IS 2486-2 (1989): Insulator fittings for overhead power lines with nominal voltage greater than 1 000 V, Part 2: Dimensional requirements [ETD 6: Electrical Insulators and Accessories]

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IS 2486 ( Part 2 ) : 1989

( Reaffirmed 2004 )

# भारतीय मानक

## शिरोपरि पावर लाइनों में 1 000 वोल्ट से अधिक की अभिहित वोल्टता के लिए विद्युत रोधी फिटिंग — विशिष्टि

भाग 2 प्रायामीय अपेक्षायें

( दूसरा पुनरीक्षण )

*Indian Standard*

# INSULATOR FITTINGS FOR OVERHEAD POWER LINES WITH NOMINAL VOLTAGE GREATER THAN 1 000 V — SPECIFICATION

**PART 2 DIMENSIONAL REQUIREMENTS**

*( Second Revision )*

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*July* 1990

**Price Group 10**

## FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards on 22 August 1989, after the draft finalized by the Electrical Insulators and Accessories Sectional Committee had been approved by the Electrotechnical Division Council.

The insulator fittings for overhead power lines are generally the insulator pins, ball and socket connections, clevis and tongue connections, cross arm straps, etc. The dimensions of such fittings have been covered in this standard.

This standard was first issued in 1963. The first revision was carried out in 1974 to include dimensions of one more size of ball and socket connections. The requirements and dimensions of security clips were covered separately in Part 3 and Part 4 of IS 2486. In this second revision, the recommended dimensions of insulator string fittings rated above 72·5 kV have been included from IS 10136 : 1982 so as to bring information at one place.

The Sectional Committee responsible for the preparation of this standard is of the view that the list of fittings for which the dimensions have been given is by no means exhaustive and it would be necessary to add to it as and when the need arises.

The general requirements, materials and tests for these metal fittings are covered in IS 2486 (Part 1) : 1971. The requirements of locking devices for these metal fittings are covered in IS 2486 (Part 3) : 1974 and IS 2486 (Part 4) : 1981.

The insulators for which these fittings are meant are covered in IS 731 : 1971 and IS 3188 : 1980.

The insulator fittings for overhead distribution lines up to 1 000 V are covered in IS 7935 : 1975.

In the preparation of this standard considerable assistance has been derived from the following publications:

IEC Pub 120 (1984) Dimensions of ball and socket couplings for string insulator units — International Electrotechnical Commission (IEC).

IEC Pub 438 (1973) Dimensions of clevis and tongue couplings for string insulator units — International Electrotechnical Commission (IEC).

BS 3288 Part 2 : 1977 Insulator and conductor fittings for overhead power lines – British Standards Institution (UK).

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical valves (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

# *Indian Standard*

# INSULATOR FITTINGS FOR OVERHEAD POWER LINES WITH NOMINAL VOLTAGE GREATER THAN 1 000 V — SPECIFICATION

## PART 2 DIMENSIONAL REQUIREMENTS

## *( Second Revision )*

### 1. SCOPE

**1.1** This standard ( Part 2 ) gives the dimensions of the insulator fittings and their associated gauges for use on overhead power lines with a nominal voltage greater than 1 000 V.

### 2 REFERENCE STANDARDS

**2.1** The Indian Standards listed in Annex A are necessary adjuncts to this standard.

### 3 TERMINOLOGY

**3.1** For the purpose of this standard, the definitions given in IS 1885 ( Part 54 ) : 1980 and IS 2486 ( Part 1 ) : 1971 shall apply.

### 4 MATERIALS AND REQUIREMENTS

**4.1** Unless specified otherwise, the materials of metal parts of insulator shall be as specified in IS 2486 ( Part 1 ) : 1971.

### 5 INSULATOR FITTINGS FOR PIN INSULATORS AND STRING INSULATOR UNITS

**5.1** The requirements relating to shape and dimensions of fittings specified in **6, 7** and **8** shall be complied to achieve interchangeability of insulator fitting.

### 6 INSULATOR PINS

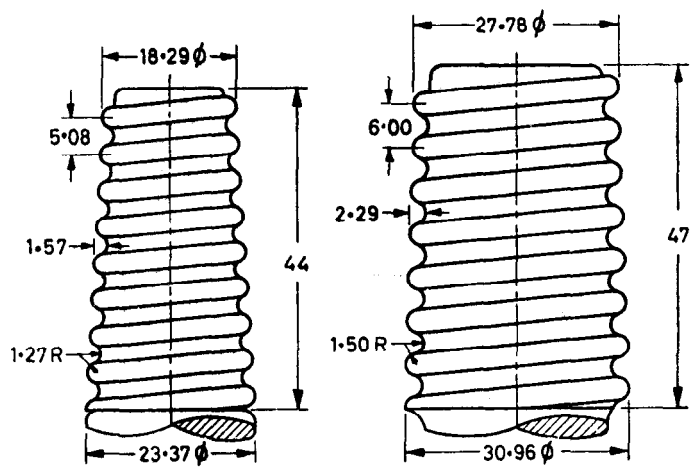
#### 6.1 Line and Pilot Pins

**6.1.1** *Heads*

The heads shall be of steel and shall be in accordance with Fig. 1. They shall screw into a thimble or equivalent component fixed in the pin hole of the insulator. The dimensions of the gauges for these heads are given in Fig. 2 to 4.

**6.1.2** *Pins*

The dimensions of the line pins shall be as given in Fig. 5 and 6. The pilot pins shall have the dimensions according to Fig. 7.

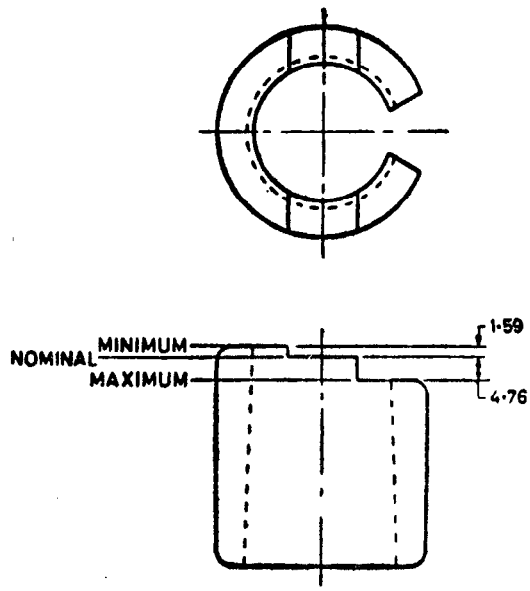



1A Small Steel Head ( Reference S )

1B Large Steel Head ( Reference L )

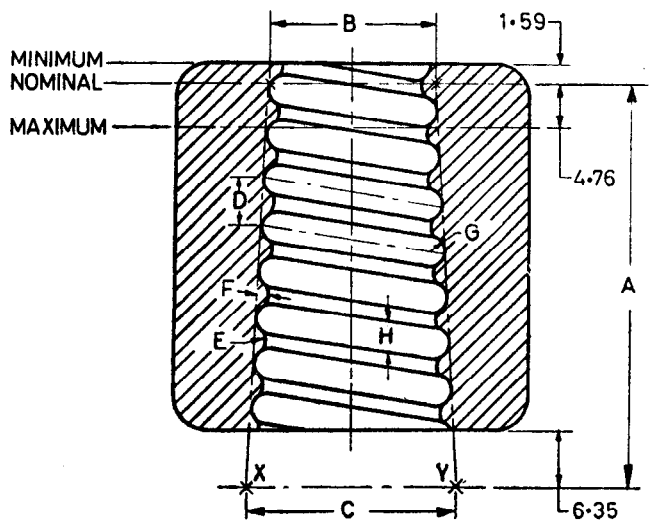
All dimensions in millimetres.

FIG. 1 PIN HEADS




All dimensions in millimetres.

FIG. 2 GENERAL CONFIGURATION OF GAUGE FOR HEADS OF INSULATOR PINS

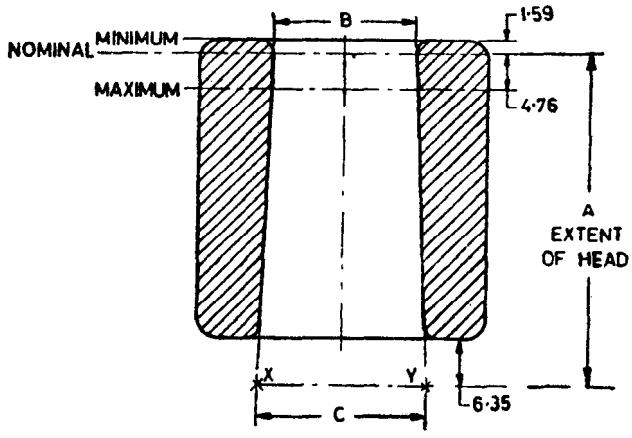



| *Size of Head* | *A* | *B* | *C* | *D* | *E* | *F* | *G* | *H* |
|---|---|---|---|---|---|---|---|---|
| Small ( *see* Fig. 1A ) | 44 | 18·29 | 23·37 | 5·08 | 1·68 | 1·19 | 1·68 | 3·33 |
| Large ( *see* Fig. 1B ) | 47 | 27·78 | 30·96 | 6·00 | 1·73 | 1·75 | 1·73 | 3·48 |

NOTE — The dimension *X-Y* is the base of the conic frustum which determines the root depth of the threads. For general configuration of gauge, *see* Fig. 2.

All dimensions in millimetres.

FIG. 3 SCREW GAUGES FOR STEEL HEADS

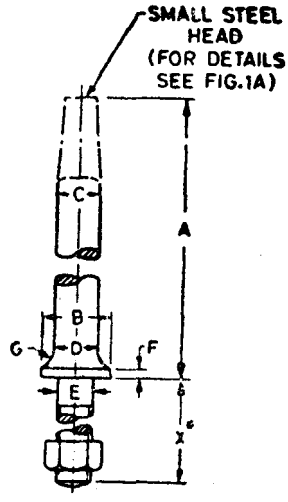



| *Size of Head* | *A* | *B* | *C* |
|---|---|---|---|
| Small ( *see* Fig. 1A ) | 44 | 18·29 | 23·37 |
| Large ( *see* Fig. 1B ) | 47 | 27·78 | 30·96 |

NOTE — The dimension *X-Y* is the base of the conic frustum which determines the taper of the gauge.

All dimensions in millimetres.

FIG. 4 RING GAUGES FOR STEEL HEADS




| *Minimum Failing Load* ( kN ) | *Reference* | *A* | *B* | *C* | *D* | *E* | *F* | *G* | *X** |
|---|---|---|---|---|---|---|---|---|---|
| 5 ( *P* ) | S115P | 115 | 33 | 24 | 24 | 20 | 5 | 12 | 50 |
| | S165P | 165 | 40 | 24 | 25 | 20 | 5 | 12 | or |
| | S230P | 230 | 40 | 24 | 29 | 24 | 6 | 12 | 150 |
| 10 ( *N* ) | S115N | 115 | 40 | 24 | 29 | 20 | 6 | 12 | 50 |
| | S165N | 165 | 45 | 24 | 32 | 20 | 6 | 12 | or |
| | S230N | 230 | 50 | 24 | 38 | 24 | 6 | 12 | 150 |

*Dimension *X* to be 150 mm ( screwed 100 mm ) or 50 mm ( screwed 45 mm ).

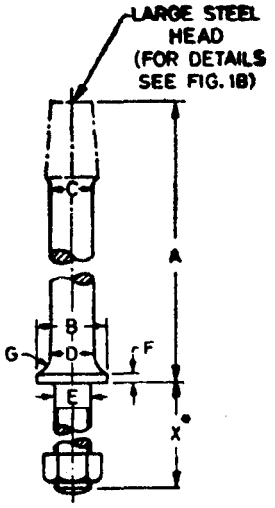
NOTES

1 In the references given above, S indicates that the steel head is small followed by the stalk length in millimetres which in turn is followed by the minimun failing load denoted by *P* ( 5 kN ) or *N* ( 10 kN ).

2 The tolerances, if necessary, shall be agreed between the purchaser and the manufacturer.

All dimensions in millimetres.

FIG. 5 PINS WITH SMALL STEEL HEADS




| *Minimum Failing Load* ( kN ) | *Reference* | *A* | *B* | *C* | *D* | *E* | *F* | *G* | *X** |
|---|---|---|---|---|---|---|---|---|---|
| 5 ( *P* ) | L165P | 165 | 40 | 24 | 25 | 20 | 5 | 12 | 50 |
| | L230P | 230 | 40 | 24 | 29 | 24 | 6 | 12 | or |
| | L300P | 300 | 50 | 24 | 35 | 24 | 6 | 12 | 150 |
| 10 ( *N* ) | L165N | 165 | 45 | 24 | 32 | 20 | 6 | 12 | 50 |
| | L230N | 230 | 50 | 24 | 38 | 24 | 6 | 12 | or |
| | L300N | 300 | 67 | 27 | 44 | 24 | 6 | 12 | 150 |

*Dimension *X* to be 150 mm ( screwed 100 mm ) or 50 mm ( screwed 45 mm ).

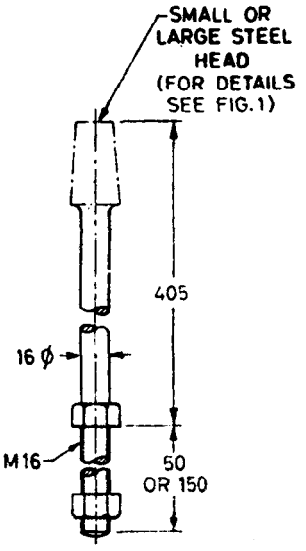
NOTES

1 In the references given above, L indicates that the steel head is large followed by the stalk length in millimetres which in turn is followed by the minimum failing load denoted by *P* ( 5 kN ) or *N* ( 10 kN ).

2 The tolerances, if necessary, shall be agreed between the purchaser and the manufacturer.

All dimensions in millimetres.

FIG. 6 PINS WITH LARGE STEEL HEADS




All dimensions in millimetres.

FIG. 7 PILOT PIN

**6.1.2.1** *Stalks*

The stalk length of line pins (dimension *A* in Fig. 5 and 6) shall be measured above the seating face of the collar. In pilot pins (*see* Fig. 7), this length shall be measured above the bottom face of the top nut.

**6.1.2.2** *Shanks*

The shank length of the line pins (dimension *X* in Fig. 5 and 6) shall be measured below the seating face of the collar. In pilot pins (*see* Fig. 7), this length shall be measured below the bottom face of the top nut.

The effective thread of 50 mm shank, shall be not less than 45 mm and that of a 150 mm shank, not less than 100 mm. The term effective thread shall mean that the thread, after galvanizing or after being given any other suitable anti-corrosion protection, shall take a nut for the distance stated.

NOTE — On steel cross-arms, the pins are secured with spring washer and nut and on wooden cross-arms with plain washer, nut and lock-nut.

**6.1.2.3** *Threads*

The threads on the shank and the nut shall be as specified in IS 4218 ( Part 2 ) : 1976.

**6.1.2.4** *Nuts*

The dimensions of hexagonal nuts shall be in accordance with IS 1363 ( Part 3 ) : 1986.

**6.2 Stud Pins**

The shank of the stud pin shall have a diameter of 20 mm and the lengths of 50 or 150 mm. The length shall be measured below the seating surface of the metal base. The effective thread of the 50 mm shank shall be not less than 45 mm and that of the 150 mm shank not less than 100 mm.

**6.3 Pin Strengths**

The minimum failing loads of the insulator pins shall be as follows:

| *Type* | *Minimum Failing Load* ( kN ) |
|---|---|
| Line pins | 5 and 10 |
| Pilot pins | 0·7 |
| Stud pins | 10 ( when assembled with its insulator ) |

NOTE — The reduction in the minimum mechanical failing load specified above for line pins is under consideration. The mechanical failing load may be reduced to suit the specific requirements as agreed between the manufacturer and the user till such time the revised values are finalized.

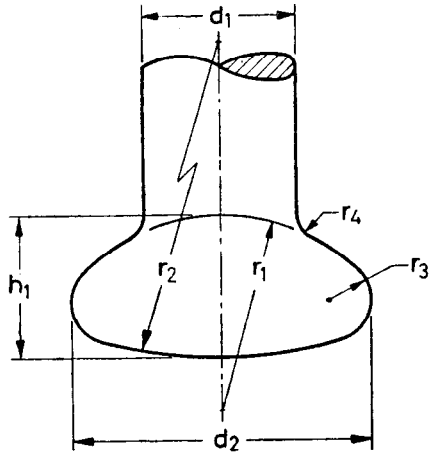
## 7 STRING INSULATOR FITTINGS

**7.1 Ball and Socket Connections**

**7.1.1** The nominal dimensions of the 11, 16, 20 and 24 mm pin ball and socket interior shall be as shown in Fig. 8 and 9.

NOTE — The external dimensions of the socket housing have not been specified, and these are left to the manufacturer. Conformity to the hook-on 'Go' gauges (*see* Fig. 10) ensures that the socket housing from one manufacturer will not foul any part of an insulator supplied by another.

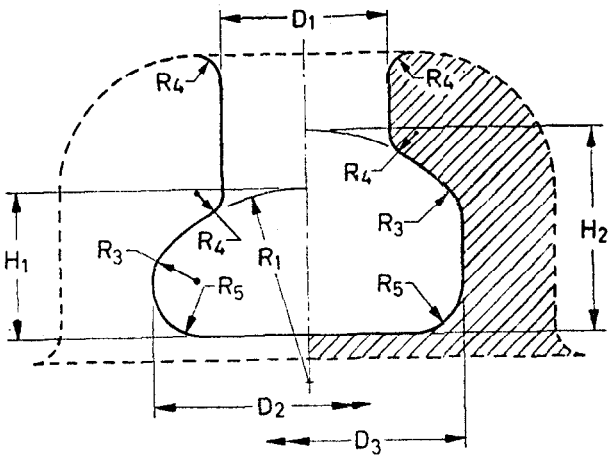
**7.1.2** The gauges for pin ball and sockets shall conform to the figure numbers given in Table 1.




| *Pin Ball* | $d_1$ | $d_2$ | $h_1$ | $r_1$ | $r_2$ | $r_3$ | $r_4$ |
|---|---|---|---|---|---|---|---|
| 11 mm | $11{\cdot}9^{+0{\cdot}0}_{-1{\cdot}1}$ | $22{\cdot}8^{+0{\cdot}0}_{-1{\cdot}3}$ | $9{\cdot}1^{+0{\cdot}0}_{-1{\cdot}2}$ | 35 | 35 | 3·5 | 1·5 |
| 16 mm | $17{\cdot}0^{+0{\cdot}0}_{-1{\cdot}2}$ | $33{\cdot}3^{+0{\cdot}0}_{-1{\cdot}5}$ | $13{\cdot}4^{+0{\cdot}0}_{-1{\cdot}3}$ | 23 | 50 | 3·0 | 3·0 |
| 20 mm | $21{\cdot}0^{+0{\cdot}0}_{-1{\cdot}3}$ | $41{\cdot}0^{+0{\cdot}0}_{-1{\cdot}6}$ | $19{\cdot}5^{+0{\cdot}0}_{-1{\cdot}4}$ | 27 | 60 | 5·7 | 3·5 |
| 24 mm | $25{\cdot}0^{+0{\cdot}0}_{-1{\cdot}4}$ | $49{\cdot}0^{+0{\cdot}0}_{-1{\cdot}8}$ | $21{\cdot}0^{+0{\cdot}0}_{-1{\cdot}7}$ | 40 | 70 | 6·6 | 4·0 |

All dimensions in millimetres.

FIG. 8 PIN BALL




| *Socket* | $D_1$ | $D_2$ (*Min*) | $D_3$ (*Min*) | $H_1$ | $H_2$ (*Min*) | $R_1$ | $R_3$ | $R_4$ | $R_5$ | $T^*$ (*Min*) |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 mm | $12{\cdot}5^{-0{\cdot}0}_{+1{\cdot}3}$ | 24·5 | 24·5 | $10{\cdot}5^{-0{\cdot}0}_{+1{\cdot}3}$ | 15·5 | 35 | 4 | 1·5 | 4 | 4·8 |
| 16 mm Alternative A | $19{\cdot}2^{-0{\cdot}0}_{+1{\cdot}6}$ | 34·5 | 34·5 | $14{\cdot}5^{-0{\cdot}0}_{+1{\cdot}6}$ | 20·5 | 23 | 3 | 3 | 5 | 5·5 |
| 16 mm Alternative B | $19{\cdot}2^{-0{\cdot}0}_{+1{\cdot}6}$ | 34·5 | 34·5 | $17{\cdot}0^{-0{\cdot}0}_{+1{\cdot}6}$ | 25·0 | 23 | 3 | 3 | 5 | 7·9 |
| 20 mm | $23{\cdot}0^{-0{\cdot}0}_{+2{\cdot}1}$ | 42·5 | 42·5 | $20{\cdot}5^{-0{\cdot}0}_{+2{\cdot}1}$ | 28·5 | 27 | 6 | 3·5 | 7 | 7·0 |
| 24 mm | $27{\cdot}5^{-0{\cdot}0}_{+2{\cdot}5}$ | 51·0 | 51·0 | $23{\cdot}5^{-0{\cdot}0}_{+2{\cdot}5}$ | 32·5 | 40 | 5 | 4 | 10 | 8·7 |

*$T$ = Thickness of locking device (*see* IS 2486 ( Part 3 ) : 1974 ).

All dimensions in millimetres.

FIG. 9 SOCKET

## Table 1 Gauges for Pin Ball and Sockets

( *Clause* 7.1.2 )

| Gauges | Fig. No. |
|---|---|
| Hook-on 'Go' gauge | 10 |
| 'Go' gauge for pin ball height, shank diameter and shank length | 11 |
| 'Go' gauge for pin ball diameter | 12 |
| 'Not Go' gauge for pin ball height | 13 |
| 'Not Go' gauge for pin ball diameter | 14 |
| 'Not Go' gauge for pin shank diameter | 15 |
| 'Go' gauge for socket entry height, entry width and neck width | 16 |
| 'Go' gauge for socket internal height and internal diameter | 17 |
| 'Not Go' gauge for socket entry height | 18 |
| 'Not Go' gauge for socket neck width | 19 |

NOTES

1 The 'Go' gauges have an allowance for wear and manufacturing tolerance for the gauge, which falls within the tolerance zone for the part. If desired, the manufacturing tolerance for the gauge may be measured and the wear allowance correspondingly reduced. The gauges should be discarded when they have worn to the dimensions given for worn gauges.

2 The 'Not Go' gauges have a manufacturing tolerance symmetrically disposed about the tolerance limit for the part and have no wear allowance.

**7.1.3** Dimensions of twin-balled pins for coupling of two socket ends are given in Fig. 20.

**7.1.4** Clearance and locking conditions as well as the extreme position of the pin ball in the socket end are given in Fig. 21 to 24.

### 7.2 Clevis and Tongue Connection

The dimensions of the clevis and tongue connection shall be as shown in Fig. 25.

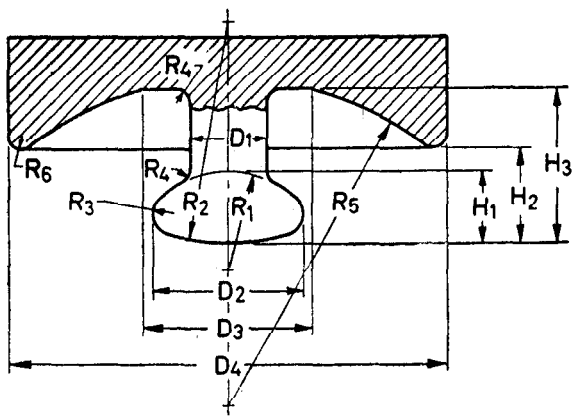
NOTE — The exterral dimensions of the clevis have not been given and these are left to the manufacturer.

### 7.3 Cross-Arm Strap

The dimensions of cross-arm strap shall be as shown in Fig. 26.

## 8 STRING INSULATOR UNIT FITTINGS FOR SYSTEM VOLTAGE 72·5 kV AND ABOVE

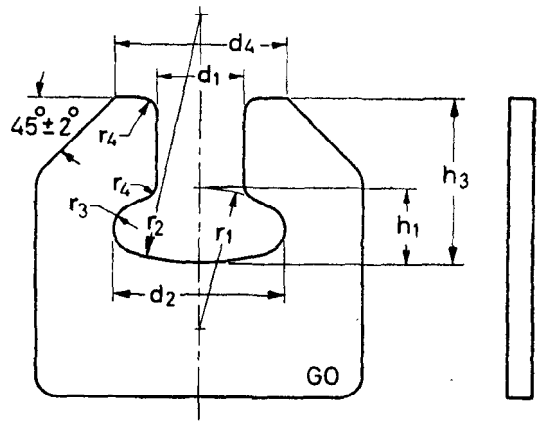
**8.0** The shape and dimensions covered in **8.1** to **8.13** are recommended values and for the purpose of guidance only. An agreement may be reached between the purchaser and the manufacturer on this account.




| *Gauge* | | $D_1$ | $D_2$ | $D_3$ | $D_4$ | $H_1$ | $H_2$ | $H_3$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_5$ | $R_6$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 mm | *Max* | 12·000 | 22·950 | 25·322 | 60·15 | 9·250 | 17·775 | 23·771 | 35·075 | 35·075 | 3·631 | 1·450 | 49·70 | 2·80 |
| | *Nom* | 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* | 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* | 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 mm Alternatives A and B | *Max* | 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 |
| | *Nom* | 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* | 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* | 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 mm | *Max* | 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 |
| | *Nom* | 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* | 21·090 | 41 120 | 46·561 | 120·35 | 19·610 | 25·805 | 42·405 | 27·055 | 60·055 | 5·803 | 3·455 | 89·85 | 3·15 |
| | *Worn* | 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 mm | *Max* | 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 |
| | *Nom* | 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* | 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* | 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 |

All dimensions in millimetres.

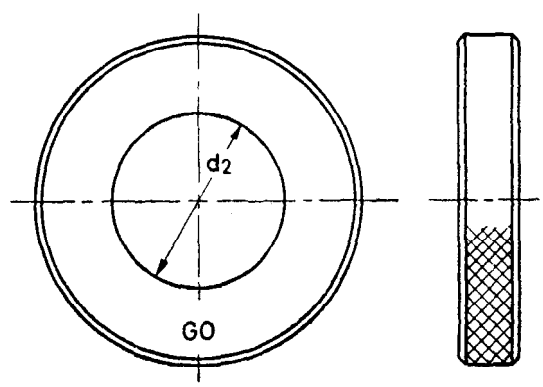
FIG. 10 HOOK-ON 'GO' GAUGES




| Gauge | | $d_1$ | $d_2$ | $d_4$ | $h_1$ | $h_3$ | $r_1$ | $r_2$ | $r_3$ | $r_4$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 mm | *Min* | 11·826 | 22·712 | 25·5 | 9·008 | 24·11 | 34·954 | 34·954 | 3·509 | 1·537 |
| | *Nom* | 11·836 | 22·728 | 25·0 | 9·024 | 24·08 | 34·962 | 34·962 | 3·517 | 1·532 |
| | *Max* | 11·846 | 22·744 | 24·5 | 9·040 | 24·05 | 34·970 | 34·970 | 3·525 | 1·527 |
| | *Worn* | 11·900 | 22·800 | 24·0 | 9·100 | 24·00 | 35·000 | 35·000 | 3·556 | 1·500 |
| 16 mm | *Min* | 16·922 | 33·204 | 35·5 | 13·304 | 32·14 | 22·952 | 49·952 | 2·945 | 3·039 |
| | *Nom* | 16·932 | 33·222 | 35·0 | 13·320 | 32·10 | 22·960 | 49·960 | 2·952 | 3·034 |
| | *Max* | 16·942 | 33·240 | 34·5 | 13·336 | 32·06 | 22·968 | 49·968 | 2·959 | 3·029 |
| | *Worn* | 17·000 | 33·300 | 34·0 | 13·400 | 32·00 | 23·000 | 50·000 | 2·993 | 3·000 |
| 20 mm | *Min* | 20·916 | 40·900 | 45·5 | 19·400 | 42·64 | 26·950 | 59·950 | 5·703 | 3·542 |
| | *Nom* | 20·928 | 40·920 | 45·0 | 19·418 | 42·60 | 26·959 | 59·959 | 5·711 | 3·536 |
| | *Max* | 20·940 | 40·940 | 44·5 | 19·436 | 42·56 | 26·968 | 59·968 | 5·719 | 3·530 |
| | *Worn* | 21·000 | 41·000 | 44·0 | 19·500 | 42·50 | 27·000 | 60·000 | 5·753 | 3·500 |
| 24 mm | *Min* | 24·912 | 48·890 | 50·5 | 20·888 | 46·65 | 39·944 | 69·944 | 6·558 | 4·044 |
| | *Nom* | 24·924 | 48·912 | 50·0 | 20·908 | 46·61 | 39·954 | 69·954 | 6·567 | 4·038 |
| | *Max* | 24·936 | 48·934 | 49·5 | 20·928 | 46·57 | 39·964 | 69·964 | 6·577 | 4·032 |
| | *Worn* | 25·000 | 49·000 | 49·0 | 21·000 | 46·50 | 40·000 | 70·000 | 6·615 | 4·000 |

All dimensions in millimetres.

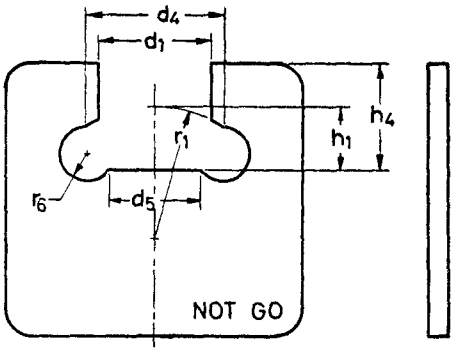
FIG. 11 'GO' GAUGE FOR PIN BALL HEIGHT, SHANK DIAMETER AND SHANK LENGTH




| Gauge | | $d_2$ |
|---|---|---|
| 11 mm | *New* | 22·728 ± 0·011 |
| | *Worn* | 22·800 |
| 16 mm | *New* | 33·223 ± 0·012 |
| | *Worn* | 33·300 |
| 20 mm | *New* | 40·920 ± 0·013 |
| | *Worn* | 41·000 |
| 24 mm | *New* | 48·913 ± 0·014 |
| | *Worn* | 49·000 |

All dimensions in millimetres.

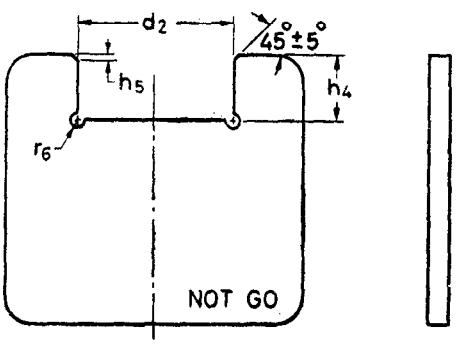
FIG. 12 'GO' GAUGE FOR PIN BALL DIAMETER




| Gauge | | $d_1$ | $d_4$ | $d_5$ | $h_1$ | $h_4$ | $r_1$ | $r_6$ |
|---|---|---|---|---|---|---|---|---|
| 11 mm | *Min* | 16·08 | 18·60 | 12·3 | 7·884 | 15·5 | 34·992 | 3·7 |
| | *Nom* | 16·10 | 18·40 | 12·0 | 7·900 | 16·0 | 35·000 | 4·0 |
| | *Max* | 16·12 | 18·20 | 11·7 | 7·916 | 16·5 | 35·008 | 4·3 |
| 16 mm | *Min* | 23·66 | 30·3 | 18·3 | 12·084 | 21·5 | 22·992 | 4·7 |
| | *Nom* | 23·70 | 30·0 | 18·0 | 12·100 | 22·0 | 23·000 | 5·0 |
| | *Max* | 23·74 | 29·7 | 17·7 | 12·116 | 22·5 | 23·008 | 5·3 |
| 20 mm | *Min* | 28·36 | 36·3 | 23·3 | 18·082 | 29·5 | 26·991 | 6·7 |
| | *Nom* | 28·42 | 36 0 | 23·0 | 18·100 | 30·0 | 27·000 | 7·0 |
| | *Max* | 28·48 | 35·7 | 22·7 | 18·118 | 30·5 | 27·009 | 7·3 |
| 24 mm | *Min* | 34·48 | 42·3 | 28·3 | 19·280 | 31·5 | 39·990 | 7·7 |
| | *Nom* | 34·54 | 42·0 | 28·0 | 19·300 | 32·0 | 40·000 | 8·0 |
| | *Max* | 34·60 | 41·7 | 27·7 | 19·320 | 32·5 | 40·010 | 8·3 |

All dimensions in millimetres.

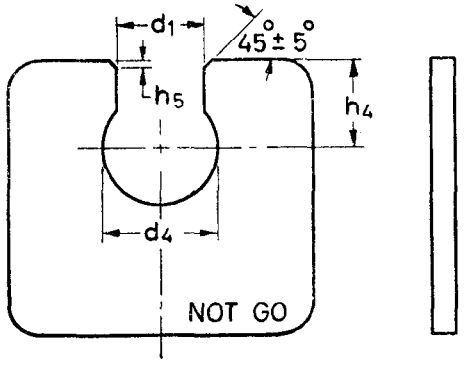
FIG. 13 'NOT GO' GAUGE FOR PIN BALL HEIGHT




| Gauge | $d_2$ | $h_4$ | $h_5$ | $r_6$ |
|---|---|---|---|---|
| 11 mm | 21·500 ± 0·011 | 10·0 ± 0·5 | 1·0 ± 0·3 | 1·5 ± 0·5 |
| 16 mm | 31·800 ± 0·012 | 12·0 ± 0·5 | 1·0 ± 0·3 | 1·5 ± 0·5 |
| 20 mm | 39·400 ± 0·013 | 18·0 ± 0·5 | 1·0 ± 0·3 | 1·5 ± 0·5 |
| 24 mm | 47·200 ± 0·014 | 20·0 ± 0·5 | 1·0 ± 0·3 | 1·5 ± 0·5 |

All dimensions in millimetres.

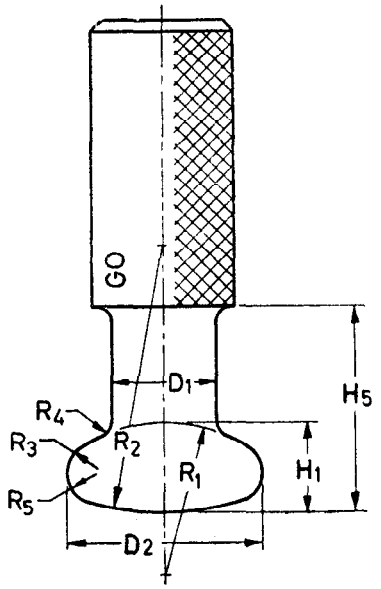
FIG. 14 'NOT GO' GAUGE FOR PIN BALL DIAMETER




| *Gauge* | $d_1$ | $d_4$ | $h_4$ | $h_5$ |
|---|---|---|---|---|
| 11 mm | 10·800 ± 0·009 | 15·0 ± 0·5 | 12·0 ± 0·5 | 1·0 ± 0·3 |
| 16 mm | 15·800 ± 0·010 | 20·0 ± 0·5 | 15·0 ± 0·5 | 1·0 ± 0·3 |
| 20 mm | 19·700 ± 0·012 | 25·0 ± 0·5 | 18·0 ± 0·5 | 1·0 ± 0·3 |
| 24 mm | 23·600 ± 0·012 | 30·0 ± 0·5 | 23·0 ± 0·5 | 1·0 ± 0·3 |

All dimensions in millimetres.

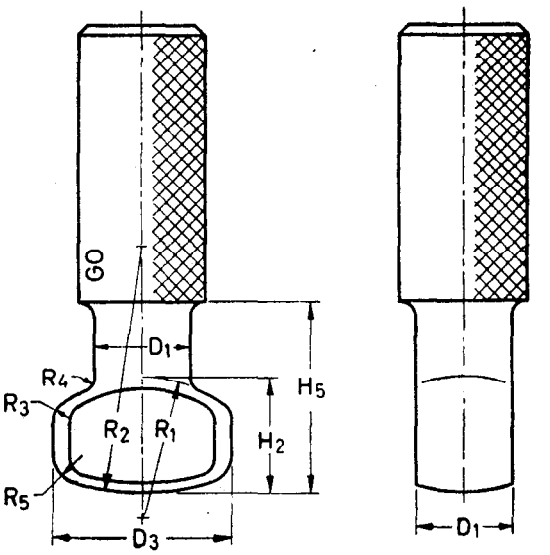
FIG. 15 'NOT GO' GAUGE FOR PIN SHANK DIAMETER




| *Gauge* | | $D_1$ | $D_2$ | $H_1$ | $H_5$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_5$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 mm | *Max* | 12·584 | 24·590 | 10·596 | 30·5 | 35·048 | 35·048 | 4·222 | 1·458 | 4·222 |
| | *Nom* | 12·572 | 24·578 | 10·580 | 30·0 | 35·040 | 35·040 | 4·213 | 1·464 | 4·213 |
| | *Min* | 12·560 | 24·566 | 10·564 | 29·5 | 35·032 | 35·032 | 4·205 | 1·470 | 4·205 |
| | *Worn* | 12·500 | 24·500 | 10·500 | 29·0 | 35·000 | 35·000 | 4·173 | 1·500 | 4·173 |
| 16 mm Alternative A | *Max* | 19·294 | 34·602 | 14·608 | 40·5 | 23·054 | 50·054 | 3·338 | 2·953 | 3·338 |
| | *Nom* | 19·280 | 34·588 | 14·588 | 40·0 | 23·044 | 50·044 | 3·325 | 2·960 | 3·325 |
| | *Min* | 19·266 | 34·574 | 14·568 | 39·5 | 23·034 | 50·034 | 3·311 | 2·967 | 3·311 |
| | *Worn* | 19·200 | 34·500 | 14·500 | 39·0 | 23·000 | 50·000 | 3·281 | 3·000 | 3·281 |
| 16 mm Alternative B | *Max* | 19·294 | 34·602 | 17·108 | 40·5 | 23·054 | 50·054 | 3·051 | 2·953 | 3·051 |
| | *Nom* | 19·280 | 34·588 | 17·088 | 40·0 | 23·044 | 50·044 | 3·044 | 2·960 | 3·044 |
| | *Min* | 19·266 | 33·574 | 17·068 | 39·5 | 23·034 | 50 034 | 3·037 | 2·967 | 3·037 |
| | *Worn* | 19·200 | 34·500 | 17·000 | 39·0 | 23·000 | 50·000 | 3·000 | 3·000 | 3·000 |
| 20 mm | *Max* | 23·116 | 42·630 | 20·632 | 50·5 | 27·066 | 60·066 | 6·065 | 3·442 | 5·565 |
| | *Nom* | 23·098 | 42·610 | 20·606 | 50·0 | 27·053 | 60·053 | 6·055 | 3·451 | 5·555 |
| | *Min* | 23·080 | 42·590 | 20·580 | 49·5 | 27·040 | 60·040 | 6·045 | 3·460 | 5·545 |
| | *Worn* | 23·000 | 42·500 | 20·500 | 49·0 | 27·000 | 60·000 | 6·000 | 3·500 | 5·500 |
| 24 mm | *Max* | 27·630 | 51·150 | 23·652 | 55·5 | 40·076 | 70·076 | 7·898 | 3·935 | 7·898 |
| | *Nom* | 27·610 | 51·126 | 23·622 | 55·0 | 40·061 | 70·061 | 7·881 | 3·945 | 7·881 |
| | *Min* | 27·590 | 51·102 | 23·592 | 54·5 | 40·046 | 70·046 | 7·864 | 3·955 | 7·864 |
| | *Worn* | 27·500 | 51·000 | 23·500 | 54·0 | 40·000 | 70·000 | 7·821 | 4·000 | 7·821 |

All dimensions in millimetres.

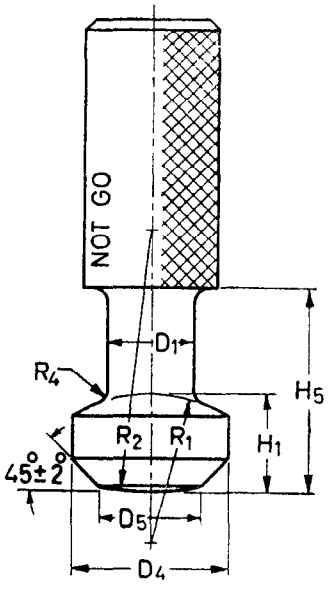
FIG. 16 'GO' GAUGE FOR SOCKET ENTRY HEIGHT, ENTRY WIDTH AND NECK WIDTH




| Gauge | | $D_1$ | $D_3$ | $H_2$ | $H_5$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_5$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 mm | *Max* | 12·584 | 24·590 | 15·596 | 30·5 | 35·048 | 35·048 | 4·045 | 1·458 | 4·045 |
| | *Nom* | 12·572 | 24·578 | 15·580 | 30·0 | 35·040 | 35·040 | 4·039 | 1·464 | 4·039 |
| | *Min* | 12 560 | 24·566 | 15·564 | 29·5 | 35·032 | 35·032 | 4·033 | 1·470 | 4·033 |
| | *Worn* | 12·500 | 24·500 | 15·500 | 29·0 | 35·000 | 35·000 | 4·000 | 1·500 | 4·000 |
| 16 mm Alternative A | *Max* | 19·294 | 34·602 | 20·608 | 40·5 | 23·054 | 50·054 | 3·051 | 2·953 | 3·051 |
| | *Nom* | 19·280 | 34·588 | 20·588 | 40·0 | 23·044 | 50 044 | 3·044 | 2·960 | 3·044 |
| | *Min* | 19·266 | 34·574 | 20·568 | 39·5 | 23·034 | 50·034 | 3·037 | 2·967 | 3·037 |
| | *Worn* | 19·200 | 34·500 | 20·500 | 39·0 | 23·000 | 50 000 | 3·000 | 3·000 | 3·000 |
| 16 mm Alternative B | *Max* | 19·294 | 34·602 | 25·108 | 40·5 | 23·054 | 50·054 | 3·051 | 2·953 | 3·051 |
| | *Nom* | 19·280 | 34·588 | 25·088 | 40·0 | 23·044 | 50·044 | 3·044 | 2·960 | 3·044 |
| | *Min* | 19·266 | 34·574 | 25·068 | 39·5 | 23·034 | 50·034 | 3·037 | 2·967 | 3·037 |
| | *Worn* | 19·200 | 34·500 | 25·000 | 39·0 | 23 000 | 50·000 | 3·000 | 3·000 | 3·000 |
| 20 mm | *Max* | 23·116 | 42·630 | 28·632 | 50·5 | 27·066 | 60·066 | 6·065 | 3·442 | 6·065 |
| | *Nom* | 23·098 | 42·610 | 28·606 | 50·0 | 27·053 | 60·053 | 6·055 | 3·451 | 6·055 |
| | *Min* | 23·080 | 42·590 | 28·580 | 49·5 | 27·040 | 60·040 | 6·045 | 3·460 | 6·045 |
| | *Worn* | 23·000 | 42·500 | 28·500 | 49·0 | 27·000 | 60·000 | 6·000 | 3·500 | 6·000 |
| 24 mm | *Max* | 27·630 | 51·150 | 32·652 | 55·5 | 40·076 | 70·076 | 5·075 | 3·935 | 8·075 |
| | *Nom* | 27·610 | 51·126 | 32·622 | 55·0 | 40·061 | 70·061 | 5·063 | 3·945 | 8·063 |
| | *Min* | 27·590 | 51·102 | 32·592 | 54·5 | 40·046 | 70·046 | 5·051 | 3·955 | 8·051 |
| | *Worn* | 27·500 | 51·000 | 32·500 | 54·0 | 40·000 | 70·000 | 5·000 | 4·000 | 8·000 |

All dimensions in millimetres.

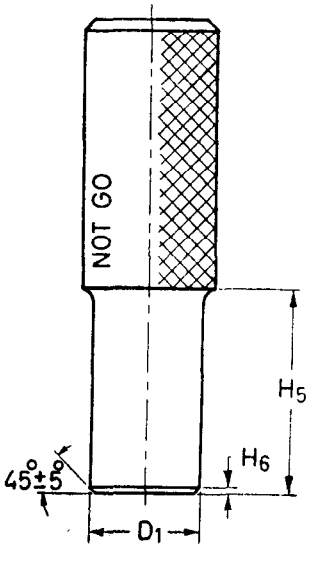
FIG. 17 'GO' GAUGE FOR SOCKET INTERNAL HEIGHT AND INTERNAL DIAMETER




| Gauge | | $D_1$ | $D_4$ | $D_5$ | $H_1$ | $H_5$ | $R_1$ | $R_2$ | $R_4$ |
|---|---|---|---|---|---|---|---|---|---|
| 11 mm | *Max* | 10·9 | 17·05 | 12·3 | 11·816 | 30·5 | 35·008 | 35·008 | 1·8 |
| | *Nom* | 10·8 | 17·00 | 12·0 | 11·800 | 30·0 | 35·000 | 35·000 | 1·5 |
| | *Min* | 10·7 | 16·95 | 11·7 | 11·784 | 29·5 | 34·992 | 34·992 | 1·2 |
| 16 mm Alternative A | *Max* | 15·9 | 30·1 | 18·3 | 16·120 | 40·5 | 23·010 | 50·010 | 3·3 |
| | *Nom* | 15·8 | 30·0 | 18·0 | 16·100 | 40·0 | 23·000 | 50·000 | 3·0 |
| | *Min* | 15·7 | 29·9 | 17·7 | 16·080 | 39·5 | 22·990 | 49·990 | 2·7 |
| 16 mm Alternative B | *Max* | 15·9 | 30·1 | 18·3 | 18·620 | 40·5 | 23·010 | 50·010 | 3·3 |
| | *Nom* | 15·8 | 30·0 | 18·0 | 18·600 | 40·0 | 23·000 | 50·000 | 3·0 |
| | *Min* | 15·7 | 29·9 | 17·7 | 18·580 | 39·5 | 22·990 | 49·990 | 2·7 |
| 20 mm | *Max* | 19·8 | 36·1 | 23·3 | 22·626 | 50·5 | 27·013 | 60·013 | 3·8 |
| | *Nom* | 19·7 | 36·0 | 23·0 | 22·600 | 50·0 | 27·000 | 60·000 | 3·5 |
| | *Min* | 19·6 | 35·9 | 22·7 | 22·574 | 49·5 | 26·987 | 59·987 | 3·2 |
| 24 mm | *Max* | 23·7 | 42·1 | 28·3 | 26·030 | 55·5 | 40·015 | 70·015 | 4·3 |
| | *Nom* | 23·6 | 42·0 | 28·0 | 26·000 | 55·0 | 40·000 | 70·000 | 4·0 |
| | *Min* | 23·5 | 41·9 | 27·7 | 25·970 | 54·5 | 39·985 | 69·985 | 3·7 |

All dimensions in millimetres.

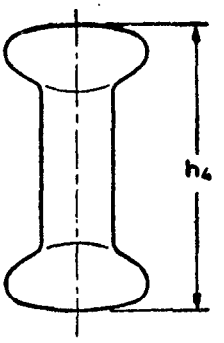
FIG. 18 'NOT GO' GAUGE FOR SOCKET ENTRY HEIGHT




| Gauge | $D_1$ | $H_5$ | $H_6$ |
|---|---|---|---|
| 11 mm | 13·800 ± 0·011 | 30·0 ± 0·5 | 1·0 ± 0·3 |
| 16 mm Alternatives A and B | 20·800 ± 0·014 | 40·0 ± 0·5 | 1·0 ± 0·3 |
| 20 mm | 25·100 ± 0·018 | 50·0 ± 0·5 | 1·0 ± 0·3 |
| 24 mm | 30·000 ± 0·020 | 55·0 ± 0·5 | 1·0 ± 0·3 |

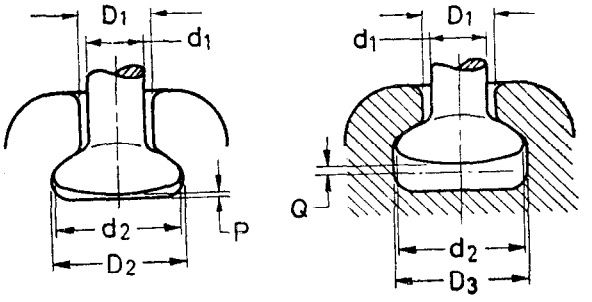
All dimensions in millimetres.

FIG. 19 'NOT GO' GAUGE FOR SOCKET NECK WIDTH




| *Size* | $h_4$ ( mm ) |
|---|---|
| 11 mm | $47{\cdot}0^{+0{\cdot}0}_{-2{\cdot}5}$ |
| 16 mm | $63{\cdot}0^{+0{\cdot}0}_{-3{\cdot}0}$ |
| 20 mm | $83{\cdot}0^{+0{\cdot}0}_{-3{\cdot}2}$ |
| 24 mm | $90{\cdot}0^{+0{\cdot}0}_{-3{\cdot}5}$ |

FIG. 20 TWIN-BALLED PIN

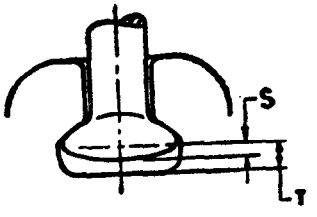



| *Size* | $D_1-d_1$ | | $D_2-d_2$ | $D_3-d_2$ | $P$ | | $Q^*$ |
|---|---|---|---|---|---|---|---|
| | *Min* | *Max* | *Min* | *Min* | *Min* | *Max* | *Min* |
| 11 mm | 0·6 | 3·0 | 1·7 | 1·7 | 1·4 | 3·9 | 1·6 |
| 16 mm Alternative A | 2·2 | 5·0 | 1·2 | 1·2 | 1·1 | 4·0 | 1·6 |
| 16 mm Alternative B | 2·2 | 5·0 | 1·2 | 1·2 | 3·6 | 6·5 | 3·7 |
| 20 mm | 2·0 | 5·4 | 1·5 | 1·5 | 1·0 | 4·5 | 2·0 |
| 24 mm | 2·5 | 6·4 | 2·0 | 2·0 | 2·5 | 6·7 | 2·8 |

*Clearance between the pin ball and locking device.

All dimensions in millimetres.

FIG. 21 CLEARANCE BETWEEN PIN BALL AND SOCKET END

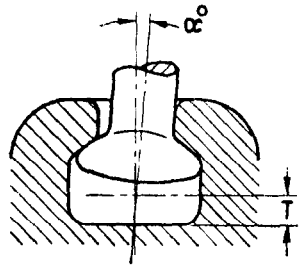



**$T$ = Minimum thickness of locking device.**

**$S$ = Effectiveness of locking.**

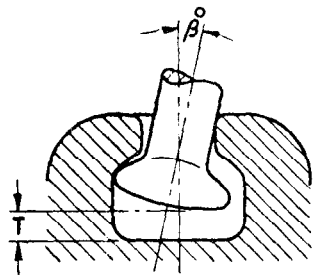
| *Size* | $S$ *Min* ( mm ) |
|---|---|
| 11 mm | 0·9 |
| 16 mm Alternative A | 1·5 |
| 16 mm Alternative B | 1·4 |
| 20 mm | 2·5 |
| 24 mm | 2·0 |

FIG. 22 EFFECTIVENESS OF LOCKING THE PIN BALL




| *Size* | $\alpha°$ *Average* |
|---|---|
| 11 mm | 1·3 |
| 16 mm Alternative A | 4·0 |
| 16 mm Alternative B | 4·0 |
| 20 mm | 3·3 |
| 24 mm | 2·7 |

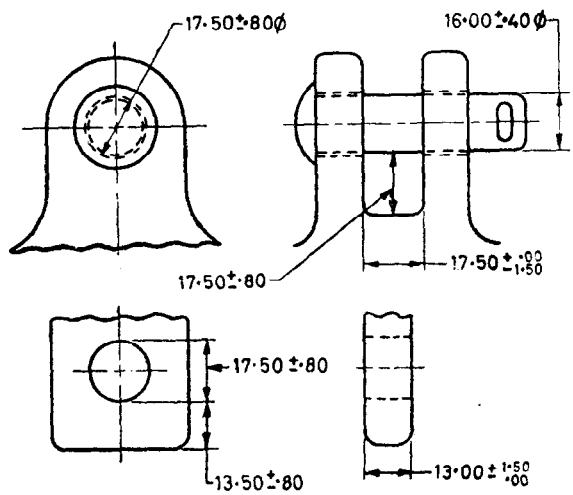
FIG. 23 SLIDING POSITION OF THE PIN BALL IN THE SOCKET END




| *Size* | $\beta°$* *Average* |
|---|---|
| 11 mm | 12 |
| 16 mm Alternative A | 9·5 |
| 16 mm Alternative B | 12 |
| 20 mm | 9 |
| 24 mm | 10 |

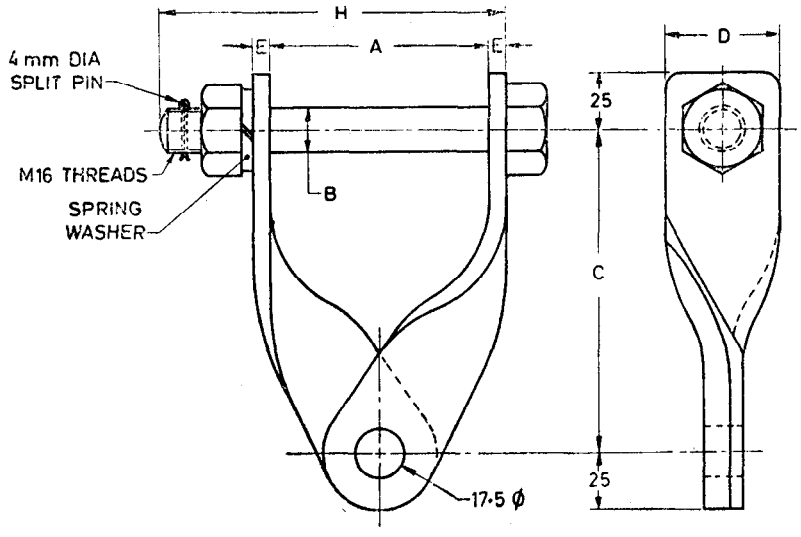
*β° values assume reasonable tolerance for $H_3$.

FIG. 24 OVER-TILTING POSITION OF THE PIN BALL IN THE SOCKET END




All dimensions in millimetres.

FIG. 25 CLEVIS AND TONGUE CONNECTION




| *A* | *B* dia | *C* | *D** | *E* | *H* |
|---|---|---|---|---|---|
| 100 | 16 | 140 | 35 | 6 | 145 |
| 75 | 16 | 115 | 35 | 6 | 120 |

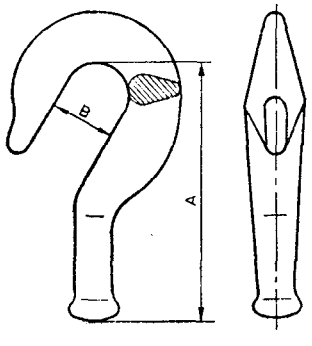
*The strip of higher width may be used by agreement with the user.

All dimensions in millimetres.

FIG. 26 CROSS-ARM STRAPS

### 8.1 Ball Hook

The shape and dimensions of the ball hook are shown in Fig. 27.



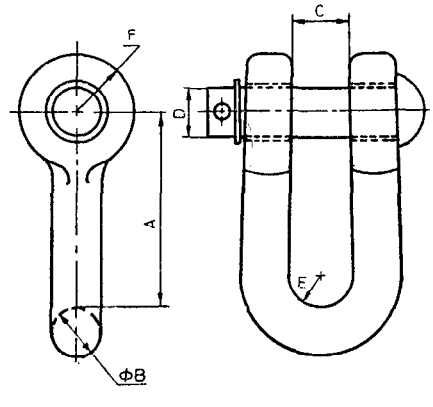

| *Dimensions* | | *Pin Ball Designation** |
|---|---|---|
| *A* | *B* | |
| mm | mm | mm |
| 85 | 22 | 16 |
| 95 | 25 | 20/16 |

*For details, *see* Fig. 8.

FIG. 27 BALL HOOK

### 8.2 Anchor Shackle

The shape and dimensions of the anchor shackle are shown in Fig. 28.




| *Dimensions*, mm | | | | | |
|---|---|---|---|---|---|
| *A* | *B* | *C* | *D* | *E* | *F* |
| 76 | 16 | 19 | 16 | 11 | 19 |
| 76 | 16 | 19 | 16 | 11 | 19 |
| 76 | 19 | 22 | 19 | 14 | 22 |
| 89 | 22 | 25 | 22 | 19 | 25 |
| 102 | 25 | 29 | 25 | 19 | 25 |

FIG. 28 ANCHOR SHACKLE

### 8.3 Twisted Shackle

The shape and dimensions of the twisted shackle are shown in Fig. 29.

### 8.4 Socket-Tongue

The shape and dimensions of socket-tongue are shown in Fig. 30 and 31.

### 8.5 Suspension Clamp

**8.5.1** The general shape and dimensions of the suspension clamp are shown in Fig. 32. The actual design of the clamp shall be subject to the agreement between the manufacturer and the purchaser. The bell mouth of the suspension clamp shall be designed to take into account the hypothetical catenary angle of the conductor which it holds, as well as the effects of conductor vibration. The clamp body and the conductor groove of the keeper piece shall hold the conductor at mutually suitable curvature, so that the conductor compression as it reaches the bell mouth, in order that any damage to conductor receives maximum compression at the clamp centre, with gradually lessening due to vibration is minimized.

**8.5.2** The test for slip-strength shall be conducted in accordance with **5.4.1** of IS 2486 ( Part 1 ) : 1971. The conductor should not slip at a load of 12·5 percent of the breaking load of the conductor. The slip strength shall not exceed 20 percent of the breaking load of the conductor. For the purpose of this test, breaking load of the conductor shall be taken as the value given in the relevant conductor specification.

### 8.6 Ball-Eye

The shape and dimensions of ball-eye are shown in Fig. 33.

### 8.7 Ball-Clevis

The shape and dimensions of the ball-clevis are shown in Fig. 34.

### 8.8 Socket-Clevis

The shape and dimensions of the socket-clevis are shown in Fig. 35.

### 8.9 Yoke Plate

The shape and dimensions of yoke plate are shown in Fig. 36.

### 8.10 Clevis-Clevis

The shape and dimensions of the clevis-clevis are shown in Fig. 37.

### 8.11 Tension Clamp

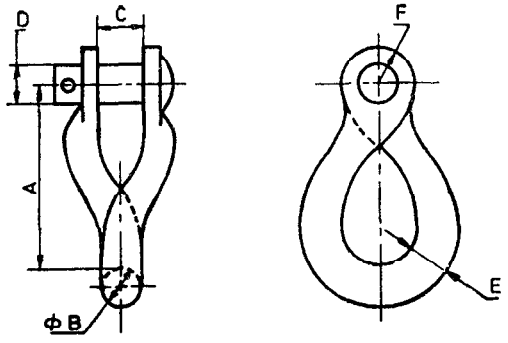
The shape and dimensions of tension clamp are shown in Fig. 38 and 39.

### 8.12 Clevis-Tongue

The shape and dimension of clevis-tongue are shown in Fig. 40.

### 8.13 Sag Adjuster Plate

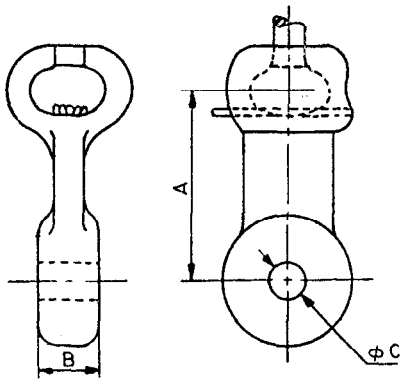
The shape and dimensions of sag adjuster plate are shown in Fig. 41 and 42 or according to any other design as agreed upon between the manufacturer and the purchaser.




*Dimensions*, mm

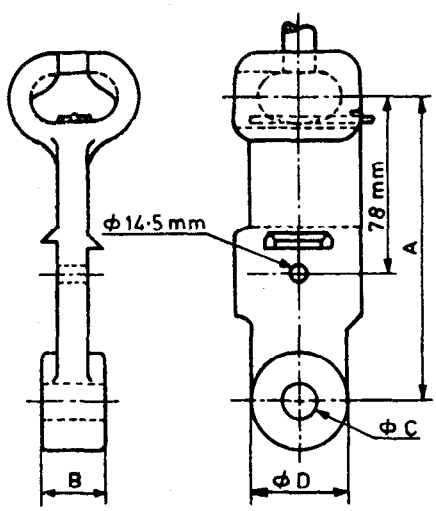
| *A* | *B* | *C* | *D* | *E* | *F* |
|---|---|---|---|---|---|
| 76 | 16 | 19 | 16 | 16 | 19 |
| 89 | 16 | 19 | 16 | 13 | 19 |
| 102 | 19 | 22 | 19 | 19 | 22 |
| 102 | 22 | 25 | 22 | 19 | 22 |

FIG. 29 TWISTED SHACKLE




| *Dimensions*, mm | | | *Socket Size* |
|---|---|---|---|
| *A* | *B* | *C* | |
| 51 | 16 | 17·5 | *See* Fig. 9 for size 16 mm Alternative *B* |
| 51 | 30 | 17·5 | |
| 51 | 35 | 17·5 | |
| 51 | 41 | 17·5 | |
| 51 | 48 | 17·5 | |
| 51 | 59 | 21·0 | |
| 51 | 66 | 17·5 | |
| 162 | 16 | 17·5 | |
| 162 | 19 | 17·5 | |
| 162 | 25 | 17·5 | |
| 162 | 30 | 17·5 | |
| 162 | 38 | 21·0 | |
| 64 | 41 | 17·5 | *See* Fig. 9 for size 20 mm/16 mm Alternative *B* |
| 64 | 47 | 17·5 | |
| 64 | 59 | 21·0 | |
| 64 | 66 | 17·5 | |
| 162 | 19 | 17·5 | |
| 162 | 25 | 17·5 | |
| 162 | 29 | 21·0 | |
| 162 | 38 | 21·0 | |

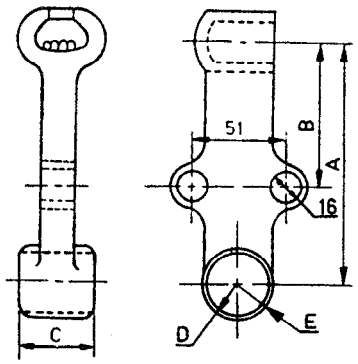
30A Without Horn Holder




| *Dimension*, mm | | | | *Socket Size* | *Ultimate Strength* kgf |
|---|---|---|---|---|---|
| *A* | *B* | *C* | *D* | | |
| 129 | 16 | 17·5 | 41 | *See* Fig. 9 for size of 16 mm Alternative *B* | 7 000 |
| 129 | 19 | 17·5 | 38 | | |
| 129 | 22 | 17·5 | 38 | | |
| 129 | 25 | 17·5 | 38 | | |
| 129 | 29 | 17·5 | 38 | | |
| 129 | 35 | 17·5 | 38 | | |
| 129 | 19 | 17·5 | 51 | | 12 000 |
| 129 | 22 | 17·5 | 51 | | |
| 129 | 25 | 17·5 | 44 | | |
| 129 | 29 | 17·5 | 44 | | |
| 129 | 29 | 21 | 41 | | |
| 129 | 35 | 17·5 | 44 | | |

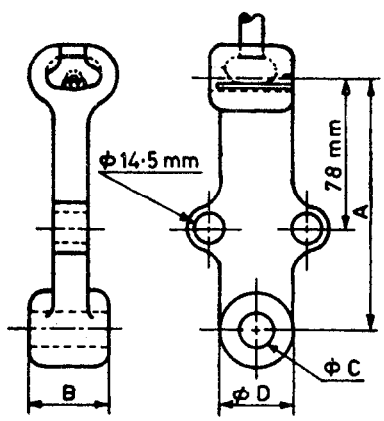
30B With Single Horn Holder

FIG. 30 SOCKET-TONGUE




| *Dimensions*, mm | | | | | *Socket Size* |
|---|---|---|---|---|---|
| *A* | *B* | *C* | *D* | *E* | |
| 129 | 78 | 86 | 17·5 | 19 | *See* Fig. 9 for size of 16 mm Alternative *B* |
| 129 | 78 | 105 | 17·5 | 19 | |
| 129 | 78 | 114 | 17·5 | 19 | |
| 203 | 95 | 29 | 21 | 22 | |
| 203 | 95 | 35 | 21 | 22 | |
| 203 | 95 | 38 | 21 | 22 | |
| 203 | 95 | 29 | 21 | 22 | *See* Fig. 9 for size of 20 mm/16 mm Alternative *B* |
| 203 | 95 | 35 | 21 | 22 | |
| 203 | 95 | 38 | 21 | 22 | |

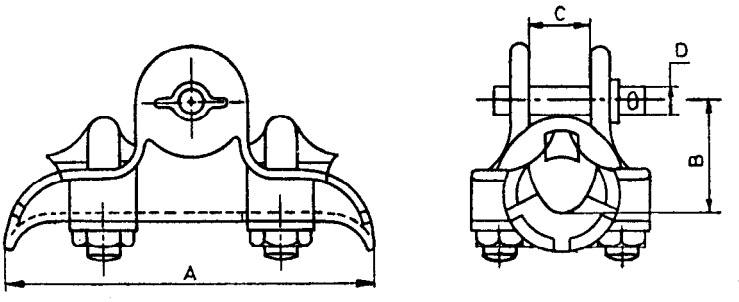
31A Double Horn Holder Type ( Suitable for 20 mm/16 mm, Alternative *B* Socket )




| *Dimension*, mm | | | | *Socket Size* | *Ultimate Strength kgf* |
|---|---|---|---|---|---|
| *A* | *B* | *C* | *D* | | |
| 129 | 29 | 17·5 | 44 | *See* Fig. 9 for size of 16mm Alternative *A* | 12 000 |
| 129 | 29 | 21 | 44 | | |
| 129 | 32 | 17·5 | 41 | | |
| 129 | 35 | 17·5 | 88 | | |
| 129 | 41 | 17·5 | 38 | | |
| 129 | 44 | 17·5 | 38 | | |
| 129 | 48 | 17·5 | 38 | | |
| 129 | 51 | 17·5 | 38 | | |
| 129 | 57 | 17·5 | 41 | | |
| 146 | 32 | 21 | 44 | | |

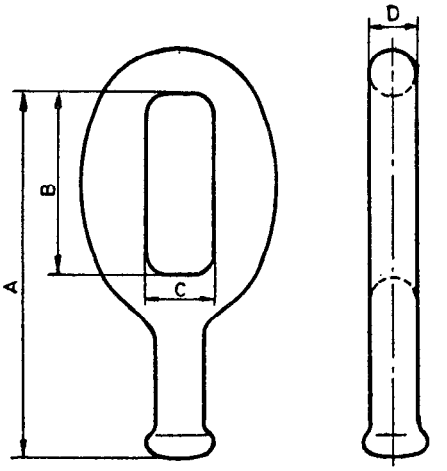
31B Double Horn Holder Type ( Suitable for 16 mm, Alternative *A* Socket )

FIG. 31 SOCKET-TONGUE ( DOUBLE HORN HOLDER TYPE )




| *Conductor Dia*, mm | | *Dimensions*, mm | | | | *Socket Size* |
|---|---|---|---|---|---|---|
| *Min* | *Max* | *A* | *B* | *C* | *D* | |
| 7·6 | 17·8 | 181 | 60·5 | 19 | 16 | *See* Fig. 9 for size 16 mm Alternative *B* |
| 12·7 | 21·1 | 190 | 63·5 | 22 | 16 | |
| 20·3 | 29·2 | 203 | 70·0 | 32 | 16 | |
| 25·4 | 38·9 | 228 | 85·5 | 42 | 16 | |
| 30·0 | 41·9 | 241 | 82·5 | 45 | 16 | |
| 38·1 | 50·8 | 254 | 101·5 | 54 | 16 | |
| 43·2 | 57·2 | 280 | 101·5 | 60 | 16 | |
| 50·8 | 63·5 | 279 | 108·0 | 67 | 16 | |
| 12·7 | 25·9 | 203 | 66·5 | 27 | 16 | *See* Fig 9 for size 20 mm/16 mm Alternative *B* |
| 22·9 | 35·6 | 222 | 71·5 | 37 | 16 | |
| 27·9 | 41·1 | 241 | 85·5 | 44 | 16 | |
| 31·8 | 47·0 | 254 | 89·0 | 48 | 16 | |
| 35·6 | 50·8 | 267 | 92·0 | 54 | 16 | |
| 44·4 | 57·2 | 279 | 101·5 | 60 | 16 | |
| 50·8 | 64·8 | 305 | 111·0 | 70 | 16 | |

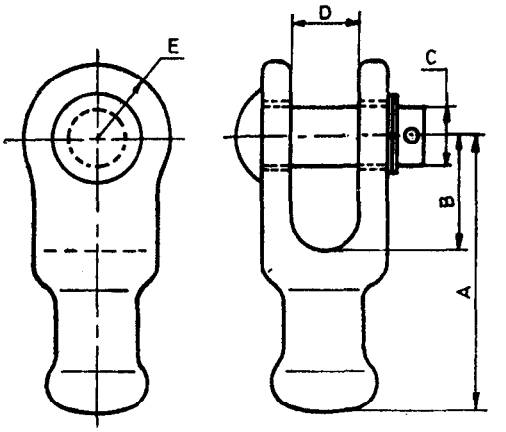
FIG. 32 SUSPENSION CLAMP




| *Dimensions*, mm | | | | *Pin Ball Designation** |
|---|---|---|---|---|
| *A* | *B* | *C* | *D* | |
| 102 | 51 | 19 | 12·7 | 20 mm/16 mm |
| 114 | 63·5 | 22 | 16·0 | 20 mm/16 mm |
| 114 | 63·5 | 25 | 19·0 | 20 mm/16 mm |

**See* Fig. 8.

FIG. 33 BALL-EYE




| *Dimensions*, mm | | | | | *Pin Ball Designation** |
|---|---|---|---|---|---|
| *A* | *B* | *C* | *D* | *E* | |
| 76 | 32 | 16 | 19 | 20·5 | 16 mm |
| 83 | 32 | 16 | 19 | 22 | 20 mm/16 mm |
| 95 | 38 | 19 | 22 | 22 | 20 mm/16 mm |
| 95 | 38 | 19 | 25 | 22 | 20 mm/16 mm |

**See* Fig. 8.

FIG. 34 BALL-CLEVIS

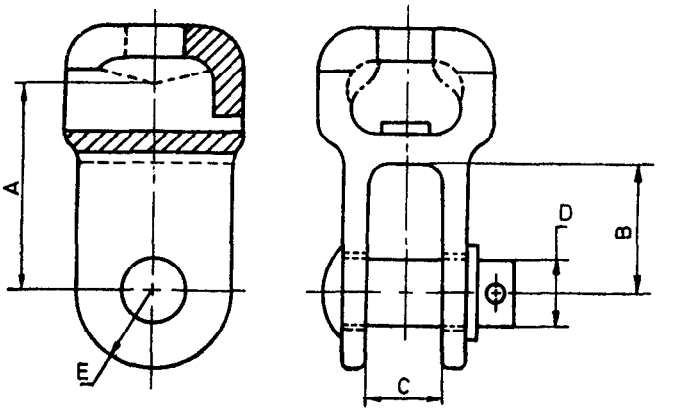



Fig. 35 (a)

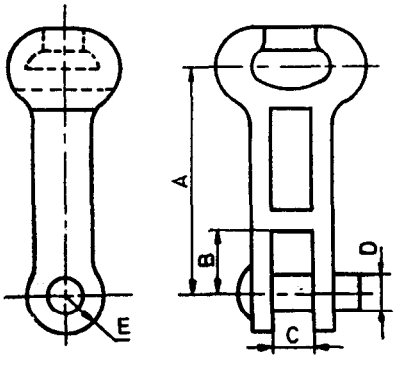
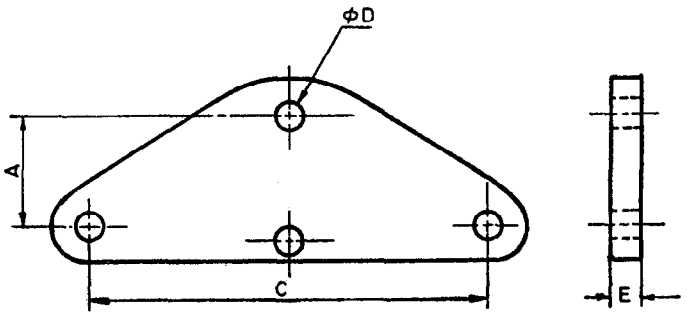



Fig. 35 (b)

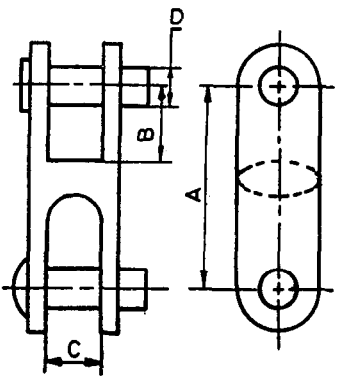
| *Figure* | *Dimensions*, mm | | | | | *Socket Size* |
|---|---|---|---|---|---|---|
| | A | *B* | *C* | *D* | *E* | |
| (a) | 51 | 32 | 19 | 16 | 19 | *See* Fig. 9 for size 16 mm Alternative *B* |
| (a) | 51 | 32 | 19 | 16 | 25 | |
| (b) | 114 | 32 | 19 | 16 | 19 | |
| (b) | 114 | 38 | 19 | 16 | 25 | |
| (b) | 114 | 38 | 22 | 19 | 29 | |
| (a) | 54 | 32 | 19 | 16 | 25 | *See* Fig. 9 for size 20 mm/16 mm Alternative *B* |
| (b) | 114 | 38 | 19 | 16 | 27 | |
| (b) | 114 | 38 | 22 | 19 | 29 | |
| (b) | 114 | 38 | 25 | 19 | 29 | |

FIG. 35 SOCKET-CLEVIS



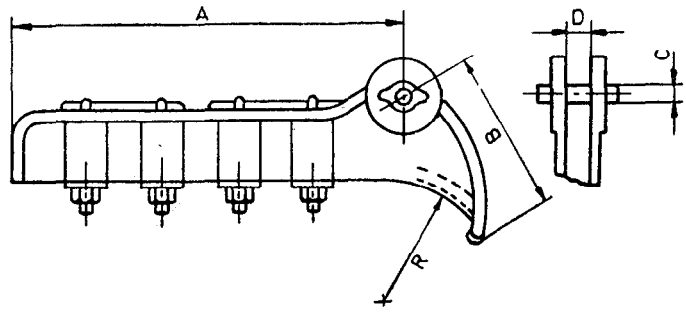

| *Dimensions*, mm | | | |
|---|---|---|---|
| *A* | *C* | *D* | *E* |
| 43 | 330 | 17·5 | 16 |
| 78 | 330 | 17·5 | 16 |
| 91 | 330 | 21 | 19 |
| 91 | 356 | 24 | 22 |

FIG. 36 YOKE PLATE

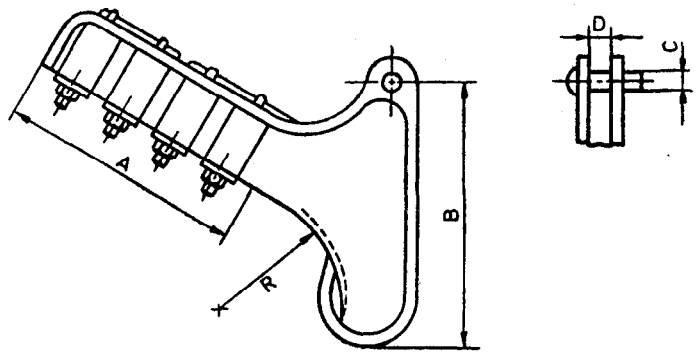



| *Dimensions*, mm | | | |
|---|---|---|---|
| *A* | *B* | *C* | *D* |
| 75 | 32 | 19 | 16 |
| 75 | 32 | 22 | 16 |
| 75 | 32 | 24 | 16 |
| 85 | 38 | 27 | 16 |
| 92 | 38 | 27 | 19 |
| 100 | 38 | 27 | 19 |

FIG. 37 CLEVIS-CLEVIS




TYPE A

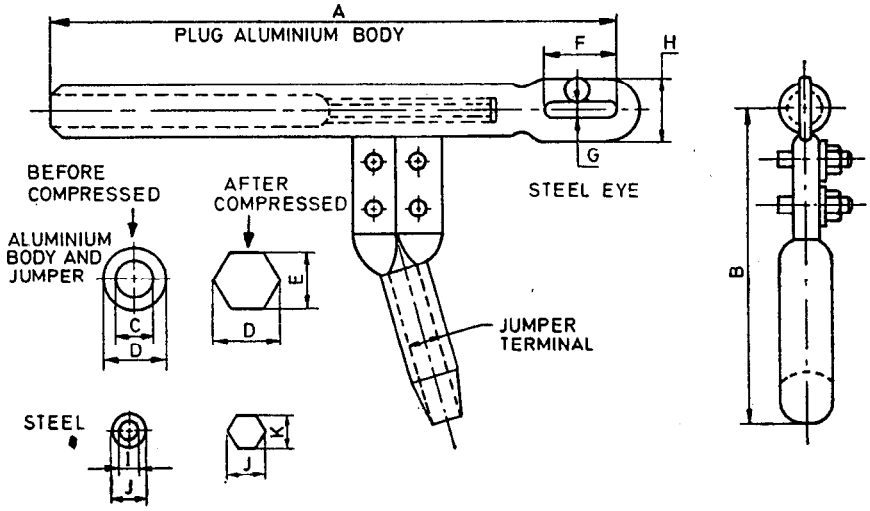



TYPE B

| *Material* | *Type of Clamp* | *Conductor Diameter* | | *Dimensions* | | | | | *Number of U-Bolts* |
|---|---|---|---|---|---|---|---|---|---|
| | | *Min* | *Max* | *A* | *B* | *C* | *D* | *R* | |
| Malleable iron | A | 11·4 | 21·6 | 311·2 | 127·0 | 22·2 | 15·9 | 96·8 | 4 |
| | | 16·5 | 25·4 | 412·8 | 203·2 | 28·6 | 15·9 | 160·3 | 5 |
| | | 21·6 | 31·8 | 495·3 | 254·0 | 31·8 | 19·0 | 200·0 | 6 |
| | | 24·4 | 35·6 | 565·2 | 254·0 | 38·1 | 19·0 | 203·2 | 7 |
| | B | 5·1 | 13·9 | 187·3 | 203·2 | 17·5 | 15·9 | 95·2 | 3 |
| | | 12·2 | 21·3 | 274·6 | 292·1 | 22·2 | 15·9 | 136·5 | 4 |
| | | 18·0 | 27·9 | 400·0 | 355·6 | 30·2 | 19·0 | 187·3 | 5 |
| | | 19·0 | 32·5 | 501·6 | 381·0 | 34·9 | 19·0 | 206·4 | 6 |
| Aluminium alloy | A | 7·6 | 17·8 | 222·2 | 107·6 | 22·2 | 16 | 76·2 | 3 |
| | | 15·2 | 21·6 | 330·2 | 152·4 | 25·4 | 16 | 114·3 | 4 |
| | | 17·8 | 25·4 | 412·8 | 203·2 | 28·6 | 16 | 158·8 | 5 |
| | | 19·3 | 30·0 | 495·3 | 228·6 | 31·8 | 19·0 | 241·3 | 6 |
| | | 25·4 | 38·1 | 565·2 | 254·0 | 41·3 | 19·0 | 254·0 | 7 |
| | B | 5·1 | 11·7 | 101·6 | 149·2 | 19·0 | 16 | 69·8 | 2 |
| | | 5·1 | 13·5 | 187·3 | 203·2 | 19·0 | 16 | 95·2 | 3 |
| | | 7·6 | 17·3 | 238·1 | 260·4 | 22·2 | 16 | 120·6 | 4 |
| | | 12·7 | 24·4 | 330·2 | 327·0 | 28·6 | 16 | 155·6 | 5 |
| | | 19·0 | 32·5 | 463·6 | 381·0 | 34·9 | 19·0 | 206·4 | 6 |

All dimensions in millimetres.

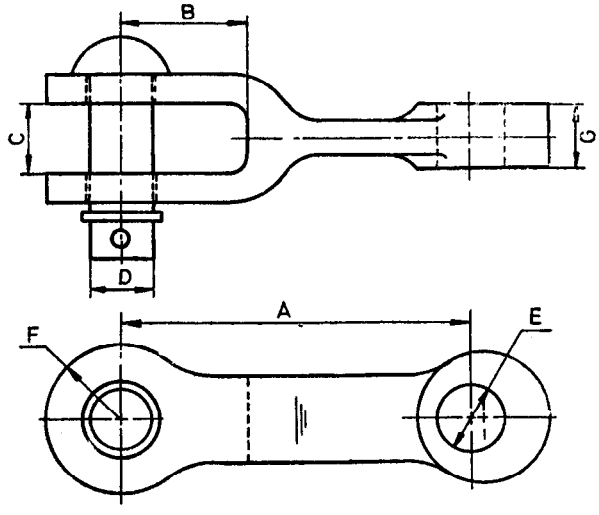
FIG. 38 STRAIN CLAMP




| *ACSR Conductor* | | | *Dimensions* | | | | | | | | | | | *Size and Number of Bolts* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Standard Nominal Copper Area | Stranding and Wire Diameter | | *A* | *B* | *C* | *D* | *E* | *F* | *G* | *H* | *I* | *J* | *K* | |
| | Aluminium | Steel | | | | | | | | | | | | |
| 65 | 6/4·72 | 7/1·57 | 391 | 196 | 15·3 | 26 | 22·5 | 50 | 20 | 12 | 5·0 | 12 | 10·4 | M12/2 |
| 80 | 6/5·28 | 7/1·90 | 431 | 222 | 17·0 | 30 | 26·0 | 50 | 20 | 12 | 5·6 | 12 | 10·4 | M12/2 |
| 80 | 26/2·54 | 7/1·90 | 431 | 222 | 17·0 | 30 | 26·0 | 50 | 20 | 12 | 6·0 | 12 | 10·4 | M12/2 |
| 80 | 30/2·35 | 7/2·36 | 440 | 222 | 17·7 | 30 | 26·0 | 50 | 20 | 18 | 7·4 | 16 | 13·9 | M12/2 |
| 95 | 30/2·59 | 7/2·59 | 465 | 234 | 19·3 | 34 | 29·4 | 50 | 20 | 18 | 8·1 | 18 | 15·6 | M12/2 |
| 110 | 30/2·79 | 7/2·79 | 465 | 234 | 20·8 | 34 | 29·4 | 50 | 20 | 18 | 8·8 | 18 | 15·6 | M12/2 |
| 130 | 30/3·00 | 7/3·00 | 510 | 266 | 22·2 | 38 | 32·9 | 50 | 20 | 18 | 9·4 | 20 | 17·3 | M16/2 |
| 140 | 30/3·18 | 7/3·18 | 510 | 266 | 23·5 | 38 | 32·9 | 50 | 20 | 18 | 9·9 | 20 | 17·3 | M16/2 |
| 160 | 30/3·35 | 7/3·35 | 573 | 284 | 24·8 | 44 | 38·1 | 60 | 22 | 20 | 10·5 | 22 | 19·1 | M16/2 |
| 185 | 30/3·71 | 7/3·71 | 579 | 284 | 27·4 | 44 | 38·1 | 60 | 26 | 24 | 11·5 | 24 | 20·8 | M16/2 |
| 225 | 30/3·99 | 7/3·99 | 624 | 301 | 29·3 | 48 | 31·6 | 60 | 26 | 24 | 12·4 | 26 | 22·5 | M12/4 |
| 260 | 30/4·27 | 7/4·27 | 659 | 317 | 31·3 | 52 | 45·0 | 60 | 26 | 24 | 13·3 | 28 | 24·2 | M12/4 |
| 258 | 54/3·18 | 7/3·18 | 629 | 317 | 29·8 | 52 | 45·0 | 60 | 26 | 24 | 9·9 | 24 | 20·8 | M12/4 |
| 300 | 30/4·50 | 7/4·50 | 659 | 317 | 32·9 | 52 | 45·0 | 60 | 26 | 24 | 14·0 | 30 | 26·0 | M12/4 |
| 300 | 54/3·35 | 7/3·35 | 659 | 317 | 31·5 | 52 | 45·0 | 60 | 26 | 24 | 10·5 | 28 | 24·2 | M12/4 |
| 325 | 54/3·53 | 7/3·53 | 659 | 333 | 33·2 | 54 | 46·8 | 60 | 26 | 24 | 11·0 | 24 | 20·8 | M12/4 |

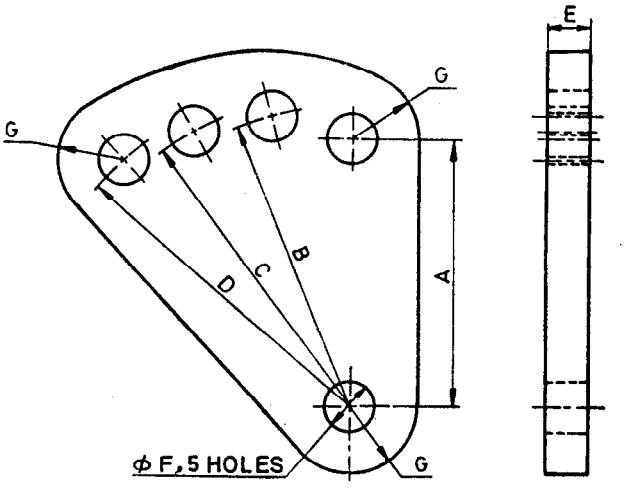
All dimensions in millimetres.

FIG. 39 STRAIN CLAMP ( COMPRESSION TYPE )



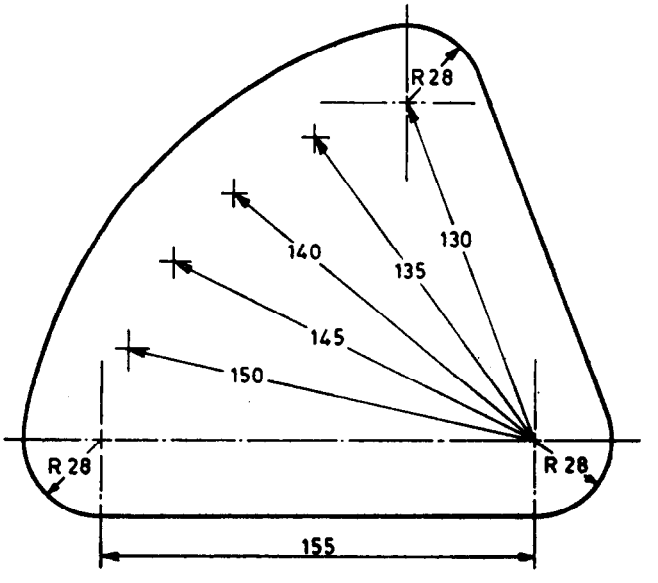

| *Dimensions*, mm | | | | | | |
|---|---|---|---|---|---|---|
| *A* | *B* | *C* | *D* | *E* | *F* | *G* |
| 89 | 32 | 19 | 16 | 17·5 | 19 | 16 |
| 102 | 35 | 19 | 16 | 17·5 | 22 | 19 |
| 102 | 35 | 19 | 16 | 17·5 | 22 | 25 |
| 140 | 54 | 22 | 19 | 21 | 25 | 29 |
| 140 | 54 | 22 | 19 | 21 | 25 | 32 |
| 140 | 54 | 22 | 19 | 21 | 25 | 35 |
| 140 | 54 | 22 | 19 | 21 | 25 | 38 |

FIG. 40 CLEVIS-TONGUE




| *Dimensions*, mm | | | | | | |
|---|---|---|---|---|---|---|
| *A* | *B* | *C* | *D* | *E* | *F* | *G* |
| 76 | 102 | 127 | 152 | 16 | 17·5 | 22 |
| 76 | 102 | 127 | 152 | 19 | 21 | 29 |
| 89 | 114 | 140 | 162 | 22 | 24 | 32 |

FIG. 41 SAG ADJUSTER PLATE



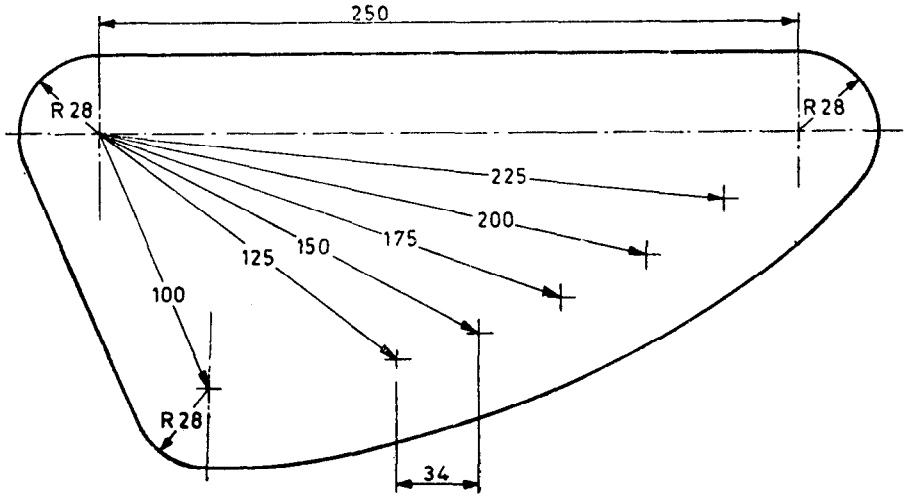

All dimensions in millimetres.

Plate 20 mm thick

Tolerance ± 3 percent

**42A Alternative 1**

FIG. 42 SAG ADJUSTER PLATE — *Contd*




All dimensions in millimetres.

External Hole $\phi$ 21·4

Plate 12 mm thick

Tolerance $\pm$ 5 percent

42B Alternative 2

FIG. 42 SAG ADJUSTER PLATE

# ANNEX A
( *Clause* 2 )

## LIST OF REFERRED INDIAN STANDARDS

| *IS No.* | *Title* |
|---|---|
| IS 731 : 1971 | Porcelain insulators for overhead power lines with a nominal voltage greater than 1 000 V ( *second revision* ) |
| IS 1363 ( Part 3 ) : 1984 | Hexagon head bolts, screws and nuts of product grade C: Part 3 Hexagon nuts ( size range M5 to M36 ) ( *second revision* ) |
| IS 1885 ( Part 54 ) : 1980 | Electrotechnical vocabulary: Part 54 Insulator |
| IS 2486 ( Part 1 ) : 1971 | Insulator fittings for overhead power lines with a nominal voltage greater than 1 000 V : Part 1 General requirements and tests ( *first revision* ) |
| ( Part 3 ) : 1974 | Part 3 Locking devices |
| ( Part 4 ) : 1981 | Part 4 Tests for locking devices |
| IS 3188 : 1980 | Characteristics of string insulator units ( *first revision* ) |
| IS 4218 ( Part 2 ) : 1976 | ISO metric screw threads: Part 2 Diameter pitch combinations ( *first revision* ) |
| IS 7935 : 1975 | Insulator fittings for overhead power lines with a nominal voltage up to and including 1 000 V |
| IS 10136 : 1982 | Code of practice for selection of disc insulator fittings for highest system voltages of 72·5 kV and above |

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