IEC 63330-1

Edition 1.0 2024-06

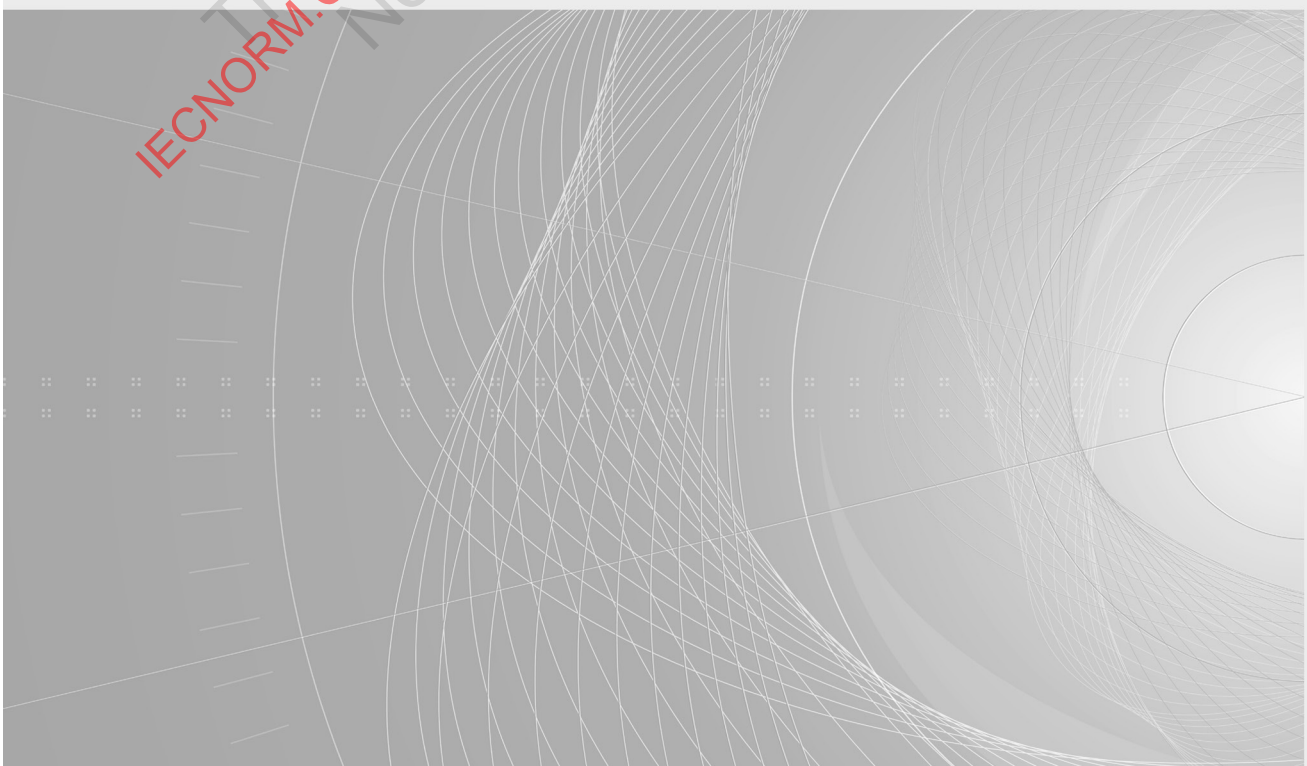
INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Repurposing of secondary batteries – Part 1: General requirements

Réaffectation des batteries d'accumulateurs – Partie 1: Exigences générales



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Repurposing of secondary batteries – Part 1: General requirements

Réaffectation des batteries d'accumulateurs – Partie 1: Exigences générales

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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

Draft	Report on voting
21/1193/FDIS	21/1202/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 63330 series, published under the general title *Repurposing of secondary batteries*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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INTRODUCTION

Increasing concerns about global warming, air quality and energy saving have been encouraging the utilization of rechargeable energy storage systems for different applications such as electric mobility. In parallel, technical advances in secondary batteries, especially in lithium-ion batteries, provide the market with the practical option to repurpose used batteries and battery systems that can maintain substantial performance even after the end of use of the original equipment such as electric vehicles.

In order to foster such new business and to accelerate effective and safe utilization of energy source, it is indispensable to establish a basic International Standard for evaluation of safety and performance of used batteries and battery systems, which derive from different equipment with different histories, and will be repurposed for different applications.

This document intends to provide basic requirements and a procedure to evaluate the performance and safety of used batteries and battery systems, and also provide general requirements for application of repurposed batteries.

Figure 1 contains an overview of different standards on reuse and repurposing of batteries and battery-based energy storage systems (BESS) developed by IEC TC 21 *Secondary cells and batteries* and IEC TC 120 *Electrical Energy Storage (EES) systems*. The purpose of Figure 1 is to inform users of these standards about the existence of the other standards listed in Figure 1 and give a concise overview of those standards. It also identifies areas of possible overlap and informs users in these cases which of the standards takes precedence.

		IEC 63338		IEC 63330-1		IEC 62933-4-4		IEC 62933-5-3	
Title		**General guidance on reuse and repurposing of secondary cells and batteries –**		**Repurposing of secondary cells and batteries – Part 1: General requirements**		**Electrical energy storage (EES) systems – Part 4-4: Environmental requirements for battery-based energy storage systems (BESS) with reused batteries**		**Electrical energy storage (EES) systems – Part 5-3: Safety requirements for grid-integrated EES systems – Performing unplanned modification of electrochemical based system**	
Scope		Secondary lithium ion and Ni-MH		Repurposing of secondary batteries and systems (excluding redox flow/ Ni-MH/Pb batteries)		BESS using reused batteries		Energy storage systems	
		Battery	System	Battery	System	Battery	System	Battery	System
Requirements	**General**			✔ Clause 4/5/6					
	Environment					✔ Annex A (info)	✔ Clause 4/5/6/7 Annex B (info)		
	Safety			✔ Clause 4/5/6	✔ Clause 6 (ESS) Clause 6 (other)			✔ Annex A (info)	✔ Clause 5/6/7/8 ✔ Clause 9
	Assessment			✔ Clause 5	✔ Clause 6 (ESS) Clause 6 (other)				
Guidance	**General**	✔ Clause 4							
	Environment	✔ Clause 9							
	Safety	✔ Clause 5/6 ✔ Clause 7/8							

■ = Priority ■ = No overlap
■ = Support

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Figure 1 – Standards on reuse and repurposing of batteries and battery-based energy storage systems (BESS)

REPURPOSING OF SECONDARY BATTERIES –

Part 1: General requirements

1 Scope

This part of IEC 63330 provides general requirements for repurposing of secondary cells, modules, battery packs and battery systems, herein also referred to as "PRODUCT", that are originally manufactured for other applications such as electric vehicles.

This document specifies the procedure to evaluate the performance and safety of used PRODUCT for repurposing.

This document also provides basic requirements for application of repurposed PRODUCT.

This document targets secondary lithium ion PRODUCT and battery technologies with data traceability.

The redox flow, Ni-MH and Pb-acid batteries are not covered by this document.

NOTE 1 General guidance on reuse and repurposing of secondary cells and batteries is provided in IEC 63338 (under development).

NOTE 2 Transportation is out of the scope of this document.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
repurposing
operation that results in PRODUCT being used for a different purpose or application than the one that PRODUCT was originally designed for

Note 1 to entry: In this document, PRODUCT is cell, battery, module, battery pack and battery system.

Note 2 to entry: The repurposing in this document includes usage of used battery for the same type of purpose as original equipment, with change of battery pack composition.

Note 3 to entry: Alternative common terms for repurposing include "second use" and "second life".

3.2
secondary cell
cell
basic manufactured unit providing a source of electrical energy by direct conversion of chemical energy, that consists of electrodes, separators, electrolyte, container and terminals, and that is designed to be charged electrically

3.3
module
group of cells connected together either in a series and/or parallel configuration with or without protective devices (e.g. fuse or positive temperature coefficient device) and monitoring circuitry

[SOURCE: IEC 62619:2022, 3.9]

3.4
battery pack
energy storage device, which comprises one or more cells or modules electrically connected and has monitoring circuitry which provides information (e.g. cell voltage) to a battery system to influence the battery's safety, performance and/or service life

Note 1 to entry: The battery pack may incorporate a protective housing and be provided with terminals or other interconnection arrangements.

[SOURCE: IEC 62619: 2022, 3.10]

3.5
battery system
system which comprises one or more cells, modules or battery packs and has a battery management system capable of controlling current in case of overcharge, overcurrent, overdischarge, and overheating

Note 1 to entry: The battery system may have cooling or heating units. More than one battery system may constitute a larger battery system. The battery system is sometimes also referred to as a battery.

[SOURCE: IEC 62619:2022, 3.11 modified – The second preferred term and original Note 1 to entry have been deleted.]

3.6
battery management system
BMS
electronic system associated with a battery which has functions to control current in case of overcharge, overcurrent, overdischarge, and overheating and which monitors and/or manages the battery's state, calculates secondary data, reports that data and/or controls its environment to influence the battery's safety, performance and/or service life

Note 1 to entry: Overdischarge cut off is not mandatory if there is an agreement between the cell manufacturer and the customer.

Note 2 to entry: The function of the BMS can be assigned to the battery pack or to equipment that uses the battery.

Note 3 to entry: The BMS can be divided and it can be found partially in the battery pack and partially on the equipment that uses the battery.

Note 4 to entry: The BMS is sometimes also referred to as a BMU (battery management unit).

[SOURCE: IEC 62619:2022, 3.12, modified – Note 1 to entry has been modified.]

3.7
rated capacity
C_n
capacity value of a cell or battery determined under specified conditions and declared by the cell manufacturer

Note 1 to entry: C_n is expressed in ampere hour (A h).

[SOURCE: IEC 60050-482:2004, 482-03-15, modified – The definition has been changed because both a cell and a battery can be tested for rated capacity. Note 1 to entry has been added.]

3.8
state of charge
SOC
quantity of electricity stored in a cell expressed as a percentage of rated capacity

3.9
state of certified energy
SOCE
measured or on-board usable battery energy (UBE) performance at a specific point in its lifetime, expressed as a percentage of the certified usable battery energy

Note 1 to entry: SOCE is available only for off vehicle charging hybrid electric vehicle and pure electric vehicle.

[SOURCE: UN-GTR22, 3.9]

3.10
usable battery energy
UBE
the energy supplied by the battery from the beginning of the test procedure used for certification until the applicable break-off criterion of the test procedure used for certification is reached

[SOURCE: UN-GTR22, 3.3]

3.11
operating region
set of conditions during charging and discharging in which the cell operates within the range of voltage, current and temperature as specified by the cell manufacturer to ensure the safe use of the cell

Note 1 to entry: The limits of the operating region are specified for the minimum safety; they are different from the charging voltage and temperature to optimize the performance of the cell such as cycle life.

3.12
operating range
set of conditions during charging and discharging in which the battery system operates within the range of voltage, current and temperature as specified by the system manufacturer to ensure the safe use of the battery system

Note 1 to entry: Figure B.2 shows the relation between the operating range and the operating region.

3.13
safety design
battery design to avoid or control systematic failures and to detect or control random hardware failures, or mitigate their harmful effects

3.14
systematic failure
failure related in a deterministic way to a certain cause, that can only be eliminated by a change of the design or of the manufacturing process, operational procedures, documentation or other relevant factors

3.15
random hardware failure
failure that can occur unpredictably during the lifetime of a battery and that follows a probability distribution

3.16
critical failure
termination of an intended behaviour of a battery due to a fault manifestation

3.17
fault
abnormal condition that can cause a battery to fail

3.18
service life
total period of useful life of PRODUCT in operation which is specified for original usage

Note 1 to entry: For secondary cells and batteries, the service life may be expressed in time, number of charging/discharging cycles, capacity in ampere hours (Ah) and operating conditions (temperature range, depth of discharge, etc.).

Note 2 to entry: The service life does not equal the guarantee or warrantee period provided by the original manufacturer.

Note 3 to entry: The service life is not clearly specified for vehicle propulsion application.

[SOURCE: IEC 60050-482:2004, 482-03-46, modified – The entry has been changed because batteries can still be utilized after reaching the end of their service life for the original purpose when repurposed.]

3.19
residual usable period
remaining period of service life or estimated remaining period of useful life of battery in operation

3.20
usable period for repurposing
period usable in the application with repurposed PRODUCT specified by the designer of a system with repurposed PRODUCT

3.21
basic system design
design of repurposed PRODUCT in order to use repurposed PRODUCT safely in a system or subsystem for energy storage

4 General requirements

4.1 Structure of repurposing

Typical structure for repurposing of PRODUCT is shown in Figure 2. In this document, requirements for the following phases are specified:

– removal of PRODUCT from original equipment;
– inspection and assessment of used PRODUCT;
– storage of PRODUCT to be repurposed;
– basic system design using repurposed PRODUCT.

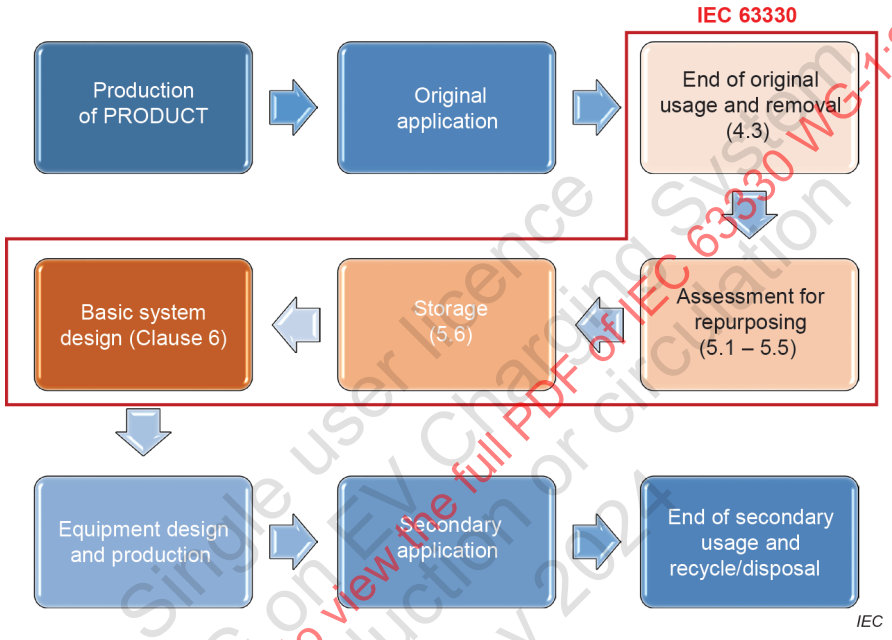
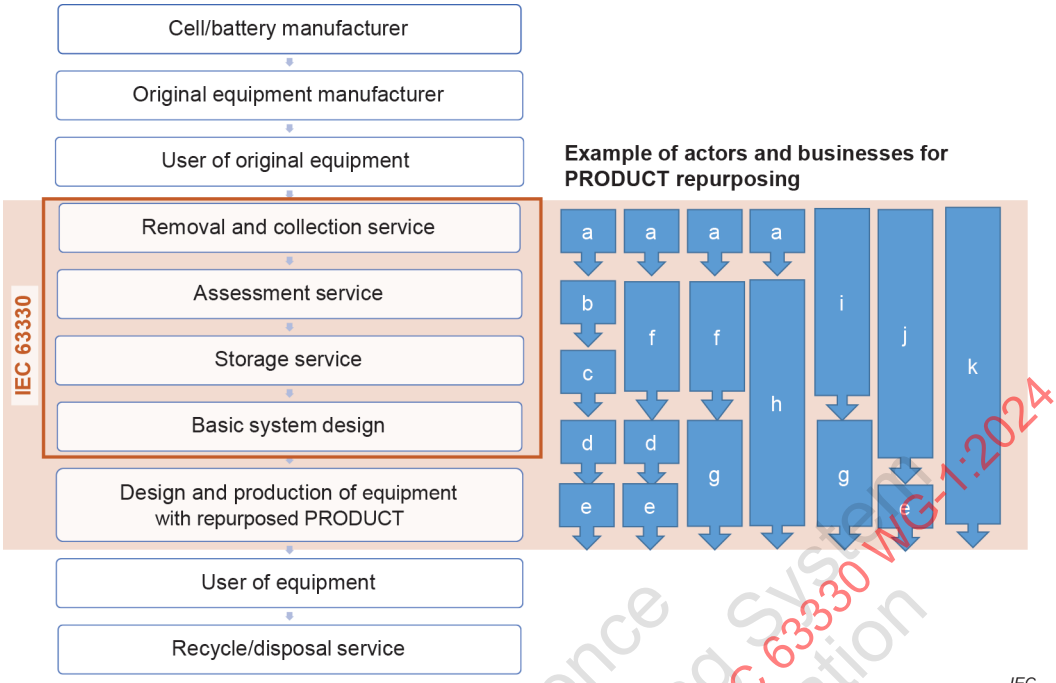


Figure 2 – Typical structure of PRODUCT repurposing

Figure 3 shows examples of actors for PRODUCT repurposing.



Key

a to k actors for each business area

Figure 3 – Example of actors for PRODUCT repurposing

This document may be applied for the PRODUCT that is repurposed after the second use. If the PRODUCT is repurposed multiple times, all the data on original usage (Table 1) and any subsequent usage shall be assessed.

NOTE For specific requirements for electrical energy storage (EES) systems using reused battery, see IEC 62933-4-4 and IEC 62933-5-3.

4.2 Relevant data

Data required for repurposing of PRODUCT are as follows.

1) Basic information:
   - manufacturer of original equipment;
   - chemistry;
   - manufacture year and month;
   - serial number, if available;
   - battery pack dismantling safety procedure.
2) Data on original usage:
   - operating range;
   - history of critical failure;
   - residual performance;
   - residual usable period for original usage at the end of it;
   - SOCE for traction batteries for off vehicle charging hybrid electric vehicle and pure electric vehicle;
   - storage;
   - history of repair and date, if existing.

If the PRODUCT is repurposed multiple times, data listed above for any usage subsequent to the original usage are also required.

If the PRODUCT is repaired in accordance with the specification by the manufacturer, relevant data should be provided.

3) Data for designing system with repurposing PRODUCT:
   - operating range;
   - usable period for repurposing;
   - performance design;
   - safety design.

NOTE Usable period for repurposing is determined by the actor conducting basic system design in Figure 3.

Annex A provides examples of data templates to be used for collection and management of data from 1) to 3).

4.3 Removal of used PRODUCT and external damage check

Used PRODUCT shall be removed from the original equipment as instructed in a dismantle or disassembly manual issued by the original equipment manufacturer. If such instructions are not available, special caution for high voltage hazards applies. The removal of battery systems can result in harm if adequate precautions are not taken. The removal should only be performed by qualified and experienced persons using adequate protection.

For PRODUCT from an electric vehicle application, it is recommended to obtain the data on usage and critical failure before removal from the vehicle using, for example, a vehicle diagnostic device.

After removal from original equipment, the PRODUCT shall be checked externally as follows:

– Make sure there is no leakage of electrolyte by visual confirmation or by using an odour sensor. If fluid leakage is detected in a liquid-cooled battery pack, the PRODUCT shall be identified as damaged except in cases of coolant leakage or water ingress.

Used PRODUCT with external damage – for example, severe deformation, crack or blemish in the outer case of the PRODUCT – shall not be repurposed, and should be recycled or disposed of. Relevant laws and regulations can exist.

Used PRODUCT without external damage shall be assessed for feasibility of repurposing in accordance with Clause 5.

If available and not damaged, the module and BMS of battery packs and battery systems may be reused even if the battery pack or battery system has a damaged outer case. Degree of damage and, if possible, cause of damage of outer case shall be recorded.

5 Diagnosis and assessment of used PRODUCT

5.1 General

The diagnosis and assessment of used PRODUCT for feasibility of repurposing and applicability to specific equipment shall be made based on the data on original usage in Table 1. The data in Table 1 are indispensable to ensure the safety and performance of used PRODUCT for repurposing. If the data in Table 1 are not available, the PRODUCT shall not be repurposed.

The other data, for example, insulation resistance, EMC (electromagnetic compatibility), operating region of cell, may be assessed in accordance with the agreement of the data provider, if indispensable for a specific application of repurposing.

NOTE The data provider is the original equipment manufacturer, the cell or battery manufacturer, or the administrator of relevant data.

Table 1 – Data on original usage for repurposing assessment

Subclause of this document	Data on original usage
5.2	Data on operating range
5.3	Data on history of critical failure of original equipment
5.4	Data on residual performance
5.5	Data on residual usable period for original usage
5.6	Data on storage
5.7	Data on history of repair

If the PRODUCT is repurposed multiple times, the data in Table 1 are also required for any usage subsequent to the original usage.

5.2 Operating range

The operating range of PRODUCT for original usage shall be confirmed.

The data on operating range shall include the following:

– upper limit operating temperature;
– lower limit operating temperature;
– upper limit charging voltage;
– lower limit discharging voltage;
– maximum charging current;
– maximum discharging current.

The operating region of the cell shall be confirmed, if necessary.

5.3 History of critical failure of original equipment

Used PRODUCT with one or more of the following critical failure data shall not be repurposed:

– overcharge;
– overdischarge;
– overcurrent;
– overtemperature;
– insulation failure;
– accident.

The other data may be assessed in accordance with the agreement of the data provider, if indispensable for specific application of repurposing.

History of critical failure and other data of PRODUCT may be stored in the battery management system, other storage devices in the equipment or external storage devices.

When the critical failure is limited to an insulation failure, the PRODUCT may be repurposed provided that there is no evidence of water exposure, and the insulation resistance is higher than the specified value.

When the critical failure data are limited to an accident, the PRODUCT may be repurposed provided that there is no evidence of any battery damage.

NOTE The accident history can be confirmed, for example, for electric vehicles, by incident data in the electronic control unit, such as history of high voltage cutoff.

5.4 Residual performance

The actual capacity of used PRODUCT shall be estimated or measured in accordance with, for example, standards applicable to the original equipment. The estimation or measuring method shall be recorded. The measuring conditions include charging condition (upper and lower limit voltage, charging current and charging time), discharging current, cut-off voltage, and temperature.

The actual capacity of PRODUCT of electric vehicle application can be obtained through an on-board PRODUCT performance indicating function, before removal from the vehicle.

SOCE can be used as a residual performance parameter instead of the actual capacity.

NOTE Additional parameters can be measured or obtained in order to specify the residual performance including resistance, power, energy efficiency, self-discharge rate, spread in cell voltage, etc. in accordance with standards or other documents applicable to the original equipment.

5.5 Residual usable period for original usage

The residual usable period for original usage after the original usage of used PRODUCT shall be assessed

– based on the estimated usable period specified by the original equipment manufacturer after deduction of age of service of the original equipment, or
– based on the age of service and history of original usage.

If the PRODUCT is repurposed multiple times, the residual usable period after any usage subsequent to the original usage shall also be assessed.

NOTE The history of original usage includes, for example, data on remaining life of contactors and residual capacity.

If the used PRODUCT has been stored after the original usage and before application to new equipment, the period of such storage shall also be deducted from the usable period.

5.6 Storage

The PRODUCT for repurposing shall be stored under controlled conditions until the application to equipment.

The PRODUCT in storage shall:

– be kept dry;
– be kept away from heat and fire;
– be kept away from direct sunlight;
– be kept away from high temperature;
– not be dropped and stepped on.

The PRODUCT shall not be repurposed if the storage data are not available. The following storage data shall be recorded:

– SOC or voltage of PRODUCT at the beginning of storage;
– ambient temperature of storage;
– period and beginning date of storage.

If the SOC or voltage after the storage is below the lower limit of operating range of equipment that is going to use repurposed PRODUCT, the PRODUCT shall not be repurposed.

5.7 History of repair

The data on history of repair shall contain all the relevant information of components within PRODUCT which had been changed or modified with the date of these modifications.

6 Requirements for application of repurposed PRODUCT

6.1 General

The applicability of repurposed PRODUCT to an equipment shall be determined based on the data in Clause 5, and the specifications required by the equipment to which the repurposed PRODUCT is to be applied.

NOTE 1 Additional requirements can be applied by standards and/or regulations relevant to a new application going to use repurposed PRODUCT as required.

The following shall be evaluated for each application and for each PRODUCT:

– operating range;
– safety;
– performance;
– usable period for repurposing.

Table 2 shows the guidance of reference clauses depending on system designs with used PRODUCT.

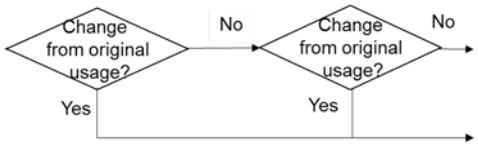
If the repurposed PRODUCT is used without change in system design under the environmental and usage conditions with the load not exceeding that of the original equipment, the safety design, performance design and residual usage period of the original usage may be applied.

If the system design is changed from the original usage, the safety design, performance design and usable period shall be proved and assessed for repurposing.

NOTE 2 The environmental and usage conditions include:

– installation environment;
– ambient temperature;
– humidity;
– dust;
– vibration;
– acceleration;
– high power (kW) and high frequency charge and/or discharge;
– cell fixing condition inside module, etc.

Table 2 – Reference clauses for repurposed PRODUCT applications

System design		Safety design	Performance design	Usable period
Hardware design	Software design			
		Safety design of original usage applicable (6.3)	Performance design of original usage applicable (6.4)	Usable period of original usage applicable (6.5)
		Safety design for repurposing to be proved (B.3)	Performance design for repurposing to be proved (B.4)	Usable period for repurposing to be proved (B.5)

NOTE 2 An example of cases where system design change is not required is when the PRODUCT was originally designed with consideration for some specific usages of repurposed PRODUCT. Examples of the systems with design change from the original equipment are shown in Clause B.1.

6.2 Operating range

A system applying the repurposed PRODUCT should be designed to be used within the operating range of the PRODUCT for original usage (see 5.2).

The operating range of repurposing PRODUCT shall include the following:

– upper limit operating temperature;
– lower limit operating temperature;
– upper limit charging voltage;
– lower limit discharging voltage;
– maximum charging current;
– maximum discharging current.

For the operating range of used PRODUCT whose system design is changed, Clause B.2 of Annex B applies.

6.3 Safety design

Safety of repurposed PRODUCT shall be assessed and secured based on the data on original usage as specified in Clause 5 and safety design of the system applying the repurposing PRODUCT.

If the age of service of the PRODUCT at the end of original usage goes beyond the service life or if the service life is not specified, the safety of repurposed PRODUCT shall be determined in accordance with the assessment of age of service and history of original usage.

If the PRODUCT is repurposed multiple times, the age of service and history of any usage subsequent to the original usage shall also be assessed.

WARNING – Aging of the PRODUCT can incur unstable electrode condition and leakage of electrolyte due to decrease of airtightness, and can cause hazardous events.

NOTE The PRODUCT is designed as a system including BMS to secure the safety of original equipment. If the PRODUCT is repurposed without change from the originally designed system, and within the operating range and under the environmental and usage conditions with the load not exceeding that of the original equipment, the safety design of the battery system is maintained.

For used PRODUCT whose system design is changed from original usage, and when the safety design of original equipment is not applicable, Clause B.3 applies.

6.4 Performance design

The PRODUCT is designed to ensure the required performance of original equipment. If the PRODUCT is repurposed without change from the originally designed system, within the operating range of original equipment, and to be used under the environmental and usage conditions with the load not exceeding that of the original equipment, the performance design of the battery system is maintained.

NOTE The usage environment includes installation environment, ambient temperature, humidity and charging/discharging cycles.

The performance includes, for example, the following:

a) capacity;

b) resistance;

c) power;

d) energy efficiency;

e) self-discharge;

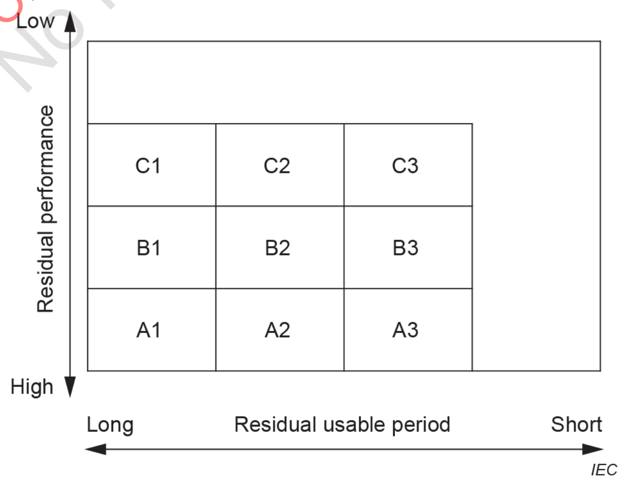
f) others.

The repurposed PRODUCT shall have performance required by the equipment to be applied. The residual performance of used PRODUCT is as specified in 5.4.

The performance of repurposed PRODUCT can be remeasured in accordance with the relevant standard for the equipment to be applied.

Required performance of repurposed PRODUCT depends on the applications. For the same application, the PRODUCT with the same level of residual performance and usable period should be used. The PRODUCT with different level of performance can be used for the same application if the safety of the system is confirmed in accordance with 6.3.

Figure 4 shows an example of classification based on the residual performance level and usable period, which can be used to evaluate the homogeneity of repurposed PRODUCT. The PRODUCT classified as A1 group, for example, has relatively long usable period and high performance, and can be used for a system which requires a PRODUCT with relatively high specifications.



Key

A1 to A3, B1 to B3, C1 to C3 example classification of repurposed PRODUCT in terms of performance and usable period

Figure 4 – Example of classification of repurposed PRODUCT

The residual performance level of the repurposed PRODUCT in Figure 4 can be classified by some performance criteria such as capacity, resistance, etc. Table 3 shows an example of a sorting method using the performance level. In this method, the worst criterion level determines the performance bin, for example, a PRODUCT with capacity level a_c and resistance level b_r goes into performance bin B.

Table 3 – Example of classification of repurposed PRODUCT by performance level

Performance level				Performance bin
Residual capacity ratio (Ah/Ah %)		Internal resistance ratio (Ω/Ω %)		
range of value	level	range of value	level	
100 to x	a_c	100 to x'	a_r	A
x to y	b_c	x' to y'	b_r	B
y to z	c_c	y' to z'	c_r	C
< z	d_c	< z'	d_r	Recycling
Key a_c, b_c, c_c, d_c level ratings of residual capacity ratio a_r, b_r, c_r, d_r level ratings of internal resistance ratio x' is not equal to x. This is also the case with y' and z'.				

For used PRODUCT whose system design is changed from the original usage, and when the performance design of original equipment is not applicable, Clause B.4 applies.

6.5 Usable period for repurposing

A system applying repurposed PRODUCT shall be designed in accordance with the residual usable period of PRODUCT as specified in 5.5.

The usable period for repurposing depends on the design, operating range, environmental and usage conditions and purpose of the equipment applying the repurposed PRODUCT. If the PRODUCT is repurposed without change from originally designed system, and within the operating range and under the environmental and usage conditions with the load not exceeding that of the original equipment, the usable period for repurposing is equal to the residual usable period.

When the environmental and usage conditions of equipment applying the repurposing PRODUCT are different from those of the original equipment, the usable period shall be determined taking those differences into consideration by the actor conducting basic system design in Figure 3.

The SOC window should be considered and can be reduced.

Usable period of PRODUCT peripherals such as BMS, contactor and fuse shall also be assessed.

For used PRODUCT whose system design is changed from the original usage, and when the residual usable period of original equipment is not applicable, Clause B.5 of Annex B applies.

Annex A
(informative)

Examples of data templates

This Annex A provides examples of templates for the data specified in Clauses 4, 5 and 6. Table A.1 shows an example of a template for data on PRODUCT that are required for repurposing. Table A.2 provides an example of a template for data to be used for application of repurposed PRODUCT.

Table A.1 – Example of template for data on PRODUCT to be repurposed

Item		Data on PRODUCT to be repurposed			
Manufacturer					
Chemistry					
Model and type					
Manufacture year and month					
Serial number (if available)					
Battery pack dismantling safety procedure					
Operating range of original usage					
	Temperature	upper limit		lower limit	
	Voltage	upper limit		lower limit	
	Current	upper limit		lower limit	
History of critical failure		□ No overcharge □ No overdischarge □ No overcurrent □ No overtemperature □ No insulation failure □ No accident			
Data on history of repair					
History of usage, if available		□ Charging history not exceeding the specified operating range □ Discharging history not exceeding the specified operating range			
Actual capacity					
Age of service					
Estimated usable period (if available)					
Storage					
	SOC or voltage at the beginning of storage				
	Ambient temperature of storage				
	Period and beginning date of storage				

Table A.2 – Example of template for data on application of repurposed PRODUCT

Item		Data on application of repurposed PRODUCT			
Operating range of repurposed PRODUCT					
	Temperature	upper limit		lower limit	
	Voltage	upper limit		lower limit	
	Current	upper limit		lower limit	
Capacity					
Estimated usable period					
Safety design		□ The safety design of original equipment is applicable. □ The safety design of system with used PRODUCT is applicable.			
Classification (if any)					
Applicable equipment					