SRI LANKA STANDARD 1126 PART 2: 2022
(IEC 60095-2:2021)
UDC 621.35

SPECIFICATION FOR LEAD-ACID STARTER BATTERIES PART 2 : DIMENSIONS OF BATTERIES AND DIMENSIONS AND MARKING OF TERMINALS

(Third Revision)

SRI LANKA STANDARDS INSTITUTION

Sri Lanka Standard

SPECIFICATION FOR LEAD-ACID STARTER BATTERIES PART 2 : DIMENSIONS OF BATTERIES AND DIMENSIONS ANDMARKING OF TERMINALS

(Third Revision)

SLS 1126 Part 2: 2022
(IEC 60095-2:2021)

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SRI LANKA

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This Standard does not purport to include all the necessary provisions of a contract

Sri Lanka Standard
Specification for Lead-Acid Starter Batteries
Part 2: Dimensions of batteries and dimensions and marking of terminals
(Third Revision)

NATIONAL FOREWORD

This standard was approved by the Sectoral Committee on Electrical Appliances and Accessoriesand was authorized for adoption and publication as a Sri Lanka Standard by the Council of Sri Lanka Standards Institution on 2022-06-02.

This is the third revision of the **SLS 1126** Part **2** and which is identical with **IEC 60095-2 Edition 5.0 2021-08** Lead-Acid Starter Batteries : Part 2 : Dimensions of batteries and dimensions and marking of terminals published by the International Electrotechnical Commission (IEC), except for the deviations given in the National Appendix.

For the purpose of deciding whether a particular requirement of this standard is complied withthe final value, observed or calculated, expressing the results of a test or an analysis shall be rounded off in accordance with **SLS 102**. The number of significant places to be retained in the rounded off value shall be the same as that of the specified value in the standard.

Terminology and conventions

The text of the International Standard has been accepted as suitable for publication with additional information given in the National Appendix. However, certain terminology and conventions are not identical with those used in Sri Lanka Standards; attention is therefore drawnto the following:

a) Wherever the words “International Standard” appear referring to this standard they should be interpreted as “Sri Lanka Standard”.

b) Wherever the page numbers are quoted they are the page numbers of IEC standard.

c) The comma has been used as a decimal marker. In Sri Lanka Standards it is the currentpractices to use a full point on the base line as a decimal marker.

Cross references International Standard	Corresponding Sri Lanka Standard
IEC 60050-482 : International Electrotechnical Vocabulary (IEV) Chapter 482 : Primary and secondary cells and batteries	
IEC 60095-1:2018 Lead-acid starter batteries - Part 1: General requirements and methods of test	SLS 1126 Part 1: Lead-acid starter batteries - General requirements and methods of test
IEC 60417 *DB 2002: Graphical symbols for use on equipment - 12-month subscription to regularly updated online database comprising all graphical symbols published in IEC 60417	
ISO 1043-1: Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics	SLS 1559 Part 1 Symbols and abbreviated terms for plastics - Basic polymers and their special characteristics
ISO /IEC 10646 Information Technology – Universal coded Character set (UCS)	

NATIONAL APPENDIX

AMENDMENTS TO THE TEXT OF IEC 60095-2

1. Table 7 Dimensions of series AS

Replace the " h max" value 255 mm of D 26 and D 31 with 225 mm.

SLS 1126 Part 2: 2022

IEC 60095-2

Edition 5.0 2021-08

INTERNATIONAL STANDARD

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Lead-acid starter batteries –
Part 2: Dimensions of batteries and dimensions and marking of terminals

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Lead-acid starter batteries –
Part 2: Dimensions of batteries and dimensions and marking of terminals

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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LEAD-ACID STARTER BATTERIES –

Part 2: Dimensions of batteries and dimensions and marking of terminals

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60095-2 has been prepared by IEC technical committee 21: Secondary cells and batteries.

This fifth edition cancels and replaces the fourth edition published in 2009. This edition constitutes a technical revision.

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

a) update of the dimensions of batteries:
   - in Europe according to the last version of the European standard;
   - in USA with figures updated;
   - in Asia with one type of Japanese battery removed.

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

FDIS	Report on voting
21/1086/FDIS	21/1092/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/standardsdev/publications.

A list of all parts in the IEC 60095 series, published under the general title *Lead-acid starter 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,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

LEAD-ACID STARTER BATTERIES –

Part 2: Dimensions of batteries and dimensions and marking of terminals

1 Scope

This part of IEC 60095 is applicable to lead-acid batteries used for starting, lighting and ignition of passenger cars and light vehicles with a nominal voltage of 12 V.

All batteries in accordance with this document can be fastened to the vehicle either by means of the ledges around the container or by means of a hold-down device engaging with the lid.

This document specifies dimensions of battery for Europe, East Asia and North America.

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 60050-482, *International Electrotechnical Vocabulary – Part 482: Primary and secondary cells and batteries*

IEC 60095-1:2018, *Lead-acid starter batteries – Part 1: General requirements and methods of test*

IEC 60417:2002 , *Graphical symbols for use on equipment*

ISO/IEC 10646, *Information technology – Universal coded character set (UCS)*

ISO 1043-1, *Plastics – Symbols and abbreviated terms – Part 1: Basic polymers and their special characteristics*

ISO 11469, *Plastics – Generic identification and marking of plastics products*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 60050-482 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

4 General requirements

4.1 General

The specifications of Clause 4 are common to all starter batteries according to this document.

4.2 Marking

4.2.1 Safety labelling

The batteries shall bear the six coloured safety symbols in accordance with 6.1.6 of IEC 60095-1:2018.

4.2.2 Marking of the polarity of terminals

4.2.2.1 General

The batteries shall carry the marking of polarity, at least of the positive terminal.

4.2.2.2 Marking of positive terminals

This marking shall take the form of the symbol "+" either on the upper surface of the positive terminal or on the lid adjacent to the positive terminal.

4.2.2.3 Marking of negative terminals

This marking shall take the form of the symbol "–" either on the upper surface of the negative terminal or on the lid adjacent to the negative terminal.

4.2.2.4 Design and dimensions of marking of terminals

The symbols used for marking the terminals shall be in accordance with IEC 60417-5005:2012-10 for the positive and IEC 60417-5006:2012-10 for the negative polarity.

The dimensions of the marking shall be according to Figure 1.

Dimensions in millimetres

Figure 1 – Marking of polarity

The polarity symbols may be either indented or embossed by (0,4 ± 0,1) mm.

As an alternative, the wordings "POS" and "NEG" are permitted for the North American market only.

4.3 Recycling

4.3.1 Recycling of lead

The batteries shall be marked with the symbols for recycling and separate collection according to IEC 60095-1.

4.3.2 Recycling of plastic material

Injection moulded battery components need to be marked according to ISO 11469 and ISO 1043-1. The marking shall be placed on the bottom of the battery container or on one short side near the ledge.

According to ISO 11469 and ISO 1043-1 the minimum marking for polypropylene-polyethylene copolymer is >PP< or >PP/PE<.

In addition it is possible to show the recycling symbol with number 7 (Unicode character 'RECYCLING SYMBOL FOR TYPE-7 PLASTICS' (U+2679) according to ISO/IEC 10646) and the term "Other".

The recommended thickness is (0,3 ± 0,1) mm. The height of the marking characters shall be between 3 mm and 7 mm.

An example for this marking is shown in Figure 2.

Figure 2 – Marking of polypropylene-polyethylene copolymer battery components

4.4 Dimensions and design

All dimensions given in this document correspond to a temperature of 20 °C of the polypropylene-polyethylene copolymer.

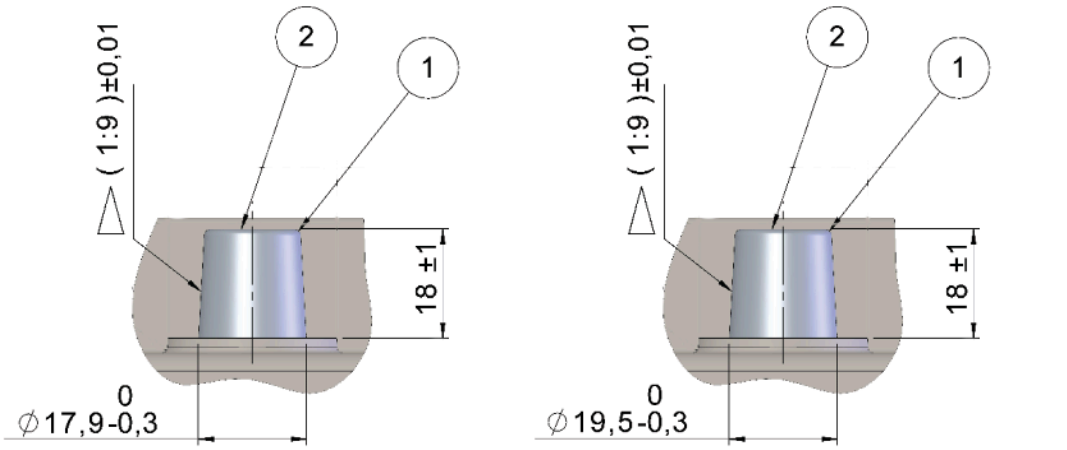
Details of the design that are not indicated in the generic drawings need to be chosen appropriately.

The generic drawings in this document are possible examples only. Especially the design of the lid, handles, ribs, ledges and vent caps are not mandatory in total.

4.5 Dimensions of tapered battery terminals

The dimensions of the tapered positive and negative terminal shall be according to Figure 3.

Dimensions in millimetres



Key

1 Edge with radius

2 Convex or concave surface design permitted within height dimensions of (18 $^{+1}_{-2}$) mm related to the center of the terminal

Figure 3 – Dimensions of positive (on the right) and negative (on the left) terminal

5 Recommended types used in Europe (EU)

5.1 General

For new battery developments, only the recommended series shall be used.

Clause 5 specifies:

– the main dimensions of starter batteries of the preferred LN series;
– the location of the positive and negative terminals with respect to the fastening system;
– the dimensions of tapered terminals of starter batteries.

5.2 Main dimensions of batteries

The main dimensions of the batteries of the LN series are shown in Table 1 and Figure 4, Figure 5, Figure 6 and Figure 7.

NOTE The schematic drawings do not show every design detail of the battery.

The following symbols are used:

a_1 Overall length at the battery base with ledges

a_2 Length at the battery base without ledges

a_3 Length at battery lid

a_4 Distance of the inside notches

a_5 Distance between terminal and the edges of the lid at the short side (see Figure 4 and Figure 6)

a_6 Distance of the grip-segments for handling by robot equipment (see Figure 14)

A Position of optional sensors (see Figure 13)

B Position of optional sensors (see Figure 13)

H Overall height including lid and plugs

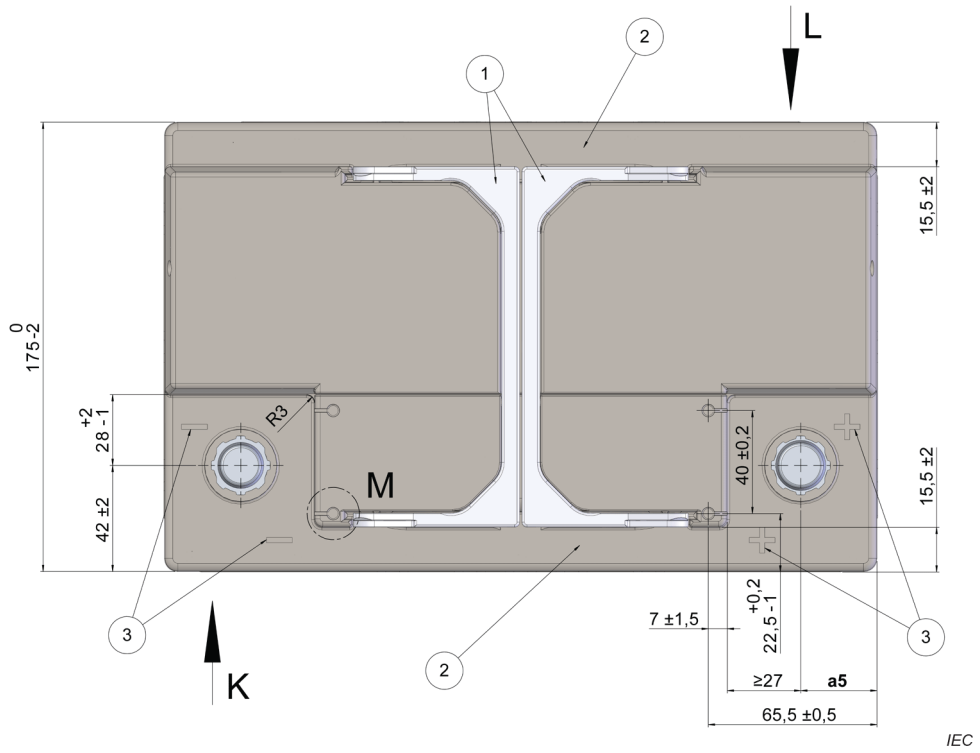
h Height of the top clamping area supporting the hold-down device

Table 1 – Main dimensions of batteries of standard series LN

Dimensions in millimetres

Type	a_1	a_2	a_3	a_4	a_5	a_6	*A*	*B*	*H*	*h*
	+0 / −2	± 1	+0 / −3	+0 / −1	± 2	± 2	± 2	± 2	+0 / −3	+0 / −4
LN 0	175	161	175	40	19	79	13	40		
LN 1	207	193	207	40	24	95	18	48		
LN 2	242	228	242	40	26	113	19	57		
LN 3	278	264	277	40	29	130	27	65	190	168
LN 4	315	301	314	40	31	150	27	74		
LN 5	353	339	352	60	27	168	28	84		
LN 6	394	379	393	60	30	187	31	94		

Dimensions in millimetres



Key

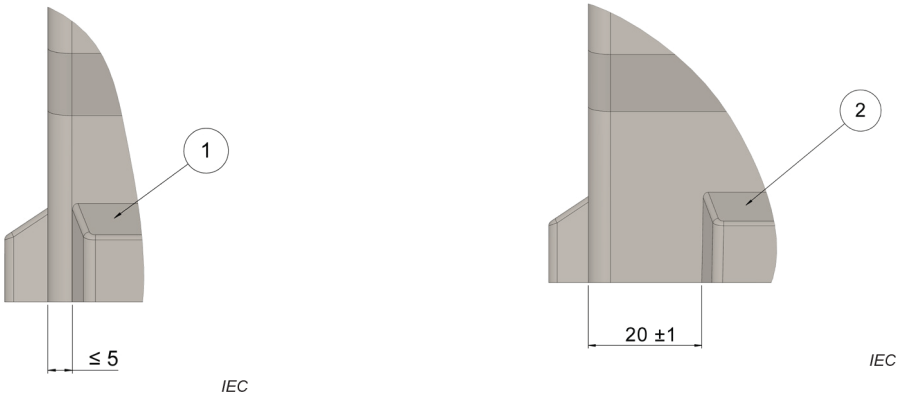
1 Handles shown as example only

2 Top clamping area for fastening

3 Polarity markings

Figure 4 – Main dimensions of batteries of standard series LN and LBN – Top view

Dimensions in millimetres



a) Detail K **b) Detail L**

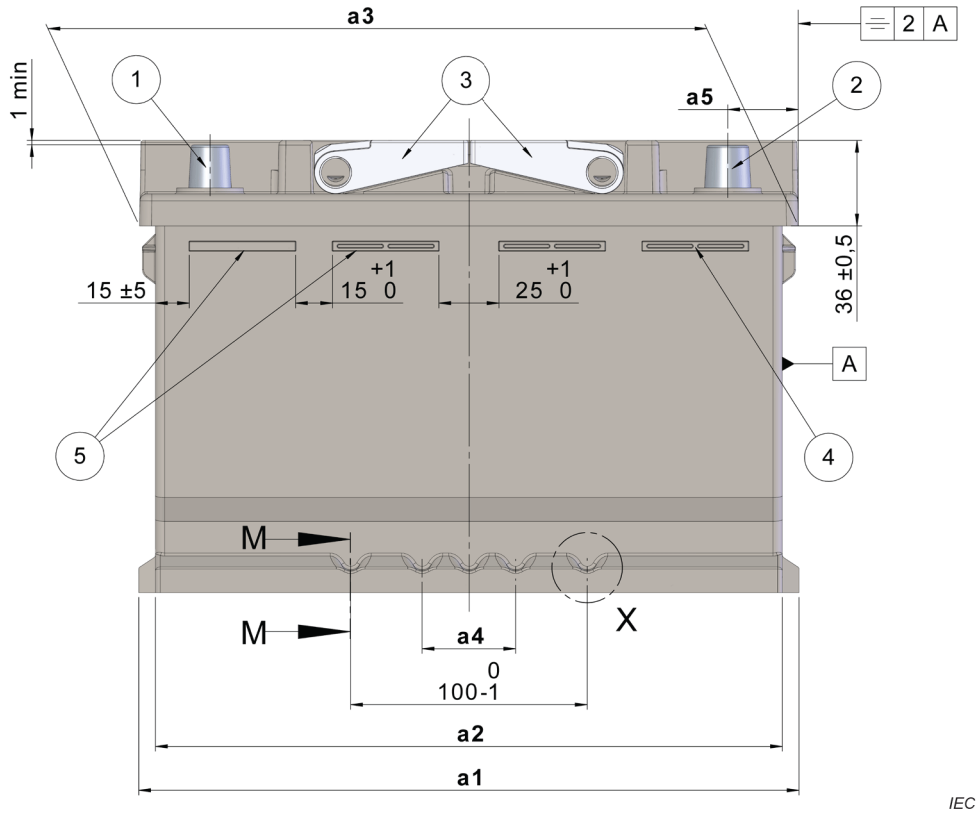
Key

1 Ledge on battery front side

2 Ledge on battery back side

Figure 5 – Details of Figure 4

Dimensions in millimetres



Key

1 Negative terminal

2 Positive terminal

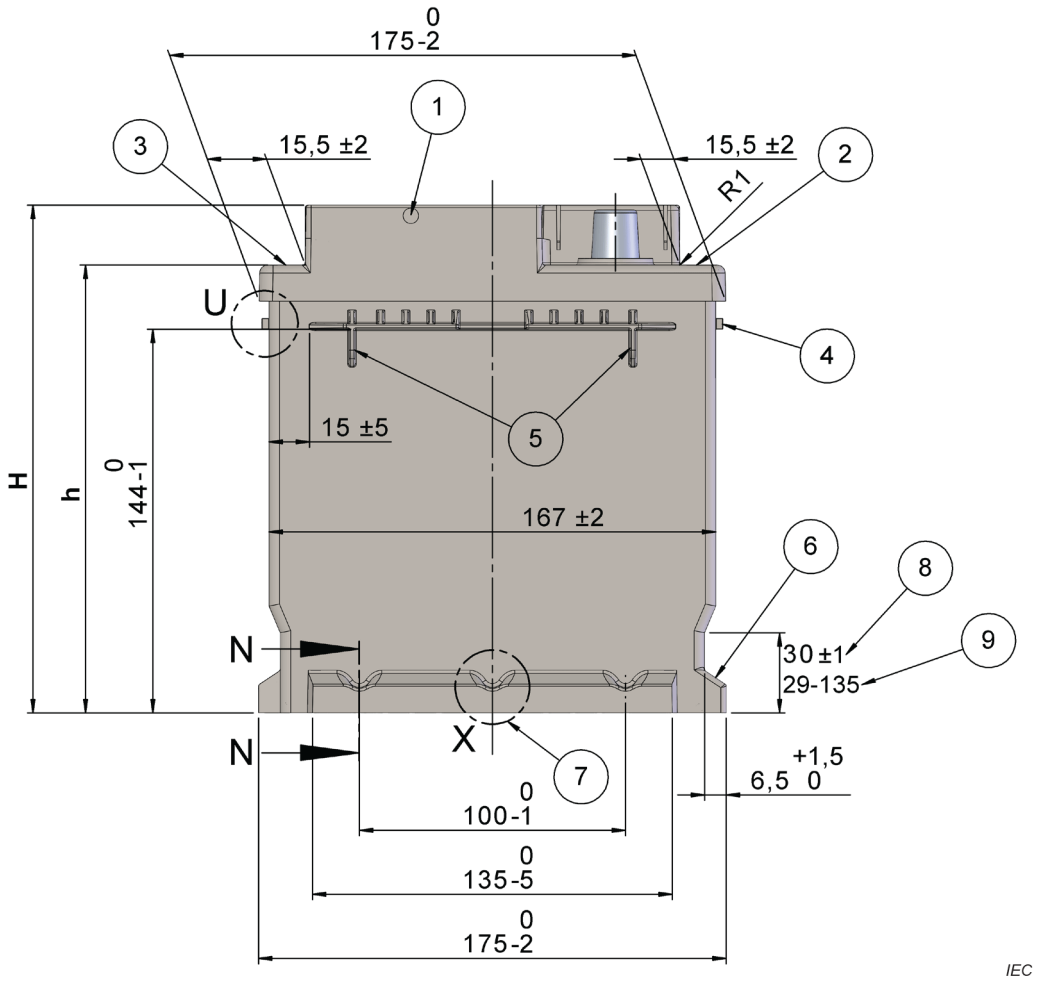
3 Handles shown as example only

4 Both versions acceptable

5 Interruption acceptable

Figure 6 – Main dimensions of batteries of standard series LN – Front view

Dimensions in millimetres



Key

1 Degassing outlet
2 Top clamp area
3 Top clamp area
4 Robotic grip
5 Ribs acceptable
6 Ledge
7 Notch
8 For flooded batteries
9 For VRLA batteries

Figure 7 – Main dimensions of batteries of standard series LN – Side view

5.3 Handles

5.3.1 General

Batteries with a weight less than or equal to 20 kg may be designed without, with one, or with two handles. Batteries with a weight of more than 20 kg shall have two handles.

5.3.2 Mounting of handles

If the batteries have handles, the handles shall be integrated in the lid (see Figure 4).

NOTE The handle design shown on all the pages of this document is for information only. It is left to the battery manufacturer to propose a design in accordance with this document with respect to overall dimensions.

5.4 Mounting of batteries

5.4.1 General

Starter batteries in accordance with the LN series may be fixed to the vehicles either:

– by a bottom hold-down device of the long side,

– by a bottom hold-down device of the short side, or

– by means of a hold-down device engaging with the upper part of the battery (for example, a metal frame), connected to the top clamping area (see Figure 4 and Figure 7).

In either case, these batteries shall have top clamping areas on the long sides.

The hold-down clamps of support shall match with the ledges and notches to provide secure fastening in all directions.

5.4.2 Dimensions and arrangement of ledges and notches

All batteries of the LN series shall have ledges for fastening over the length of all sides as an integral part of the battery container and allowing the battery to be fixed by means of the bottom of the container.

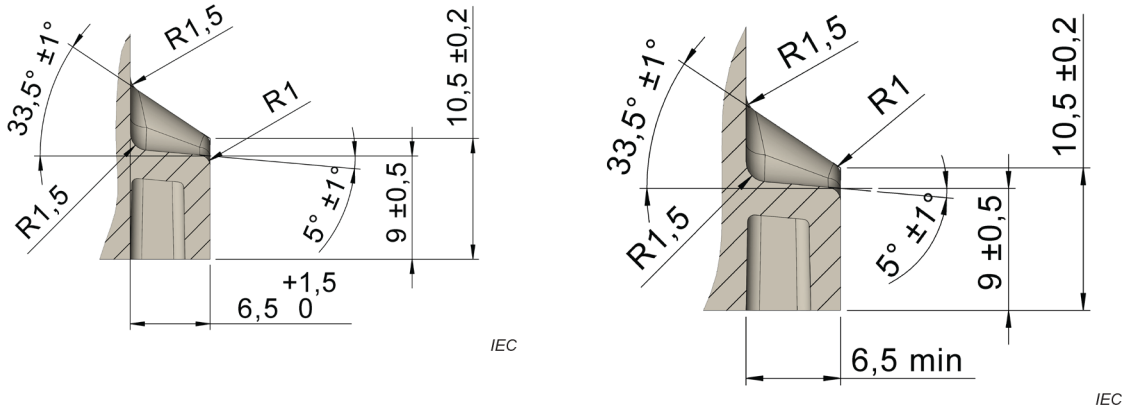
The positions and dimensions of ledges and notches shall be according to Figure 6 and Figure 7.

The profile of the ledges shall be in accordance with Figure 8 and Figure 9. The length of the ledges on the rear side of the battery shall be reduced by 20 mm from both ends compared to the one on the front side (see Figure 4).

The hold-down clamps of the support shall match with the ledges and the notches to provide secure fastening in either direction.

To allow a symmetrical rotation for fastening the opposite ledges contain an equal number of notches. To secure correct positioning of the battery on the support the ledges shall have 5 notches on the long sides and 3 notches on the short sides.

Dimensions in millimetres



a) Details of section M-M – Ledge on the long sides

b) Details of section N-N – Ledge on the short side

Figure 8 – Details of ledges of Figure 6 and Figure 7

Dimensions in millimetres

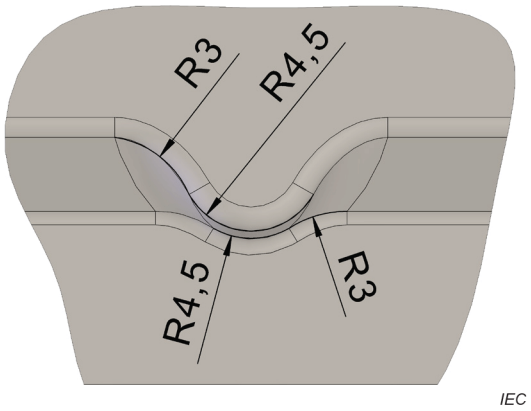


Figure 9 – Detail X – Notch on ledge

5.5 Terminals

5.5.1 Position of terminals

The position of positive and negative terminals shall be in accordance with Figure 4.

5.5.2 Dimensions of battery terminals

The dimensions of the tapered positive and negative terminal shall be according to Figure 3.

5.5.3 Marking of polarity

The polarity of the batteries of the LN series shall be marked twice in the area of the terminals (see Figure 4).

The symbol of the polarity and the dimension of the symbols shall be in accordance with 4.2.2.

5.6 Special features of the battery lid

5.6.1 General

Batteries of the LN series shall have the following details.

5.6.2 Semi bloc lid

Batteries of the LN series shall have a block lid which includes the terminals and the vent plugs so that they are not higher than the lid surface. A special feature of the semi bloc lid is the top clamping area (see Figure 4 and Figure 7).

5.6.3 Central degassing

Batteries of the LN series shall have a central degassing system with degassing outlets at one or both of the short sides (see Figure 7 and Figure 10).

The central degassing system shall be designed in such a way that charging gasses from all six cells can leave the battery via all available outlets. A separation of a subset of cells to one outlet is not permissible.

A minimum depth of 10 mm for the insertion of connection parts in the degassing outlet shall be provided.

Any connection parts shall be connected gas tight to the degassing outlet.

Dimensions in millimetres

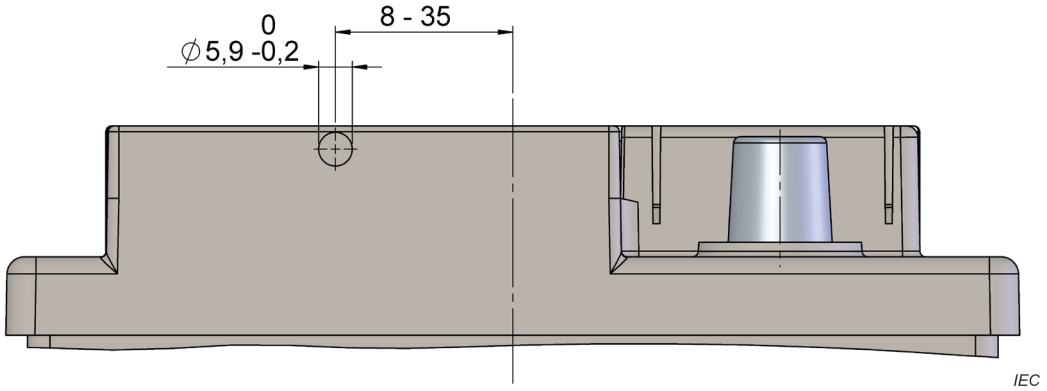
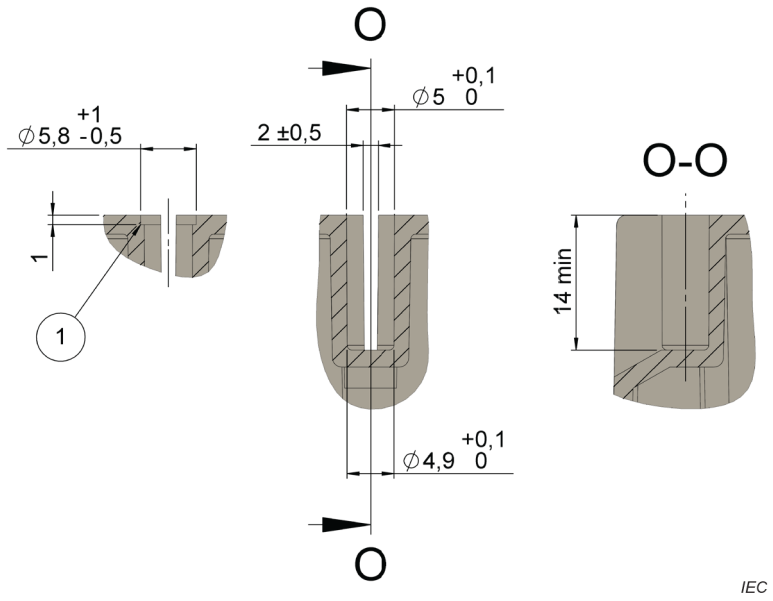


Figure 10 – Degassing outlet

5.6.4 Recessed holes

Batteries of the LN series shall have recessed holes 'M' for optional terminal protection covers on both sides (see Figure 4 and Figure 11).

Dimensions in millimetres



Key

1 optional

Figure 11 – Recessed holes "M" for optional terminal protection

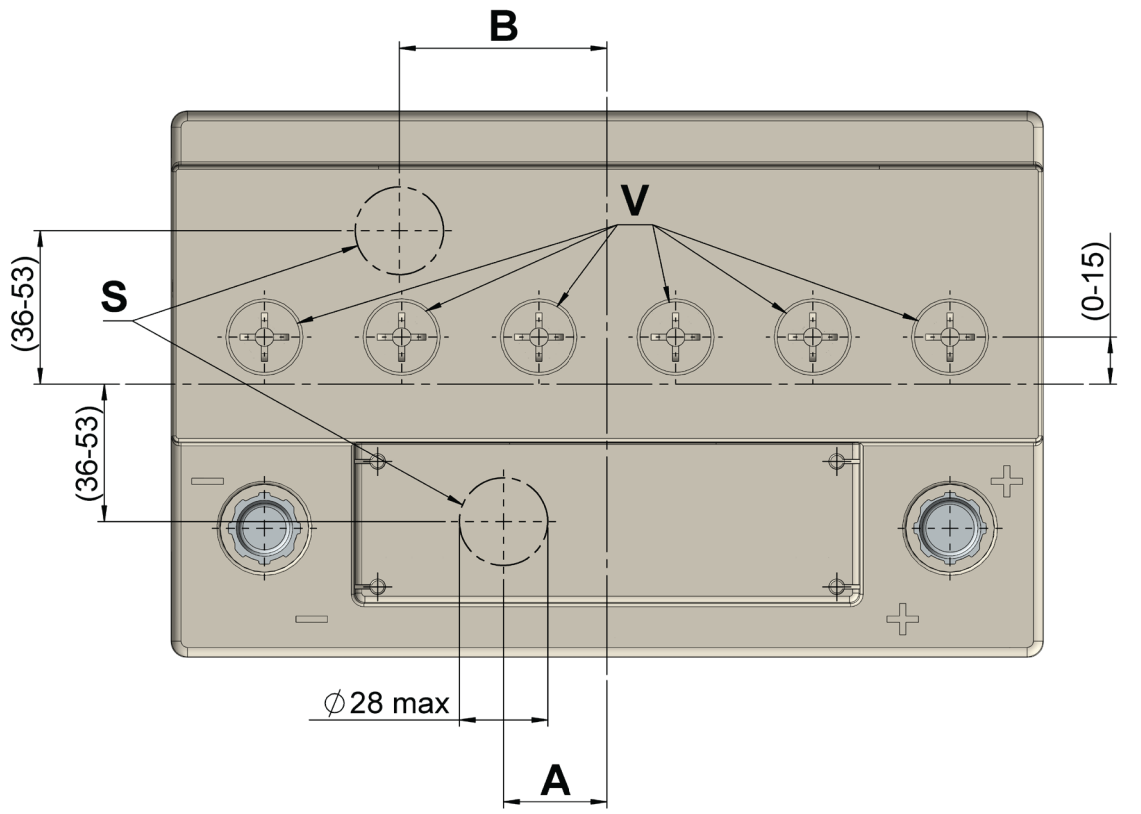
5.6.5 Removable cell plugs

If removable cell plugs are used in batteries of the LN series a flat battery surface shall be maintained and their position shall be according to Figure 12.

5.6.6 Position of sensor openings

Optional sensor openings of batteries of the LN series might be placed in one of the cell openings (V) or separate sensor openings (S). The sensor openings shall have the diameter and position according to Figure 12 and Table 1.

Dimensions in millimetres



Key

V Cell openings for removable cell plugs or optional sensors

S Additional optional sensor openings

A Dimension defined in Table 1

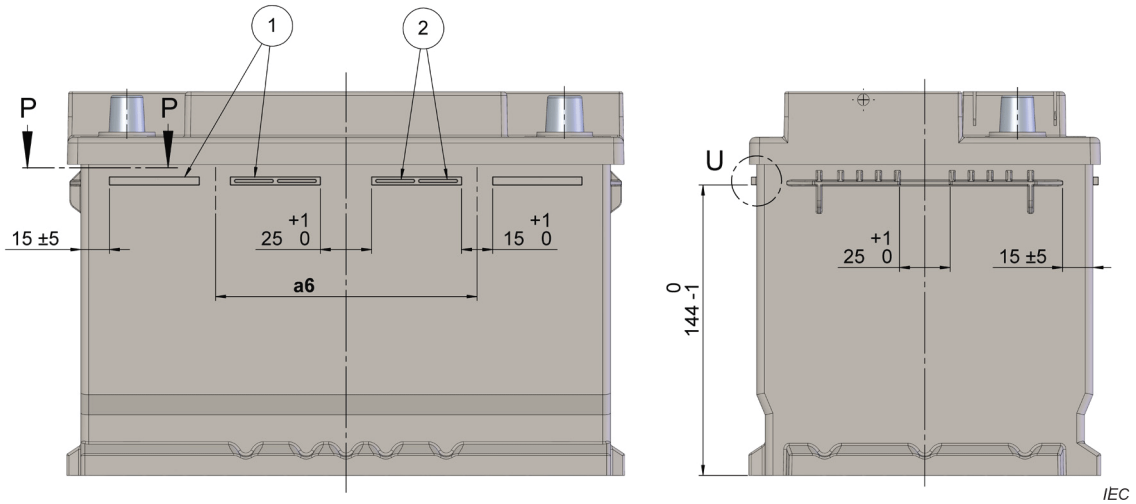
B Dimension defined in Table 1

Figure 12 – Removable cell plugs and sensor positions

5.7 Handling of starter batteries by robot-equipment

Optional grips for the handling of LN series batteries by robot-equipment shall comply with Figure 13, Figure 14, Figure 15 and Table 1.

Dimensions in millimetres



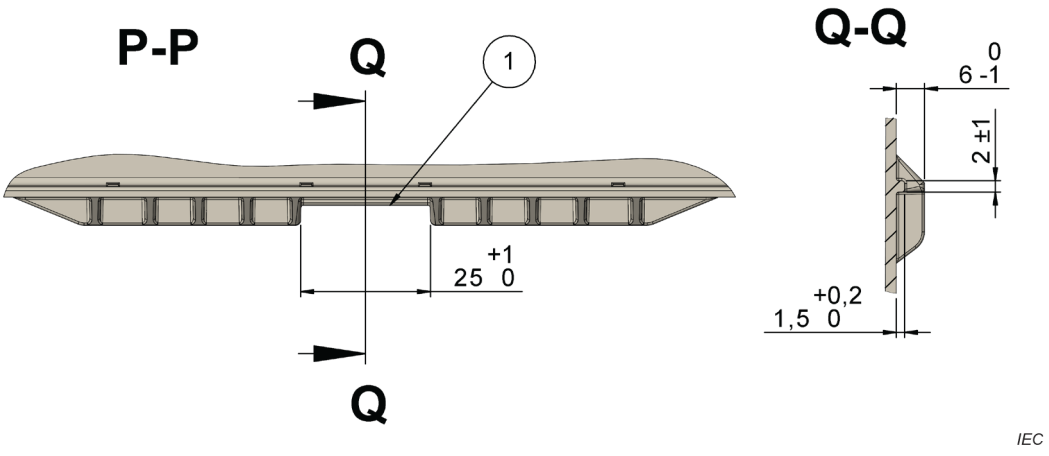
Key

1 Both versions acceptable

2 Interruption acceptable

Figure 13 – Grips for handling by robot equipment

Dimensions in millimetres



Key

1 Wall reinforcement in this area acceptable

Figure 14 – Section P-P of Figure 13 and Figure 22

Dimensions in millimetres

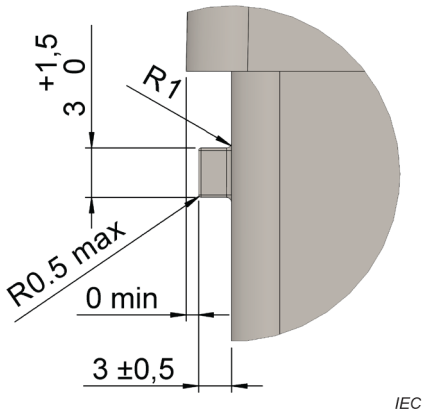


Figure 15 – Detail U of Figure 13 and Figure 22

5.8 Bulging and reinforcement of battery side walls

The maximum bulging of battery side walls shall not exceed the maximum tolerance of 5 mm as shown in Figure 16. In addition the maximum bulging shall not exceed 2 mm at 30 mm height.

All dimensions refer to new batteries at the start of electrical testing according to IEC 60095-1 and not to aged batteries.

Reinforced side walls may be needed for certain types of starter batteries (e.g. VRLA batteries) to prevent excessive bulging. This can be realized by means of thicker side walls or additional ribs as shown in Figure 17 and Figure 18.

Dimensions in millimetres

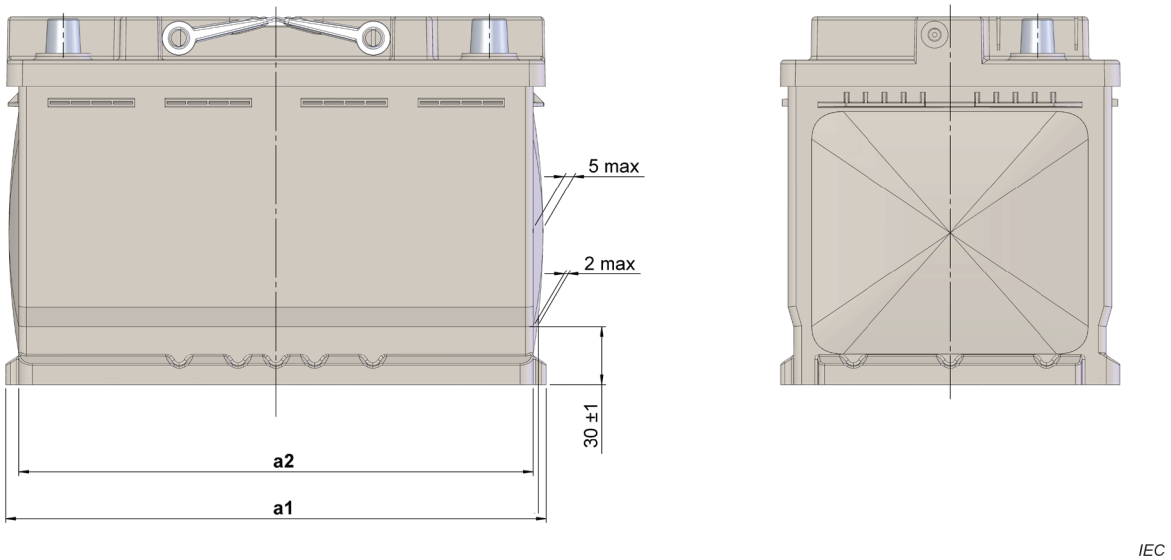


Figure 16 – Maximum allowed bulging on short sides

Dimensions in millimetres

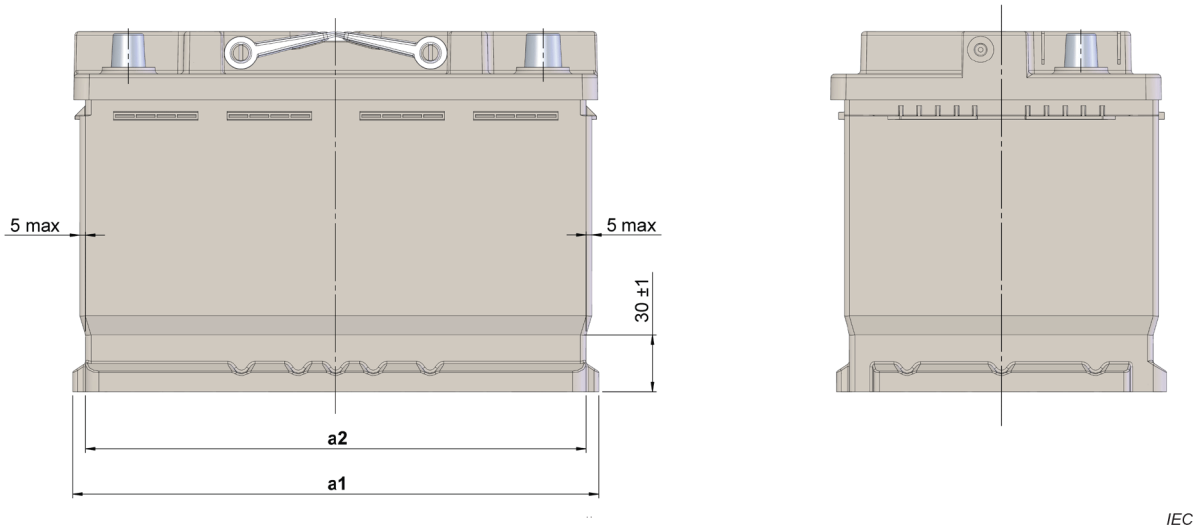
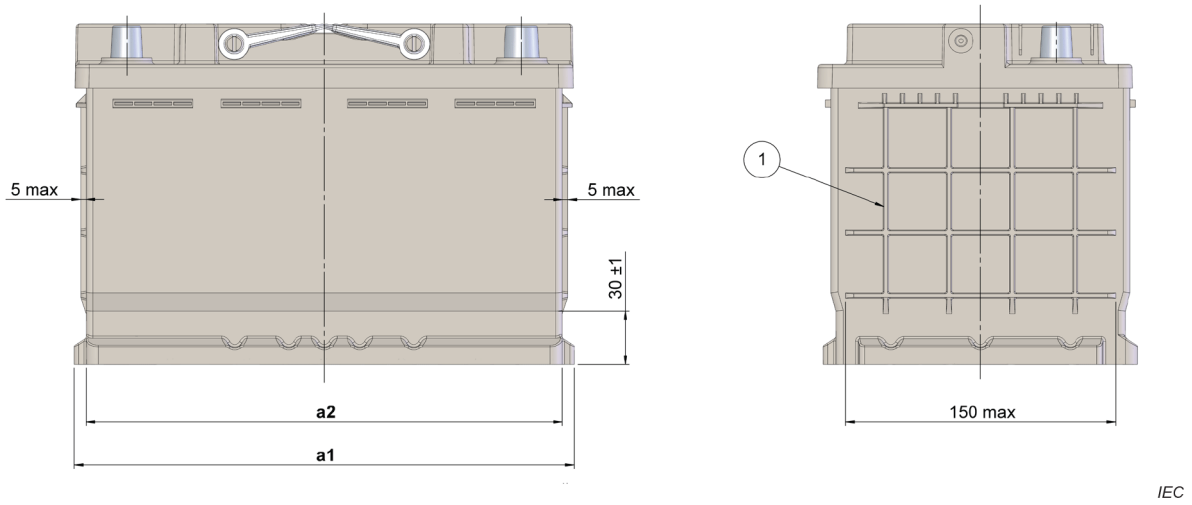


Figure 17 – Reinforcement by thicker walls on short sides

Dimensions in millimetres



Key

1 Ribs shown as example only

Figure 18 – Reinforcement by additional ribs on short sides

6 Other battery types used in Europe (EU)

6.1 General

Clause 6 applies to types of lead-acid starter batteries for passenger cars and light vehicles widely and predominantly used in Europe. In the following, the series is designated "EU".

The following battery types are listed for reference only and shall not be used for new developments.

The object of this clause is to specify:

– the main dimensions of starter batteries of LBN, L, LB, E, EB, LS, LBS, ES and EBS series;
– the location of the positive and negative terminals with respect to the fastening system;
– the dimensions of tapered terminals;
– the marking of the polarity.

6.2 Main dimensions of batteries

The main dimensions of the batteries of series LBN are shown in Table 2, Figure 4, Figure 5, Figure 6 and Figure 7. Note that the main difference of LBN types compared to LN types is the dimensions H and h.

The main dimensions of the batteries of series L, LS, LB and LBS are shown in Table 3, Figure 19, Figure 20 and Figure 21.

The main dimensions of the batteries of series E, ES, EB and EBS are shown in Table 4, Figure 19, Figure 20 and Figure 21.

NOTE The schematic drawings do not show every design detail of the battery.

The following symbols are used:

b Overall width above ledges

b_1 Width across ledges

l Overall length without handles

l_1 Length at battery base

l_2 Length at battery base with ledges

C Additional length for handles

H Overall height including lid, plugs and terminals

Table 2 – Main dimensions of batteries of other series LBN

Dimensions in millimetres

Type	a_1	a_2	a_3	a_4	a_5	A	B	H	h
	+0 / −2	± 1	+0 / −3	+0 / −1	± 2	± 2	± 2	+0 / −3	+0 / −4
LBN 0	175	161	175	40	19	13	40	175	153
LBN 1	207	193	207	40	24	18	48		
LBN 2	242	228	242	40	26	19	57		
LBN 3	278	264	277	40	29	27	65		
LBN 4	315	301	314	40	31	27	74		
LBN 5	353	339	352	60	27	28	84		
LBN 6	394	379	393	60	30	31	94		

Table 3 – Main dimensions of other series L, LS, LB and LBS

Dimensions in millimetres

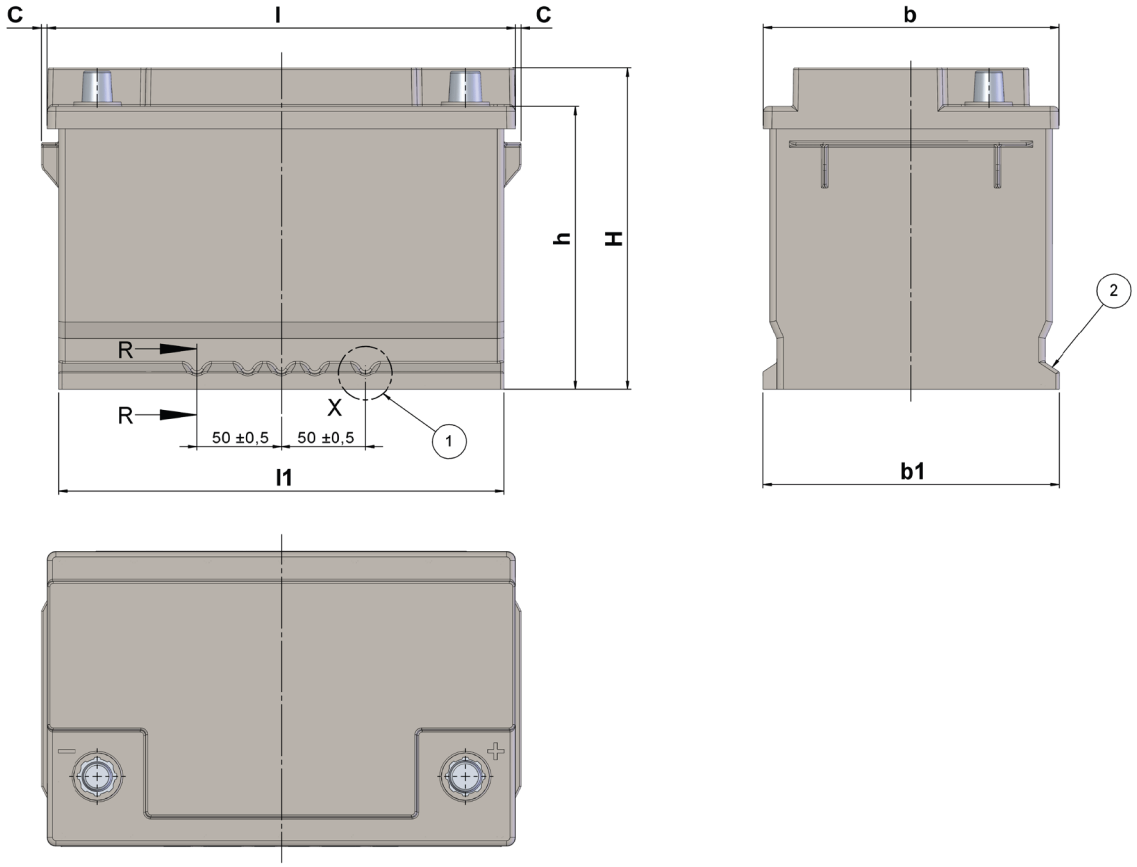
Series	Type	Length			Width		Height		Grips	Handles
		l	l_1 max	l_2	b +0 / −4	b_1	H +0 / −4	h +0 / −4	a ± 2	C max
L	L 0	175^{+0}_{-2}	162	-	175	175^{+0}_{-2}	190	169	-	14
	L 1	207^{+0}_{-2}	194	-					95	
	L 2	242^{+0}_{-2}	229	-					113	
	L 3	278^{+0}_{-3}	265	-					130	
	L 4	315^{+0}_{-3}	302	-					150	
	L 5	353^{+0}_{-4}	340	-					168	
LS	LS 1	207^{+0}_{-2}	194	207^{+0}_{-2}	175	175^{+0}_{-2}	190	169	95	14
	LS 2	242^{+0}_{-2}	229	242^{+0}_{-2}					113	
	LS 3	278^{+0}_{-3}	265	278^{+0}_{-3}					130	
	LS 4	315^{+0}_{-3}	302	315^{+0}_{-3}					150	
	LS 5	353^{+0}_{-4}	340	353^{+0}_{-4}					168	
LB	LB 1	207^{+0}_{-2}	194	-	175	175^{+0}_{-2}	175	154	95	14
	LB 2	242^{+0}_{-2}	229	-					113	
	LB 3	278^{+0}_{-3}	265	-					130	
LBS	LBS 1	207^{+0}_{-2}	194	207^{+0}_{-2}	175	175^{+0}_{-2}	175	154	95	14
	LBS 2	242^{+0}_{-2}	229	242^{+0}_{-2} $^{+0}_{-2}$					113	
	LBS 3	278^{+0}_{-3}	265	278^{+0}_{-3}					130	

Table 4 – Main dimensions of other series E, ES, EB and EBS

Dimensions in millimetres

Series	Type	Length			Width		Height		Handles
		l	l_1 max	l_2	b +0 / −4	b_1	H +0 / −4	h +0 / −4	C max
E	E1	178^{+0}_{-2}	173	-	135	135^{+0}_{-2}	225	204	14
	E2	219^{+0}_{-2}	214	-					
	E3	260^{+0}_{-3}	255	-					
	E4	301^{+0}_{-3}	296	-					
ES	ES 1	178^{+0}_{-2}	173	186^{+0}_{-2}	135	135^{+0}_{-2}	225	204	14
	ES 2	219^{+0}_{-2}	214	227^{+0}_{-2}					
	ES 3	260^{+0}_{-3}	255	268^{+0}_{-3}					
	ES 4	301^{+0}_{-3}	296	309^{+0}_{-3}					
EB	EB 1	178^{+0}_{-4}	174	-	135	135^{+0}_{-4}	205	185	14
	EB 2	220^{+0}_{-4}	216	-					
	EB 3	266^{+0}_{-5}	262	-					
	EB 4	315^{+0}_{-5}	311	-					
EBS	EBS 1	178^{+0}_{-4}	174	188^{+0}_{-2}	135	135^{+0}_{-4}	205	185	14
	EBS 2	220^{+0}_{-4}	216	230^{+0}_{-2}					
	EBS 3	266^{+0}_{-5}	262	276^{+0}_{-3}					
	EBS 4	315^{+0}_{-5}	311	326^{+0}_{-4}					

Dimensions in millimetres



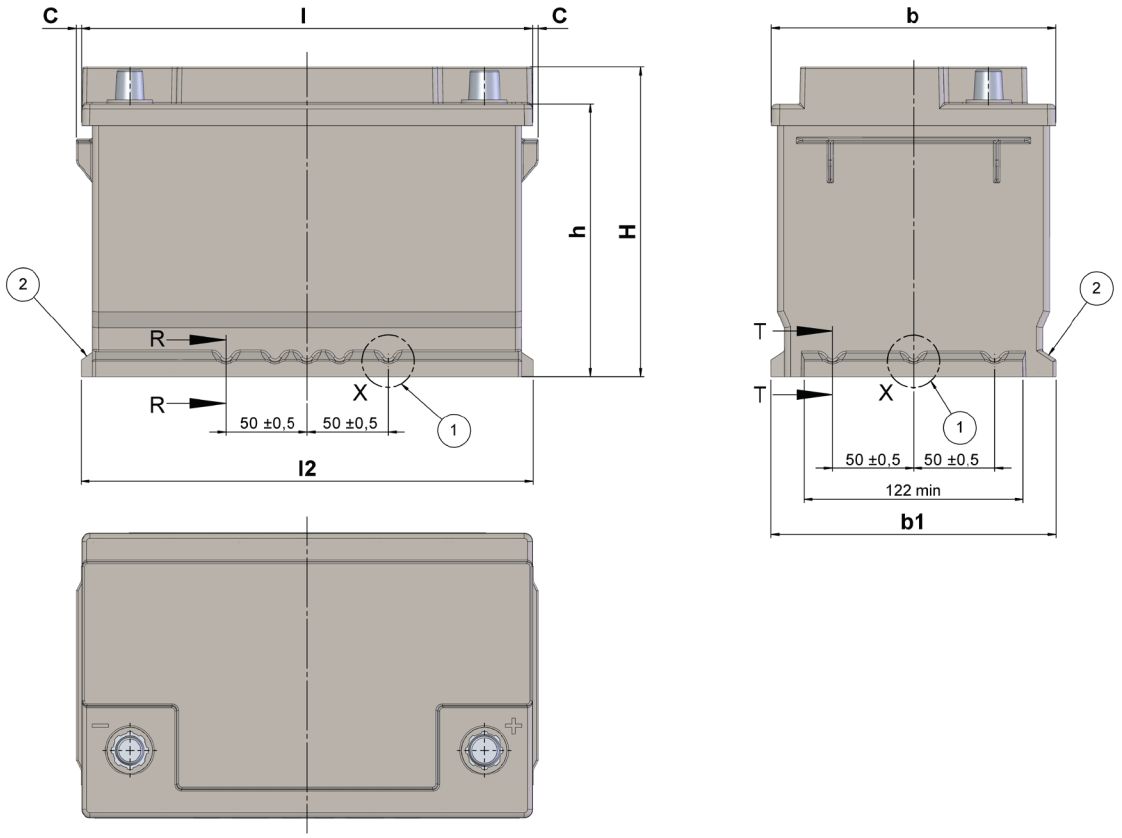
Key

1 Notch

2 Ledge

Figure 19 – Main dimensions of batteries of series L, LB, E, EB

Dimensions in millimetres



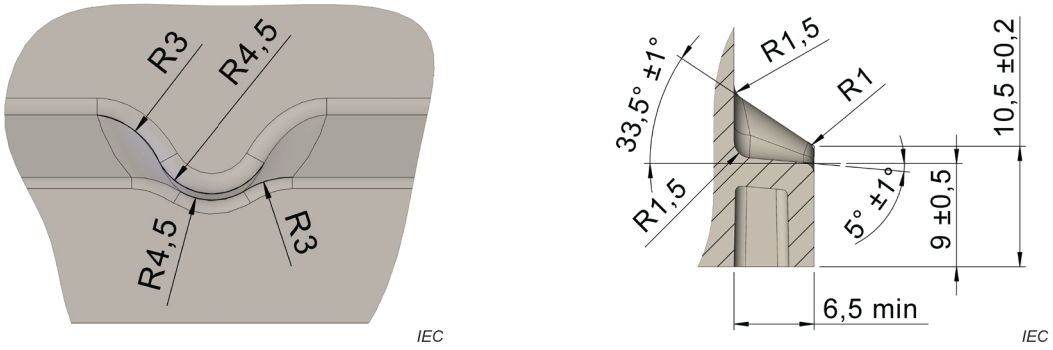
Key

1 Notch

2 Ledge

Figure 20 – Main dimensions of batteries of series LS, LBS, ES, EBS

Dimensions in millimetres



a) Details X of Figure 19 and Figure 20

b) Sections R and T of Figure 19 and Figure 20

Figure 21 – Details of Figure 19 and Figure 20

6.3 Handles

Batteries in accordance with this document may have handles. The projection 'C' of handles (see Figure 19, Figure 20 or Figure 21) shall not exceed the values given in Table 3 and Table 4. The handles shall be capable of being folded or removed so as not to interfere with the other dimensions.

6.4 Mounting of batteries

6.4.1 General

Starter batteries in accordance with this document may be fixed to the vehicles either:

– by a bottom hold-down device of the long side (L, LB, E, EB series),

– by a bottom hold-down device of the short side (LS, LBS, ES, EBS series), or

– by means of a hold-down device engaging with the upper part of the battery (for example, a metal frame).

6.4.2 Dimensions and arrangement of ledges and notches

All batteries in accordance with this document shall have ledges (or recesses forming ledges) over the full length of the long sides of the container. The ledges shall be an integral part of the battery container and allow the battery to be fixed by means of the bottom of the container.

The position and dimensions of ledges and notches shall be according to Figure 19, Figure 20 and Figure 21.

The hold-down clamps of support shall match with the ledges and notches to provide secure fastening in all directions.

The hold-down clamps of the support shall match with the ledges and the notches to provide secure fastening in either direction.

To secure correct positioning of the battery on the support, the ledge on the side of the terminals shall have one notch; the ledge on the opposite side shall have two notches. Three or five notches on both sides are permitted.

6.5 Terminals

6.5.1 Position of terminals

The position of positive and negative terminal shall be in accordance with Figure 19, Figure 20 or Figure 21.

6.5.2 Dimensions of battery terminals

The dimensions of the tapered positive and negative terminal shall be in accordance with Figure 3.

6.5.3 Marking of polarity

The polarity of the batteries shall be marked in accordance with 4.2.2 at least for the positive terminal.

If the negative terminal is also marked, the symbol used shall also be in accordance with 4.2.2.

6.6 Handling of starter batteries by robot-equipment

Optional grips for handling of LBN series batteries shall comply with Figure 22.

Optional grips for handling of L and LS series batteries by robot-equipment shall comply with Figure 23.

Optional grips for handling of LB and LBS series batteries by robot-equipment shall comply with Figure 25 or Figure 26.

Robot grips shall not exceed dimensions of the lid (see detail V according to Figure 24 and detail Y according to Figure 27).

Dimensions in millimetres

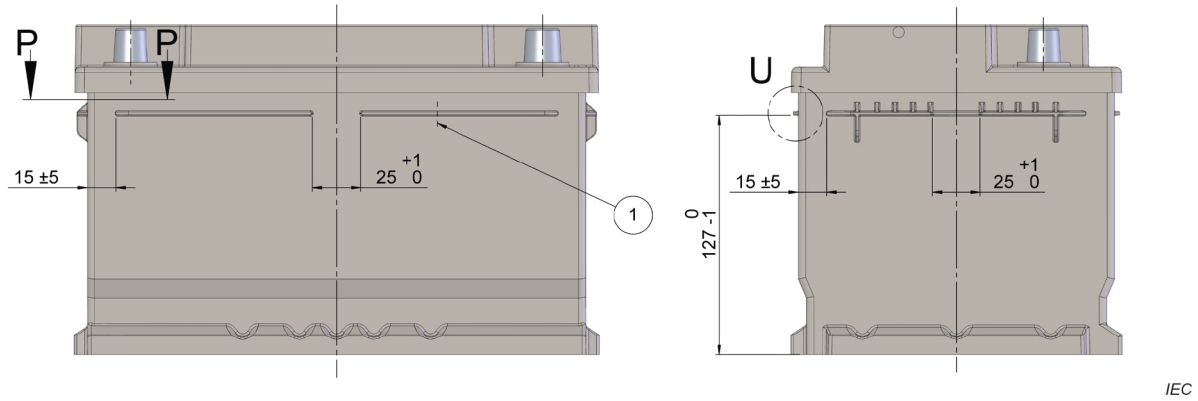


Figure 22 – Grips for handling by robot equipment for LBN series

Dimensions in millimetres

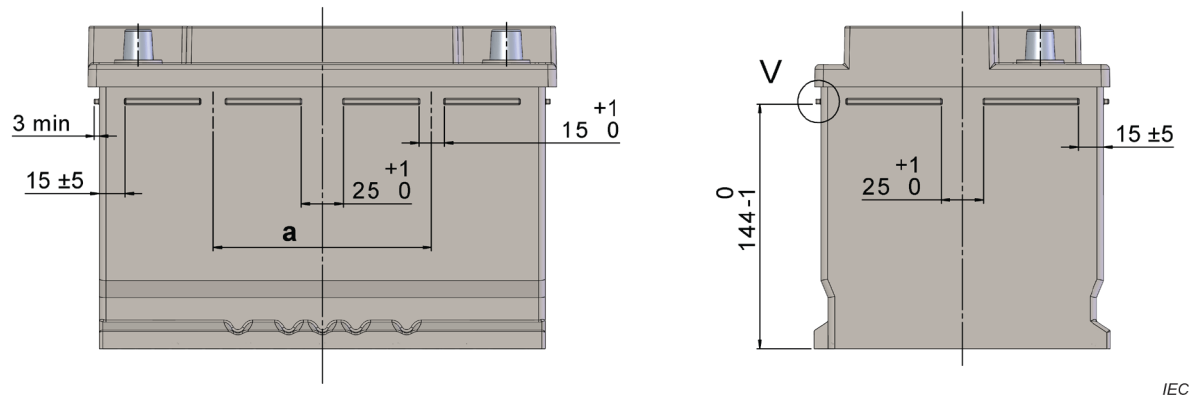


Figure 23 – Grips for handling by robot equipment for L and LS series

Dimensions in millimetres

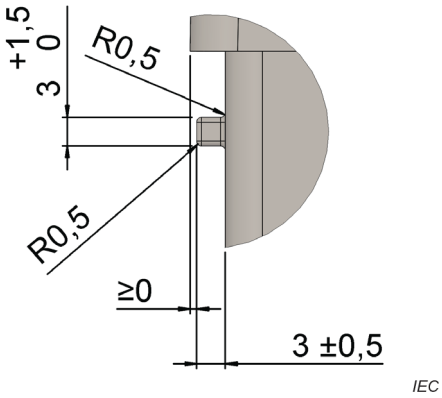


Figure 24 – Detail V of Figure 23

Dimensions in millimetres

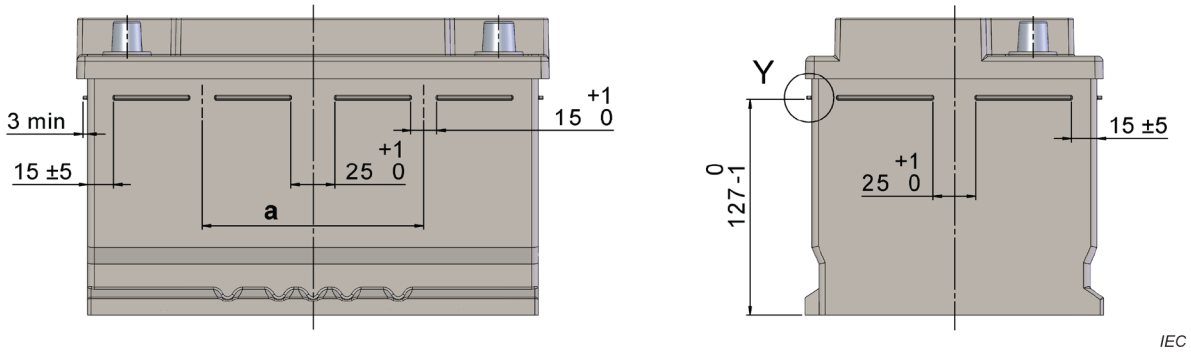


Figure 25 – Grips for handling by robot equipment for LB and LBS series – Option 1

Dimensions in millimetres

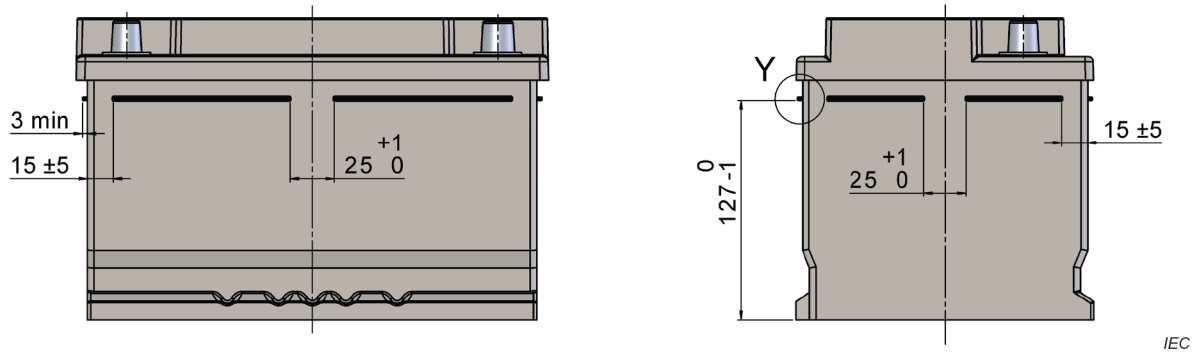


Figure 26 – Grips for handling by robot equipment for LB and LBS series – Option 2

Dimensions in millimetres

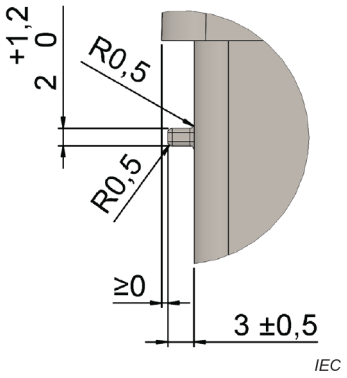


Figure 27 – Detail Y of Figure 25 and Figure 26

7 Recommended types used in North America (AM)

7.1 General

Clause 7 applies to types of lead-acid starter batteries for passenger cars and light vehicles widely and predominantly used in North America. In the following, the group sizes are designated "AM".The group sizes AM comprise 19 types of batteries. They cover the majority of present aftermarket need. All of 19 types are designed to be fastened to the vehicle by means of ledges on the long sides of the battery container which are, however, different from those specified in Clause 5 and Clause 6.

7.2 Terminals and terminal configuration

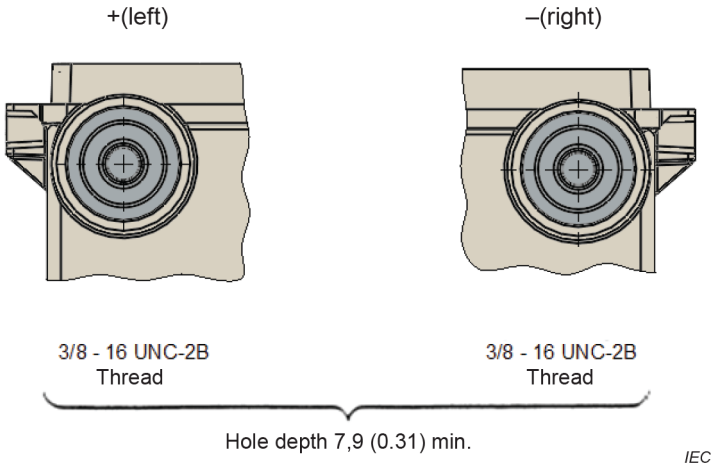
7.2.1 Tapered terminals

The dimensions of the tapered positive and negative terminal shall be according to Figure 3.

7.2.2 Side terminals

Two types of these group sizes AM have side terminals in accordance with Figure 28 and Figure 29.

IMPORTANT: Battery types with side terminals are not recommended types for new developments.



NOTE 1 "3/8 – 16 UNC-2B" is according to ANSI ASME B.1.1.

NOTE 2 Dimension are given in millimetres and, in brackets, in inches.

Figure 28 – Side terminal groove description

Dimensions in millimetres and in brackets, in inches

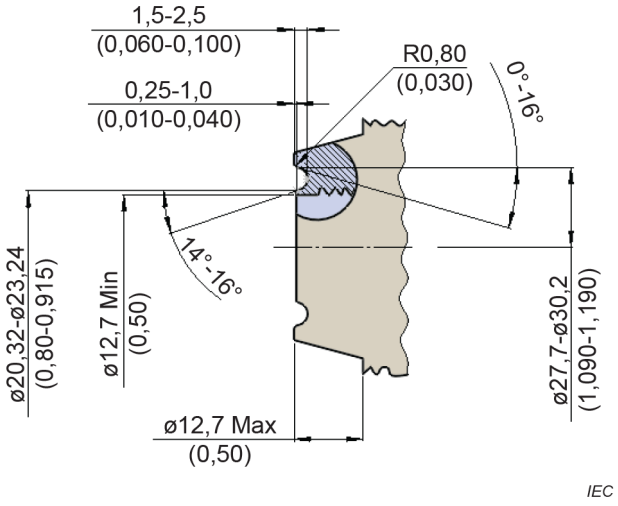


Figure 29 – Side terminal groove dimensions in mm and (in)

7.2.3 Terminal configuration

The terminal configurations are shown in Figure 35 through Figure 40. Dimensions are given in Table 5.

7.3 Standard fastening on the bottom

7.3.1 General

All batteries of these group sizes AM shall have ledges or recesses for fastening over the length or over the front as an integral part of the battery container and allowing the battery to be fixed by means of the bottom of the container.

7.3.2 Design of ledges

The profile of the ledges shall be in accordance with Figure 30.

Dimensions in millimetres and in brackets, in inches

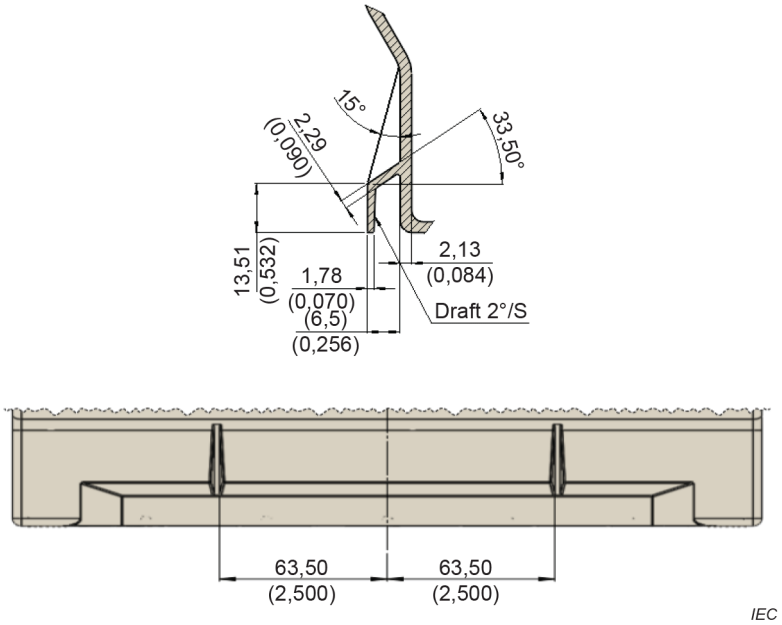


Figure 30 – Design for batteries with ledges on long sides for hold-down-devices in mm and (in)

7.3.3 Design of recesses

The profile of the recesses shall be in accordance with Figure 31, Figure 32, Figure 33 and Figure 34.

Dimensions in millimetres and in brackets, in inches

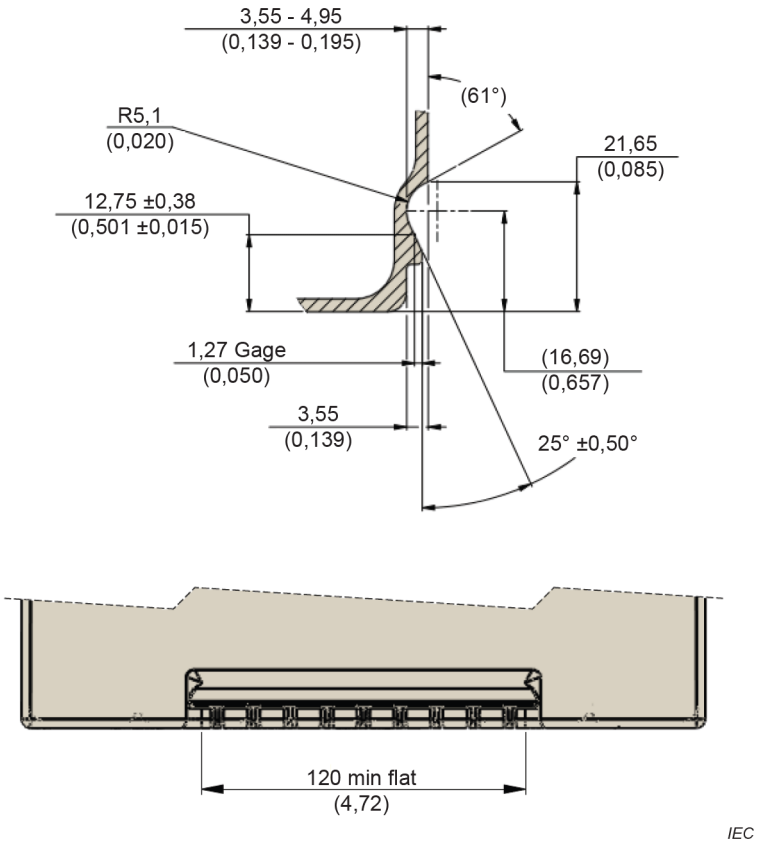


Figure 31 – Design for batteries with recesses on long sides for hold-down-devices in mm and (in)

Dimensions in millimetres and in brackets, in inches

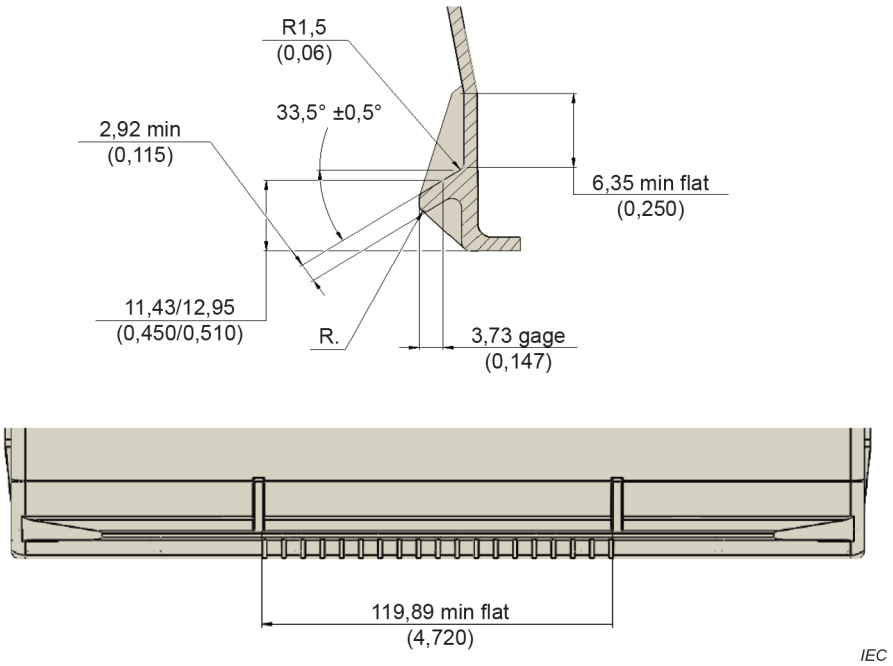


Figure 32 – Design for batteries with recesses on sides for hold-down-devices in mm and (in)

Dimensions in millimetres and in brackets, in inches

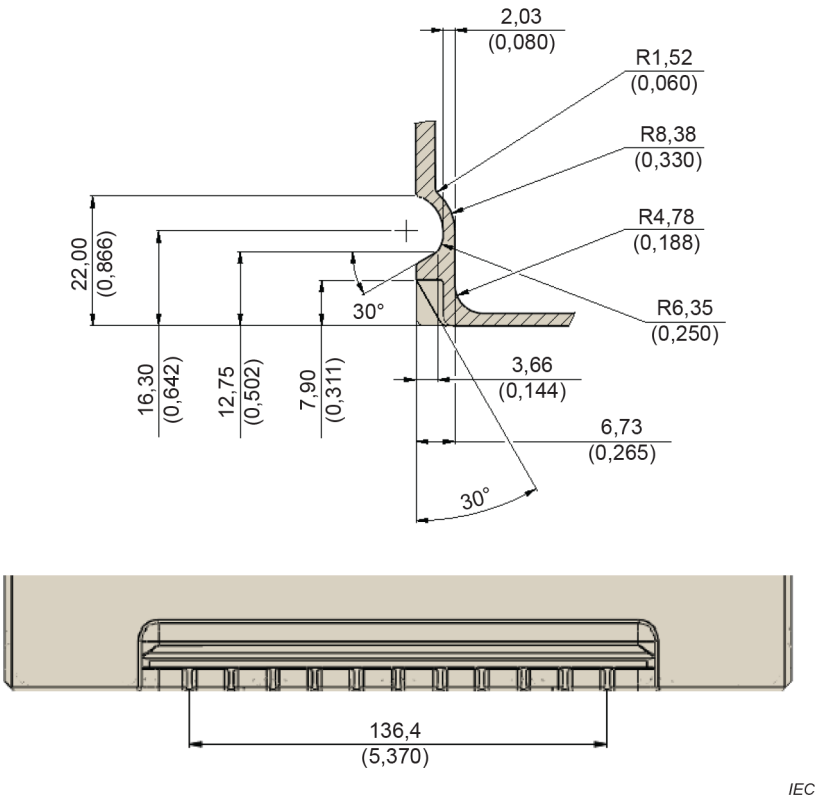


Figure 33 – Design for batteries with recesses on sides for hold-down-devices in mm and (in)

Dimensions in millimetres and in brackets, in inches

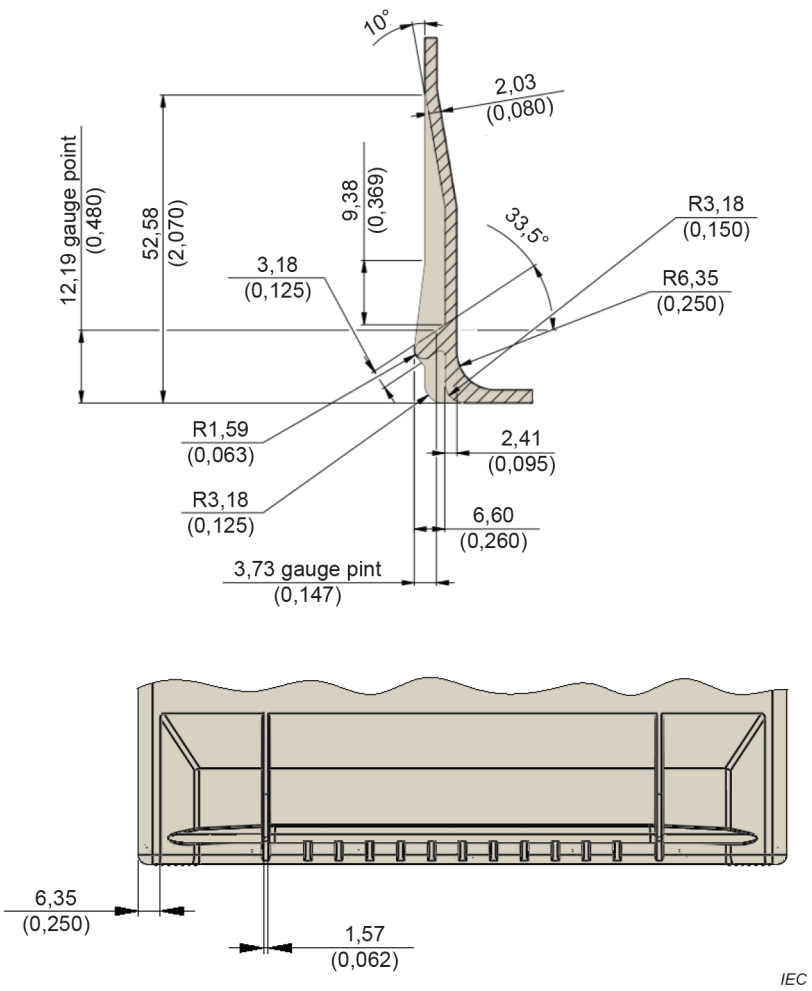


Figure 34 – Design for batteries with recesses on sides for hold-down-devices in mm and (in)

7.4 Main dimensions of the battery group sizes AM

The main dimensions are represented by symbols as indicated in Figure 35 through Figure 40. The dimensions corresponding to the symbols shall be in accordance with Table 5.

l length of lid

b width of battery

h height to terminal

h_1 height to lid

Table 5 – Battery group sizes AM

Group size	Length	Width	Height		Terminal	Hold-down
	l	*b*	*h* Max	h_1	Figure	Figure
24	260- $^{+0}_{-4}$	173 $^{+0}_{-4}$	225	203 $^{+0}_{-4}$	Figure 3	Figure 32
24R	260- $^{+0}_{-4}$	173 $^{+0}_{-4}$	225	203 $^{+0}_{-4}$	Figure 3	Figure 32
25	230- $^{+0}_{-4}$	175 $^{+0}_{-4}$	225	203 $^{+0}_{-4}$	Figure 3	Figure 32
26	208- $^{+0}_{-4}$	174 $^{+0}_{-4}$	197	175 $^{+0}_{-4}$	Figure 3	Figure 32
26R	208- $^{+0}_{-4}$	174 $^{+0}_{-4}$	197	175 $^{+0}_{-4}$	Figure 3	Figure 32
27	306- $^{+0}_{-4}$	173 $^{+0}_{-4}$	225	203 $^{+0}_{-4}$	Figure 3	Figure 32
34	260 $^{+0}_{-4}$	173 $^{+0}_{-4}$	200	178 $^{+0}_{-4}$	Figure 3	Figure 32
34R	260 $^{+0}_{-4}$	173 $^{+0}_{-4}$	200	178 $^{+0}_{-4}$	Figure 3	Figure 32
35	230- $^{+0}_{-4}$	175 $^{+0}_{-4}$	225	203 $^{+0}_{-4}$	Figure 3	Figure 32
36R	260 $^{+0}_{-4}$	173 $^{+0}_{-4}$	206	184 $^{+0}_{-4}$	Figure 3	Figure 32
51	238 $^{+0}_{-4}$	129 $^{+0}_{-4}$	223	201 $^{+0}_{-4}$	Figure 3	Figure 32
51R	238 $^{+0}_{-4}$	129 $^{+0}_{-4}$	223	201 $^{+0}_{-4}$	Figure 3	Figure 32
59	255 $^{+0}_{-4}$	193 $^{+0}_{-4}$	196	174 $^{+0}_{-4}$	Figure 3	Figure 31
65	306 $^{+0}_{-4}$	192 $^{+0}_{-4}$	192	170 $^{+0}_{-4}$	Figure 3	Figure 31
75	230 $^{+0}_{-4}$	180 $^{+0}_{-4}$	186	186 max	Figure 28 and Figure 29	Figure 32
78	260 $^{+0}_{-4}$	180 $^{+0}_{-4}$	186	186 max	Figure 28 and Figure 29	Figure 32
85	230 $^{+0}_{-4}$	173 $^{+0}_{-4}$	203	181 $^{+0}_{-4}$	Figure 3	Figure 32
86	230 $^{+0}_{-4}$	173 $^{+0}_{-4}$	203	181 $^{+0}_{-4}$	Figure 3	Figure 32
100	260 $^{+0}_{-4}$	179 $^{+0}_{-4}$	170	148 $^{+0}_{-4}$	Figure 28 and Figure 29	Figure 31

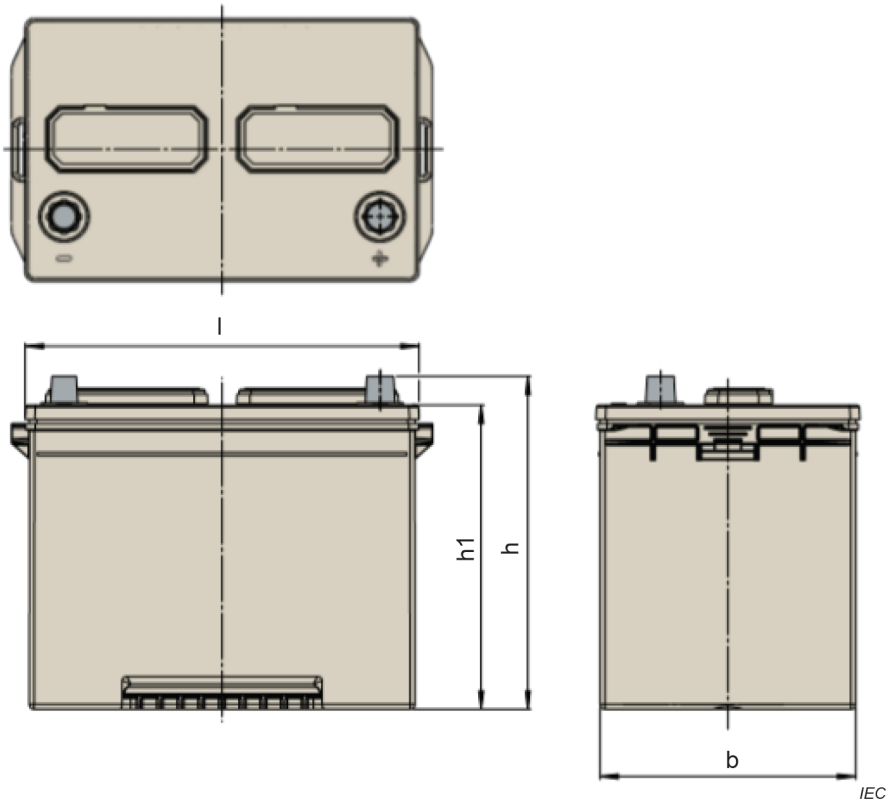


Figure 35 – Main dimensions of batteries of group sizes 24R, 26R, 34R, 35, 51R, 85

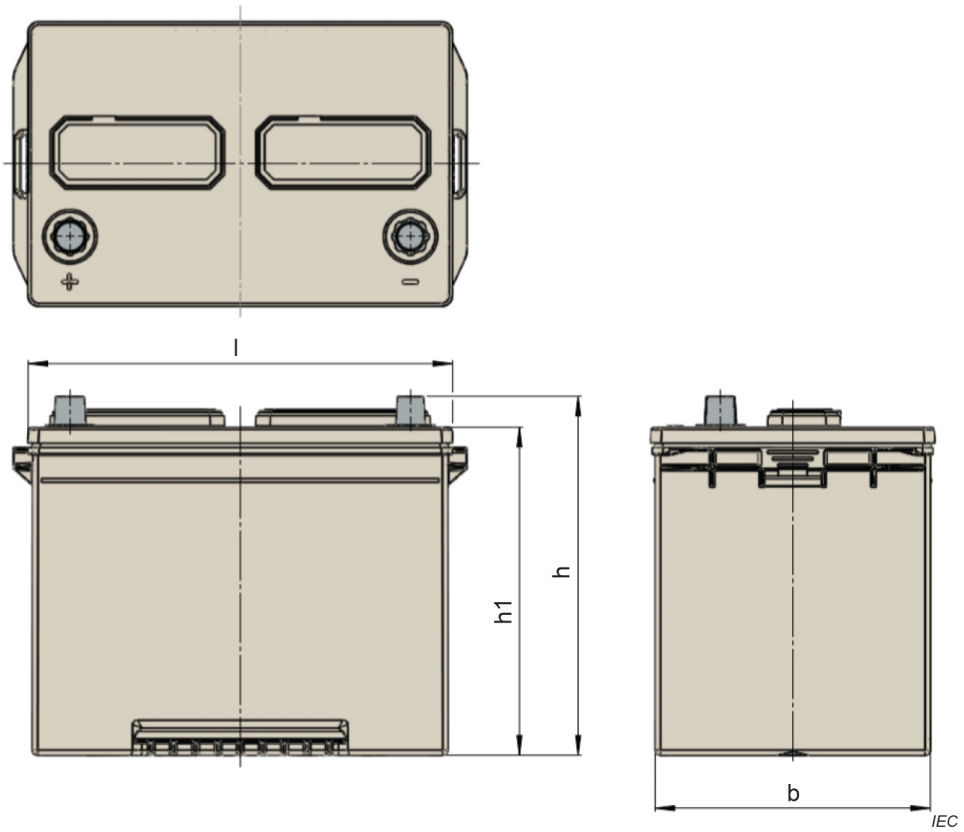


Figure 36 – Main dimensions of batteries of group size 24, 25, 26, 27, 34, 51, 86

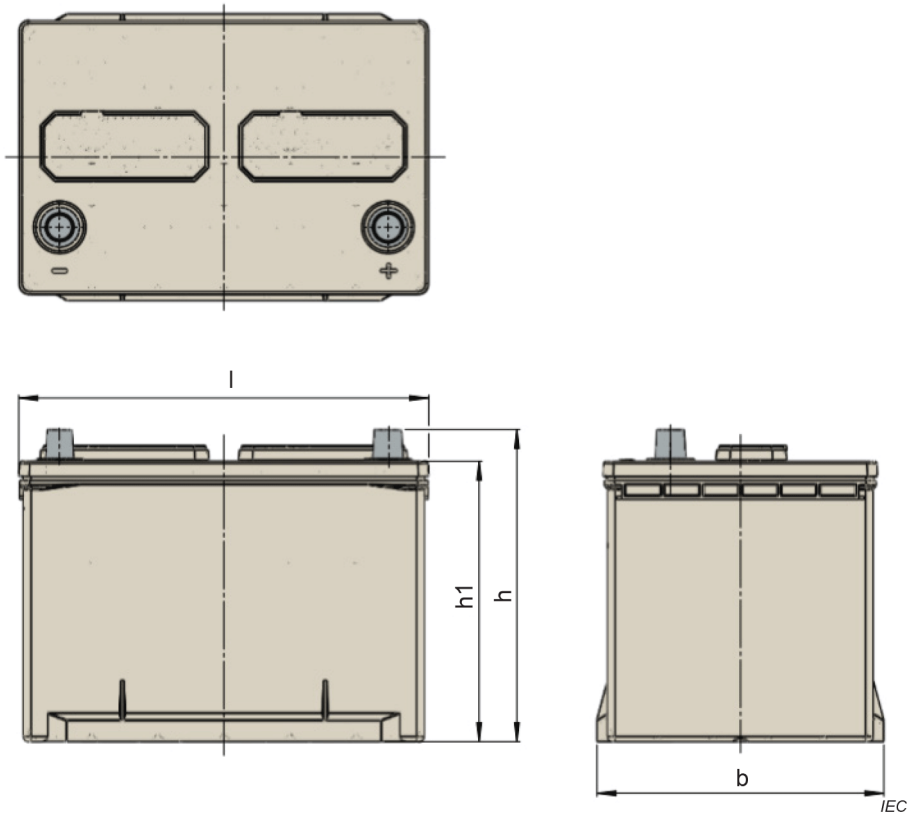


Figure 37 – Main dimensions of batteries of group size 36R

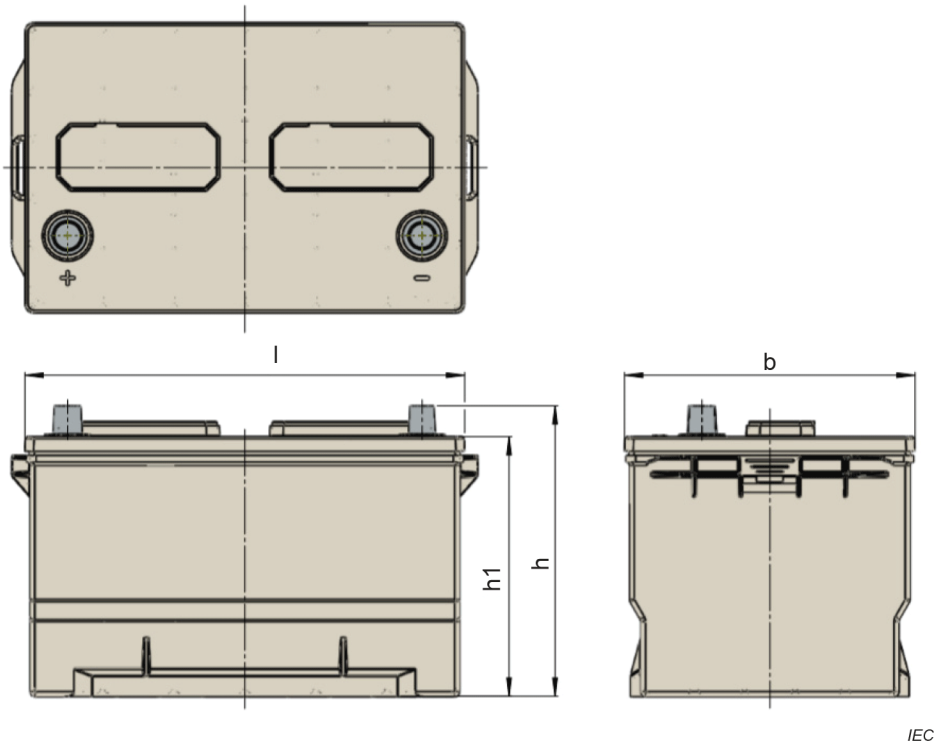


Figure 38 – Main dimensions of batteries of group sizes 59, 65

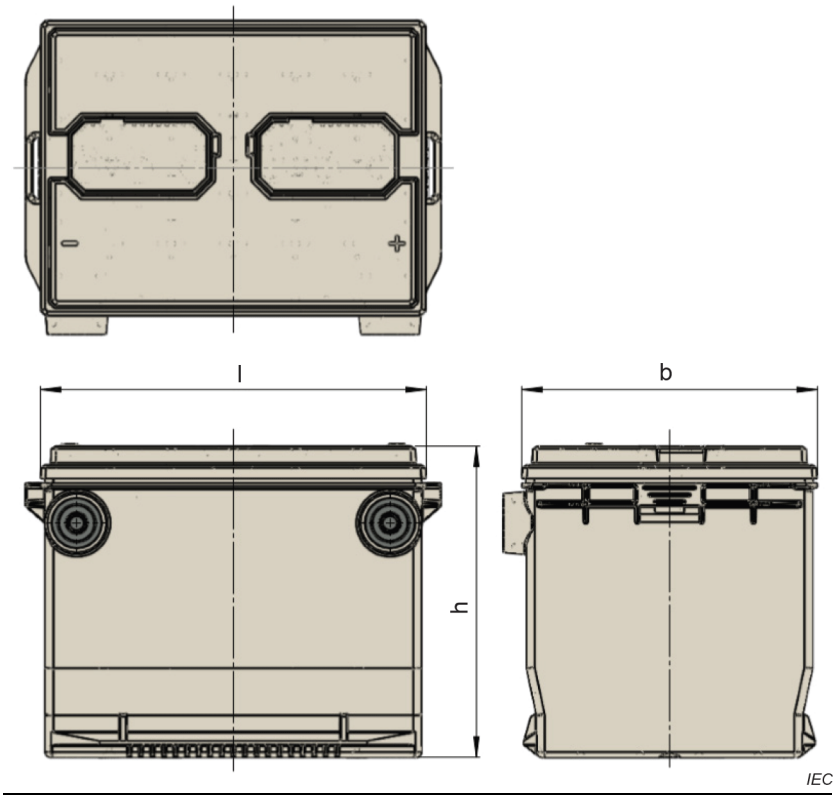


Figure 39 – Main dimensions of batteries of group size 75, 78,100 with positive terminal on the right

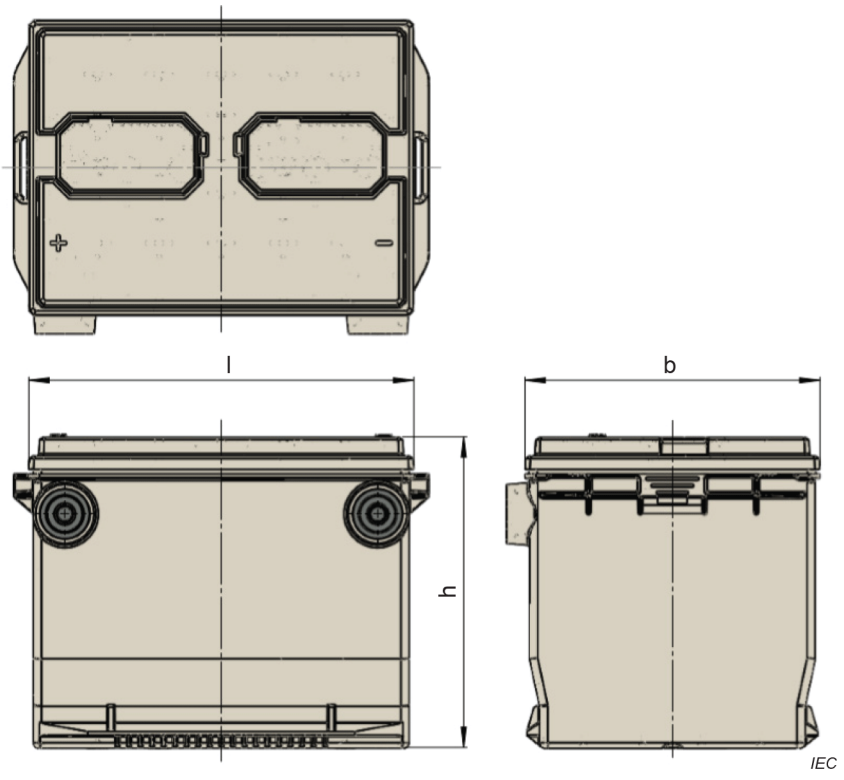


Figure 40 – Main dimensions of batteries of group size 75, 78,100 with positive terminal on the left

8 Recommended types used in East Asia (AS)

8.1 General

This clause applies to the group sizes of lead-acid starter batteries for passenger vehicles and light vehicles widely and predominantly used in East Asia. In the following, the group sizes are designated "AS".

The series AS comprises 8 types of batteries. All of these are designed to be fastened to the vehicle by means of a hold-down device engaging with the upper part of the battery (for example a metal frame), connected to the support platform.

8.2 Terminals and terminal configuration

8.2.1 Design of terminals

All types of this group size AS have tapered terminals T_1 or T_2 according to Figure 3 and Table 6.

8.2.2 Dimensions and classification of terminals

The dimensions of the terminals T_1 and T_2 shall be in accordance with the measurements in Table 6.

Table 6 – Dimensions and classification of terminals

Dimensions in millimetres

Classification of terminals	***D* dimensions** mm	
	Positive terminal	**Negative terminal**
T_1 (thin type)	$14{,}7^{+0}_{-0{,}3}$	$13{,}0^{+0}_{-0{,}3}$
T_2 (thick type)	$19{,}5^{+0}_{-0{,}3}$	$17{,}9^{+0}_{-0{,}3}$

8.2.3 Configuration of terminals

The terminal configuration as shown in Figure 41 is recommended.

8.3 Main dimensions of the battery group sizes AS

The main dimensions are represented by symbols as indicated in Figure 41. The dimensions corresponding to the symbols shall be in accordance with Table 7.

Symbols used:

l	length of lid
l_1	length at battery base
b	width across lid
b_1	width at battery base
h	height up to terminal
h_1	height up to lid

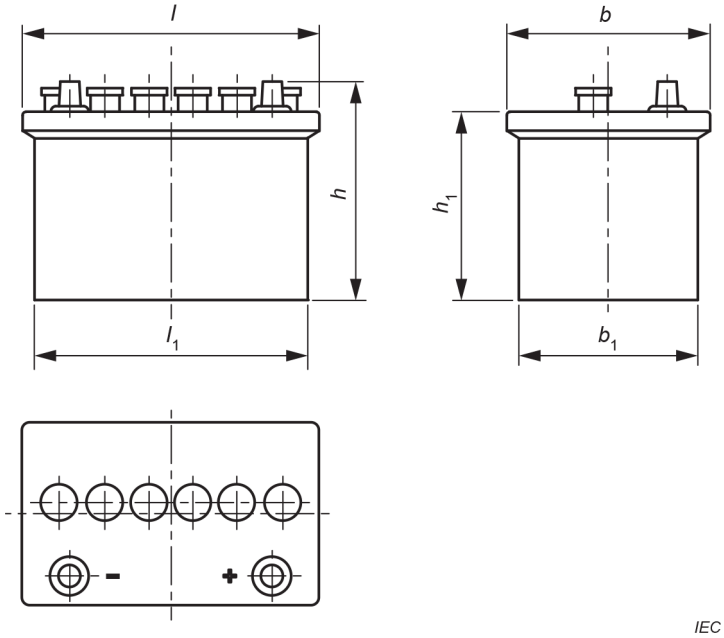


Figure 41 – Main dimensions of battery group sizes AS

Table 7 – Dimensions of group sizes AS

All measurements are in mm

Type (for lead-acid starter batterie	Type (for lead-acid micro-cycle applications	Length		Width		Height		Classification of terminals
		l	l_1 max	b	b_1 max	h_1	h max	
B17	J	167^{+0}_{-4}	161	127^{+0}_{-4}	123	203^{+0}_{-5}	227	T_1 or T_2
B19	K	187^{+0}_{-4}	185	127^{+0}_{-4}	123	203^{+0}_{-5}	227	
B20	M	197^{+0}_{-4}	195	129^{+0}_{-4}	125	203^{+0}_{-5}	227	
B24	N	238^{+0}_{-4}	237	129^{+0}_{-4}	125	203^{+0}_{-5}	227	
D20	P	202^{+0}_{-4}	200	173^{+0}_{-5}	172	204^{+0}_{-6}	225	T_2
D23	Q	232^{+0}_{-4}	231	173^{+0}_{-5}	172	204^{+0}_{-6}	225	
D26	S	260^{+0}_{-4}	259	173^{+0}_{-5}	172	204^{+0}_{-6}	255	
D31	T	306^{+0}_{-5}	304	173^{+0}_{-5}	172	204^{+0}_{-6}	255	

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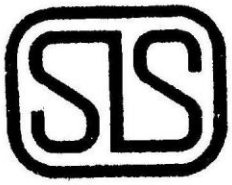

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