

PAKISTAN STANDARD

LEAD ACID STARTER BATTERIES -

Part – 2: Dimensions of Batteries and Dimensions and Marking for Terminals



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**PAKISTAN STANDARD SPECIFICATION
FOR
LEAD –ACID STARTER BATTERIES
PART-2:
DIMENSIONS OF BATTERIES AND DIMENSIONS AND
MARKING FOR TERMINALS**

0. Foreword

- 0.1 This Pakistan Standard was adopted by the authority of the Board of Directors after the draft prepared by the technical committee for “Dry-cell Batteries & Accumulators (ENSC-6)” and approved and endorsed by the Electro-technical National Standards Committee on 19 -01-2012
- 0.2 This standard PS: 206-2/2010 is based on IEC 60095-2/2009 “Lead –acid starter batteries Part-2: Dimensions of Batteries and Dimensions and Marking for Terminals” and its hereby acknowledge with thanks.
- 0.3 This standard has been prepared and finalized after taking into consideration the view and suggestions put forwarded by the representatives section of technologists, manufacturers and utilizing agencies.
- 0.4 This standard is subject to periodical review in order to keep pace with changing requirements and test development in the industry. Any suggestions for improvement will be recorded and placed before the revising committee in due course.
- 0.5 This standard covers technical provisions and it does not purport to include all necessary provision of a contract.

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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 standard 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 standard covers battery sizes of the geographical regions Europe, East Asia and North America.

2 Normative references

The following referenced documents are indispensable for the application 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, *Lead-acid starter batteries – Part 1: General requirements and methods of test*

IEC 60417-DB:2002¹, *Graphical symbols for use on equipment*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-482 apply.

4 General

The following specifications are common to all starter batteries, not only for the batteries of this standard.

4.1 Marking

4.1.1 Safety labelling

The batteries shall be marked in accordance with IEC 60095-1.

4.1.2 Marking of the polarity

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

4.1.2.1 Marking of positive polarity

The marking of positive polarity 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.

4.1.2.2 Marking of negative polarity

If the negative polarity is also marked, the 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.

4.1.2.3 Design and dimensions of marking of polarity

The symbols used for marking the terminals shall be in accordance with the symbol IEC 60417-5005 (DB: 2002-10) for the positive polarity and symbol IEC 60417-5006 (DB: 2002-10) for the negative polarity.

The polarity symbols may be either indented or embossed by $(0,4 \pm 0,1)$ mm. Suggested dimensions are shown in Figure 1.

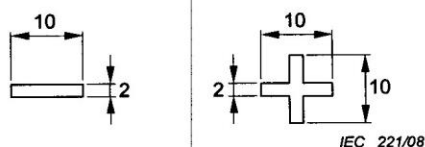


Figure 1 – Marking of polarity

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

4.2 Marking of plastic material for recycling

4.2.1 Recycling of lead

Various marking schemes exist around the world in line with local regulations, therefore the marking of recycling of lead must be in accordance with this local regulations of the market.

4.2.2 Recycling of plastic material

Batteries are universally marked to identify the plastic material. Various marking schemes exist around the world in line with local regulations. However, all schemes identify the plastic material by embossing or indenting it into the battery housing.

The marking of material content shall be in accordance with ISO 1043-1. For the polypropylene/polyethylene copolymer, the marking is either > PP < or > PP/PE <.

The following additions are permissible (see Figure 2):

- the recycling symbol (ISO 7000-1135);
- the material code 7 or 07, and
- the addition of "other" to cover additives to the polypropylene.



**OTHER
>PP/PE**

IEC 2079/09

Figure 2 – Example of marking of material

NOTE Producers are encouraged to consult the regulations of the target market.

4.3 Dimensions and design

All dimensions are in millimetres.

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

The designs illustrated in this standard, especially those of the lid, handles, ribs, ledges, vent caps and their locations are not mandatory.

5 Recommended types

5.1 Recommended types used in Europe (EU)

5.1.1 General

The object of this clause is to update the previous edition of this standard and to introduce an updated version of LS and LBS models. Those updated versions LN and LBN are so designed that they may replace the earlier models LS and LBS. Therefore for new developments only the recommended series LN and LBN shall be used.

This clause specifies:

- the main dimensions of starter batteries of the two preferred series LN and LBN;
- the location of the positive and negative terminals with respect to the fastening system;
- the dimensions of tapered terminals of starter batteries;
- the main dimensions and design of the “Semi Lid” (SL);
- the top clamping area (M) for fastening on the upper part.

5.1.2 Recommended types LN and LBN

5.1.2.1 General

Starter batteries in accordance with this subclause are marked with LN and LBN (N = new). Both battery series have the same width (L = large) but different height:

LN = standard height (H = 190 mm)

LBN = low height (H = 175 mm)

Of the two series, the model LN (large, standard height, new) shall be considered as the most preferred series.

5.1.2.2 Main dimensions of batteries

The main dimensions of the batteries are represented by symbols as indicated on the drawings. These schematic drawings do not represent any design details of the top of the battery.

The dimensions corresponding to the symbols below shall be in accordance with Figure 3, Figure 4, Figure 5, Table 2 and Table 3.

Symbols 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
- H = overall height including lid, plugs and terminals
- h = height of the upper surface M, supporting the hold-down device
- a_4 = distance of the inside notches
- a_5 = distance between terminal and the edges of the lid at the short side (Figures 4 and 5)
- a_6 = distance of the robotic-grips-segments (see Figure 11 and Table 4)

5.1.2.3 Handles

5.1.2.3.1 General

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

5.1.2.3.2 Handles, if any

If the batteries have handles, the handles shall be integrated in the lid (see Figure 3).

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

5.1.2.4 Standard fastening on the bottom

5.1.2.4.1 General

All batteries in accordance with this clause 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.

5.1.2.4.2 Design of ledges

The profile of the ledges shall be in accordance with Figure 6. The length of the ledges on the back side shall be reduced (see Figure 3); 20 mm from both sides compared the one on the front side.

5.1.2.4.3 Notches

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, and, 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.

5.1.2.4.4 Arrangement and dimensions of ledges and notches

The shape and dimensions of ledges and notches shall be in accordance with Figure 3, Figure 4, Figure 5 and Figure 6 (details "X", "Y" and "Z").

5.1.2.5 General information concerning permissible alternative fastening

5.1.2.5.1 General

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

- by a bottom hold-down device at the long side,
- by a bottom hold-down device at 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 M (see 5.1.2.5.3).

In either case, such batteries shall have on the long sides top clamping areas "M".

5.1.2.5.2 Fastening by ledges at the short side

For fastening at the short sides only batteries of this standard series are recommended to be used because of reduced tolerances in the length. The shape and dimensions of the ledges and notches shall correspond to Figure 6.

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

5.1.2.5.3 Fastening by upper part of the battery

Batteries for fastening by the upper part (top clamping area M) shall be designed so that the lid provides appropriate support for the hold-down device, for instance a metal frame.

5.1.2.6 Dimensions and position of terminals

The position of positive and negative terminals "P" (see Figure 4 or 5) with respect to the shortened ledge shall be in accordance with Figure 3.

5.1.2.7 Dimensions of battery terminals (P)

5.1.2.7.1 Dimensions of the positive terminal

The tapered positive terminal shall be in accordance with Figure 7a.

5.1.2.7.2 Dimensions of the negative terminal

The tapered negative terminal shall be in accordance with Figure 7b.

5.1.2.8 Marking of polarity and dimensions of corresponding symbols

Batteries in accordance with this part shall be marked twice in the area of the terminals as indicated (Figure 3 or 10), when applied on the lid (see 4.1.2).

The symbol of the polarity shall be in accordance with 4.1.2.

5.1.2.9 Special features of lid

The properties of the battery lid are as follows.

5.1.2.9.1 Semi monobloc lid

This describes a monobloc lid which includes the terminals and the vent plugs so that they are not higher than the lid surface. The special feature of the Semi monobloc lid is the top clamping area "M" (Figures 3 to 5).

5.1.2.9.2 Spray water proof

That means a flat surface and water sealed maintenance openings, if any.

5.1.2.9.3 Central degassing

That means a central degassing system and gas outlets "E" on one or both front ends, vertical to the surface of the short side of the battery (Figure 8).

5.1.2.9.4 Recessed holes

That means recessed holes "K" for optional terminal protection on both sides (Figure 9).

5.1.2.9.5 Reversible vent plugs

That means, if reversible vent plugs "V" are present, they are relevant to safety of the degassing systems (Figure 10).

5.1.2.9.6 Information for tooling the lid

For further developments of lid tooling, provision should be made to enable sensor-holes "S" of 28 mm maximal diameter (Figure 10) to be included.

Position of alternatives is demonstrated in Figure 10 in conjunction with the dimensions of Table 1. Details will be given by the battery makers.

Table 1 – Position of sensor holes of Figure 10

Lid size	A ± 2	B ± 2
LN 0 / LNB 0	13	40
LN 1 / LBN 1	18	48
LN 2 / LBN 2	19	57
LN 3 / LBN 3	27	65
LN 4 / LBN 4	27	74
LN 5 / LBN 5	28	84
LN 6 / LNB 6	31	94

5.1.2.10 Welded lid

The welded lid shall exceed the container walls equal or more than 2,5 mm along all sides.

5.1.2.11 Handling of starter batteries by robot-equipment

5.1.2.11.1 General

Starter batteries are increasingly being installed by car manufacturers into vehicle bodies by robot units. This practice requires appropriate means for the exact positioning of robot arms on the battery container.

The object of this subclause is to specify the position and dimensions of grips on battery containers according to the series LN and LBN for handling by robot assembly equipment. Such ledges may optionally be requested by agreement between the car manufacturer and the battery manufacturer.

5.1.2.11.2 Position and dimensions of robotic grips

If robot grips are requested, they shall conform to the dimensions and positions shown in Figures 11a, 11b and 11c:

- Figure 11a shall correspond to series LN.
- Figures 11a and 11b are alternative, both corresponding to series LBN.

The robot grips shall be integral parts of the battery container.

It is emphasised that, according to the detail drawing U (see Figure 11c), the robot grips shall not exceed dimensions of the battery lid.

In all cases, they should confirm to the dimensions given in this standard.

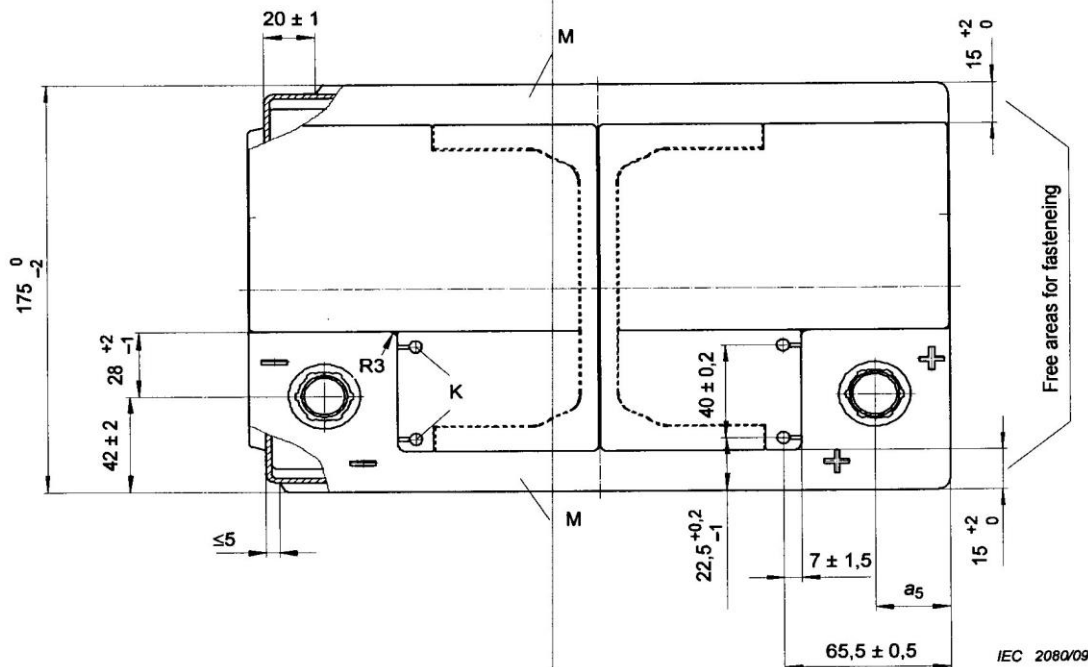
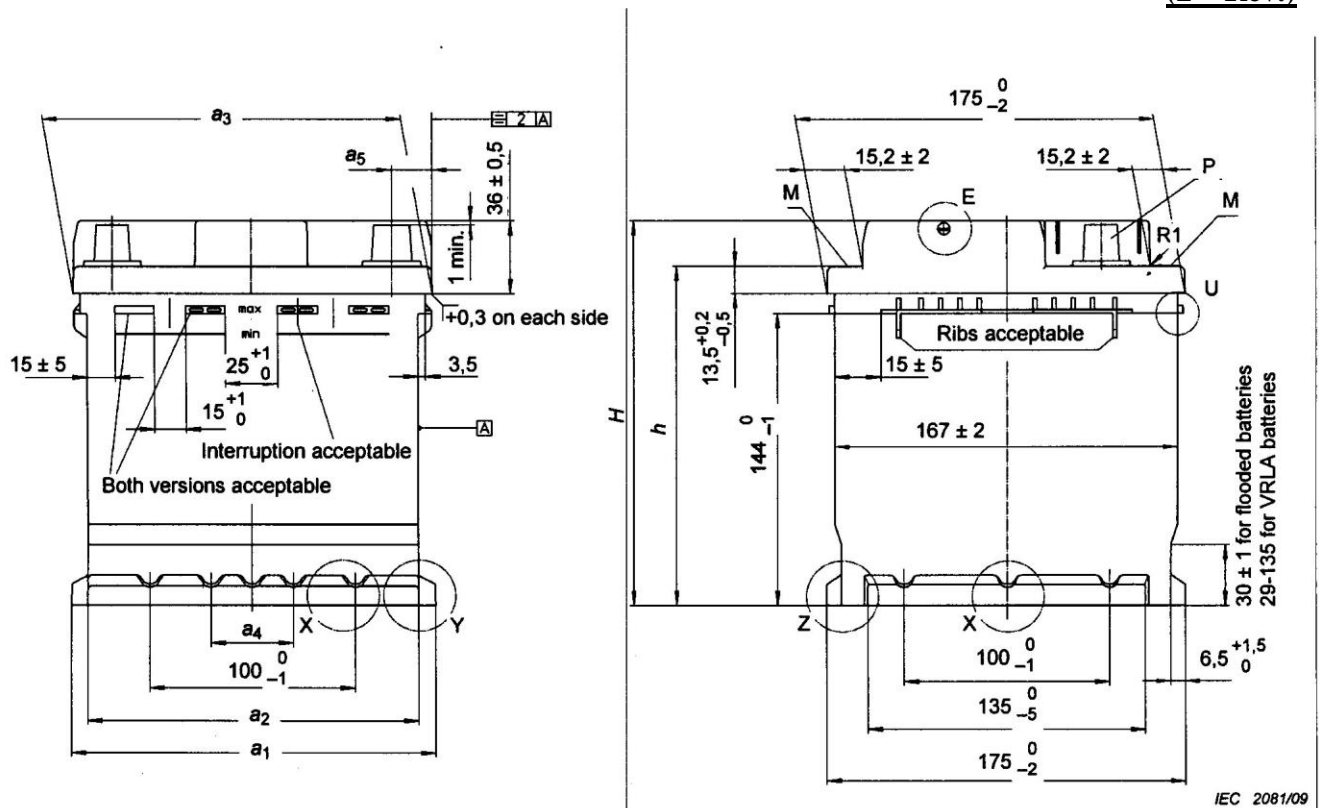


Figure 3 – Main dimensions of batteries and arrangement of standard fastening system, the top clamping area "M", the terminals, recessed holes "K" and the integrated handles (if any)



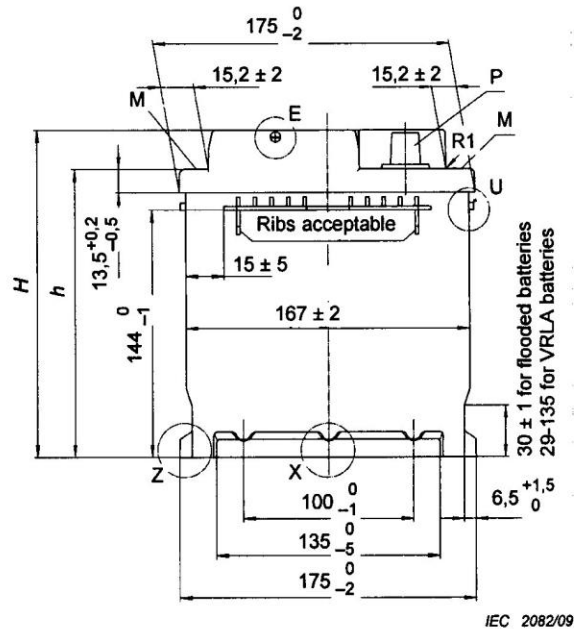
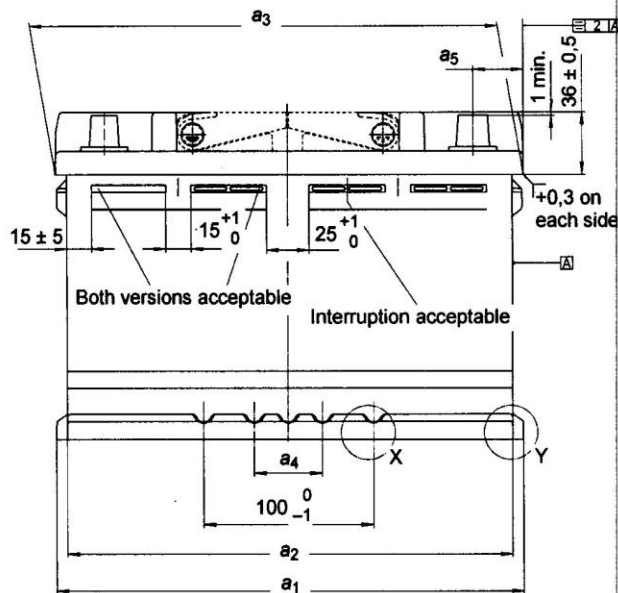
- E = degassing outlet (see detail "E" in Figure 8)
- M = top clamping area (see detail "M" in Figure 3, Figure 4 and Figure 5)
- P = positive and negative terminal (see Figure 7)
- U = robotic grips (see detail "U" in Figure 11c)
- X = notches on ledges (see detail "X" in Figure 6a)
- Y = ledges (see detail "Y" in Figure 6b)
- Z = ledges (see detail "Z" in Figure 6c)

NOTE 1 The datum "A" shows that container and lid has to be positioned by process of welding with the given tolerance in accordance with ISO 1101.

NOTE 2 Holes for fixation of adapters in the notches of the ledges along all sides are permissible.

NOTE 3 The space between the measurements a_1 and a_2 must be kept clear by the car maker from assembly parts because of wall expansion of the battery.

Figure 4 – Main dimensions of batteries and arrangement of standard fastening system



- E = degassing outlet (see detail "E" in Figure 8)
- M = top clamping area (see detail "M" in Figure 3, Figure 4 and Figure 5)
- P = positive and negative terminal (see Figure 7)
- U = robotic grips (see detail "U" in Figure 11c)
- X = notches on ledges (see detail "X" in Figure 6a)
- Y = ledges (see detail "Y" in Figure 6b)
- Z = ledges (see detail "Z" in Figure 6c)

NOTE 1 The datum "A" shows that container and lid has to be positioned by process of welding with the given tolerance in accordance with ISO 1101.

NOTE 2 Holes for fixation of adapters in the notches of the ledges along all sides are permissible.

NOTE 3 The space between the measurements a_1 and a_2 must be kept clear by the car maker from assembly parts because of wall expansion of the battery.

Figure 5 – Main dimensions of batteries and arrangement of standard fastening system

Table 2 – Main dimensions of batteries of standard series LN with standard fastenings with 5 notches at length side and 3 notches at width side (see Figures 4 and 5)

Type	a_1 +0/-2	a_2 ± 1	a_3 +0/-3	a_4 +0/-1	a_5 ± 2	H +0/-3	h +0/-4
LN 0	175	161	175	40	19	190	168
LN 1	207	193	207	40	24		
LN 2	242	228	242	40	26		
LN 3	278	264	277	40	29		
LN 4	315	301	314	40	31		
LN 5	353	339	352	60	27		
LN 6	394	379	393	60	30		

Table 3 – Main dimensions of batteries of standard series LBN with standard fastenings with 5 notches at length side and 3 notches at width side (see Figures 4 and 5)

Type	a_1 +0/-2	a_2 ± 1	a_3 +0/-3	a_4 +0/-1	a_5 ± 2	H +0/-3	h +0/-4
LBN 0	175	161	175	40	19	175	153
LBN 1	207	193	207	40	24		
LBN 2	242	228	242	40	26		
LBN 3	278	264	277	40	29		
LBN 4	315	301	314	40	31		
LBN 5	353	339	352	60	27		
LBN 6	394	379	393	60	30		

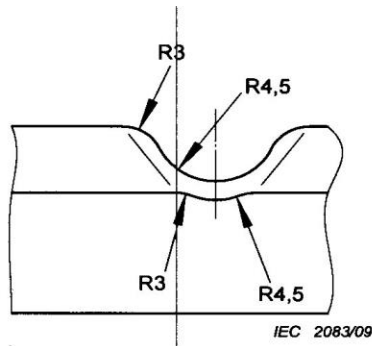


Figure 6a – Detail “X” – Notch, with dimensions for all series

NOTE Holes for fixation of adapters in the hold down notches along all sides are permissible.

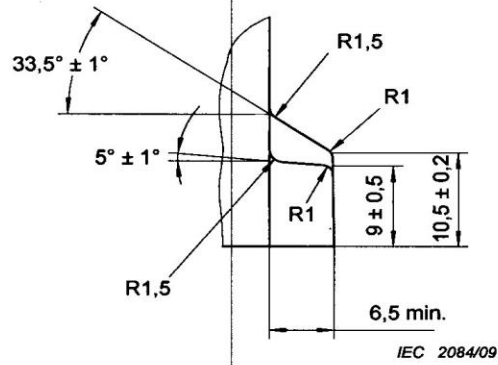


Figure 6b – Detail “Y” – Ledges, with dimensions on the short sides

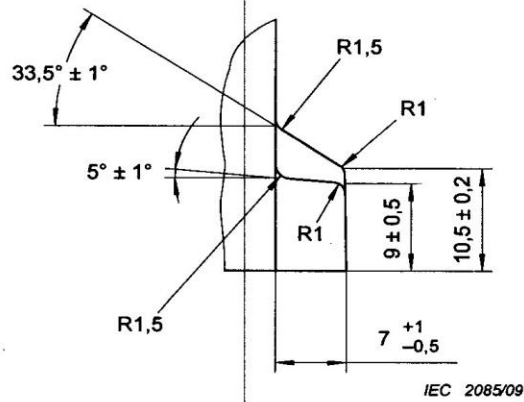


Figure 6c – Detail “Z” – Ledges, with dimensions on the long sides

Figure 6 – Details of ledges

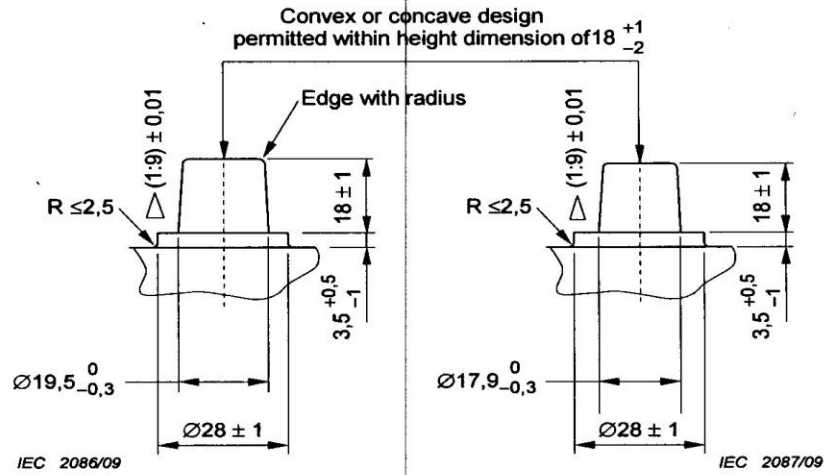
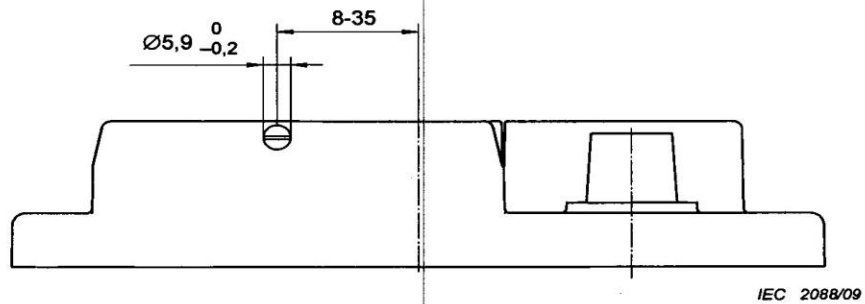


Figure 7a – Positive terminal

Figure 7b – Negative terminal

Figure 7 – Dimensions of positive and negative terminal “P”



NOTE 1 Minimum depth of insertion of 10 mm in the degassing outlet has to be provided.

NOTE 2 Attachments with connecting piece have to be gastight.

Figure 8 – Degassing outlet (detail “E”)

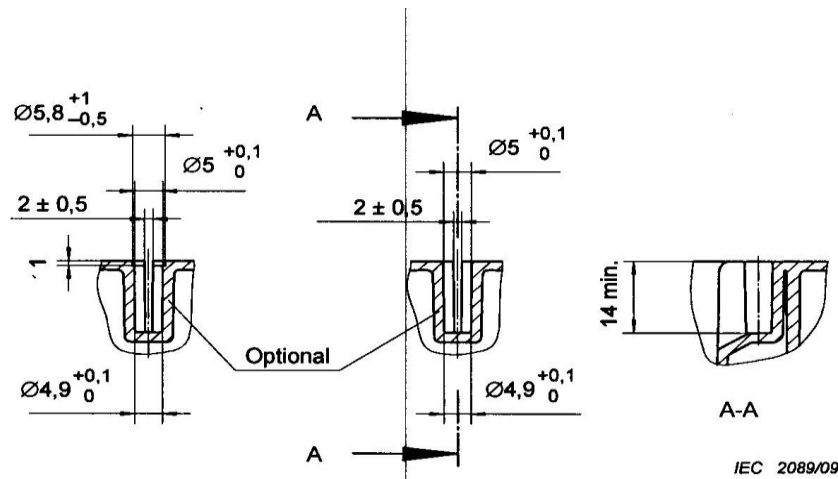


Figure 9 – Recessed holes for terminal protection cover (detail “K”)

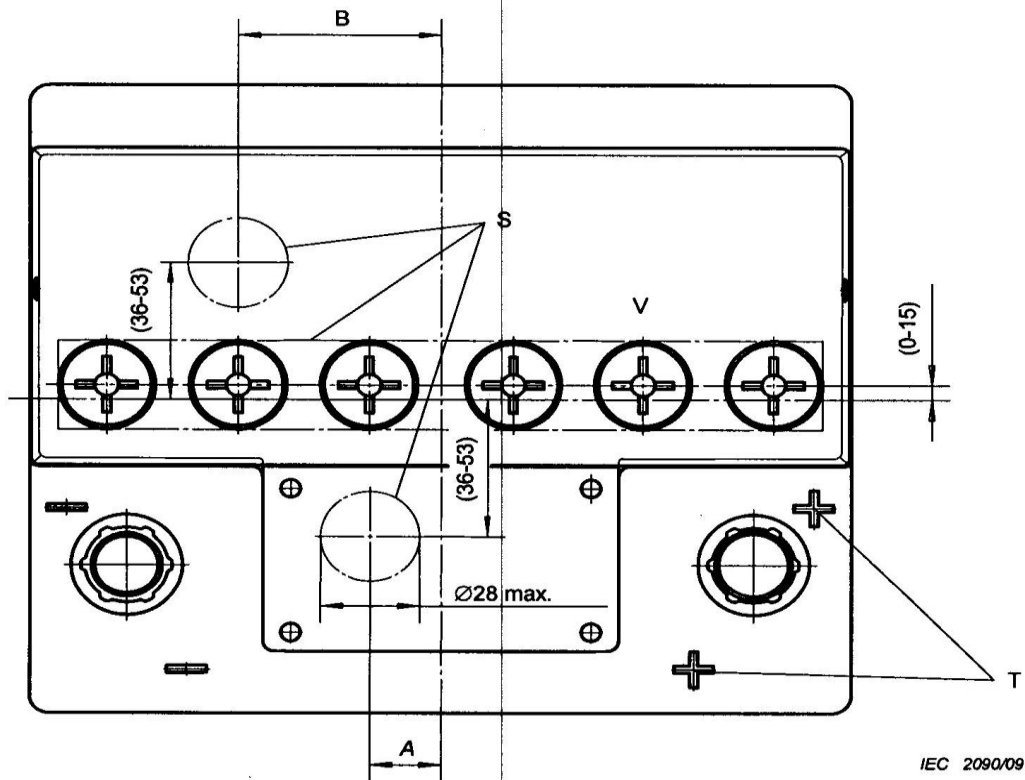
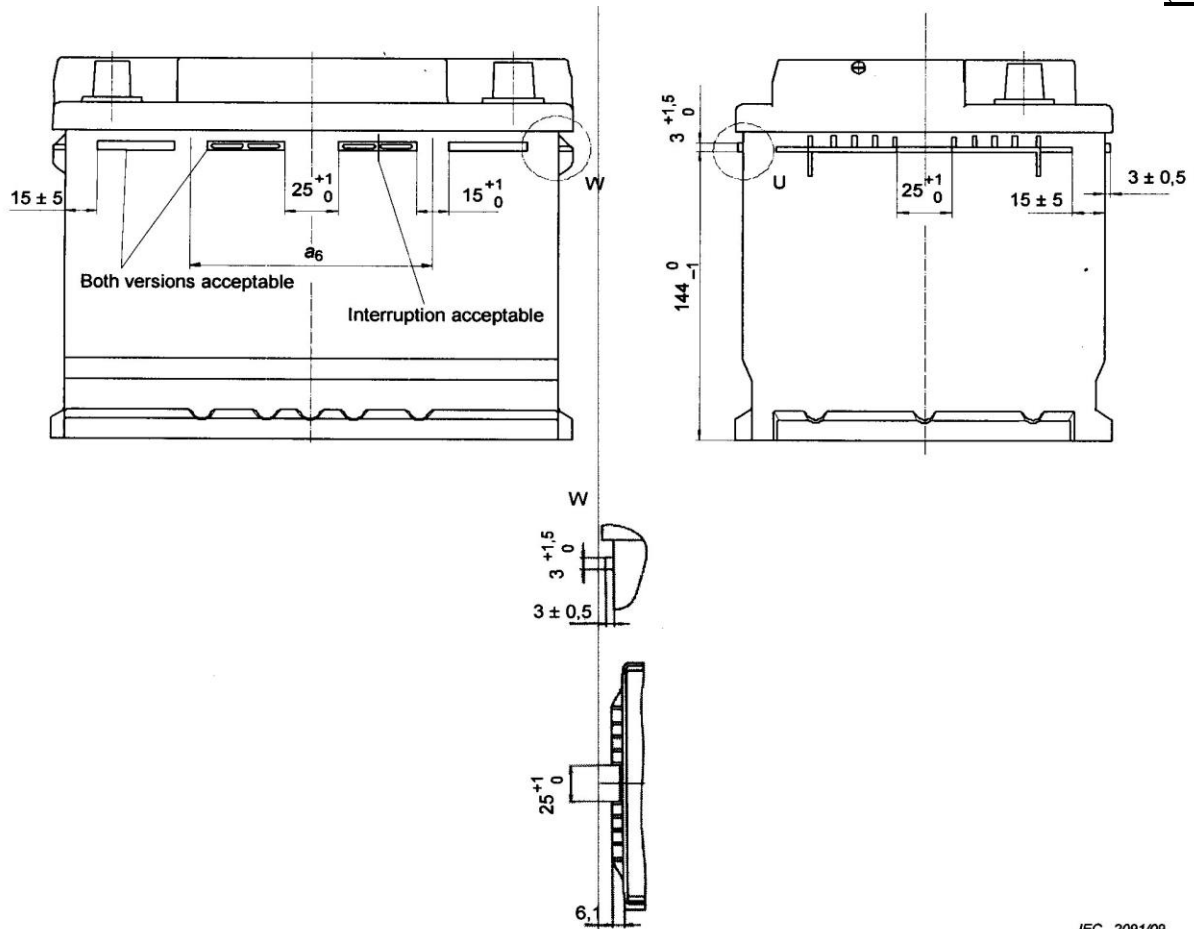


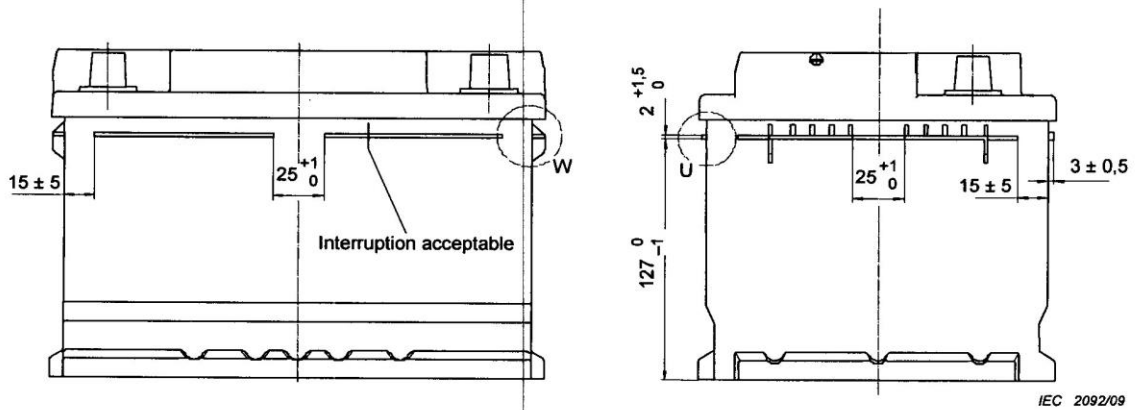
Figure 10 – Plugs “V” and position of sensor holes “S”



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NOTE In Figure 11a, the number of grips is 4 on each long side.

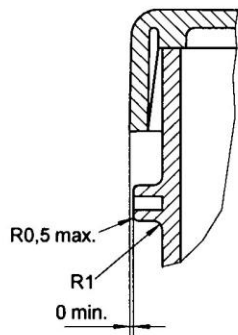
Figure 11a – Dimensions and positions of grips for series LN or LBN



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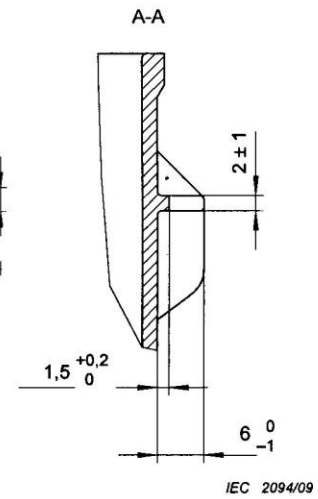
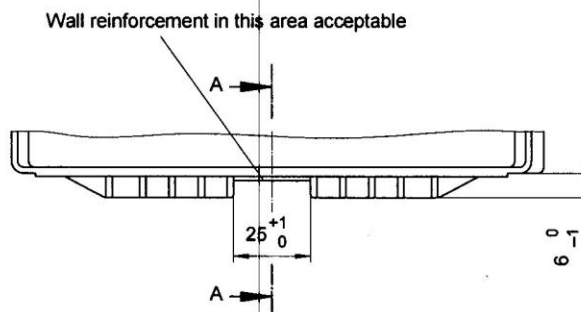
NOTE The long sides in Figure 11b may have 2 or 4 grips respectively (4 grips like Figure 11a).

Figure 11b – Dimensions and positions of grips for series LBN



IEC 2093/09

Figure 11c – Detail “U”, grips on long sides (see Figures 4, 5, 11a, 11b)



IEC 2094/09

Figure 11d – Detail “W”, grips on short sides, design optional (see Figures 11a, 11b)

Figure 11 – Dimensions and positions of grips

Table 4 – Dimensions of grips in accordance with Figure 11a and 11b

Type	$a_6 \pm 2$	Figure
LN 0	79	11a
LN 1	95	
LN 2	113	
LN 3	130	
LN 4	150	
LN 5	168	
LN 6	187	
LBN 1	(95) ^a	11b
LBN 2	(113) ^a	
LBN 3	(130) ^a	
LBN 4	(150) ^a	
LBN 5	(168) ^a	
LBN 6	(187) ^a	

^a Measurements applies to the version with 4 grips only (Figure 11a).

5.2 Recommended types used in North America (AM)

5.2.1 General

This subclause 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 series is designated "AM".

The series AM comprises 11 types of batteries. All of these 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 the European parts.

5.2.2 Terminals and terminal configuration

5.2.2.1 Tapered terminals

Nine types of this AM series have tapered terminals according to Figure 12.

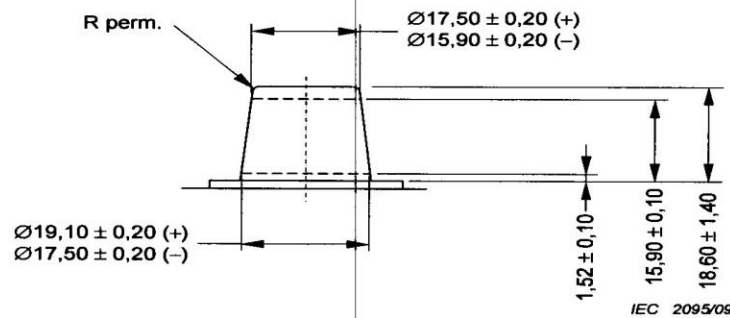


Figure 12 – Terminal post dimensions in mm (1:9 taper ref.)

5.2.2.2 Side terminals

Two types of this series AM have side terminals in accordance with Figures 13 and 14.

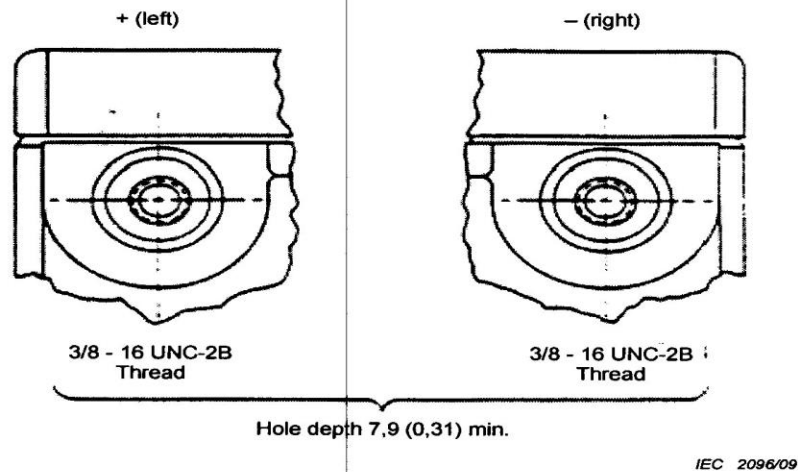


Figure 13 – Side terminal groove description

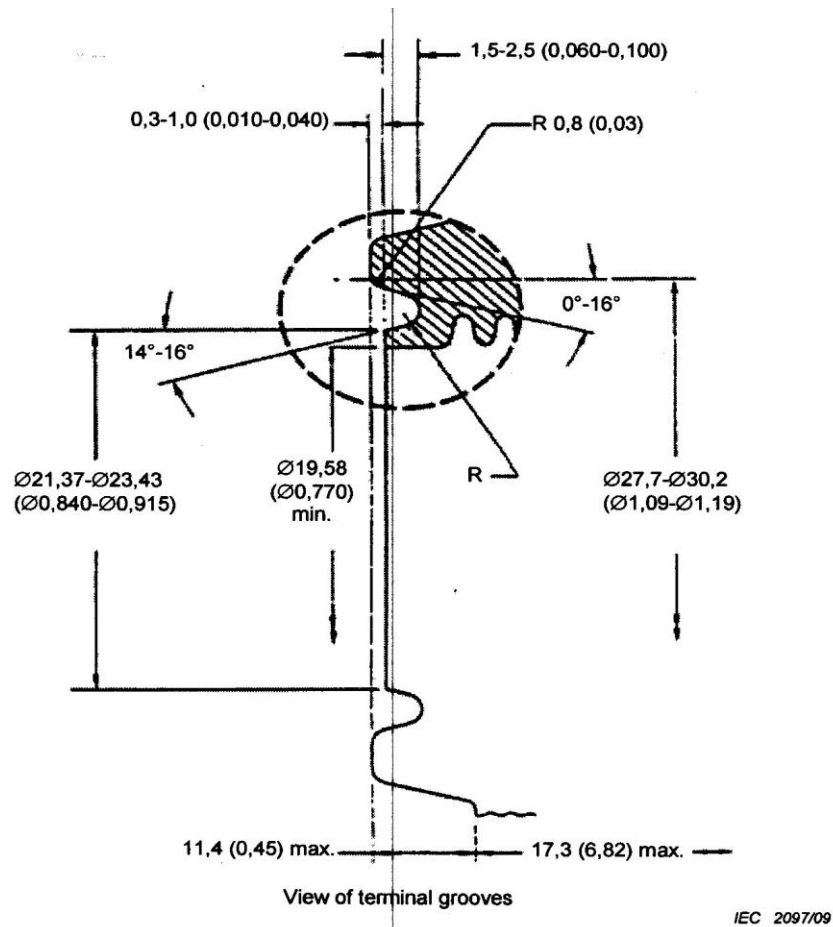


Figure 14 – Side terminal groove dimensions in mm and (in)

5.2.2.3 Terminal configuration

The terminal configuration are shown in Figures 17 up to 22. Dimensions are given in Table 3.

5.2.3 Standard fastening on the bottom

5.2.3.1 General

All batteries of this series 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.

5.2.3.2 Design of ledges

The profile of the ledges shall be in accordance with the following Figures 15 and 16.

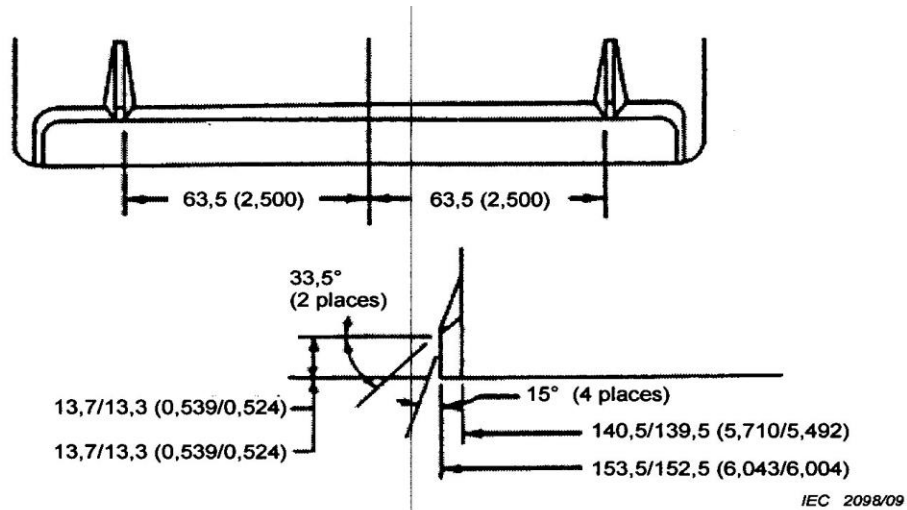


Figure 15 – Design for batteries with ledges on long sides for hold-down-devices in mm and (in)

5.2.3.3 Design of recesses

The profile of the recesses shall be in accordance with the following Figure 16.

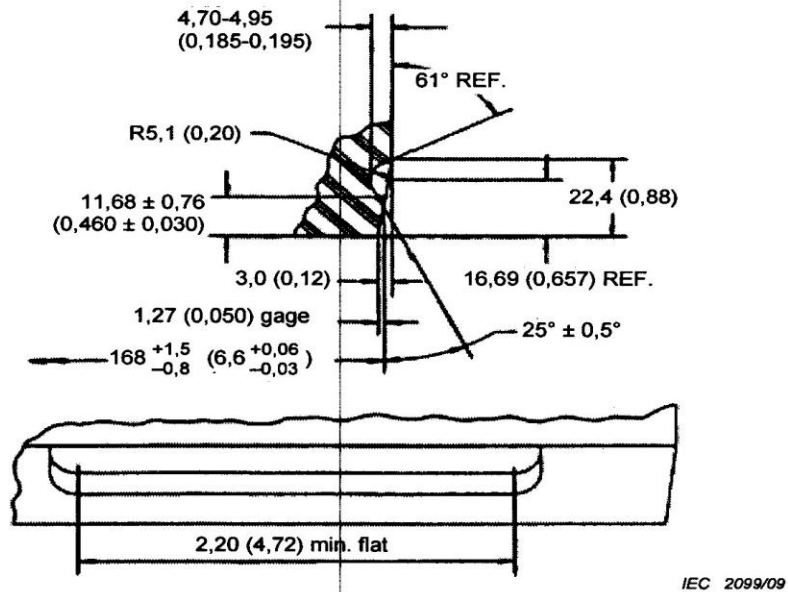


Figure 16 – Design for batteries with recesses in long sides for hold-down-devices in mm and (in)

5.2.4 Main dimensions of the battery series AM

The main dimensions are represented by symbols as indicated in the Figures 18 up to 22. 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 series AM

Group size	Length	Width	Height		Terminal	Hold-down
	l	b	h Max	h_1	Figure	Figure
26R	208 ⁺⁰ ₋₄	174 ⁺⁰ ₋₄	197	175 ⁺⁰ ₋₄	12	16
27	306 ⁺⁰ ₋₄	173 ⁺⁰ ₋₄	225	203 ⁺⁰ ₋₄	12	16
34	260 ⁺⁰ ₋₄	173 ⁺⁰ ₋₄	200	178 ⁺⁰ ₋₄	12	16
36R	260 ⁺⁰ ₋₄	173 ⁺⁰ ₋₄	206	184 ⁺⁰ ₋₄	12	15
59	255 ⁺⁰ ₋₄	193 ⁺⁰ ₋₄	196	174 ⁺⁰ ₋₄	12	15
65	306 ⁺⁰ ₋₄	192 ⁺⁰ ₋₄	192	170 ⁺⁰ ₋₄	12	15
75	230 ⁺⁰ ₋₄	180 ⁺⁰ ₋₄	186	186 max	13 + 14	15
78	260 ⁺⁰ ₋₄	180 ⁺⁰ ₋₄	186	186 max	13 + 14	15
85	230 ⁺⁰ ₋₄	173 ⁺⁰ ₋₄	203	181 ⁺⁰ ₋₄	12	16
86	230 ⁺⁰ ₋₄	173 ⁺⁰ ₋₄	203	181 ⁺⁰ ₋₄	12	16
100	260 ⁺⁰ ₋₄	179 ⁺⁰ ₋₄	170	148 ⁺⁰ ₋₄	12	15

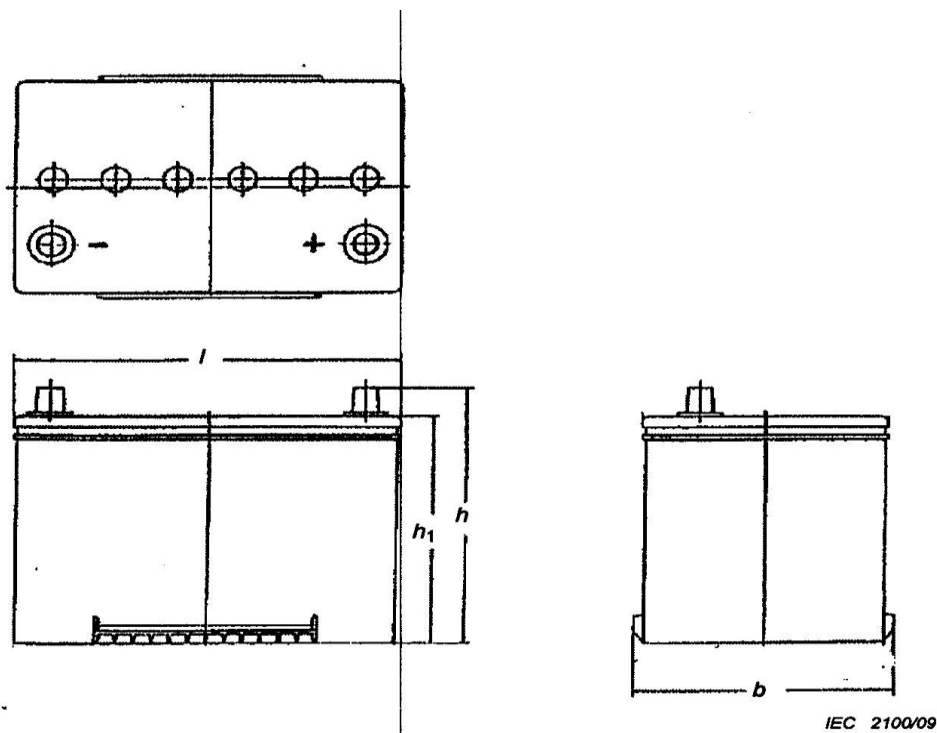


Figure 17 – Group size 26R, 85

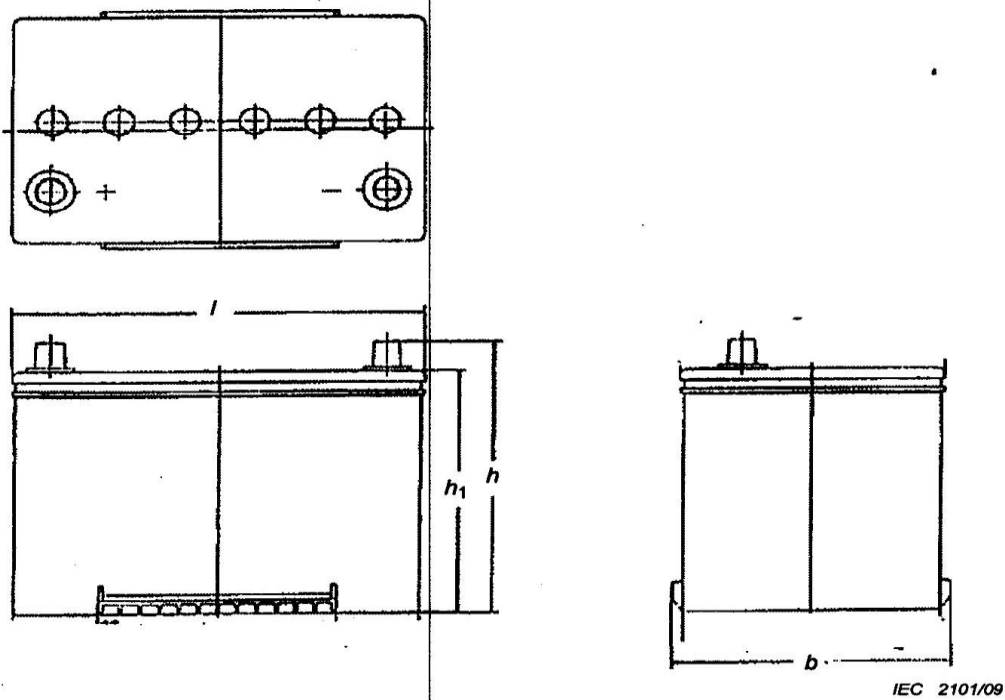
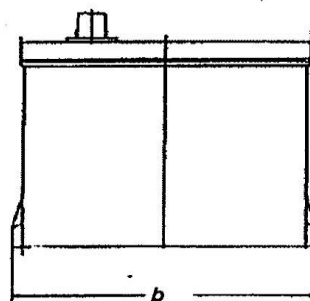
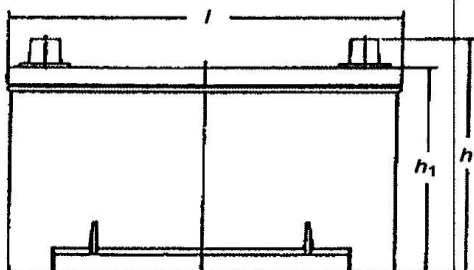
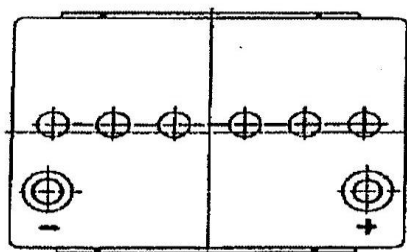
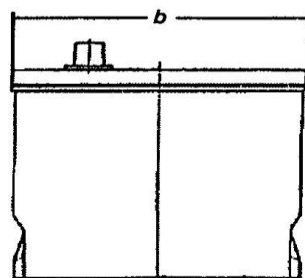
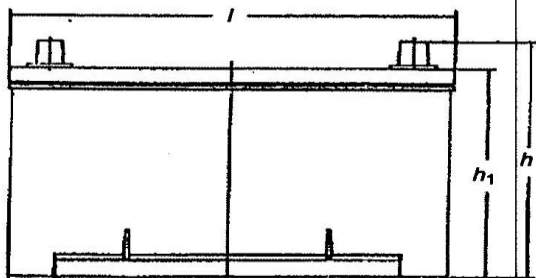
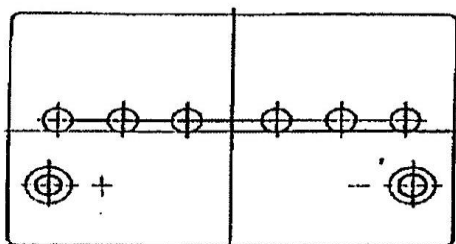


Figure 18 – Group size 27, 34, 86



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Figure 19 – Group size 36R



IEC 2103/09

Figure 20 – Group size 59, 65

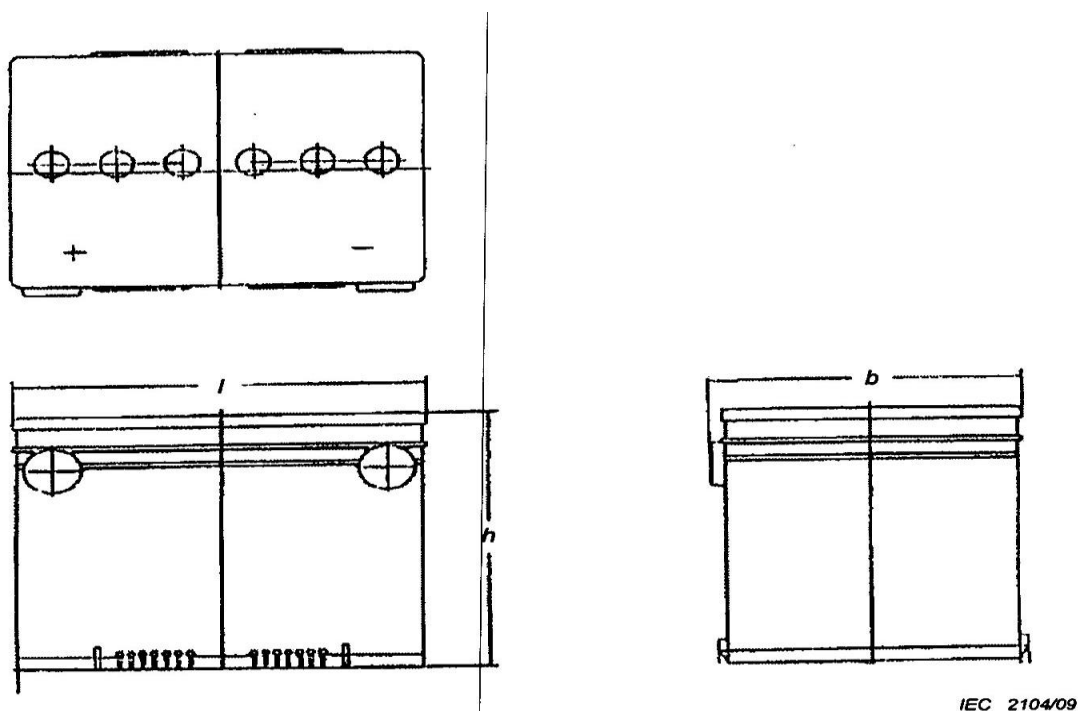


Figure 21 – Group size 75

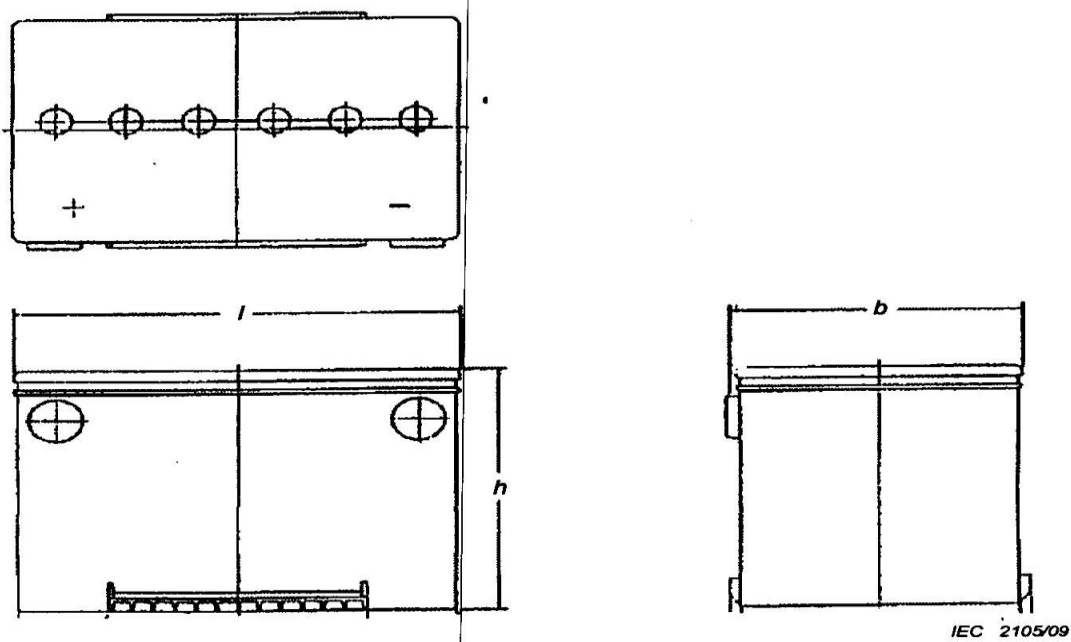


Figure 22 – Group size 78,100

5.3 Recommended types used in East Asia (AS)

5.3.1 General

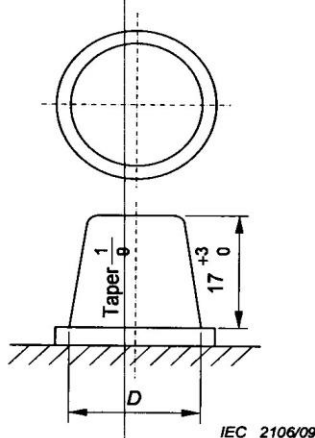
This subclause applies to the series of lead acid starter batteries for passenger vehicles and light vehicles widely and predominantly used in East Asia. In the following, the series is designated "AS".

The series AS comprises 9 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.

5.3.2 Terminals and terminal configuration

5.3.2.1 Design of terminals

All types of this series AS have terminals T_1 or T_2 according to Figure 23.



NOTE Dimensions are in mm.

Figure 23 – Tapered terminals T_1 and T_2

5.3.2.2 Dimensions and classification of terminals

The dimensions of the terminals T_1 and T_2 shall be in accordance with the Figure 23 and the measurements in Table 6.

Table 6 – Dimensions and classification of terminals

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

5.3.2.3 Configuration of terminals

All types of this series AS have standard terminal configuration STC as shown in the Figure 24.

5.3.3 Main dimensions of the battery series AS

The main dimensions are represented by symbols as indicated in the Figure 24. 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

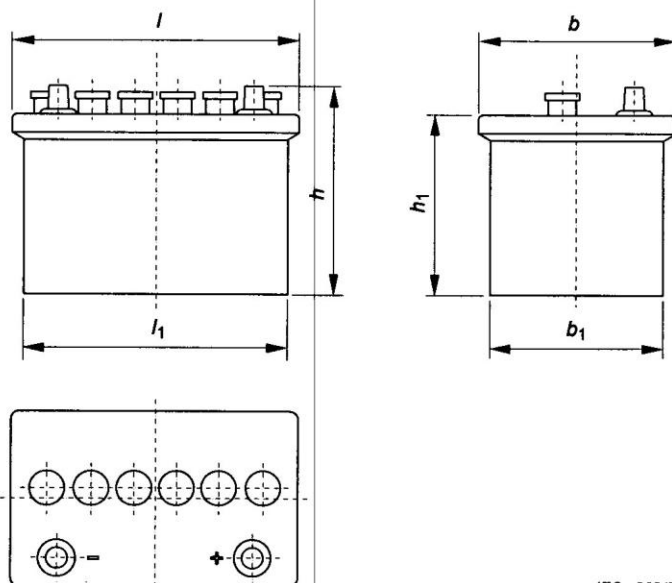


Figure 24 – Main dimensions of battery series AS

Table 7 – Dimensions of series AS

Type	Length		Width		Height		Classification of terminals
	l	l_1 max	b	b_1 max	h_1	h max	
B17	167 ⁺⁰ ₋₄	161	127 ⁺⁰ ₋₄	123	203 ⁺⁰ ₋₅	227	T_1 or T_2
B19	187 ⁺⁰ ₋₄	185	127 ⁺⁰ ₋₄	123	203 ⁺⁰ ₋₅	227	
B20	197 ⁺⁰ ₋₄	195	129 ⁺⁰ ₋₄	125	203 ⁺⁰ ₋₅	227	
B24	238 ⁺⁰ ₋₄	237	129 ⁺⁰ ₋₄	125	203 ⁺⁰ ₋₅	227	
C24	238 ⁺⁰ ₋₄	237	135 ⁺⁰ ₋₄	134	207 ⁺⁰ ₋₅	232	T_2
D20	202 ⁺⁰ ₋₄	200	173 ⁺⁰ ₋₅	172	204 ⁺⁰ ₋₆	225	
D23	232 ⁺⁰ ₋₄	231	173 ⁺⁰ ₋₅	172	204 ⁺⁰ ₋₆	225	
D26	260 ⁺⁰ ₋₄	259	173 ⁺⁰ ₋₅	172	204 ⁺⁰ ₋₆	255	
D31	306 ⁺⁰ ₋₅	304	173 ⁺⁰ ₋₅	172	204 ⁺⁰ ₋₆	255	

NOTE All measurements are in mm.

6 Other battery types

6.1 Other battery types used in Europe (EU)

6.1.1 General

The following battery types shall not be used for new developments.

The object of this subclause is to specify:

- the main dimensions of starter batteries of eight standard 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.

Starter batteries in accordance with this part shall belong to one of the following series:

L, LB, E, EB (with ledges on the long sides) or

LS, LBS, ES, EBS (with ledges on all sides).

6.1.2 Battery series

6.1.2.1 Wide series

The first four series have the same width ($L =$ large) but different height:

$L / LS =$ standard height ($H = 190$ mm)

LB / LBS = low height (H = 175 mm)

6.1.2.2 Narrow series

The last four series have the same width (E = narrow) but different height:

E / ES = standard height (H = 225 mm)

EB / EBS = low height (H = 205 mm)

6.1.3 Handles, if any

Batteries in accordance with this part may have handles. The projection "C" of handles (see Figure 25 or Figure 26) shall not exceed the values (see Table 8). The handles shall be capable of being folded or removed so as not to interfere with the other dimensions.

6.1.4 Standard fastening

6.1.4.1 Ledges on long sides

All batteries in accordance with the series L, LB, E and EB shall have, on the lower part, ledges (or recesses forming ledges) for fastening over the full length of the long sides, forming an integral part of the battery container and allowing the battery to be fixed by means of the bottom of the container.

6.1.4.2 Notches

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.

6.1.5 Dimensions of batteries

6.1.5.1 General

The main dimensions of the batteries are represented by symbols as indicated on the drawing. This schematic drawing does not represent any design details of the top of the battery.

6.1.5.2 Main dimensions of series L, LB, E and EB

The dimensions corresponding to the symbols below shall be in accordance with Figure 25 and Table 8.

Symbols 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

6.1.5.3 Dimensions and arrangement of ledges and notches

The shape and dimensions of ledges and notches shall be in accordance with Detail "X" (see Figures 27a) and Detail "Y" (see Figure 27b).

The positions of ledges and notches are indicated in the Figures 25 and 26.

6.1.5.4 Supplementary dimensions of batteries with permissible alternative fastening

6.1.5.4.1 General concerning permissible alternative fastening

Starter batteries of this part having the main dimensions of the standard series L, LB, E and EB may, as alternatives to the standard fastening, be fixed to the vehicles either:

- by additional ledges at the short sides (letter S added to the designation of the standard series LS, LBS, ES and EBS), or
- 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 L, LS, LB, LBS, E, ES, EB and EBS.

In either case, such batteries shall have on the long side ledges in accordance with Figure 30.

6.1.5.4.2 Fastening by ledges at the short side

Batteries for fastening at the short sides, the series LS, LBS, ES and EBS shall have ledges at the bottom of the short sides, forming an integral part of the battery container. The shape and dimensions of the ledges shall be in accordance with Figures 27a and 27b.

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

6.1.5.4.3 Fastening by upper part of the battery

6.1.5.4.3.1 Arrangement of the upper part of container

Batteries for fastening by the upper part (series L, LS, LB, LBS, E, ES, EB and EBS shall be designed so that the lid provides appropriate support for the hold-down device, for instance a metal frame.

6.1.5.4.3.2 Supplementary dimension of batteries with fastening by upper part of the container

The height of the upper surface (h), supporting the hold-down device, of series L, LS, LB, LBS, E, ES, EB and EBS above the bottom of the container (see Figures 25 and 26) shall be in accordance with the values in Table 9.

6.1.6 Terminals

6.1.6.1 Location of terminals

The arrangement of positive and negative terminals with respect to the position of the notches shall be in accordance with Figure 25 or Figure 26.

6.1.6.2 Dimensions of terminals (P)

6.1.6.2.1 Dimensions of the positive terminal

The tapered positive terminal shall be in accordance with Figure 28a.

6.1.6.2.2 Dimensions of the negative terminal

The tapered negative terminal shall be in accordance with Figure 28b.

6.1.6.3 Marking of polarity of batteries and dimensions of corresponding symbols

Batteries shall carry the marking of polarity in accordance with 4.1.2, at least of the positive terminal.

If the negative terminal is also marked, the symbol used shall also be in accordance with 4.1.2.

6.1.7 Handling of starter batteries by robot-equipment

6.1.7.1 General

Starter batteries are increasingly being installed by car manufacturers into car bodies by robot units. This practice requires appropriate means for the exact positioning of robot arms on the battery container.

The object of this subclause is to specify the position and dimensions of grips on battery containers according to the series L, LS, LB and LBS for handling by robot assembly equipment. Such ledges may optionally be requested by agreement between the car manufacturer and the battery manufacturer.

6.1.7.2 Position and dimensions of robot grips

If robot grips are requested, they shall conform to the dimensions and positions shown in Figures 29a, 29b and 29c and Table 10.

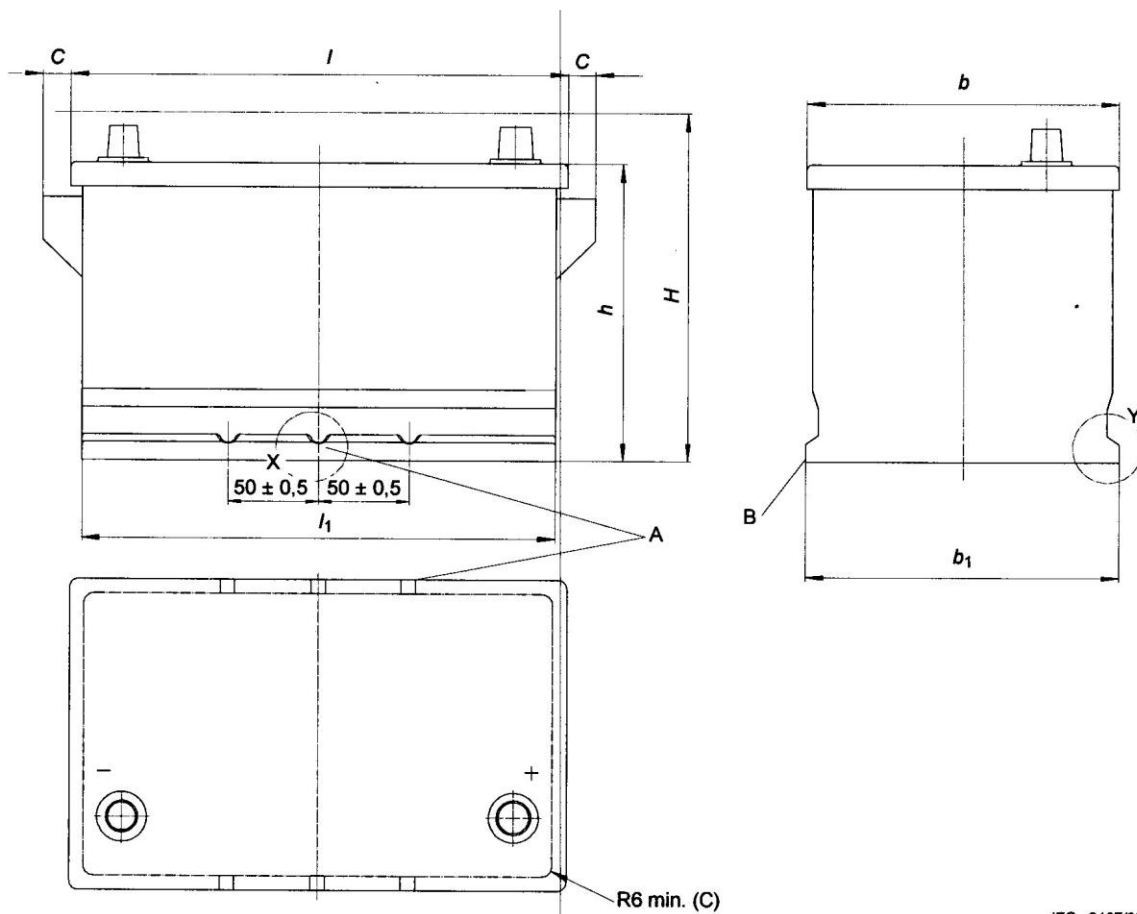
Figure 29a shall correspond to series L and LS.

Figures 29b and 29c are alternative, both corresponding to series LB and LBS.

The robot grips shall be integral parts of the battery container.

It is emphasised that, according to the detail drawing X, the robot grips shall not exceed dimensions of the lid.

NOTE If robot grips are requested, it is preferred that they are on the two long sides. They may, however, alternatively be on the two short sides or on all four sides. In all cases, they should conform to the dimensions given in this standard.



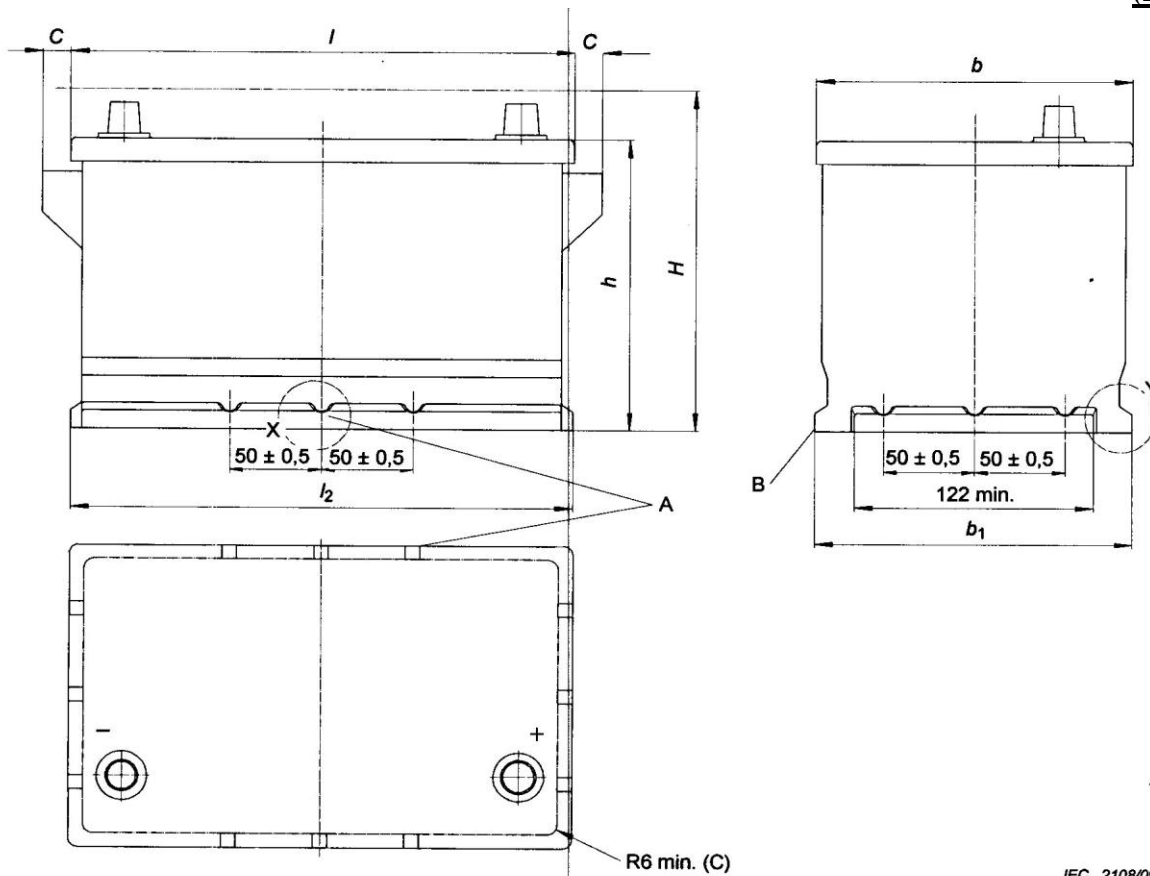
IEC 2107/09

- A = notches on ledges (see detail "X" in Figure 27a)
- B = ledges (see detail "Y" in Figure 27b)
- C = on ledges only

Figure 25 – Main dimensions of batteries and arrangement of the standard fastening system (ledges, notches) and of the terminals

Table 8 – Main dimensions of batteries with standard fastening (see Figure 25)

Series	Type	Length		Width		Height		Handles
		<i>l</i>	<i>l</i> ₁ max	<i>b</i> +0 / -4	<i>b</i> ₁	<i>H</i> +0 / -4	<i>h</i> +0 / -4	
L	L0	175 ⁺⁰ ₋₂	162	175	175 ⁺⁰ ₋₂	190	169	14
	L1	207 ⁺⁰ ₋₂	194					
	L2	242 ⁺⁰ ₋₂	229					
	L3	278 ⁺⁰ ₋₃	265					
	L4	315 ⁺⁰ ₋₃	302					
	L5	353 ⁺⁰ ₋₄	340					
LB	LB 1	207 ⁺⁰ ₋₂	194	175	175 ⁺⁰ ₋₂	175	154	14
	LB 2	242 ⁺⁰ ₋₂	229					
	LB 3	278 ⁺⁰ ₋₃	265					
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					
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					



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- A = notches on ledges (see detail "X" in Figure 27a)
- B = ledges (see detail "Y" in Figure 27b)
- C = on ledges only

Figure 26 – Supplementary dimensions of batteries with permissible alternative fastening, arrangement of ledges, notches and terminals

Table 9 – Supplementary dimension additional to Table 8 (dimension l_2 see Figure 26 of batteries with permissible additive fastening by ledges on the short side of the container

Series	l_2	Series	l_2	Series	l_2	Series	l_2
LS 1	207 $\begin{smallmatrix} +0 \\ -2 \end{smallmatrix}$	LBS 1	207 $\begin{smallmatrix} +0 \\ -2 \end{smallmatrix}$	ES 1	186 $\begin{smallmatrix} +0 \\ -2 \end{smallmatrix}$	EBS 1	188 $\begin{smallmatrix} +0 \\ -2 \end{smallmatrix}$
LS 2	242 $\begin{smallmatrix} +0 \\ -2 \end{smallmatrix}$	LBS 2	242 $\begin{smallmatrix} +0 \\ -2 \end{smallmatrix}$	ES 2	227 $\begin{smallmatrix} +0 \\ -2 \end{smallmatrix}$	EBS 2	230 $\begin{smallmatrix} +0 \\ -2 \end{smallmatrix}$
LS 3	278 $\begin{smallmatrix} +0 \\ -3 \end{smallmatrix}$	LBS 3	278 $\begin{smallmatrix} +0 \\ -3 \end{smallmatrix}$	ES 3	268 $\begin{smallmatrix} +0 \\ -3 \end{smallmatrix}$	EBS 3	276 $\begin{smallmatrix} +0 \\ -3 \end{smallmatrix}$
LS 4	315 $\begin{smallmatrix} +0 \\ -3 \end{smallmatrix}$			ES 4	309 $\begin{smallmatrix} +0 \\ -3 \end{smallmatrix}$	EBS 4	326 $\begin{smallmatrix} +0 \\ -4 \end{smallmatrix}$
LS 5	353 $\begin{smallmatrix} +0 \\ -4 \end{smallmatrix}$						

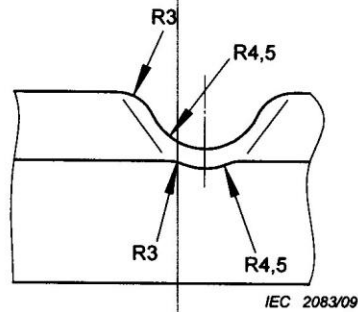


Figure 27a – Detail X – Notch, dimensions for all series

NOTE Holes for fixation of adapters in the hold down notches along all sides are permissible.

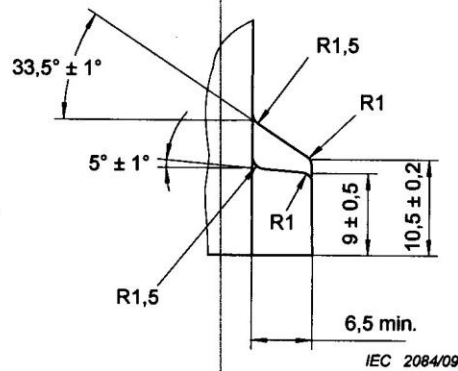
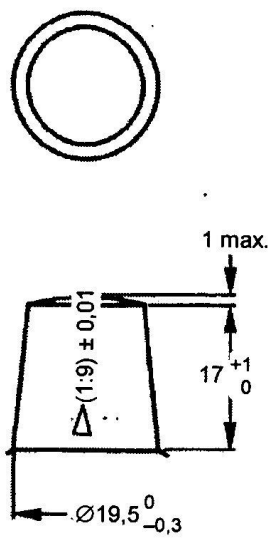


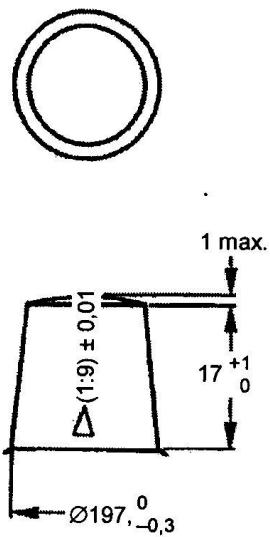
Figure 27b – Detail Y – Ledges, dimensions for all series

Figure 27 – Details of ledges and notches



IEC 2109/09

Figure 28a – Positive terminal



IEC 2110/09

Figure 28b – Negative terminal

Figure 28 – Dimensions of positive and negative terminal “P”

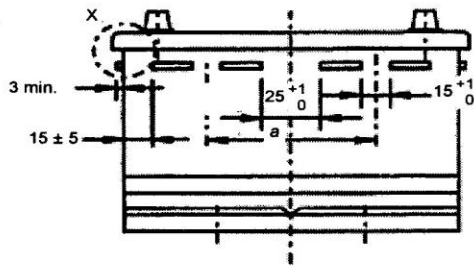
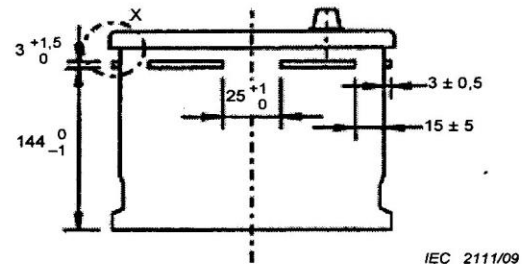


Figure 29a – Robotic grips for series L and LS



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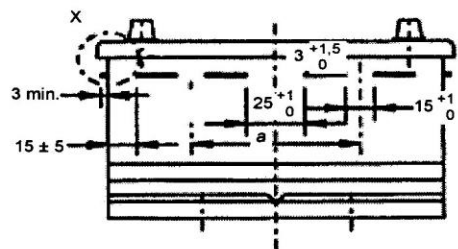
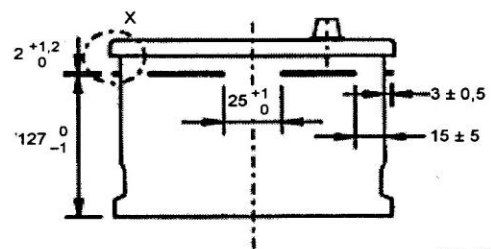


Figure 29b – Robotic grips for series LB and LBS



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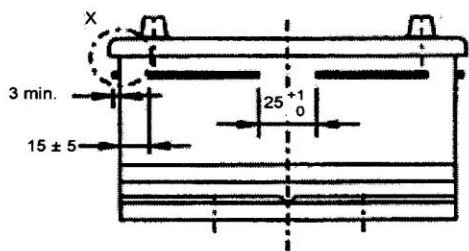
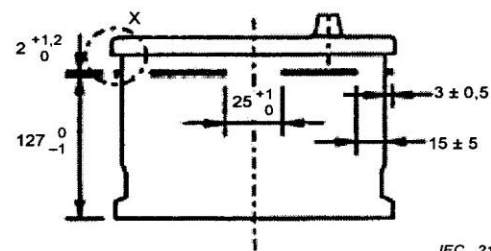


Figure 29c – Robotic grips for series LB and LBS (alternative)



IEC 2113/09

Figure 29 – Position and dimensions of robotic grips

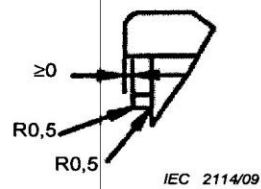


Figure 30 – Robotic grips, detail "X"

Table 10 – Dimension of grips in accordance with Figure 29a and 29b

Series	a ± 2	Figure
L 0	-	29a
L 1	95	
L 2	113	
L 3	130	
L 4	150	
L 5	168	
LB 1	95	29b
LB 2	113	
LB 3	130	

Bibliography

IEC 61429, *Marking of secondary cells and batteries with the international recycling symbol*
ISO 7000-1135

ISO 1101, *Geometrical Product Specifications (GPS) – Geometrical tolerancing – Tolerances of form, orientation, location and run-out*

ISO 7000:2004, *Graphical symbols for use on equipment – Index and synopsis*

