éléments lexicaux du builtin float\_value sont présentés dans le Tableau 161.

**Tableau 161 – Builtin float\_value**

| Nom du paramètre | Type      | Direction | Utilisation | Description                      |
|------------------|-----------|-----------|-------------|----------------------------------|
| source_var_name  | reference | I         | m           | Nom d'une référence de VARIABLE. |
| <return>         | double    | O         | m           | Valeur de la VARIABLE.           |

#### Exemple

```
float fval;
fval = float_value(pressure_upper_range_value);
```

Dans cet exemple, la valeur de pressure\_upper\_range\_value est retournée et stockée dans le paramètre fval de la variable de méthode.

### 6.5.10 Builtin fvar\_value

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Obtenir la valeur d'une VARIABLE de type à virgule flottante

Le builtin fvar\_value retourne la valeur de la VARIABLE spécifiée. La VARIABLE référencée doit être de type FLOAT.

#### Structure lexicale

```
fvar_value(source_var)
```

Les éléments lexicaux du builtin fvar\_value sont présentés dans le Tableau 162.

**Tableau 162 – Builtin fvar\_value**

| Nom du paramètre | Type      | Direction | Utilisation | Description                      |
|------------------|-----------|-----------|-------------|----------------------------------|
| source_var       | reference | I         | m           | Nom de la référence de VARIABLE. |
| <return>         | double    | O         | m           | Valeur de la VARIABLE.           |

### 6.5.11 Builtin get\_date\_value

**Profils de communication:** FF, ISA100

**Objet:** Obtenir la valeur actuelle d'une VARIABLE de date

Le builtin get\_date\_value extrait de la mémoire cache ou du dispositif la valeur actuelle mise à l'échelle de la VARIABLE spécifiée et la retourne.

La valeur est une mémoire tampon d'octet qui peut contenir jusqu'à huit caractères et une VARIABLE de type date-and-time, time ou duration du dispositif.

Les paramètres id et member\_id sont spécifiés en utilisant les builtins ITEM\_ID et MEMBER\_ID et le nom ou la référence de la VARIABLE en question.

### Structure lexicale

```
get_date_value(id, member_id, data, size)
```

Les éléments lexicaux du builtin get\_date\_value sont présentés dans le Tableau 163.

**Tableau 163 – Builtin get\_date\_value**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                  |
|------------------|---------------|-----------|-------------|--------------------------------------------------------------|
| id               | unsigned long | I         | m           | ID d'une référence de VARIABLE.                              |
| member_id        | unsigned long | I         | m           | ID de membre de la VARIABLE à laquelle accéder.              |
| data             | char[]        | O         | m           | Mémoire tampon de 8 octets max. pour le résultat du builtin. |
| size             | long          | O         | m           | Taille de la mémoire tampon utilisée.                        |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.        |

### Exemple

```
long status, date_size;
char date_buf[8];
```

```
status = get_date_value(ITEM_ID(PARAM.CALIBRATION), MEMBER_ID(DATE),
date_buf, &date_size);
```

### 6.5.12 Builtin get\_date\_value2

**Profils de communication:** FF, ISA100

**Objet:** Extraire la valeur d'une VARIABLE, d'un membre d'enregistrement ou d'un élément de matrice

Le builtin get\_date\_value2 extrait de la mémoire cache ou du dispositif la valeur actuelle mise à l'échelle de la VARIABLE spécifiée et la retourne.

La valeur est une mémoire tampon d'octets qui peut contenir jusqu'à huit caractères et une VARIABLE de type date-and-time, time ou duration du dispositif.

Le paramètre blk\_id spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre blk\_num spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre id référence une VARIABLE simple, le paramètre member\_id est ignoré. Si le paramètre id référence un enregistrement, le paramètre member\_id spécifie un membre de l'enregistrement. Si le paramètre id référence un paramètre de matrice, le paramètre member\_id spécifie un élément de la matrice.

Les paramètres blk\_id, id et member\_id sont généralement spécifiés à l'aide des builtins ITEM\_ID et MEMBER\_ID.



Le paramètre blk\_num est généralement spécifié à l'aide des builtins get\_block\_instance\_by\_object\_index et get\_block\_instance\_by\_block\_tag.

Les paramètres value et length spécifient une mémoire tampon qui, après retour, contient jusqu'à huit caractères du type de données Date, Time of Day ou Time Difference.

Le type de la VARIABLE, du membre d'enregistrement ou de l'élément de matrice doit être l'un des suivants:

- DATE\_AND\_TIME
- TIME
- DURATION

### Structure lexicale

get\_date\_value2(blk\_id, blk\_num, id, member\_id, data, size)

Les éléments lexicaux du builtin get\_date\_value2 sont présentés dans le Tableau 164.

**Tableau 164 – Builtin get\_date\_value2**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                      |
|------------------|---------------|-----------|-------------|------------------------------------------------------------------|
| blk_id           | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.           |
| blk_num          | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder. |
| id               | unsigned long | I         | m           | ID d'une référence de VARIABLE, RECORD ou ARRAY.                 |
| member_id        | unsigned long | I         | m           | Membre d'enregistrement ou élément de matrice auquel accéder.    |
| data             | char[]        | O         | m           | Mémoire tampon de 8 octets max. pour le résultat du builtin.     |
| size             | long          | O         | m           | Taille de la mémoire tampon utilisée.                            |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.            |

### Exemple

```
long status, date_size;
char date_buf[8];

status = get_date_value2(ITEM_ID(transducer_block), 0,
MEMBER_ID(CALIBRATION), MEMBER_ID(DATE), date_buf, &date_size);
```

### 6.5.13 Builtin get\_double\_value

**Profils de communication: FF, ISA100**

**Objet: Obtenir la valeur actuelle d'une VARIABLE double à virgule flottante**

Le builtin get\_double\_value extrait de la mémoire cache ou du dispositif la valeur actuelle mise à l'échelle de la VARIABLE spécifiée et la retourne.

Les paramètres id et member\_id sont spécifiés en utilisant les builtins ITEM\_ID et MEMBER\_ID et le nom ou la référence de la VARIABLE.

La variable doit avoir un type de données DOUBLE.

### Structure lexicale

```
get_double_value(id, member_id, value)
```

Les éléments lexicaux du builtin `get_double_value` sont présentés dans le Tableau 165.

**Tableau 165 – Builtin `get_double_value`**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| id               | unsigned long | I         | m           | ID d'élément de la VARIABLE à laquelle accéder.       |
| member_id        | unsigned long | I         | m           | ID de membre de la VARIABLE à laquelle accéder.       |
| value            | double        | O         | m           | Valeur retournée de la VARIABLE.                      |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

### Exemple

```
long status;
double value;
status = get_double_value(ITEM_ID(PARAM.SAMPLE), 0, &value);
```

#### 6.5.14 Builtin `get_double_value2`

**Profils de communication: FF, ISA100**

**Objet: Obtenir la valeur actuelle d'une VARIABLE, d'un membre d'enregistrement ou d'un élément de matrice**

Le builtin `get_double_value2` extrait de la mémoire cache ou du dispositif la valeur actuelle mise à l'échelle de la VARIABLE, du membre d'enregistrement ou de l'élément de matrice spécifié et la retourne.

Le paramètre `blk_id` spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre `blk_num` spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre `id` référence une VARIABLE simple, le paramètre `member_id` est ignoré. Si le paramètre `id` référence un enregistrement, le paramètre `member_id` spécifie un membre de l'enregistrement. Si le paramètre `id` référence un paramètre de matrice, le paramètre `member_id` spécifie un élément de la matrice.

Les paramètres `blk_id`, `id` et `member_id` sont spécifiés en utilisant les builtins `ITEM_ID` et `MEMBER_ID` et le nom ou la référence de la VARIABLE. Le paramètre `blk_num` est généralement spécifié à l'aide des builtins `get_block_instance_by_object_index` et `get_block_instance_by_block_tag`.

La VARIABLE, le membre d'enregistrement ou la matrice doit avoir un type de données DOUBLE.

### Structure lexicale

```
get_double_value2(blk_id, blk_num, id, member_id, value)
```

Les éléments lexicaux du builtin `get_double_value2` sont présentés dans le Tableau 166.

**Tableau 166 – Builtin get\_double\_value2**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                      |
|------------------|---------------|-----------|-------------|------------------------------------------------------------------|
| blk_id           | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.           |
| blk_num          | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder. |
| id               | unsigned long | I         | m           | ID d'élément de la VARIABLE à laquelle accéder.                  |
| member_id        | unsigned long | I         | m           | ID de membre de la VARIABLE à laquelle accéder.                  |
| value            | double        | O         | m           | Valeur retournée de la VARIABLE.                                 |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.            |

### Exemple

```
long status;
double value;
status = get_double_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(SAMPLE), 0, &value);
```

### 6.5.15 Builtin get\_float\_value

**Profils de communication: FF, ISA100**

**Objet: Obtenir la valeur actuelle mise à l'échelle d'une VARIABLE à virgule flottante**

Le builtin get\_float\_value extrait de la mémoire cache ou du dispositif la valeur actuelle mise à l'échelle de la VARIABLE spécifiée et la retourne.

Les paramètres id et member\_id sont spécifiés en utilisant les builtins ITEM\_ID et MEMBER\_ID et le nom ou la référence de la VARIABLE.

La variable doit avoir un type de données FLOAT.

### Structure lexicale

```
get_float_value(id, member_id, value)
```

Les éléments lexicaux du builtin get\_float\_value sont présentés dans le Tableau 167.

**Tableau 167 – Builtin get\_float\_value**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| id               | unsigned long | I         | m           | ID d'élément de la VARIABLE à laquelle accéder.       |
| member_id        | unsigned long | I         | m           | ID de membre de la VARIABLE à laquelle accéder.       |
| value            | float         | O         | m           | Valeur retournée de la VARIABLE.                      |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

**Exemple**

```
long status;
float value;
status = get_float_value(ITEM_ID(PARAM.SAMPLE), 0, &value);
```

**6.5.16 Builtin get\_float\_value2****Profils de communication: FF, ISA100**

**Objet: Extraire la valeur d'une VARIABLE, d'un membre d'enregistrement ou d'un élément de matrice**

Le builtin `get_float_value2` extrait de la mémoire cache ou du dispositif la valeur actuelle mise à l'échelle de la VARIABLE spécifiée et la retourne.

Le paramètre `blk_id` spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre `blk_num` spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre `id` référence une VARIABLE simple, le paramètre `member_id` est ignoré. Si le paramètre `id` référence un enregistrement, le paramètre `member_id` spécifie un membre de l'enregistrement. Si le paramètre `id` référence un paramètre de matrice, le paramètre `member_id` spécifie un élément de la matrice.

Les paramètres `blk_id`, `id` et `member_id` sont spécifiés en utilisant les builtins `ITEM_ID` et `MEMBER_ID` et le nom ou la référence de la VARIABLE. Le paramètre `blk_num` est généralement spécifié à l'aide des builtins `get_block_instance_by_object_index` et `get_block_instance_by_block_tag`.

Le type de la VARIABLE, du membre d'enregistrement ou de l'élément de matrice doit être `FLOAT`.

**Structure lexicale**

```
get_float_value2(blk_id, blk_num, id, member_id, value)
```

Les éléments lexicaux du builtin `get_float_value2` sont présentés dans le Tableau 168.

**Tableau 168 – Builtin get\_float\_value2**

| Nom du paramètre       | Type          | Direction | Utilisation | Description                                                      |
|------------------------|---------------|-----------|-------------|------------------------------------------------------------------|
| <code>blk_id</code>    | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.           |
| <code>blk_num</code>   | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder. |
| <code>id</code>        | unsigned long | I         | m           | ID d'élément de la VARIABLE à laquelle accéder.                  |
| <code>member_id</code> | unsigned long | I         | m           | ID de membre de la VARIABLE à laquelle accéder.                  |
| <code>value</code>     | float         | O         | m           | Valeur retournée de la VARIABLE.                                 |
| <return>               | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.            |

### Exemple

```
long status;
float value;
status = get_float_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(SAMPLE), 0, &value);
```

### 6.5.17 Builtin get\_signed\_value

**Profils de communication: FF, ISA100**

**Objet: Obtenir la valeur actuelle mise à l'échelle d'une VARIABLE entière signée**

Le builtin get\_signed\_value extrait de la mémoire cache ou du dispositif la valeur actuelle mise à l'échelle de la VARIABLE spécifiée et la retourne.

L'ID et le member\_id sont spécifiés en utilisant les builtins ITEM\_ID et MEMBER\_ID et le nom ou la référence de la VARIABLE. La VARIABLE doit avoir un type de données signed long.

#### Structure lexicale

```
get_signed_value(id, member_id, value)
```

Les éléments lexicaux du builtin get\_signed\_value sont présentés dans le Tableau 169.

**Tableau 169 – Builtin get\_signed\_value**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| id               | unsigned long | I         | m           | ID d'élément de la VARIABLE à laquelle accéder.       |
| member_id        | unsigned long | I         | m           | ID de membre de la VARIABLE à laquelle accéder.       |
| value            | signed long   | O         | m           | Valeur retournée de la VARIABLE signée.               |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

### Exemple

```
long status;
long value;
status = get_signed_value(ITEM_ID(PARAM.PV_SCALE), MEMBER_ID(DECIMAL_PT),
&value);
```

### 6.5.18 Builtin get\_signed\_value2

**Profils de communication: FF, ISA100**

**Objet: Extraire la valeur d'une VARIABLE, d'un membre d'enregistrement ou d'un élément de matrice**

Le builtin get\_signed\_value2 extrait de la mémoire cache ou du dispositif la valeur actuelle mise à l'échelle de la VARIABLE, du membre d'enregistrement ou de l'élément de matrice spécifié et la retourne.

Le paramètre blk\_id spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre blk\_num spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre `id` référence une VARIABLE simple, le paramètre `member_id` est ignoré. Si le paramètre `id` référence un enregistrement, le paramètre `member_id` spécifie un membre de l'enregistrement. Si le paramètre `id` référence un paramètre de matrice, le paramètre `member_id` spécifie un élément de la matrice.

Les paramètres `blk_id`, `id` et `member_id` sont spécifiés à l'aide des builtins `ITEM_ID` et `MEMBER_ID`. Le paramètre `blk_num` est spécifié à l'aide des builtins `get_block_instance_by_object_index` et `get_block_instance_by_block_tag`.

La VARIABLE, le membre d'enregistrement ou l'élément de matrice doit avoir un type de données signed long.

### Structure lexicale

```
get_signed_value2(blk_id, blk_num, id, member_id, value)
```

Les éléments lexicaux du builtin `get_signed_value2` sont présentés dans le Tableau 170.

**Tableau 170 – Builtin `get_signed_value2`**

| Nom du paramètre            | Type          | Direction | Utilisation | Description                                                      |
|-----------------------------|---------------|-----------|-------------|------------------------------------------------------------------|
| <code>blk_id</code>         | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.           |
| <code>blk_num</code>        | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder. |
| <code>id</code>             | unsigned long | I         | m           | ID d'élément de la VARIABLE à laquelle accéder.                  |
| <code>member_id</code>      | unsigned long | I         | m           | ID de membre de la VARIABLE à laquelle accéder.                  |
| <code>value</code>          | signed long   | O         | m           | Valeur retournée de la VARIABLE signée.                          |
| <code>&lt;return&gt;</code> | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.            |

### Exemple

```
long status;
long value;
status = get_signed_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(PV_SCALE), MEMBER_ID(DECIMAL_PT), &value);
```

#### 6.5.19 Builtin `get_string_value`

**Profils de communication:** FF, ISA100

**Objet:** Obtenir la valeur actuelle d'une VARIABLE de chaîne

Le builtin `get_string_value` extrait de la mémoire cache ou du dispositif la valeur de chaîne actuelle de la VARIABLE spécifiée et la retourne.

Les paramètres `id` et `member_id` sont spécifiés en utilisant les builtins `ITEM_ID` et `MEMBER_ID` et le nom ou la référence de la variable en question.

La VARIABLE doit avoir un type de données char et être une mémoire tampon d'octet qui peut contenir différents types de données non-ANSI, tels que:

- VISIBLE
- OCTET

- PASSWORD
- BITSTRING
- EUC
- ASCII

### Structure lexicale

```
get_string_value(id, member_id, string, len)
```

Les éléments lexicaux du builtin `get_string_value` sont présentés dans le Tableau 171.

**Tableau 171 – Builtin `get_string_value`**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                                                    |
|------------------|---------------|-----------|-------------|------------------------------------------------------------------------------------------------|
| id               | unsigned long | I         | m           | ID d'une référence de VARIABLE.                                                                |
| member_id        | unsigned long | I         | m           | ID de membre d'un BLOCK_A, PARAMETER_LIST, RECORD, VALUE_ARRAY, COLLECTION ou REFERENCE_ARRAY. |
| string           | char*         | O         | m           | Mémoire tampon de la chaîne de résultat.                                                       |
| len              | long          | O         | m           | Taille de la chaîne de résultat.                                                               |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                          |

### Exemple

```
long status;
long len;
char buf[256];
len = 256;
status = get_string_value(ITEM_ID(PARAM.TAG_DESC), 0, buf, &len);
```

### 6.5.20 Builtin `get_string_value2`

**Profils de communication:** FF, ISA100

**Objet:** Extraire la valeur d'une VARIABLE, d'un membre d'enregistrement ou d'un élément de matrice

Le builtin `get_string_value2` extrait de la mémoire cache ou du dispositif la valeur de chaîne actuelle de la VARIABLE, du membre d'enregistrement ou de l'élément de matrice spécifié et la retourne.

Le paramètre `blk_id` spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre `blk_num` spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre `id` référence une VARIABLE simple, le paramètre `member_id` est ignoré. Si le paramètre `id` référence un enregistrement, le paramètre `member_id` spécifie un membre de l'enregistrement. Si le paramètre `id` référence un paramètre de matrice, le paramètre `member_id` spécifie un élément de la matrice.

Les paramètres `blk_id`, `id` et `member_id` sont spécifiés à l'aide des builtins `ITEM_ID` et `MEMBER_ID`. Le paramètre `blk_num` est spécifié à l'aide des builtins `get_block_instance_by_object_index` et `get_block_instance_by_block_tag`.

Le type de la VARIABLE, du membre d'enregistrement ou de l'élément de matrice doit être l'un des suivants:

- EUC
- ASCII
- PASSWORD
- BITSTRING
- VISIBLE
- OCTET

### Structure lexicale

```
get_string_value2(blk_id, blk_num, id, member_id, string, len)
```

Les éléments lexicaux du builtin `get_string_value2` sont présentés dans le Tableau 172.

**Tableau 172 – Builtin `get_string_value2`**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                                                    |
|------------------|---------------|-----------|-------------|------------------------------------------------------------------------------------------------|
| blk_id           | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.                                         |
| blk_num          | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder.                               |
| id               | unsigned long | I         | m           | ID d'une référence de VARIABLE.                                                                |
| member_id        | unsigned long | I         | m           | ID de membre d'un BLOCK_A, PARAMETER_LIST, RECORD, VALUE_ARRAY, COLLECTION ou REFERENCE_ARRAY. |
| string           | char*         | O         | m           | Spécifie la mémoire tampon de la chaîne de résultat.                                           |
| len              | long          | O         | m           | Taille de la chaîne de résultat.                                                               |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                          |

### Exemple

```
long status;
long len;
char buf[256];
len = 256;
status = get_string_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(TAG_DESC), 0, buf, &len);
```

#### 6.5.21 Builtin `get_unsigned_value`

**Profils de communication:** FF, ISA100

**Objet:** Obtenir la valeur actuelle d'une VARIABLE entière non signée

Le builtin `get_unsigned_value` extrait de la mémoire cache ou du dispositif la valeur actuelle mise à l'échelle de la VARIABLE spécifiée et la retourne.

Les paramètres `id` et `member_id` sont spécifiés en utilisant les builtins `ITEM_ID` et `MEMBER_ID` et le nom ou la référence de la VARIABLE en question.



La VARIABLE doit avoir un type de données unsigned. Une valeur non signée peut contenir des VARIABLES des types de données suivants:

- UNSIGNED
- ENUMERATED
- BIT\_ENUMERATED
- INDEX
- BOOLEAN

Les VARIABLES avec les types de données enumerated, bit\_enumerated et index doivent être gérées par la méthode, car elles ne sont pas prises en charge par le langage de programmation C.

### Structure lexicale

`get_unsigned_value(id, member_id, value)`

Les éléments lexicaux du builtin `get_unsigned_value` sont présentés dans le Tableau 173.

**Tableau 173 – Builtin `get_unsigned_value`**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| id               | unsigned long | I         | m           | ID d'élément de la VARIABLE à laquelle accéder.       |
| member_id        | unsigned long | I         | m           | ID de membre de la VARIABLE à laquelle accéder.       |
| value            | unsigned long | O         | m           | Valeur retournée de la VARIABLE.                      |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

### Exemple

```
long status;
unsigned long value;
status = get_unsigned_value(ITEM_ID(PARAM.PV_STATE), 0, &value);
```

### 6.5.22 Builtin `get_unsigned_value2`

**Profils de communication:** FF, ISA100

**Objet:** Extraire la valeur d'une VARIABLE, d'un membre d'enregistrement ou d'un élément de matrice

Le builtin `get_unsigned_value2` extrait de la mémoire cache ou du dispositif la valeur actuelle mise à l'échelle de la VARIABLE, du membre d'enregistrement ou de l'élément de matrice spécifié et la retourne.

Le paramètre `blk_id` spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre `blockInstance` spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre `id` référence une VARIABLE simple, le paramètre `member_id` est ignoré. Si le paramètre `id` référence un enregistrement, le paramètre `member_id` spécifie un membre de l'enregistrement. Si le paramètre `id` référence un paramètre de matrice, le paramètre `member_id` spécifie un élément de la matrice.

Les paramètres blk\_id, id et member\_id sont spécifiés à l'aide des builtins ITEM\_ID et MEMBER\_ID. Le paramètre blk\_num est spécifié à l'aide des builtins get\_block\_instance\_by\_object\_index et get\_block\_instance\_by\_block\_tag.

La VARIABLE doit avoir un type de données unsigned. Une valeur non signée peut contenir des VARIABLES des types de données suivants:

- UNSIGNED
- ENUMERATED
- BIT\_ENUMERATED
- INDEX
- BOOLEAN

Les VARIABLES avec les types de données enumerated, bit\_enumerated et index doivent être gérées par la méthode, car elles ne sont pas prises en charge par le langage de programmation C.

### Structure lexicale

```
get_unsigned_value2(blk_id, blk_num, id, member_id, value)
```

Les éléments lexicaux du builtin get\_unsigned\_value2 sont présentés dans le Tableau 174.

**Tableau 174 – Builtin get\_unsigned\_value2**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                      |
|------------------|---------------|-----------|-------------|------------------------------------------------------------------|
| blk_id           | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.           |
| blk_num          | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder. |
| id               | unsigned long | I         | m           | ID d'élément de la VARIABLE à laquelle accéder.                  |
| member_id        | unsigned long | I         | m           | ID de membre de la VARIABLE à laquelle accéder.                  |
| value            | unsigned long | O         | m           | Valeur retournée de la VARIABLE.                                 |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.            |

### Exemple

```
long status;
unsigned long value;
status = get_unsigned_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(PV_STATE), 0, &value);
```

### 6.5.23 Builtin iassign

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Assigner une valeur à une VARIABLE de type entier

Le builtin iassign assigne la valeur spécifiée à la VARIABLE. La VARIABLE doit référencer une VARIABLE de type INTEGER.

### Structure lexicale

```
iassign(device_var, new_value)
```

Les éléments lexicaux du builtin iassign sont présentés dans le Tableau 175.

**Tableau 175 – Builtin iassign**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                                                                                                                                           |
|------------------|-----------|-----------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| device_var       | reference | I         | m           | Nom de la VARIABLE à laquelle accéder.                                                                                                                                |
| new_value        | int       | I         | m           | Nouvelle valeur de la VARIABLE.                                                                                                                                       |
| <return>         | int       | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. BI_SUCCESS si l'assignation a abouti et BI_ERROR si l'identifiant de la VARIABLE était non valide ou incorrect. |

#### 6.5.24 Builtin int\_value

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Obtenir la valeur d'une VARIABLE de type entier

Le builtin int\_value retourne la valeur de la VARIABLE spécifiée. La VARIABLE doit être de type INTEGER.

##### Structure lexicale

int\_value(variable)

Les éléments lexicaux du builtin int\_value sont présentés dans le Tableau 176.

**Tableau 176 – Builtin int\_value**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                 |
|------------------|-----------|-----------|-------------|---------------------------------------------|
| variable         | reference | I         | m           | VARIABLE dont la valeur doit être extraite. |
| <return>         | int       | O         | m           | Valeur de la VARIABLE.                      |

#### 6.5.25 Builtin ivar\_value

**Profils de communication:** CS, GPE, HART, PB, PN

**Objet:** Obtenir la valeur d'une VARIABLE de type entier

Le builtin ivar\_value retourne la valeur de la VARIABLE spécifiée. Le paramètre source\_var\_name de la VARIABLE doit être de type INTEGER.

##### Structure lexicale

ivar\_value(source\_var\_name)

Les éléments lexicaux du builtin ivar\_value sont présentés dans le Tableau 177.

**Tableau 177 – Builtin ivar\_value**

| Nom du paramètre | Type      | Direction | Utilisation | Description            |
|------------------|-----------|-----------|-------------|------------------------|
| source_var_name  | reference | I         | m           | Nom de la VARIABLE.    |
| <return>         | int       | O         | m           | Valeur de la VARIABLE. |

### 6.5.26 Builtin lassign

**Profils de communication:** CS, GPE, PB, PN

**Objet:** Assigner une valeur longue à une VARIABLE

Le builtin lassign assigne la valeur spécifiée à la VARIABLE. La VARIABLE doit référencer une VARIABLE de type long.

#### Structure lexicale

```
lassign(var_name, new_value)
```

Les éléments lexicaux du builtin lassign sont présentés dans le Tableau 178.

**Tableau 178 – Builtin lassign**

| Nom du paramètre | Type      | Direction | Utilisation | Description                                           |
|------------------|-----------|-----------|-------------|-------------------------------------------------------|
| var_name         | reference | I         | m           | Nom de la VARIABLE.                                   |
| new_value        | long      | I         | m           | Nouvelle valeur de la VARIABLE.                       |
| <return>         | int       | O         | m           | Un des codes de retour spécifiés dans le Tableau 377. |

### 6.5.27 Builtin long\_value

**Profils de communication:** CS, GPE, PB, PN

**Objet:** Obtenir la valeur longue d'une VARIABLE

Le builtin long\_value retourne la valeur de la VARIABLE spécifiée. Le paramètre source\_var\_name de la VARIABLE doit référencer une VARIABLE de type long.

#### Structure lexicale

```
long_value(source_var_name)
```

Les éléments lexicaux du builtin long\_value sont présentés dans le Tableau 179.

**Tableau 179 – Builtin long\_value**

| Nom du paramètre | Type      | Direction | Utilisation | Description            |
|------------------|-----------|-----------|-------------|------------------------|
| source_var_name  | reference | I         | m           | Nom de la VARIABLE.    |
| <return>         | int       | O         | m           | Valeur de la VARIABLE. |

### 6.5.28 Builtin lvar\_value

**Profils de communication:** CS, GPE, PB, PN

**Objet:** Obtenir une valeur longue

Le builtin lvar\_value retourne la valeur de la VARIABLE spécifiée.

#### Structure lexicale

```
lvar_value(source_var_name)
```

Les éléments lexicaux du builtin lvar\_value sont présentés dans le Tableau 180.

**Tableau 180 – Builtin lvar\_value**

| Nom du paramètre | Type      | Direction | Utilisation | Description            |
|------------------|-----------|-----------|-------------|------------------------|
| source_var_name  | reference | I         | m           | Nom de la VARIABLE.    |
| <return>         | long      | O         | m           | Valeur de la VARIABLE. |

**6.5.29 Builtin put\_date\_value****Profils de communication: FF, ISA100****Objet: Placer la valeur spécifiée d'une variable date\_and\_time, time ou duration**

Le builtin put\_date\_value stocke la valeur fournie de la VARIABLE spécifiée mise à l'échelle dans la mémoire cache ou dans le dispositif.

Les paramètres id et member\_id sont spécifiés en utilisant les builtins ITEM\_ID et MEMBER\_ID et le nom ou la référence de la VARIABLE en question.

Le builtin place la valeur spécifiée de la VARIABLE date\_and\_time, time ou duration dans la mémoire cache ou dans le dispositif.

La VARIABLE doit avoir un type de données char. La chaîne de caractères peut contenir jusqu'à huit caractères et contenir une VARIABLE des types de données suivants:

- DATE\_AND\_TIME
- TIME
- DURATION

**Structure lexicale**

```
put_date_value(id, member_id, data, size)
```

Les éléments lexicaux du builtin put\_date\_value sont présentés dans le Tableau 181.

**Tableau 181 – Builtin put\_date\_value**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| id               | unsigned long | I         | o           | ID d'élément de la VARIABLE à laquelle accéder.       |
| member_id        | unsigned long | I         | o           | ID de membre de la VARIABLE à laquelle accéder.       |
| data             | char[]        | I         | m           | Nouvelle valeur de la VARIABLE.                       |
| size             | long          | I         | m           | Longueur de la nouvelle valeur.                       |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

**Exemple**

```

long duration_size, status;
char duration_value[6];

/* set DURATION to 25 (days): 10 (hours): 20: 05.218 */

duration_size = 6;
duration_value[0] = 0x02;    /*0x0237B4E2 = 37205218 ms since midnight */
duration_value[1] = 0x37;
duration_value[2] = 0xB4;
duration_value[3] = 0xE2;
duration_value[4] = 0x00;    /*0x0019 = 25 days */
duration_value[5] = 0x19;

status = put_date_value (ITEM_ID (PARAM.CALIBRATION), MEMBER_ID (DURATION),
duration_value, duration_size);

```

**6.5.30 Builtin put\_date\_value2****Profils de communication: FF, ISA100****Objet: Définir la valeur d'une VARIABLE, d'un membre d'enregistrement ou d'un élément de matrice**

Le builtin put\_date\_value2 stocke la valeur fournie de la VARIABLE spécifiée mise à l'échelle dans la mémoire cache ou dans le dispositif.

Le paramètre blk\_id spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre blk\_num spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre id référence une VARIABLE simple, le paramètre member\_id est ignoré. Si le paramètre id référence un enregistrement, le paramètre member\_id spécifie un membre de l'enregistrement. Si le paramètre id référence un paramètre de matrice, le paramètre member\_id spécifie un élément de la matrice.

Les paramètres blk\_id, id et member\_id sont spécifiés à l'aide des builtins ITEM\_ID et MEMBER\_ID. Le paramètre blk\_num est spécifié à l'aide des fonctions intégrées get\_block\_instance\_by\_object\_index et get\_block\_instance\_by\_block\_tag des builtins.

La VARIABLE, le membre d'enregistrement ou l'élément de matrice doit avoir un type de données char. La chaîne de caractères peut contenir jusqu'à huit caractères et contenir une VARIABLE des types de données suivants:

- DATA\_AND\_TIME
- TIME
- DURATION

**Structure lexicale**

```
put_date_value2(blk_id, blk_num, id, member_id, data, size)
```

Les éléments lexicaux du builtin put\_date\_value2 sont présentés dans le Tableau 182.

**Tableau 182 – Builtin put\_date\_value2**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                      |
|------------------|---------------|-----------|-------------|------------------------------------------------------------------|
| blk_id           | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.           |
| blk_num          | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder. |
| id               | unsigned long | I         | o           | ID d'élément de la VARIABLE à laquelle accéder.                  |
| member_id        | unsigned long | I         | o           | ID de membre de la VARIABLE à laquelle accéder.                  |
| data             | char[]        | I         | m           | Nouvelle valeur de la VARIABLE.                                  |
| size             | long          | I         | m           | Longueur de la nouvelle valeur.                                  |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.            |

**Exemple**

```
long status, time_size;
char time[6];
```

```
/* set TIME to Oct 14, 2010 03:03:03 */
```

```
time_size = 6;
time[0]=0;          /* 0xA79658 = 10983000 ms since midnight */
time[1]=0xA7;
time[2]=0x96;
time[3]=0x58;
time[4]=0x26; /* 0x2637 = 9783 days since January 1, 1984 */
time[5]=0x37;
```

```
status = put_date_value2(ITEM_ID(transducer_block), 0,
MEMBER_ID(CALIBRATION), MEMBER_ID(TIME), time, time_size);
```

**6.5.31 Builtin put\_double\_value****Profils de communication: FF, ISA100****Objet: Placer la valeur spécifiée mise à l'échelle d'une VARIABLE double**

Le builtin put\_double\_value stocke la valeur fournie de la VARIABLE spécifiée mise à l'échelle dans la mémoire cache ou dans le dispositif.

Les paramètres id et member\_id sont spécifiés en utilisant les builtins ITEM\_ID et MEMBER\_ID et le nom ou la référence de la VARIABLE en question.

La variable doit avoir un type de données DOUBLE.

**Structure lexicale**

```
put_double_value(id, member_id, value)
```

Les éléments lexicaux du builtin put\_double\_value sont présentés dans le Tableau 183.

**Tableau 183 – Builtin put\_double\_value**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| id               | unsigned long | I         | o           | ID d'élément de la VARIABLE à laquelle accéder.       |
| member_id        | unsigned long | I         | o           | ID de membre de la VARIABLE à laquelle accéder.       |
| value            | double        | I         | m           | Nouvelle valeur de la VARIABLE.                       |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

**Exemple**

```

long status;
double value;
value = 100090.738;
status = put_double_value(ITEM_ID(PARAM.SAMPLE), 0, value);

```

**6.5.32 Builtin put\_double\_value2****Profils de communication: FF, ISA100****Objet: Définir la valeur d'une VARIABLE, d'un membre d'enregistrement ou d'un élément de matrice**

Le builtin put\_double\_value2 stocke la valeur fournie de la VARIABLE spécifiée mise à l'échelle, du membre d'enregistrement ou de l'élément de matrice dans la mémoire cache ou dans le dispositif.

Le paramètre blk\_id spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre blk\_num spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre id référence une VARIABLE simple, le paramètre member\_id est ignoré. Si le paramètre id référence un enregistrement, le paramètre member\_id spécifie un membre de l'enregistrement. Si le paramètre id référence un paramètre de matrice, le paramètre member\_id spécifie un élément de la matrice.

Les paramètres blk\_id, id et member\_id sont spécifiés à l'aide des builtins ITEM\_ID et MEMBER\_ID. Le paramètre blk\_num est spécifié à l'aide des builtins get\_block\_instance\_by\_object\_index et get\_block\_instance\_by\_block\_tag.

La VARIABLE, le membre d'enregistrement ou l'élément de matrice doit avoir un type de données DOUBLE.

**Structure lexicale**

```
put_double_value2(blk_id, blk_num, id, member_id, value)
```

Les éléments lexicaux du builtin put\_double\_value2 sont présentés dans le Tableau 184.



**Tableau 184 – Builtin put\_double\_value2**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                      |
|------------------|---------------|-----------|-------------|------------------------------------------------------------------|
| blk_id           | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.           |
| blk_num          | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder. |
| id               | unsigned long | I         | o           | ID d'élément de la VARIABLE à laquelle accéder.                  |
| member_id        | unsigned long | I         | o           | ID de membre de la VARIABLE à laquelle accéder.                  |
| value            | double        | I         | m           | Nouvelle valeur de la VARIABLE.                                  |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.            |

**Exemple**

```

long status;
double value;
value = 1000090.738;
status = put_double_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(SAMPLE), 0, value);

```

**6.5.33 Builtin put\_float\_value****Profils de communication: FF, ISA100****Objet: Placer la valeur spécifiée d'une VARIABLE à virgule flottante**

Le builtin put\_float\_value stocke la valeur fournie de la VARIABLE spécifiée mise à l'échelle dans la mémoire cache ou dans le dispositif.

Le type de valeur est double précision afin de permettre la promotion automatique qui peut se produire lorsque deux valeurs à virgule flottante sont multipliées.

Les paramètres id et member\_id sont spécifiés en utilisant les builtins ITEM\_ID et MEMBER\_ID et le nom ou la référence de la VARIABLE en question.

La variable doit avoir un type de données FLOAT.

**Structure lexicale**

```
put_float_value(id, member_id, value)
```

Les éléments lexicaux du builtin put\_float\_value sont présentés dans le Tableau 185.

**Tableau 185 – Builtin put\_float\_value**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| id               | unsigned long | I         | o           | ID d'élément de la VARIABLE à laquelle accéder.       |
| member_id        | unsigned long | I         | o           | ID de membre de la VARIABLE à laquelle accéder.       |
| value            | double        | I         | m           | Nouvelle valeur de la VARIABLE.                       |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

**Exemple**

```
long status;
float value;
value = 57.2958;
status = put_float_value2(ITEM_ID(PARAM.SAMPLE), 0, (double) value);
```

**6.5.34 Builtin put\_float\_value2****Profils de communication: FF, ISA100**

**Objet: Définir la valeur d'une VARIABLE, d'un membre d'enregistrement ou d'un élément de matrice**

Le builtin put\_float\_value2 stocke la valeur fournie de la VARIABLE spécifiée mise à l'échelle, du membre d'enregistrement ou de l'élément de matrice dans la mémoire cache ou dans le dispositif.

Le type de valeur est double précision afin de permettre la promotion automatique qui peut se produire lorsque deux valeurs à virgule flottante sont multipliées.

Le paramètre blk\_id spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre blk\_num spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre id référence une VARIABLE simple, le paramètre member\_id est ignoré. Si le paramètre id référence un enregistrement, le paramètre member\_id spécifie un membre de l'enregistrement. Si le paramètre id référence un paramètre de matrice, le paramètre member\_id spécifie un élément de la matrice.

Les paramètres blk\_id, id et member\_id sont spécifiés à l'aide des builtins ITEM\_ID et MEMBER\_ID. Le paramètre blk\_num est spécifié à l'aide des builtins get\_block\_instance\_by\_object\_index et get\_block\_instance\_by\_block\_tag.

La variable doit avoir un type de données FLOAT.

**Structure lexicale**

```
put_float_value2(blk_id, blk_num, id, member_id, value)
```

Les éléments lexicaux du builtin put\_float\_value2 sont présentés dans le Tableau 186.

**Tableau 186 – Builtin put\_float\_value2**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                      |
|------------------|---------------|-----------|-------------|------------------------------------------------------------------|
| blk_id           | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.           |
| blk_num          | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder. |
| id               | unsigned long | I         | o           | ID d'élément de la VARIABLE à laquelle accéder.                  |
| member_id        | unsigned long | I         | o           | ID de membre de la VARIABLE à laquelle accéder.                  |
| value            | double        | I         | m           | Nouvelle valeur de la VARIABLE.                                  |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.            |

**Exemple**

```
long status;
float value;
value = 57.2958;
status = put_float_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(SAMPLE), 0, (double) value);
```

**6.5.35 Builtin put\_signed\_value****Profils de communication: FF, ISA100****Objet: Placer la valeur spécifiée d'une VARIABLE entière signée**

Le builtin put\_signed\_value stocke la nouvelle valeur de la VARIABLE spécifiée mise à l'échelle dans la mémoire cache ou dans le dispositif.

Les paramètres id et member\_id sont spécifiés en utilisant les builtins ITEM\_ID et MEMBER\_ID et le nom ou la référence de la VARIABLE en question.

La VARIABLE à écrire doit avoir un type de données long.

**Structure lexicale**

```
put_signed_value(id, member_id, value)
```

Les éléments lexicaux du builtin put\_signed\_value sont présentés dans le Tableau 187.

**Tableau 187 – Builtin put\_signed\_value**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                           |
|------------------|---------------|-----------|-------------|-------------------------------------------------------|
| id               | unsigned long | I         | o           | ID d'élément de la VARIABLE à laquelle accéder.       |
| member_id        | unsigned long | I         | o           | ID de membre de la VARIABLE à laquelle accéder.       |
| value            | long          | I         | m           | Nouvelle valeur de la VARIABLE.                       |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

**Exemple**

```
long status;
status = put_signed_value(ITEM_ID(PARAM.PV_SCALE), MEMBER_ID(DECIMAL_PT),
3);
```

**6.5.36 Builtin put\_signed\_value2****Profils de communication: FF, ISA100****Objet: Définir la valeur d'une VARIABLE, d'un membre d'enregistrement ou d'un élément de matrice**

Le builtin put\_signed\_value2 stocke la valeur fournie de la VARIABLE spécifiée mise à l'échelle, du membre d'enregistrement ou de l'élément de matrice dans la mémoire cache ou dans le dispositif.

Le paramètre blk\_id spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre blk\_num spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre `id` référence une VARIABLE simple, le paramètre `member_id` est ignoré. Si le paramètre `id` référence un enregistrement, le paramètre `member_id` spécifie un membre de l'enregistrement. Si le paramètre `id` référence un paramètre de matrice, le paramètre `member_id` spécifie un élément de la matrice.

Les paramètres `blk_id`, `id` et `member_id` sont spécifiés à l'aide des builtins `ITEM_ID` et `MEMBER_ID`. Le paramètre `blk_num` est spécifié à l'aide des builtins `get_block_instance_by_object_index` et `get_block_instance_by_block_tag`.

La VARIABLE, le membre d'enregistrement ou l'élément de matrice à écrire doit avoir un type de données long.

### Structure lexicale

```
put_signed_value2(blk_id, blk_num, id, member_id, value)
```

Les éléments lexicaux du builtin `put_signed_value2` sont présentés dans le Tableau 188.

**Tableau 188 – Builtin `put_signed_value2`**

| Nom du paramètre            | Type          | Direction | Utilisation | Description                                                      |
|-----------------------------|---------------|-----------|-------------|------------------------------------------------------------------|
| <code>blk_id</code>         | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.           |
| <code>blk_num</code>        | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder. |
| <code>id</code>             | unsigned long | I         | o           | ID d'élément de la VARIABLE à laquelle accéder.                  |
| <code>member_id</code>      | unsigned long | I         | o           | ID de membre de la VARIABLE à laquelle accéder.                  |
| <code>value</code>          | long          | I         | m           | Nouvelle valeur de la VARIABLE.                                  |
| <code>&lt;return&gt;</code> | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.            |

### Exemple

```
long status;
status = put_signed_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(PV_SCALE), MEMBER_ID(DECIMAL_PT), 3);
```

### 6.5.37 Builtin `put_string_value`

**Profils de communication:** FF, ISA100

**Objet:** Définir la valeur d'une VARIABLE de chaîne

Le builtin `put_string_value` stocke la valeur fournie de la VARIABLE spécifiée dans la mémoire cache ou dans le dispositif.

Les paramètres `id` et `member_id` sont spécifiés en utilisant les builtins `ITEM_ID` et `MEMBER_ID` et le nom ou la référence de la VARIABLE en question.

La VARIABLE doit avoir un type de données char; une chaîne de caractères peut contenir des VARIABLES des types de données suivants:

- ASCII
- PASSWORD
- EUC (unicode étendu)

- BITSTRING
- VISIBLE
- OCTET

Les VARIABLES avec les types de données enumerated, bit\_enumerated et index doivent être gérées par la méthode, car elles ne sont pas prises en charge par le langage de programmation C.

### Structure lexicale

```
put_string_value(id, member_id, string, len)
```

Les éléments lexicaux du builtin put\_string\_value sont présentés dans le Tableau 189.

**Tableau 189 – Builtin put\_string\_value**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                                                                                                                             |
|------------------|---------------|-----------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| id               | unsigned long | I         | o           | ID d'élément de la VARIABLE à laquelle accéder.                                                                                                                         |
| member_id        | unsigned long | I         | o           | ID de membre de la VARIABLE à laquelle accéder.                                                                                                                         |
| string           | DD_STRING     | I         | m           | Nouvelle valeur de la VARIABLE. Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| len              | long          | I         | m           | Longueur de la nouvelle valeur.                                                                                                                                         |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                   |

### Exemple

```
long status;
status = put_string_value(ITEM_ID(PARAM.TAG_DESC), 0, "|en|PID-101", 11);
```

### 6.5.38 Builtin put\_string\_value2

**Profils de communication: FF, ISA100**

**Objet: Définir la valeur d'une VARIABLE, d'un membre d'enregistrement ou d'un élément de matrice**

Le builtin put\_string\_value2 stocke la valeur fournie de la VARIABLE, du membre d'enregistrement ou de l'élément de matrice spécifié dans la mémoire cache ou dans le dispositif.

Le paramètre blk\_id spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre blk\_num spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre id référence une VARIABLE simple, le paramètre member\_id est ignoré. Si le paramètre id référence un enregistrement, le paramètre member\_id spécifie un membre de l'enregistrement. Si le paramètre id référence un paramètre de matrice, le paramètre member\_id spécifie un élément de la matrice.

Les paramètres blk\_id, id et member\_id sont spécifiés à l'aide des builtins ITEM\_ID et MEMBER\_ID. Le paramètre blk\_num est spécifié à l'aide des builtins get\_block\_instance\_by\_object\_index et get\_block\_instance\_by\_block\_tag.

La VARIABLE, le membre d'enregistrement ou l'élément de matrice doit avoir un type de données char; une chaîne de caractères peut contenir des VARIABLES des types de données suivants:

- ASCII
- PASSWORD
- EUC (unicode étendu)
- BITSTRING
- VISIBLE
- OCTET

Les VARIABLES, membres d'enregistrement ou éléments de matrice avec les types de données enumerated, bit\_enumerated et index doivent être gérés par la méthode, car ils ne sont pas pris en charge par le langage de programmation C.

### Structure lexicale

```
put_string_value2(blk_id, blk_num, id, member_id, string, len)
```

Les éléments lexicaux du builtin put\_string\_value2 sont présentés dans le Tableau 190.

**Tableau 190 – Builtin put\_string\_value2**

| Nom du paramètre | Type          | Direction | Utilisation | Description                                                                                                                                                                                                                   |
|------------------|---------------|-----------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| blk_id           | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.                                                                                                                                                                        |
| blk_num          | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder.                                                                                                                                                              |
| id               | unsigned long | I         | o           | ID d'élément de la VARIABLE, de l'enregistrement ou de la matrice auquel accéder.                                                                                                                                             |
| member_id        | unsigned long | I         | o           | ID de membre de la VARIABLE, du membre d'enregistrement ou de l'élément de matrice auquel accéder.                                                                                                                            |
| string           | DD_STRING     | I         | m           | Nouvelle valeur de la VARIABLE, du membre d'enregistrement ou de l'élément de matrice Des types de chaînes autres que DD_STRING peuvent également être utilisés et sont automatiquement convertis en DD_STRING (voir 6.18.3). |
| len              | long          | I         | m           | Longueur de la nouvelle valeur.                                                                                                                                                                                               |
| <return>         | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.                                                                                                                                                                         |

### Exemple

```
long status;
status = put_string_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(TAG_DESC), 0, "|en|PID-101", 11);
```

### 6.5.39 Builtin put\_unsigned\_value

**Profils de communication: FF, ISA100**

**Objet: Définir la valeur d'une VARIABLE non signée**

Le builtin put\_unsigned\_value stocke la valeur fournie de la VARIABLE spécifiée mise à l'échelle dans la mémoire cache ou dans le dispositif.

Les paramètres `id` et `member_id` sont spécifiés en utilisant les builtins `ITEM_ID` et `MEMBER_ID` et le nom ou la référence de la VARIABLE en question.

La VARIABLE doit avoir un type de données unsigned. Une valeur non signée peut contenir des VARIABLES des types de données suivants:

- UNSIGNED
- ENUMERATED
- BIT\_ENUMERATED
- INDEX
- BOOLEAN

Les VARIABLES de ces types de données doivent être gérées par la méthode, car elles ne sont pas prises en charge par le langage de programmation C. La variable doit être valide dans la mémoire cache ou dans le dispositif.

### Structure lexicale

```
put_unsigned_value(id, member_id, value)
```

Les éléments lexicaux du builtin `put_unsigned_value` sont présentés dans le Tableau 191.

**Tableau 191 – Builtin `put_unsigned_value`**

| Nom du paramètre            | Type          | Direction | Utilisation | Description                                           |
|-----------------------------|---------------|-----------|-------------|-------------------------------------------------------|
| <code>id</code>             | unsigned long | l         | o           | ID d'élément de la VARIABLE à laquelle accéder.       |
| <code>member_id</code>      | unsigned long | l         | o           | ID de membre de la VARIABLE à laquelle accéder.       |
| <code>value</code>          | unsigned long | l         | o           | Nouvelle valeur de la VARIABLE.                       |
| <code>&lt;return&gt;</code> | long          | o         | m           | Un des codes de retour spécifiés dans le Tableau 376. |

### Exemple

```
long status;
unsigned long value;
value = 0xFEEE;
status = put_unsigned_value(ITEM_ID(PARAM.PV_STATE), 0, value);
```

### 6.5.40 Builtin `put_unsigned_value2`

**Profils de communication: FF, ISA100**

**Objet: Définir la valeur d'une VARIABLE, d'un membre d'enregistrement ou d'un élément de matrice**

Le builtin `put_unsigned_value2` stocke la valeur fournie de la VARIABLE spécifiée mise à l'échelle dans la mémoire cache ou dans le dispositif.

Le paramètre `blk_id` spécifie l'ID d'élément du bloc auquel accéder, tandis que le paramètre `blk_num` spécifie le numéro d'occurrence du bloc auquel accéder.

Si le paramètre `id` référence une VARIABLE simple, le paramètre `member_id` est ignoré. Si le paramètre `id` référence un enregistrement, le paramètre `member_id` spécifie un membre de l'enregistrement. Si le paramètre `id` référence un paramètre de matrice, le paramètre `member_id` spécifie un élément de la matrice.

Les paramètres `blk_id`, `id` et `member_id` sont spécifiés à l'aide des builtins `ITEM_ID` et `MEMBER_ID`. Le paramètre `blk_num` est spécifié à l'aide des builtins `get_block_instance_by_object_index` et `get_block_instance_by_block_tag`.

La VARIABLE, le membre d'enregistrement ou l'élément de matrice doit avoir un type de données unsigned. Une valeur non signée peut contenir des VARIABLES des types de données suivants:

- UNSIGNED
- ENUMERATED
- BIT\_ENUMERATED
- INDEX
- BOOLEAN

Les VARIABLES de ces types de données doivent être gérées par la méthode, car elles ne sont pas prises en charge par le langage de programmation C.

### Structure lexicale

```
put_unsigned_value2(blk_id, blk_num, id, member_id, value)
```

Les éléments lexicaux du builtin `put_unsigned_value2` sont présentés dans le Tableau 192.

**Tableau 192 – Builtin `put_unsigned_value2`**

| Nom du paramètre            | Type          | Direction | Utilisation | Description                                                      |
|-----------------------------|---------------|-----------|-------------|------------------------------------------------------------------|
| <code>blk_id</code>         | unsigned long | I         | m           | ID d'élément de l'instance BLOCK_A à laquelle accéder.           |
| <code>blk_num</code>        | unsigned long | I         | m           | Numéro d'occurrence de l'instance de BLOCK_A à laquelle accéder. |
| <code>id</code>             | unsigned long | I         | o           | ID d'élément de la VARIABLE à laquelle accéder.                  |
| <code>member_id</code>      | unsigned long | I         | o           | ID de membre de la VARIABLE à laquelle accéder.                  |
| <code>value</code>          | unsigned long | I         | o           | Nouvelle valeur de la VARIABLE.                                  |
| <code>&lt;return&gt;</code> | long          | O         | m           | Un des codes de retour spécifiés dans le Tableau 376.            |

### Exemple

```
long status;
unsigned long value;
value = 0xFEEE;
status = put_unsigned_value2(ITEM_ID(__analog_input_block), 0,
MEMBER_ID(PV_STATE), 0, value);
```