

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Ball and socket couplings of string insulator units – Dimensions

Assemblages à rotule des éléments de chaînes d'isolateurs – Dimensions

IEC 60120:2020

<https://standards.iteh.ai/catalog/standards/sist/45ef008d-44cd-4afd-83b3-a48fc0bc2803/iec-60120-2020>



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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.080.10; 29.240.20

ISBN 978-2-8322-8475-9

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**BALL AND SOCKET COUPLINGS OF STRING
INSULATOR UNITS – DIMENSIONS**

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International Standard IEC 60120 has been prepared by IEC technical committee 36: Insulators.

This fourth edition cancels and replaces the third edition published in 1984. This edition constitutes a technical revision.

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

- a) Two new designated size of couplings, 36 and 40 were introduced;
- b) According to the results of the questionnaire(36/424/Q), the relevant content of the 28B W-clip was deleted;
- c) The Q_{min} column in Table C.1 was deleted;
- d) Annex A is informative, Annex B is normative, Annex C is informative.

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

| FDIS | Report on voting |
|-------------|------------------|
| 36/486/FDIS | 36/492/RVD |

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

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

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://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- withdrawn,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.

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BALL AND SOCKET COUPLINGS OF STRING INSULATOR UNITS – DIMENSIONS

1 Scope

The object of this international standard is to define the dimensions of a series of standard ball and socket couplings using the standard locking devices (see IEC 60372) in order to permit the assembly of insulators or metal fittings supplied by different manufacturers.

This document applies to string insulator units of the cap and pin and long rod types and their associated metal fittings.

For the pin ball and the socket, dimensions apply to the finished product after any surface treatment.

Extreme positions of the pin ball in the socket are given in Annex A.

Typical examples of gauges for checking the dimensions of pin balls and sockets are given in Annex B.

NOTE Only the dimensions necessary for assembly are dealt with in this standard. Properties of material and working loads are not specified. The co-ordination of dimensions with strength classes is specified in IEC 60305 and IEC 60433.

2 Normative references

[IEC 60120:2020](#)

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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 60050-471:2007, *International Electrotechnical Vocabulary (IEV) – Part 471: Insulators*

IEC 60372, *Locking devices for ball and socket couplings of string insulator units – Dimensions and tests*

3 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 60050-471, some of which are reproduced below for ease of reference, 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

ball and socket coupling

coupling consisting of a ball, a socket and a locking device, and providing flexibility

[SOURCE: IEC 60050-471:2007, 471-03-11]

3.2 string insulator unit

cap and pin insulator or long rod insulator of which end fitting are suitable for flexible attachment to other similar insulator units or to connecting accessories

[SOURCE: IEC 60050-471:2007, 471-03-08]

4 Designated size of coupling

This document includes eight standard ball and socket couplings designated by the nominal pin diameters in millimetres. Each designated size of coupling is defined by the dimensions of the pin ball, of the socket, of the hook-on "GO" gauge, of the lower part of the insulator and of the corresponding locking device.

NOTE Dimensions of twin-balled pins for coupling of two sockets are stated in Clause 13. Dimensions of the hole for the locking devices are stated in Clause 14 and Clause 15.

5 Pin ball

The pin ball shall conform to the dimensions specified in Clause 10. The main dimensions governing the shape of the pin ball are h_1 , d_2 , r_1 and r_2 . Dimension r_3 is given for guidance because its accurate value may be obtained only by the drawing. In addition, the shank diameter d_1 , must not exceed the specified values within a length equal to H_3 of the corresponding worn hook-on "GO" gauge (see Clause 12).

6 Socket

The socket interior shall conform to the dimensions specified in Clause 11, which also specifies the thickness of the locking device.

The 16 mm designated size of coupling according to Clause 11 includes two alternative sockets. There is only one type of pin ball fit for it, but the corresponding locking device should be used. That is, the 16A socket should be matched with the 16A locking device, the 16B socket should be matched with the 16B locking device.

NOTE Sockets according to the clause mentioned are shown with flat bottoms. Sockets with rounded bottoms with radii of curvature not less than the dimensions r_2 of the pin balls can also be used. In this case, the dimensions R_5 have to be correspondingly decreased.

7 Hook-on "GO" gauge

The external dimensions of the socket have not been laid down. However, the socket shall permit acceptance of the hook-on "GO" gauge according to Clause 12.

8 Lower part of the insulator

The shape of the lower part of the insulator shall be such that assembly with the socket of maximum external dimensions according to Clause 7 will always be possible.

9 Locking device

The locking device, i. e. a split-pin or W-clip, shall be designed for locking the minimum-size pin ball in the maximum size socket. This requirement is fulfilled if the locking devices standardized in IEC 60372 are used.

10 Dimensions of the pin ball

Figure 1 shows a schematic of the pin ball. Table 1 gives dimensions of the pin ball.

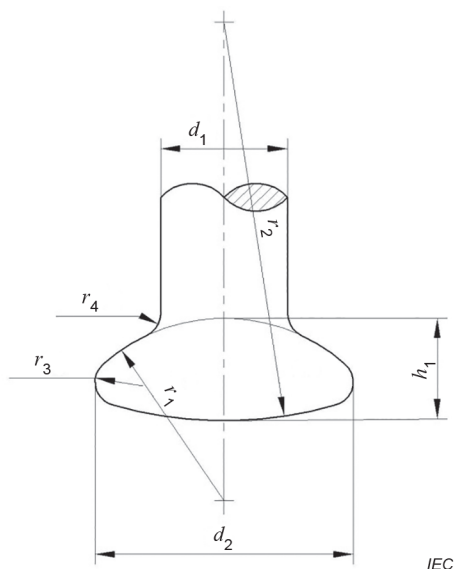


Figure 1 – Schematic of the pin ball

Table 1 – Dimensions of the pin ball

IEC 60120:2020

Dimensions in millimetres

| Designated size of coupling | d_1 | d_2 | h_1 | r_1 | r_2 | r_3^a | r_4 |
|-----------------------------|-------------------|-------------------|-------------------|-------|-------|---------|---------------------|
| 11 | $11,9^{0}_{-1,1}$ | $22,8^{0}_{-1,3}$ | $9,1^{0}_{-1,2}$ | 35,0 | 35,0 | 3,5 | $1,5^{+1,0}_{0}$ |
| 16 | $17,0^{0}_{-1,2}$ | $33,3^{0}_{-1,5}$ | $13,4^{0}_{-1,3}$ | 23,0 | 50,0 | 3,0 | $3,0^{+1,0}_{-0,5}$ |
| 20 | $21,0^{0}_{-1,3}$ | $41,0^{0}_{-1,6}$ | $19,5^{0}_{-1,4}$ | 27,0 | 60,0 | 5,7 | $3,5^{+1,0}_{-1,0}$ |
| 24 | $25,0^{0}_{-1,4}$ | $49,0^{0}_{-1,8}$ | $21,0^{0}_{-1,7}$ | 40,0 | 70,0 | 6,6 | $4,0^{+1,5}_{-1,0}$ |
| 28 | $29,0^{0}_{-1,5}$ | $57,0^{0}_{-1,9}$ | $23,5^{0}_{-1,8}$ | 55,0 | 80,0 | 8,0 | $4,5^{+1,5}_{-1,0}$ |
| 32 | $33,0^{0}_{-1,6}$ | $65,0^{0}_{-2,1}$ | $27,0^{0}_{-1,9}$ | 70,0 | 90,0 | 10,0 | $5,0^{+1,5}_{-1,0}$ |
| 36 | $37,0^{0}_{-1,6}$ | $73,0^{0}_{-2,1}$ | $34,0^{0}_{-1,9}$ | 50,0 | 110,0 | 10,5 | $8,0^{+1,5}_{-1,0}$ |
| 40 | $41,0^{0}_{-1,6}$ | $81,0^{0}_{-2,1}$ | $39,5^{0}_{-1,9}$ | 55,0 | 120,0 | 12,5 | $9,0^{+1,5}_{-1,0}$ |

^a Given for guidance.

11 Dimensions of the socket end

Figure 2 shows a schematic of the socket end. Table 2 gives dimensions of the socket end.

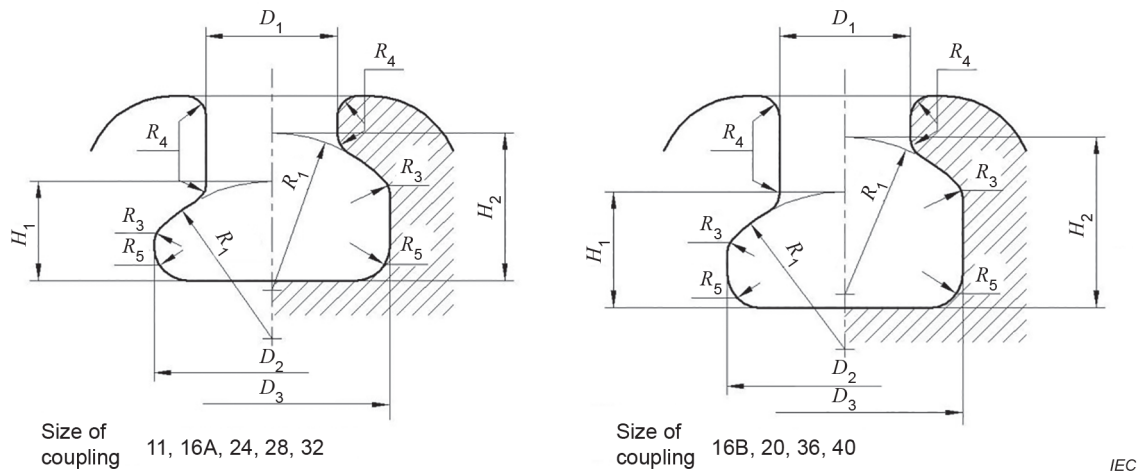


Figure 2 – Schematic of the socket end

Table 2 – Dimensions of the socket end

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Dimensions in millimetres

| Designated size of coupling | D_1 | D_2 | D_3 | H_1 | H_2 for W-clips and alternative split-pins | H_2 for standard split-pins | R_1 | R_3 | R_4 | R_5 | T^b |
|-----------------------------|-----------------|-------|-------|-----------------|--|-------------------------------|-------|-------|-------|-------|-----------------|
| | | | | | Min. | Min. | | | | | |
| 11 | $12,5_0^{+1,3}$ | 24,5 | 24,5 | $10,5_0^{+1,3}$ | 15,5 | 16,3 | 35,0 | 4,0 | 1,5 | 4,0 | $4,8_0^{+0,2}$ |
| 16 | $19,2_0^{+1,6}$ | 34,5 | 34,5 | $14,5_0^{+1,6}$ | 20,5 | 21,6 | 23,0 | 3,0 | 3,0 | 5,0 | $5,5_0^{+0,2}$ |
| | | | | | 25,0 | 25,5 | | | | | $7,9_0^{+0,2}$ |
| 20 | $23,0_0^{+2,1}$ | 42,5 | 42,5 | $20,5_0^{+2,1}$ | 28,5 | 29,3 | 27,0 | 6,0 | 3,5 | 7,0 | $7,0_0^{+0,2}$ |
| 24 | $27,5_0^{+2,5}$ | 51,0 | 51,0 | $23,5_0^{+2,5}$ | 32,5 | 33,5 | 40,0 | 5,0 | 4,0 | 10,0 | $8,7_0^{+0,2}$ |
| 28 | $32,0_0^{+2,9}$ | 59,0 | 59,0 | $26,0_0^{+2,9}$ | 36,5 | 37,4 | 55,0 | 8,0 | 4,5 | 12,0 | $10,0_0^{+0,2}$ |
| 32 | $36,0_0^{+3,3}$ | 67,5 | 67,5 | $30,0_0^{+3,3}$ | 42,0 | 43,0 | 70,0 | 10,0 | 5,0 | 14,0 | $11,5_0^{+0,2}$ |
| 36 | $40,0_0^{+3,3}$ | 75,5 | 75,5 | $38,0_0^{+3,3}$ | - | 51,0 | 50,0 | 10,5 | 8,0 | 16,0 | $11,5_0^{+0,2}$ |
| 40 | $44,0_0^{+3,3}$ | 83,5 | 83,5 | $43,5_0^{+3,3}$ | - | 56,5 | 55,0 | 12,5 | 9,0 | 17,0 | $11,5_0^{+0,2}$ |

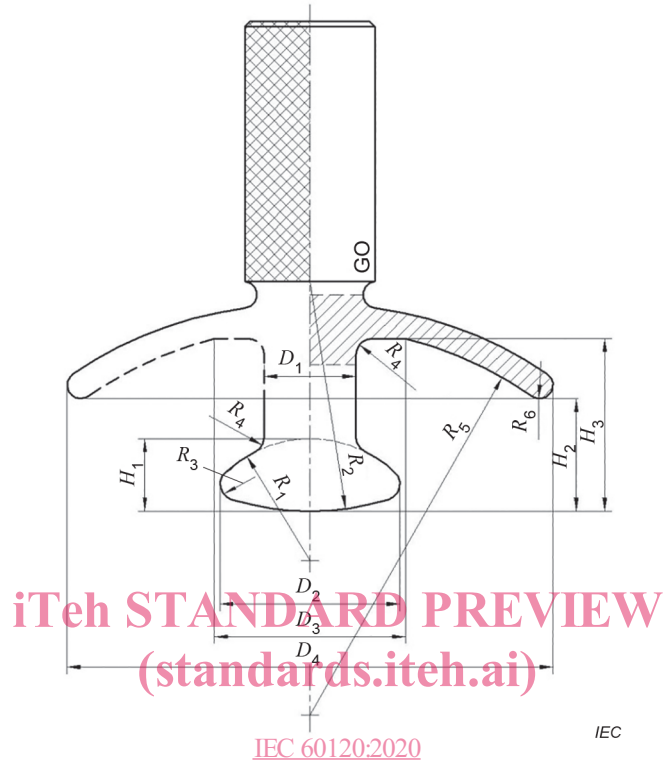
^a A greater value is given because in this case the split-pin does not always rest on the bottom of the socket. The position of the standard split-pin is determined by the position H_3 of the centre of the hole and its diameter D_4 (see clause 14) and dimension F_2 (see IEC 60372) and is also influenced by the tips of legs resting in contact with the socket. The values of H_2 ensure the correct clearances for split-pins.

^b Thickness of the locking device.

^c See Clause 6.

12 Dimensions of the hook-on "GO" gauge

Figure 3 shows a schematic of the hook-on "GO" gauge. Table 3 gives dimensions of the hook-on "GO" gauge.



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Figure 3 – Schematic of the hook-on "GO" gauge

Table 3 – Dimensions of the hook-on "GO" gauge (1 of 2)

Dimensions in millimetres

| Designated size of coupling | Gauge | D_1 | D_2 | D_3 | D_4 | H_1 | H_2 | H_3 | R_1 | R_2 | R_3 | R_4 | R_5 | R_6 |
|-----------------------------|---------------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|-------|-------|--------|-------|
| | | iTeH STANDARD PREVIEW | | | | | | | | | | | | |
| 11 | Max. contour ^a | 12,000 | 22,950 | 25,322 | 60,15 | 9,250 | 17,775 | 23,775 | 35,075 | 35,075 | 3,631 | 1,450 | 49,70 | 2,80 |
| | Nominal contour | 11,980 | 22,920 | 25,348 | 59,95 | 9,220 | 17,860 | 23,860 | 35,060 | 35,060 | 3,616 | 1,460 | 49,80 | 2,70 |
| | Min. contour ^a | 11,960 | 22,890 | 25,374 | 59,75 | 9,190 | 17,945 | 23,945 | 35,045 | 35,045 | 3,601 | 1,470 | 49,90 | 2,60 |
| | Worn ^b | 11,900 | 22,800 | 25,400 | 59,55 | 9,100 | 18,000 | 24,000 | 35,000 | 35,000 | 3,556 | 1,500 | 50,00 | 2,50 |
| 16 | Max. contour ^a | 17,122 | 33,490 | 35,326 | 90,59 | 13,572 | 20,686 | 31,786 | 23,086 | 50,086 | 3,071 | 2,939 | 71,70 | 2,80 |
| | Nominal contour | 17,096 | 33,450 | 35,351 | 90,39 | 13,536 | 20,768 | 31,868 | 23,068 | 50,068 | 3,055 | 2,952 | 71,80 | 2,70 |
| | Min. contour ^a | 17,070 | 33,410 | 35,376 | 90,19 | 13,500 | 20,850 | 31,950 | 23,050 | 50,050 | 3,039 | 2,965 | 71,90 | 2,60 |
| | Worn ^b | 17,000 | 33,300 | 35,400 | 89,99 | 13,400 | 20,900 | 32,000 | 23,000 | 50,000 | 2,993 | 3,000 | 72,00 | 2,50 |
| 20 | Max. contour ^a | 21,150 | 41,220 | 45,484 | 120,95 | 19,702 | 25,551 | 42,151 | 27,101 | 60,101 | 5,845 | 3,425 | 89,55 | 3,45 |
| | Nominal contour | 21,120 | 41,170 | 45,523 | 120,65 | 19,656 | 25,678 | 42,278 | 27,078 | 60,078 | 5,824 | 3,440 | 89,70 | 3,30 |
| | Min. contour ^a | 21,090 | 41,120 | 45,561 | 120,35 | 19,610 | 25,805 | 42,405 | 27,055 | 60,055 | 5,803 | 3,455 | 89,85 | 3,15 |
| | Worn ^b | 21,000 | 41,000 | 45,600 | 120,05 | 19,500 | 25,900 | 42,500 | 27,000 | 60,000 | 5,753 | 3,500 | 90,00 | 3,00 |
| 24 | Max. contour ^a | 25,172 | 49,250 | 50,490 | 140,90 | 21,242 | 25,971 | 46,171 | 40,121 | 70,121 | 6,732 | 3,914 | 104,55 | 3,45 |
| | Nominal contour | 25,136 | 49,190 | 50,527 | 140,60 | 21,186 | 26,093 | 46,293 | 40,093 | 70,093 | 6,706 | 3,932 | 104,70 | 3,30 |
| | Min. contour ^a | 25,100 | 49,130 | 50,564 | 140,30 | 21,130 | 26,215 | 46,415 | 40,065 | 70,065 | 6,680 | 3,950 | 104,85 | 3,15 |
| | Worn ^b | 25,000 | 49,000 | 50,600 | 140,00 | 21,000 | 26,300 | 46,500 | 40,000 | 70,000 | 6,615 | 4,000 | 105,00 | 3,00 |

^a The contour of the new gauge shall fall between the maximum and minimum contours.

^b See Clause B.1.

Table 3 (2 of 2)

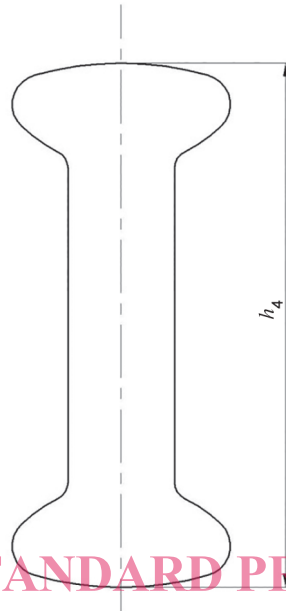
| Designated size of coupling | Gauge | D_1 | D_2 | D_3 | D_4 | H_1 | H_2 | H_3 | R_1 | R_2 | R_3 | R_4 | R_5 | R_6 |
|-----------------------------|---------------------------|--------|--------|---------|--------|--------|--------|--------|--------|---------|--------|-------|--------|--------|
| | | New | 29,190 | 57,290 | 66,870 | 165,94 | 23,770 | 29,100 | 51,100 | 55,135 | 80,135 | 7,994 | 4,414 | 129,55 |
| 28 | Nominal contour | 29,150 | 57,215 | 66,915 | 165,64 | 23,708 | 29,250 | 51,250 | 55,104 | 80,104 | 7,967 | 4,432 | 129,70 | 3,30 |
| | Min. contour ^a | 29,110 | 57,140 | 66,960 | 165,34 | 23,646 | 29,400 | 51,400 | 55,073 | 80,073 | 7,938 | 4,450 | 129,85 | 3,15 |
| | Worn ^b | 29,000 | 57,000 | 67,000 | 165,04 | 23,500 | 29,500 | 51,500 | 55,000 | 80,000 | 7,864 | 4,500 | 130,00 | 3,00 |
| 32 | Max. contour ^a | 33,220 | 65,310 | 85,800 | 198,45 | 27,300 | 34,000 | 61,400 | 70,150 | 90,150 | 9,719 | 4,914 | 149,55 | 3,45 |
| | Nominal contour | 33,170 | 65,230 | 85,850 | 198,22 | 27,225 | 34,175 | 61,600 | 70,112 | 90,113 | 9,683 | 4,932 | 149,70 | 3,30 |
| | Min. contour ^a | 33,120 | 65,150 | 85,900 | 197,98 | 27,150 | 34,350 | 61,800 | 70,075 | 90,075 | 9,647 | 4,950 | 149,85 | 3,15 |
| 36 | Worn ^b | 33,000 | 65,000 | 86,000 | 197,83 | 27,000 | 34,500 | 62,000 | 70,000 | 90,000 | 9,572 | 5,000 | 150,00 | 3,00 |
| | Max. contour ^a | 37,220 | 73,310 | 105,800 | 230,90 | 34,300 | 41,000 | 71,850 | 50,135 | 110,165 | 10,219 | 7,914 | 169,55 | 3,45 |
| | Nominal contour | 37,170 | 73,230 | 105,850 | 230,60 | 34,225 | 41,175 | 72,100 | 50,104 | 110,123 | 10,183 | 7,932 | 169,70 | 3,30 |
| 40 | Min. contour ^a | 37,120 | 73,150 | 105,900 | 230,30 | 34,150 | 41,350 | 72,350 | 50,073 | 110,081 | 10,147 | 7,950 | 169,85 | 3,15 |
| | Worn ^b | 37,000 | 73,000 | 106,000 | 230,00 | 34,000 | 41,500 | 72,500 | 50,000 | 110,000 | 10,072 | 8,000 | 170,00 | 3,00 |
| | Max. contour ^a | 41,220 | 81,310 | 126,800 | 262,90 | 39,800 | 46,500 | 82,300 | 55,135 | 120,180 | 12,219 | 8,914 | 189,55 | 3,45 |
| 40 | Nominal contour | 41,170 | 81,230 | 126,850 | 262,60 | 39,725 | 46,675 | 82,600 | 55,104 | 120,133 | 12,183 | 8,932 | 189,70 | 3,30 |
| | Min. contour ^a | 41,120 | 81,150 | 126,900 | 262,30 | 39,650 | 46,850 | 82,900 | 55,073 | 120,086 | 12,147 | 8,950 | 189,85 | 3,15 |
| | Worn ^b | 41,000 | 81,000 | 127,000 | 262,00 | 39,500 | 47,000 | 83,000 | 55,000 | 120,000 | 12,072 | 9,000 | 190,00 | 3,00 |

^a The contour of the new gauge shall fall between the maximum and minimum contours.

^b See Clause B.1.

13 Dimensions of twin-balled pins

Figure 4 shows a schematic of the twin-balled pins. Table 4 gives dimensions of the twin-balled pins.



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Figure 4 – Schematic of twin-balled pins

IEC 60120:2020

<https://standards.iteh.ai/catalog/standards/sist/45ef008d-44cd-4afd-83b3-a48fc06c2805/iec-60120-2020>

Table 4 – Dimensions of twin-balled pins

Dimensions in millimetres

| Designated size of coupling | h_4 |
|---|--------------------|
| 11 | $47,0^{0}_{-2,5}$ |
| 16 | $63,0^{0}_{-3,0}$ |
| 20 | $83,0^{0}_{-3,2}$ |
| 24 | $90,0^{0}_{-3,5}$ |
| 28 | $97,0^{0}_{-3,5}$ |
| 32 | $120,0^{0}_{-4,0}$ |
| 36 | $135,0^{0}_{-4,0}$ |
| 40 | $150,0^{0}_{-4,0}$ |
| NOTE For other dimensions, see Clause 10. | |

14 Dimensions of the hole for the split-pin

Figure 5 shows a schematic of the hole for the split-pin. Table 5 gives dimensions of the hole for the split-pin.