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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

## Wrought aluminium and aluminium alloys extruded rods/bars, tubes and profiles —

### Part 2: Mechanical properties

*Barres, tubes et profilés filés en aluminium et alliages d'aluminium corroyés —*

*Partie 2: Caractéristiques mécaniques*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6362-2 was prepared by Technical Committee ISO/TC 79, *Light metals and their alloys*.

It constitutes a partial technical revision of International Standards ISO 2779 : 1973 and ISO 3335 : 1977, which will be cancelled when the revision of ISO Recommendation R 209 : 1971 is published (see clause 2).

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

# Wrought aluminium and aluminium alloys extruded rods/bars, tubes and profiles —

## Part 2: Mechanical properties

### 1 Scope and field of application

In conjunction with ISO 6362-1, this part of ISO 6362 specifies the mechanical properties of wrought aluminium and aluminium alloys rods/bars, tubes and profiles for general engineering applications.

It applies to extruded products.

The chemical composition of these materials is given in ISO 209-1.

The designations of aluminium and aluminium alloys and the temper designations used in this International Standard are in accordance with ISO 2092 and ISO 2107, respectively.

### 2 References

ISO 209-1, *Wrought aluminium and aluminium alloys — Chemical composition and form of products — Part 1: Chemical composition.*<sup>1)</sup>

ISO 2092, *Light metals and their alloys — Code of designation based on chemical symbols.*<sup>2)</sup>

ISO 2107, *Aluminium, magnesium and their alloys — Temper designations.*

ISO 3134-3, *Light metals and their alloys — Terms and definitions — Part 3: Wrought products.*

ISO 6362-1, *Wrought aluminium and aluminium alloys extruded rods/bars, tubes and profiles — Part 1: Technical conditions for inspection and delivery.*

### 3 Definitions

For definitions of the terms *rod/bar*, *tube* and *profile*, see ISO 3134-3.

### 4 Tensile testing

For the selection of specimens and tensile testing, see ISO 6362-1.

### 5 Mechanical properties

Values for mechanical properties of aluminium and aluminium alloys are given in tables 1 to 15. For elongation two different gauge lengths are used. The choice of the gauge length for elongation measurements  $A$  or  $A_{50\text{mm}}$  shall be at the discretion of the producer, unless otherwise agreed<sup>3)</sup>.

Test results shall be rounded in accordance with the rules given in the annex.

1) At present at the stage of draft. (Partial revision of ISO 2779 : 1973 and ISO 3335 : 1977.)

2) Under revision.

3)  $A$ : Percentage elongation on a gauge length of  $5,65\sqrt{S_0}$ .

$A_{50\text{mm}}$ : Percentage elongation on a gauge length of 50 mm.

5.1 Table 1 — Al 99,5 (1050 A)

Product	Temper	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. <sup>2)</sup> N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Tube	M	$e \geq 2,5$	65	20	25	23
Rod/bar	M	$D < 35$ (30) <sup>1)</sup>	65	20	25	23

5.2 Table 2 — Al 99,0 (1200)

Product	Temper	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. <sup>2)</sup> N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Tube	M	$e \geq 2,5$	75	25	18	18
Rod/bar	M	$D < 35$ (30) <sup>1)</sup>	75	25	18	18

5.3 Table 3 — Al 99,0Cu (1100)

Product	Temper	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. <sup>2)</sup> N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Rod/bar	M	$D < 35$ (30) <sup>1)</sup>	75	20	18	18

1) Values in brackets refer to the thickness of rectangular bars.

2) Minimum values guaranteed only on special agreement.

5.4 Table 4 — Al Cu4PbMg (2030)<sup>1)</sup>

Product	Temper	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Rod/bar	TB	$3 < D < 75$	370	245	8	10

5.5 Table 5 — Al Cu6BiPb (2011)<sup>1)</sup>

Product	Temper	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Rod/bar	TB	$3 < D < 200$	275	125	14	16
	TD	$3 < D < 40$	310	260	10	10
		$40 < D < 50$	295	235	10	12
		$50 < D < 75$	290	205	10	14
	TH TF	$3 < D < 75$	370	275	10	10
		$3 < D < 75$ $75 < D < 160$	310 295	230 195	8 6	10 8

5.6 Table 6 — Al Mn1 (3103)

Product	Temper	Wall thickness $e$ , mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. <sup>2)</sup> N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Tube	M	$e > 2,5$	95	35	17	—

1) The introduction of this alloy cancels ISO 2779 : 1973.

2) Minimum values guaranteed only on special agreement.

5.7 Table 7 – Al Mn1Cu (3003)

Product	Temper	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. <sup>1)</sup> N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Tube	M	All	95	35	17	22
Profile	M	All	95	35	17	22

5.8 Table 8 – Al Mg3 (5754)

Product	Temper	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Tube	M	$e > 3$	180	80	14	—

5.9 Table 9 – Al Mg3Mn (5454)

Product	Temper	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Tube	M	$e > 3$	215	100	16	14
Rod/bar	M	All	215	100	16	14

1) Minimum values guaranteed only on special agreement.

5.10 Table 10 — Al Mg4,5Mn0,7 (5083)

Product	Temper	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Tube	M	$e \geq 3,5$	270	140	12	—
Rod/bar	M	All	270	140	12	—
Profile	M	All	270	140	12	—

5.11 Table 11 — Al MgSi (6060)

Product	Temper <sup>1)</sup>	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Tube	TF	$e \leq 15$	190	150	10	8
Rod/bar	TF	$D \leq 100$	190	150	10	8
Profile	TF	$e \leq 25$	190	150	10	8

5.12 Table 12 — Al Mg0,7Si (6063)

Product	Temper	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Tube	TE	$e < 12,5$	150	110	7	8
	TE	$12,5 < e \leq 25$	145	105	7	—
	TF <sup>1)</sup>	$e < 3,2$	205	170	—	8
	TF <sup>1)</sup>	$3,2 < e \leq 25$	205	170	9	10
Rod/bar	TE	$D < 12,5$	150	110	7	8
	TE	$12,5 < D \leq 25$	145	105	7	—
	TF <sup>1)</sup>	$D < 3,2$	205	170	—	8
	TF <sup>1)</sup>	$3,2 < D \leq 25$	205	170	9	10
Profile	TE	$e < 12,5$	150	110	7	8
	TE	$12,5 < e \leq 25$	145	105	7	—
	TF <sup>1)</sup>	$e < 3,2$	205	170	—	8
	TF <sup>1)</sup>	$3,2 < e \leq 25$	205	170	9	10

1) Controlled cooling after extrusion is permitted.

5.13 Table 13 – Al SiMg(A) (6005A)

Product	Temper	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Tube	TF <sup>1)</sup>	$e < 6$	270	225	8	—
	TF <sup>1)</sup>	$e > 6$	260	215	8	—
Rod/bar	TF <sup>1)</sup>	$D < 50$	270	225	8	—
	TF <sup>1)</sup>	$50 < D < 100$	260	215	8	—
Profile	TF <sup>1)</sup>	$e < 6$	270	225	8	—
	TF <sup>1)</sup>	$6 < e < 10$	260	215	8	—
	TE	$e < 8$	250	200	8	—

5.14 Table 14 – Al Mg1SiCu (6061)

Product	Temper <sup>1)</sup>	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Tube	TB	$e < 25$	180	110	14	16
	TF	$e < 6,3$	260	240	7	8
	TF	$6,3 < e < 25$	260	240	9	10
Rod/bar	TB	$D < 100$	180	110	14	16
	TF	$D < 6,3$	260	240	7	8
	TF	$6,3 < D < 100$	260	240	9	10
Profile	TB	$e < 25$	180	110	14	16
	TF	$e < 6,3$	260	240	7	8
	TF	$6,3 < e < 25$	260	240	9	10

5.15 Table 15 – Al Si1MgMn (6082)

Product	Temper	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Tube	TF <sup>1)</sup>	$e < 10$	310	260	8	7
Rod/bar	TB <sup>1)</sup>	$10 < D < 80$	205	110	14	14
	TF <sup>1)</sup>	$10 < D < 60$ (50) <sup>2)</sup>	310	260	8	7
	TF <sup>1)</sup>	(50) $60 < D < 150$	300	240	8	—
Profile	TB <sup>1)</sup>	$e < 15$	205	110	14	14
	TF <sup>1)</sup>	$e < 15$	310	260	8	7
	TE	$e < 15$	290	250	8	8

1) Controlled cooling after extrusion is permitted.

2) Values between brackets are for bars other than round (for example, square, hexagonal, rectangular).

5.16 Table 16 — Al Zn4,5Mg1 (7020)<sup>1)</sup>

Product	Temper	Wall thickness $e$ , or diameter $D$ mm	Tensile strength $R_m$ min. N/mm <sup>2</sup>	0,2 % proof stress $R_{p0,2}$ min. N/mm <sup>2</sup>	Elongation min.	
					$A$ %	$A_{50mm}$ %
Solid profiles	TF, TE	$3,0 < e < 30$	350	290	10	8

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1) The introduction of this alloy cancels ISO 3335 : 1977.