BRITISH STANDARD

BS 3288-3: 1989

Specification for

Insulator and conductor fittings for overhead power lines —

Part 3: Dimensions of ball and socket couplings of string insulator units

UDC 621.315.1:621.315.62/.65

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Power Electrical Engineering Standards Committee (PEL/-) to Technical Committee PEL/70 upon which the following bodies were represented:

Association of Consulting Engineers

Association of Manufacturers Allied to the Electrical and Electronic Industry (BEAMA Ltd.)

British Cable Makers' Confederation

British Ceramic Research Ltd.

British Industrial Ceramic Manufacturers' Association

Department of Energy (Electricity Division)

Electrical and Electronic Insulation Association (BEAMA Ltd.)

Transmission and Distribution Association (BEAMA Ltd.)

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Aluminium Federation

British Railways Board

Electricity Supply Industry in England and Wales

National Association of Malleable Ironfounders

Overhead Transmission Line Contractors

This British Standard, having been prepared under the direction of the Power Electrical Engineering Standards Committee, was published under the authority of the Board of BSI and comes into effect on 31 May 1989

The following BSI references relate to the work on this standard:
Committee reference PEL/70
Draft for comment 86/30888 DC

ISBN 0 580 16815 8

Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

Foreword

This Part of BS 3288 has been prepared under the direction of the Power Electrical Engineering Standards Committee. It is technically equivalent to IEC 120:1984, published by the International Electrotechnical Commission (IEC), except that the more compact British design of the size 28 coupling has been added as size 28B.

This Part of BS 3288 implements CENELEC Harmonization Document HD 474 and includes the 28B ball and socket coupling which the UK has been permitted to retain as a national type.

It is not envisaged that split-pins will be used in 28B couplings and the dimensions of the corresponding holes have not been included.

For ease of production the text of the IEC publication has been used. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

The comma has been used as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 24 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

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

2 Object

The object of this standard is to define the dimensions of a series of standard ball and socket couplings using the standard locking devices (see BS 3288-4) in order to permit the assembly of insulators or metal fittings supplied by different manufacturers.

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 BS 137-2.

3 Plan of the standard

This standard includes standard sizes designated by the nominal pin diameters which form the basis of the standard. Each standard size is defined by the dimensions of the pin ball, of the socket and of the hook-on "GO" gauge specified in Clauses **9** to **11**. Dimensions of twin-balled pins for coupling of two sockets are stated in Clause **12**. Clearance and locking conditions are tabulated in Clauses **13** and **14**. Dimensions of the hole for the locking device are stated in Clauses **15** and **16**.

All dimensions are expressed in millimetres.

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 Appendix A.

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

4 Pin ball

The pin ball shall conform to the dimensions specified in Clause **9**. 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, shall not exceed the specified values within a length equal to H_3 of the corresponding worn hook-on "GO" gauge (see Clause **11**).

NOTE There are two designs for the 28 mm ball and socket coupling. The one adopted by IEC is listed in this standard as "28"; the more compact British design is listed as "28". The 28B coupling is available only with a W-clip.

5 Socket

The socket interior shall conform to the dimensions specified in Clause **10**, which also specifies the minimum thickness of the locking device.

NOTE 1 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.

NOTE 2 The 16 mm standard size according to Clause **10** includes two alternative sockets. The reason for this is that, on the one hand, there is a need for a socket fitting exactly the standard pin ball and its predecessors with $r_1 = 23$ (alternative A) and, on the other hand, there is a need for a socket also accepting pin balls with $r_2 = 50$ (alternative B). Alternative A and alternative B are identical except for dimensions H_1, H_2 and T. Alternative A, having the smaller dimensions, is preferable where assembly with existing pin balls does not require alternative B.

NOTE 3 See Note to Clause **4** for an explanation of 28 and 28B couplings.

6 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 **11**.

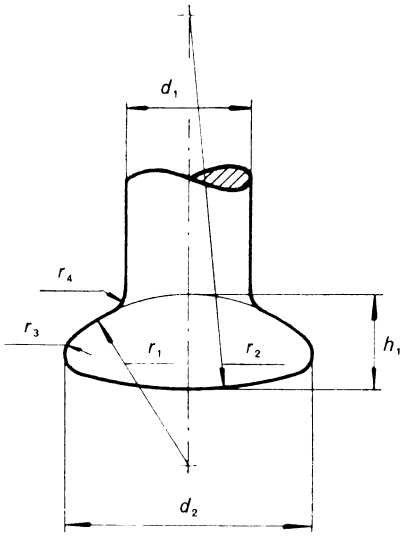
7 Lower part of the insulator

The shape of the lower part of the insulator shall be such that assembly with the socket of maximum external dimensions according to Clause **6** will always be possible.

8 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 BS 3288-4 are used.

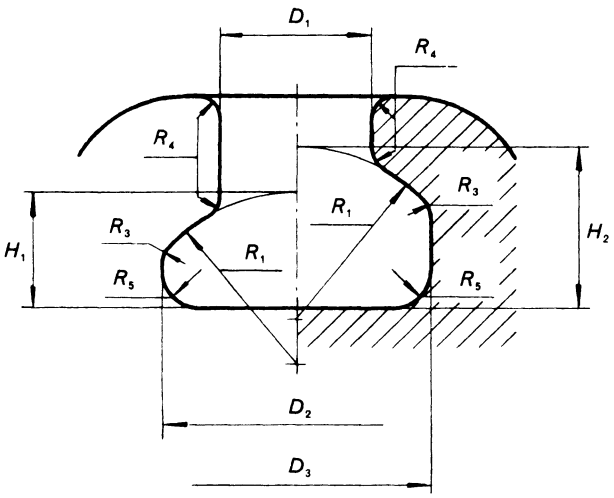
9 Dimensions of the pin ball



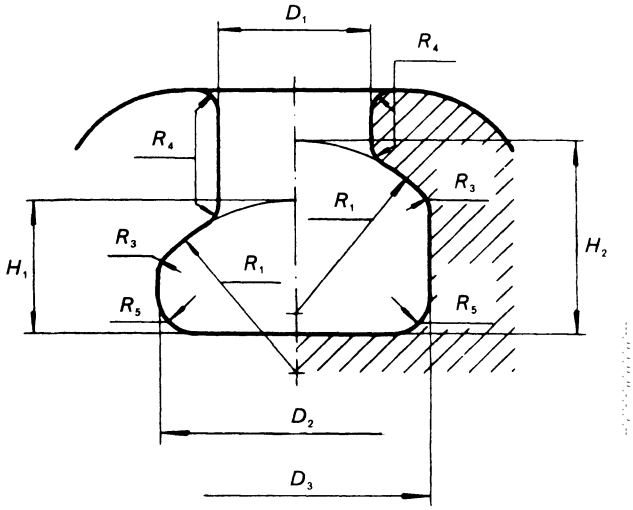
Designated size of coupling	d_1	d_2	h_1	r_1	r_2	r_3[a]	r_4
11	$11{,}9\ ^{0}_{1{,}1}$	$22{,}8\ ^{0}_{-1{,}3}$	$9{,}1\ ^{0}_{-1{,}2}$	35	35	3,5	$1{,}5\ ^{+1}_{0}$
16	$17\ ^{0}_{1{,}2}$	$33{,}3\ ^{0}_{-1{,}5}$	$13{,}4\ ^{0}_{-1{,}3}$	23	50	3	$3\ ^{+1}_{-0{,}5}$
20	$21\ ^{0}_{1{,}3}$	$41\ ^{0}_{-1{,}6}$	$19{,}5\ ^{0}_{-1{,}4}$	27	60	5,7	$3{,}5\ ^{+1}_{-1}$
24	$25\ ^{0}_{1{,}4}$	$49\ ^{0}_{-1{,}8}$	$21\ ^{0}_{-1{,}7}$	40	70	6,6	$4\ ^{+1{,}5}_{-1{,}0}$
28[b]	$29\ ^{0}_{1{,}5}$	$57\ ^{0}_{-1{,}9}$	$23{,}5\ ^{0}_{-1{,}8}$	55	80	8	$4{,}5\ ^{+1{,}5}_{-1{,}0}$
28B[b]	$29\ ^{0}_{1{,}5}$	$56\ ^{0}_{-1{,}8}$	$21\ ^{0}_{-1{,}7}$	50	100	64	$4{,}5\ ^{+1{,}5}_{-1{,}0}$
32	$33\ ^{0}_{1{,}6}$	$65\ ^{0}_{-2{,}1}$	$27\ ^{0}_{-1{,}9}$	70	90	10	$5\ ^{+1{,}5}_{-1{,}0}$

[a] Given for guidance.
[b] See Note to Clause **4**.

10 Dimensions of the socket end



Coupling 11, 16A, 24, 28B

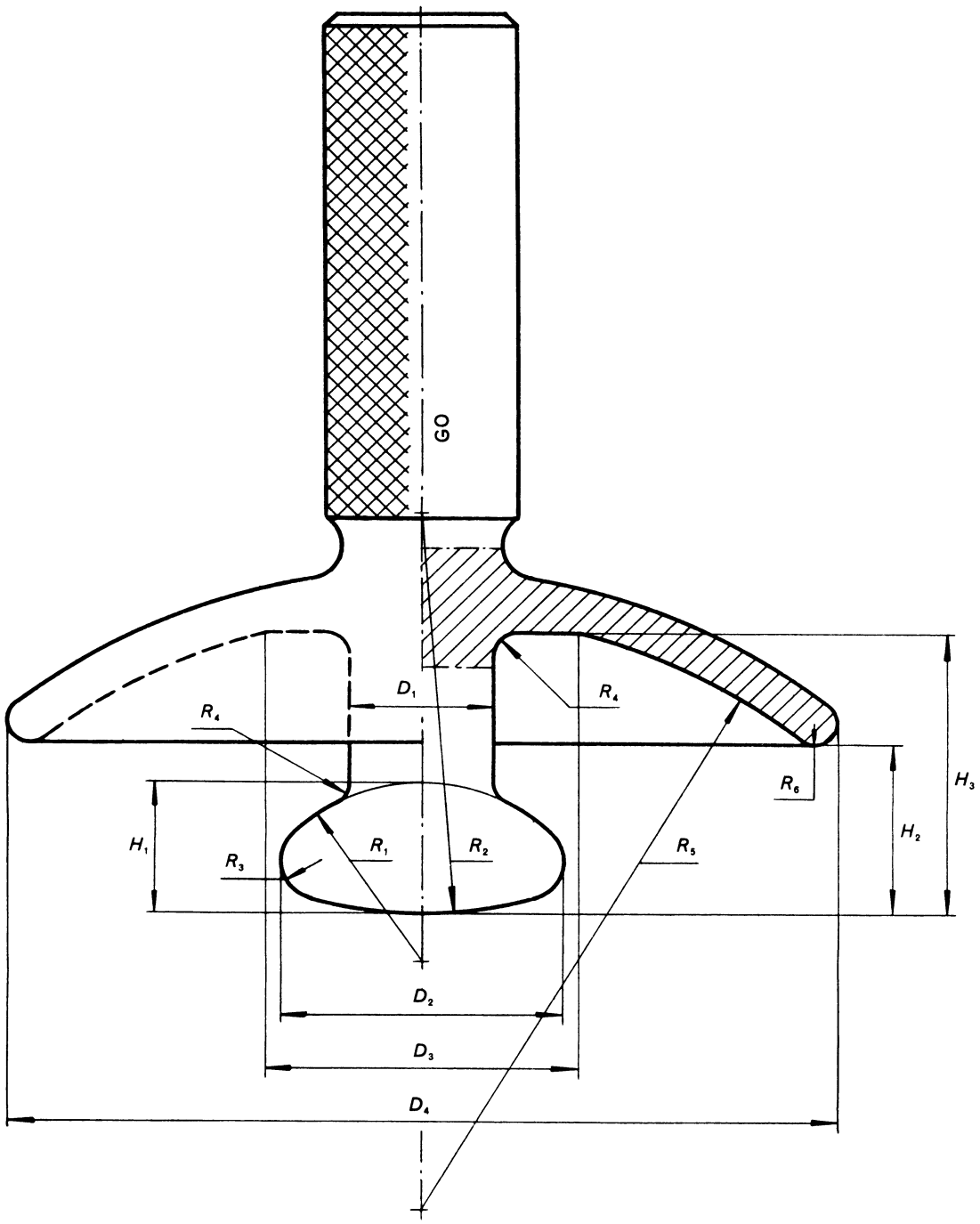


Coupling 16B, 20, 28, 32

Designated size of coupling	D_1	D_2	D_3	H_1	H_2 for W-clips and alternative split-pins	H_2[c] for standard split-pins	R_1	R_3	R_4	R_5	T[b]
		Min.	Min.		Min.	Min.					Min.
11	$12{,}5\ ^{+1{,}3}_{0}$	24,5	24,5	$10{,}5\ ^{+1{,}3}_{0}$	15,5	16,3	35	4	1,5	4	4,8
16A[a]	$19{,}2\ ^{+1{,}6}_{0}$	34,5	34,5	$14{,}5\ ^{+1{,}6}_{0}$	20,5	21,6	23	3	3	5	5,5
16B[a]	$19{,}2\ ^{+1{,}6}_{0}$	34,5	34,5	$17\ ^{+1{,}6}_{0}$	25	25,5	23	3	3	5	7,9
20	$23\ ^{+2{,}1}_{0}$	42,5	42,5	$20{,}5\ ^{+2{,}1}_{0}$	28,5	29,3	27	6	3,5	7	7,0
24	$27{,}5\ ^{+2{,}5}_{0}$	51	51	$23{,}5\ ^{+2{,}5}_{0}$	32,5	33,5	40	5	4	10	8,7
28[d]	$32\ ^{+2{,}9}_{0}$	59	59	$26\ ^{+2{,}9}_{0}$	36,5	37,4	55	8	4,5	12	10
28B[d]	$31{,}5\ ^{+2{,}5}_{0}$	58	58	$23{,}5\ ^{+2{,}5}_{0}$	32,5	—	50	5	5	10	8,7
32	$36\ ^{+3{,}3}_{0}$	67,5	67,5	$30\ ^{-3{,}3}_{0}$	42	43	70	10	5	14	11,5

[a] See Note 2 to Clause **5**.
[b] Thickness of the locking device.
[c] 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 **15**) and F_2 (see BS 3288-4) and is also influenced by the tips of the legs resting in contact with the socket.The values of H_2 ensures the correct clearances for split-pins.
[d] See Note to Clause **4**.

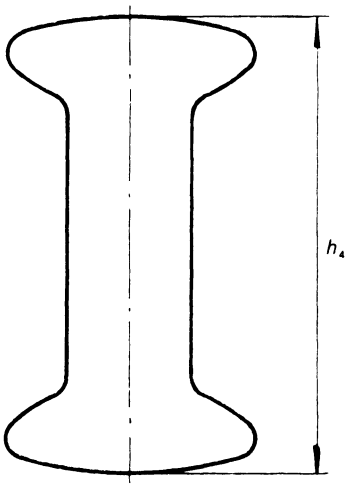
11 Dimensions of the hook-on "GO" gauge



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
11	New	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	New	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	New	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	New	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
28[c]	New	Max. contour[a]	29,190	57,290	66,870	165,94	23,770	29,100	51,100	55,135	80,135	7,994	4,414	129,55	3,45
		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
28B[c]	New	Max. contour[a]	29,190	56,280	79,850	170,90	21,242	28,000	43,900	50,130	100,150	6,473	4,914	169,55	3,45
		Nominal contour	29,150	56,210	79,900	170,60	21,186	28,101	44,000	50,100	100,100	6,448	4,932	169,70	3,30
		Min. contour[a]	29,110	56,140	79,950	170,30	21,130	28,203	44,100	50,070	100,050	6,423	4,950	169,85	3,15
	Worn[b]		29,000	56,000	80,000	170,00	21,000	28,305	44,200	50,000	100,000	6,360	5,000	170,00	3,00
32	New	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	25,225	34,175	61,600	70,112	90,113	9,683	4,932	149,70	3,30
		Min. contour[a]	33,120	65,150	87,900	197,98	27,150	34,350	61,800	70,075	90,075	9,647	4,950	149,85	3,15
	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

[a] The counter of the new gauge should fall between the maximum and minimum contours.
[b] See Clause **B.1**.
[c] See Note to Clause **4**.

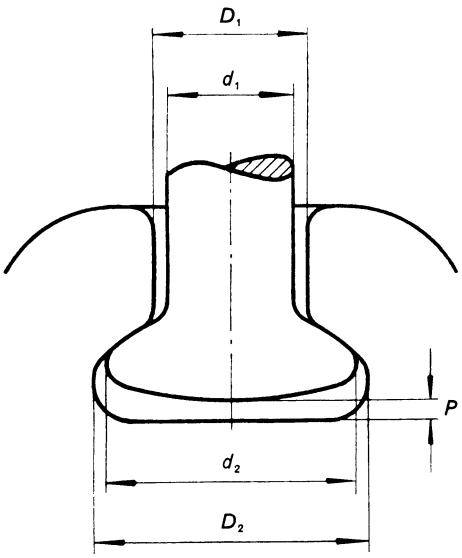
12 Dimensions of twin-balled pins



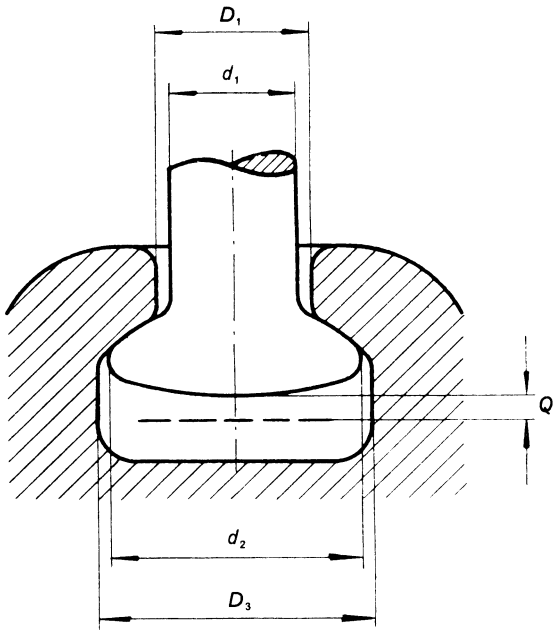
Designated size of coupling	h_4
11	$47^{\ 0}_{-2,5}$
16	$63^{\ 0}_{-3,0}$
20	$83^{\ 0}_{-3,2}$
24	$90^{\ 0}_{-3,5}$
28	$97^{\ 0}_{-3,5}$
32	$120^{\ 0}_{-4,0}$

For other dimensions, see Clause **9**.

13 Clearance between the pin ball socket end



The pin ball in the socket entry.

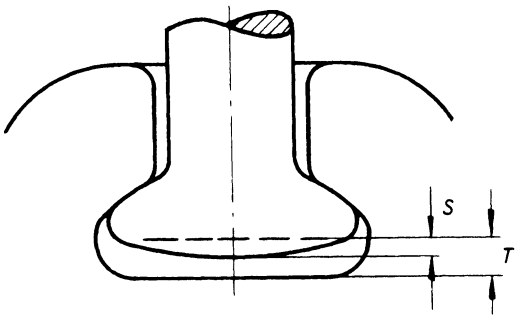


The pin ball in the socket interior.

Designated size of coupling	$D_1 - d_1$		$D_2 - d_2$	$D_3 - d_2$	P		Q^a
	Min.	Max.	Min.		Min.	Max.	Min.
11	0,6	3,0	1,7	1,7	1,4	3,9	1,6
16A	2,2	5,0	1,2	1,2	1,1	4,0	1,6
16B	2,2	5,0	1,2	1,2	3,6	6,5	3,7
20	2,0	5,4	1,5	1,5	1,0	4,5	2,0
24	2,5	6,4	2,0	2,0	2,5	6,7	2,8
28[b]	3,0	7,4	2,0	2,0	2,5	7,2	3,0
28B[b]	2,5	6,5	2,0	2,0	2,5	6,7	2,8
32	3,0	7,9	2,2,5	3,0	8,2	3,5	

[a] Clearance between the pin ball and the locking device.
[b] See Note to Clause **4**.

14 Effectiveness of locking the pin ball

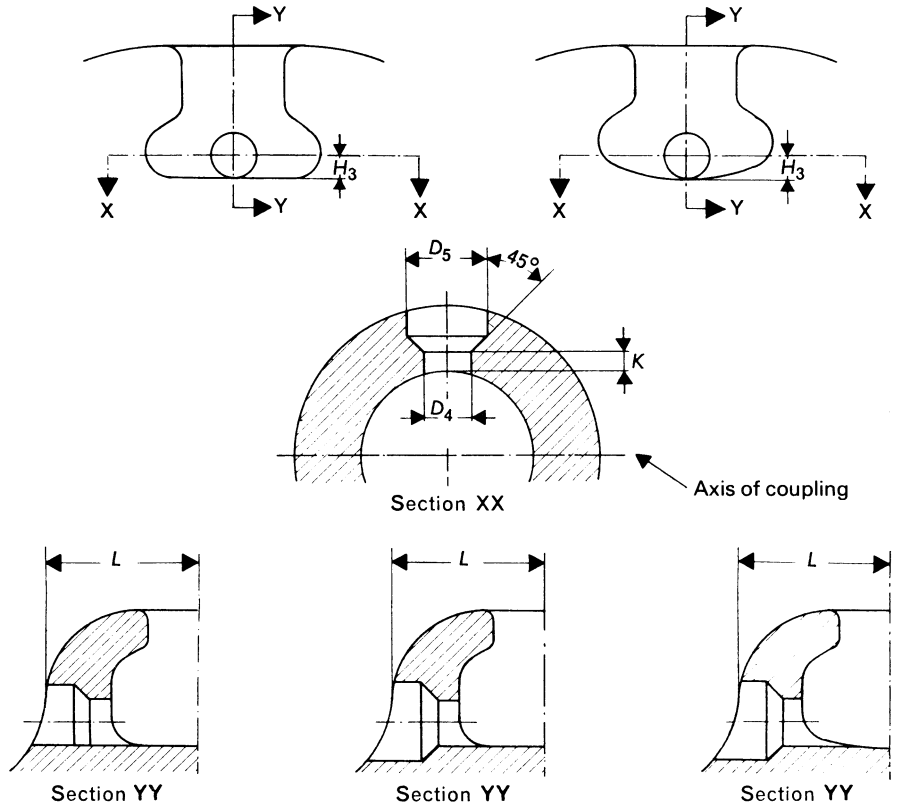


T = minimum thickness of the locking device

S = effectiveness of locking

Designated size of coupling	S
	Min.
11	0,9
16A	1,5
16B	1,4
20	2,5
24	2,0
28[a]	2,8
28B[a]	2,0
32	3,3
[a] See Note to Clause **4**.	

15 Dimensions of the hole for the split-pin

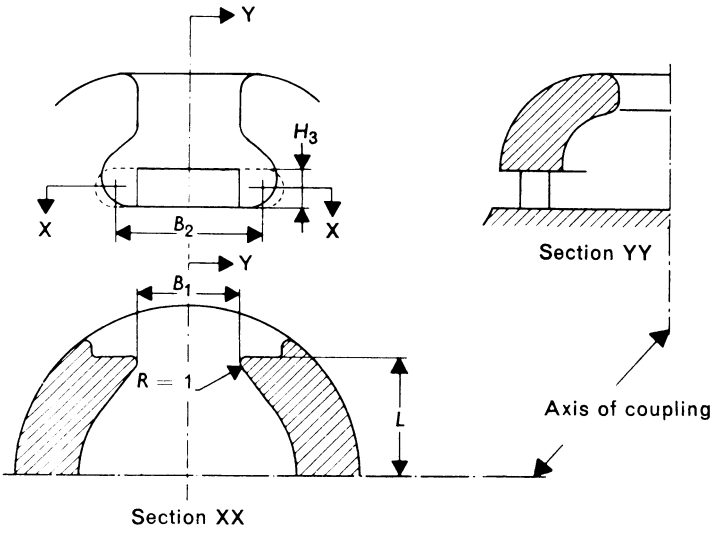


EXAMPLE 1 EXAMPLE 2a EXAMPLE 2b

Standard couplings	D_4	D_5	H_3	K	L
		Min.		Min.	Max.
11	7,5 ± 0,4	13,5	$3{,}75\ ^{+1}_{0}$	3,5 ± 0,6	26
16A	9,5 ± 0,5	16,0	$4{,}75^{+1}_{0}$	4 ± 0,7	32
16B	10 ± 0,5	18,0	$5\ ^{+1}_{0}$	5 ± 0,6	32
20	10 ± 0,5	18,0	$5\ ^{+1,2}_{0}$	5 ± 1	40
24	12 ± 0,5	21,5	$6\ ^{+1,5}_{0}$	6 ± 1	51
28[a]	13 ± 0,5	24,0	$6{,}5\ ^{+1,5}_{0}$	7 ± 1,2	59
32	15 ± 0,5	28,0	$7{,}5\ ^{+1,5}_{0}$	8 ± 1,4	68
[a] See Note to Clause **4**..					

The dimensions are applicable to both standard and alternative split-pins (see BS 3288-4).

16 Dimensions of the hole for the W-clip



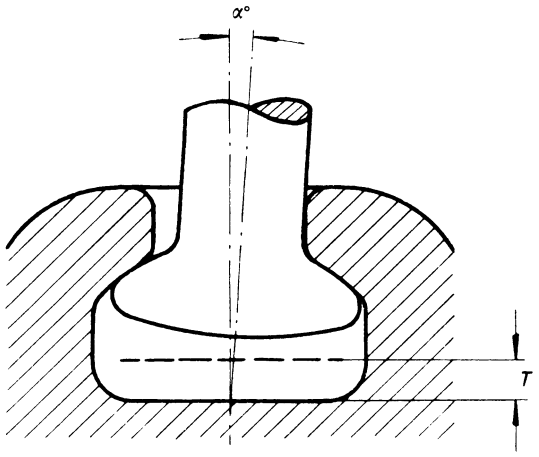
Standard couplings	B_1	B_2	H_3	L
		Min.		Max.
11	12,5 ± 0,8	24	6,5 ± 0,8	18
16A	16 ± 1	33	7 ± 0,8	24
16B	16 ± 1	33	9,5 ± 0,8	24
20	17 ± 1	34	8,5 ± 0,8	29
24	17,5 ± 1	34,5	10,5 ± 0,8	34
28[a]	20 ± 1	39	11,5 ± 0,8	42
28B[a]	17,5 ± 1	34,5	10,5 ± 0,8	42
32	22 ± 1	42	13,0 ± 0,8	48

[a] See Note to Clause **4**.

Dimension B_2 is the length of the recess over which the height H_3 shall be maintained. Beyond B_2, the shape of the recess is not important.

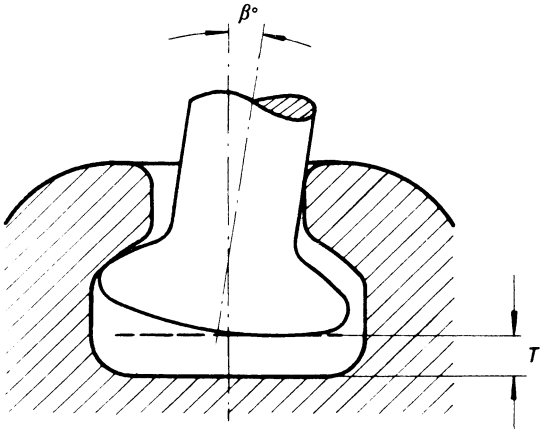
Appendix A Sliding position and over-tilting position of the pin ball in the socket end

A.1 Sliding position of the pin ball in the socket end



Designated size of coupling	$\alpha°$ average
11	1,3
16A	4,0
16B	4,0
20	3,3
24	2,7
28[b]	2,5
28B[b]	2,7
32	2,0

A.2 Over-tilting position of the pin ball in the socket end



Designated size of coupling	$\beta°$ [a] average
11	12,0
16A	9,5
16B	12,0
20	9,0
24	10,0
28[b]	9,0
28B[b]	10,0
32	9,0

[a] β values assume reasonable tolerances for H_2.
[b] See Note to Clause **4**.

Appendix B Recommended gauges

B.1 Tolerance system

The tolerances for the gauges follow the ISO system. This means that the "NOT GO" gauges only have manufacturing tolerances which are symmetrically located in relation to the corresponding tolerance limit of the coupling part. It also means that the "GO" gauges have allowances for wear and manufacturing tolerances which fall within the tolerance zone of the coupling part. Gauges which have been worn beyond any of the limits given for worn gauges shall not be used.

B.2 Constructional features of the gauges

The choice of material, the hardness, the surface finish, the surface treatment and the method of manufacture are liable to vary from one manufacturer to another. Therefore, the following recommendations are given only for general guidance:

— the thickness of the pin gauges should be not less than 5 mm;

— gauges provided with round holes should be somewhat thicker;

— the material should be a non-shrinking, oil-hardening steel;

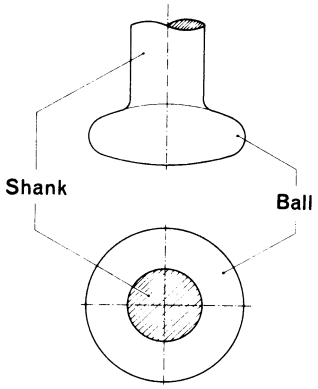
— the Rockwell C hardness number should be 62 to 63 in order to reduce deformations and wear;

— the surface roughness should be less than 4 μm;

— hard chromium plating can, in certain cases, increase resistance to wear.

NOTE The socket gauges should be provided with a ground shaft, diameter D_1, or with centre holes in order to facilitate checking of the gauges. A centre hole removes part of the curved surface, and this reduces the manufacturing tolerance.

B.3 Checking the pin ball



a) Ball and shank shall pass in at least one direction through "GO" gauge for ball height, shank diameter and shank length (see Clause **B.5**).

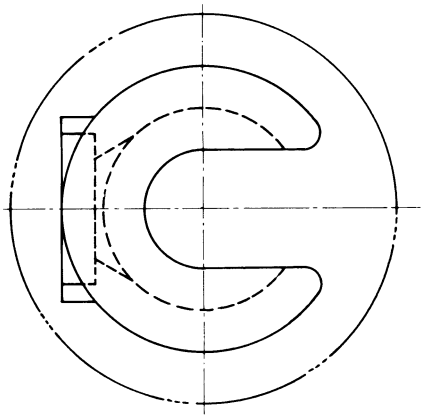
b) Ball shall pass through "GO" gauge for ball diameter (see Clause **B.6**).

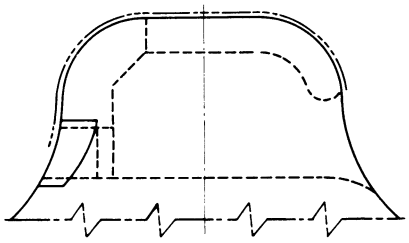
c) Ball and shank shall not pass in any direction through "NOT GO" gauge for ball height (see Clause **B.7**).

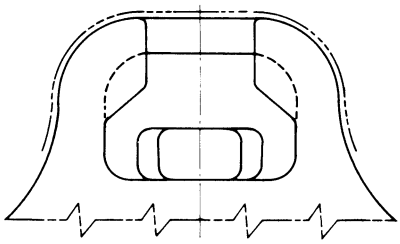
d) Ball shall not pass in any direction through "NOT GO" gauge for ball diameter (see Clause **B.8**).

e) Shank shall not enter in any direction through "NOT GO" gauge for shank diameter (see Clause **B.9**).

B.4 Checking the socket end







a) Socket entry shall accept "GO" gauge for entry height, entry width and neck width (see Clause **B.10**).

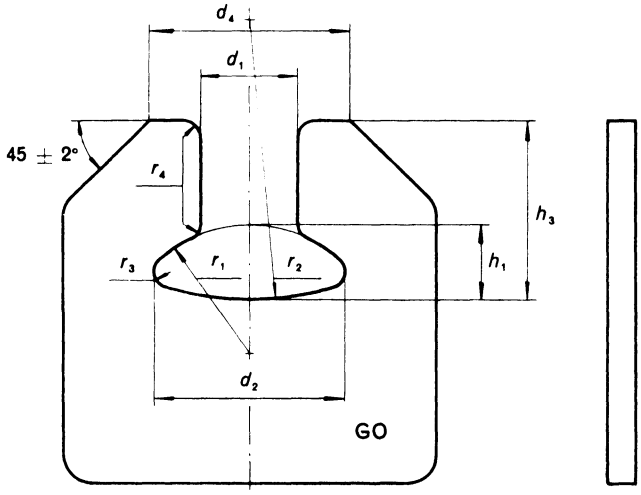
b) Internal height and internal diameter of socket shall allow rotation through 180° inside the socket of the "GO" gauge for internal height and internal diameter (see Clause **B.11**).

c) Socket entry height shall refuse the "NOT GO" gauge for entry height (see Clause **B.12**).

d) Socket entry shall refuse "NOT GO" gauge for neck width (see Clause **B.13**).

NOTE Marked contour (_ _ _ _ _) to accept hook-on "GO" gauge (see Clause **11**).

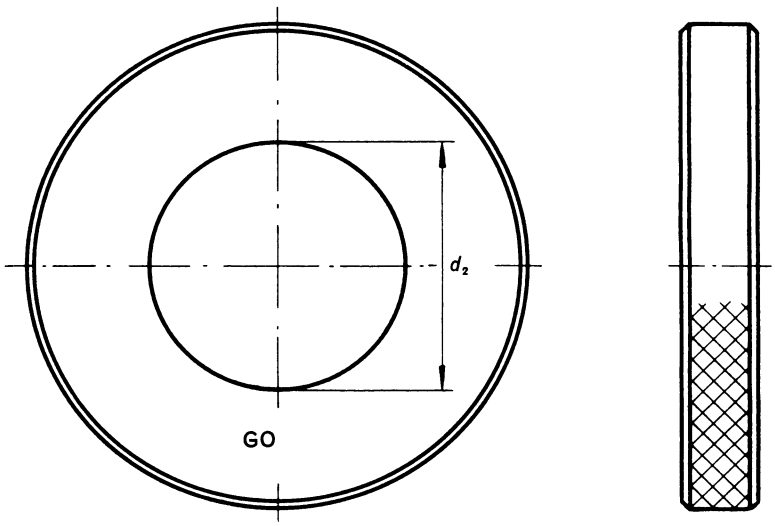
B.5 Pin "GO" gauge for ball height, shank diameter and shank length



Designated size of coupling	Gauge		d_1	d_2	d_4	h_1	h_3	r_1	r_2	r_3	r_4
11	New	Min. contour[a]	11,826	22,712	22,5	9,008	24,11	34,954	34,954	3,509	2,537
		Nominal contour	11,836	22,728	25,0	9,024	24,08	34,962	34,962	3,517	2,532
		Max. contour[a]	11,846	22,744	24,5	9,040	24,05	34,970	34,970	3,525	2,527
		Worn[b]	11,900	22,800	24,0	9,100	24,00	35,000	35,000	3,556	2,500
16	New	Min. contour[a]	16,922	33,204	35,5	13,304	32,14	22,952	49,952	2,945	4,039
		Nominal contour	16,932	33,222	35,0	13,320	32,10	22,960	49,960	2,952	4,034
		Max. contour[a]	16,942	33,240	34,5	13,336	32,06	22,968	49,968	2,959	4,029
		Worn[b]	17,000	33,300	34,0	13,400	32,00	23,000	50,000	2,993	4,000
20	New	Min. contour[a]	20,916	40,900	45,5	19,400	42,64	26,950	59,950	5,703	4,542
		Nominal contour	20,928	40,920	45,0	19,418	42,60	26,959	59,959	5,711	4,536
		Max. contour[a]	20,940	40,940	44,5	19,436	42,56	26,968	59,968	5,719	4,530
		Worn[b]	21,000	41,000	44,0	19,500	42,50	27,000	60,000	5,753	4,500
24	New	Min. contour[a]	24,912	48,890	50,5	20,888	46,65	39,944	69,944	6,558	5,544
		Nominal contour	24,924	48,912	50,0	20,908	46,61	39,954	69,954	6,567	5,538
		Max. contour[a]	24,936	48,934	49,5	20,928	46,57	39,964	69,964	6,577	5,532
		Worn[b]	25,000	49,000	49,0	21,000	46,50	40,000	70,000	6,615	5,500
28[c]	New	Min. contour[a]	28,906	56,881	68,5	23,380	51,66	54,940	79,940	7,803	6,044
		Nominal contour	28,919	56,905	68,0	23,402	51,62	54,951	79,951	7,814	6,038
		Max. contour[a]	28,932	56,929	67,5	23,424	51,58	54,962	79,962	7,825	6,032
		Worn[b]	29,000	57,000	67,0	23,500	51,50	55,000	80,000	7,864	6,000
28B[c]	New	Min. contour[a]	28,912	55,888	81,5	20,888	44,34	49,949	99,940	6,305	6,044
		Nominal contour	28,924	55,912	81,0	20,908	44,30	49,950	99,950	6,313	6,038
		Max. contour[a]	28,936	55,936	80,5	20,928	44,26	49,960	99,960	6,322	6,032
		Worn[b]	29,000	56,000	80,0	20,000	44,20	50,000	100,000	6,362	6,000
32	New	Min. contour[a]	32,899	64,871	87,5	26,868	62,16	69,934	89,934	9,506	6,544
		Nominal contour	32,913	64,897	87,0	26,892	62,12	69,946	89,946	9,517	6,538
		Max. contour[a]	32,927	64,923	86,5	26,916	62,08	69,958	89,958	9,528	6,532
		Worn[b]	33,000	65,000	86,0	27,000	62,00	70,000	90,000	9,572	6,500

[a] The contour of the new gauge should fall between the maximum and minimum contours.
[b] See Clause **B.1**.
[c] See Note to Clause **4**.

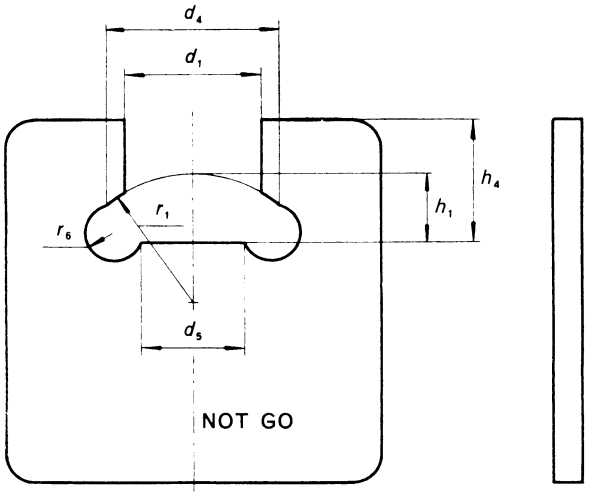
B.6 Pin "GO" gauge for ball diameter



Designated size of coupling	Gauge	d_2
11	New	22,728 ± 0,011
	Worn[a]	22,800
16	New	33,223 ± 0,012
	Worn[a]	33,300
20	New	40,920 ± 0,013
	Worn[a]	41,000
24	New	48,913 ± 0,014
	Worn[a]	49,000
28[b]	New	56,908 ± 0,015
	Worn[a]	57,000
28B[b]	New	55,913 ± 0,015
	Worn[a]	56,000
32	New	64,903 ± 0,016
	Worn[a]	65,000

[a] See Clause **B.1**.
[b] See Note to Clause **4**.

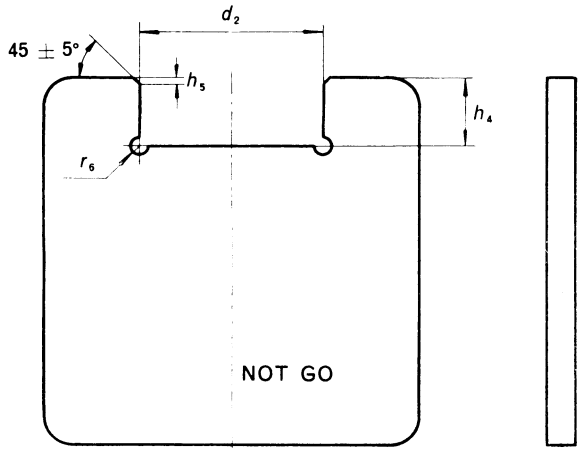
B.7 Pin "NOT GO" gauge for ball height



Designated size of coupling	Gauge	d_1	d_4	d_5	h_1	h_4	r_1	r_6
11	Min. contour[a]	16,08	18,60	12,3	7,884	15,5	34,992	3,7
	Nominal contour	16,10	18,40	12,0	7,990	16,0	35,000	4,0
	Max. contour[a]	16,12	18,20	11,7	7,916	16,5	35,008	4,3
16	Nominal contour	23,70	30,0	18,0	12,100	22,0	23,000	5,0
	Max. contour[a]	23,74	29,7	17,7	12,116	22,5	23,008	5,3
20	Min. contour[a]	28,36	36,3	23,3	18,082	29,5	26,991	6,7
	Nominal contour	28,42	36,0	23,0	18,100	30,0	27,000	7,0
	Max. contour[a]	28,48	35,7	22,7	18,118	30,5	27,009	7,3
24	Min. contour[a]	34,48	42,3	28,3	19,280	31,5	39,990	7,7
	Nominal contour	34,54	42,0	28,0	19,300	32,0	40,000	8,0
	Max. contour[a]	34,60	41,7	27,7	19,320	32,5	40,010	8,3
28[b]	Min. contour[a]	36,9	47,3	32,3	21,678	44,5	54,989	9,7
	Nominal contour	37,0	47,0	32,0	21,700	45,0	55,000	10,0
	Max. contour[a]	37,1	46,7	31,7	21,722	45,5	55,011	10,3
28B[b]	Min. contour[a]	39,90	49,3	34,3	19,280	31,5	49,990	7,7
	Nominal contour	40,00	49,0	34,0	19,300	32,0	50,000	8,0
	Max. contour[a]	40,10	48,7	33,7	19,230	32,5	50,010	8,3
32	Min. contour[a]	40,88	52,3	36,3	25,076	47,5	69,988	11,7
	Nominal contour	41,00	52,0	36,0	25,100	48,0	70,000	12,0
	Max. contour[a]	41,12	51,7	35,7	25,124	48,5	70,012	12,3

[a] The contour of the new gauge should fall between the maximum and minimum contours.
[b] See Note to Clause **4**.

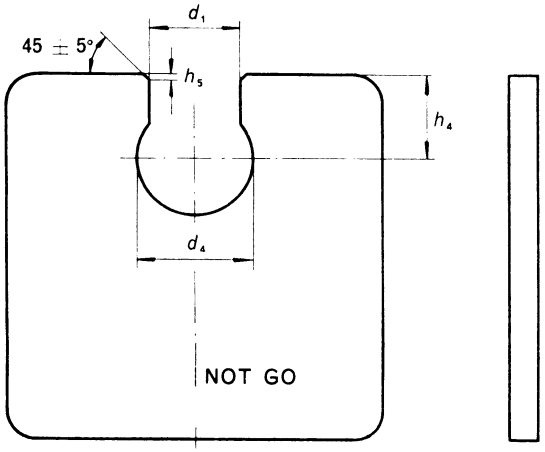
B.8 Pin "NOT GO" gauge for ball diameter



Designated size of coupling	d_2	h_4	h_5	r_6
11	21,500 ± 0,011	10,0 ± 0,5	1,0 ± 0,3	1,5 ± 0,5
16	31,800 ± 0,012	12,0 ± 0,5	1,0 ± 0,3	1,5 ± 0,5
20	39,400 ± 0,013	18,0 ± 0,5	1,0 ± 0,3	1,5 ± 0,5
24	47,200 ± 0,014	20,0 ± 0,5	1,0 ± 0,3	1,5 ± 0,5
28[a]	55,100 ± 0,015	22,0 ± 0,5	1,0 ± 0,3	1,5 ± 0,5
28B[a]	54,200 ± 0,015	20,0 ± 0,5	1,0 ± 0,3	1,5 ± 0,5
32	62,900 ± 0,016	25,0 ± 0,5	1,0 ± 0,3	1,5 ± 0,58

[a] See Note to Clause **4**.

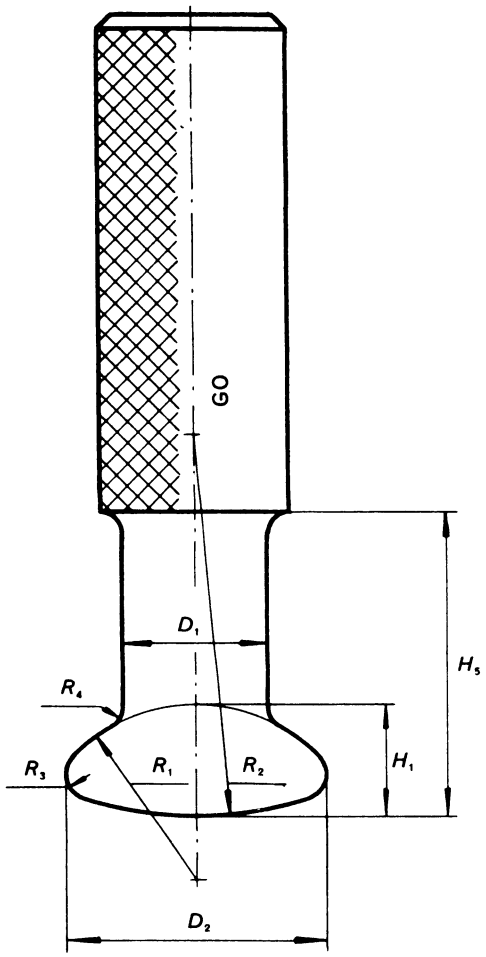
B.9 PIN "NOT GO" gauge for shank diameter



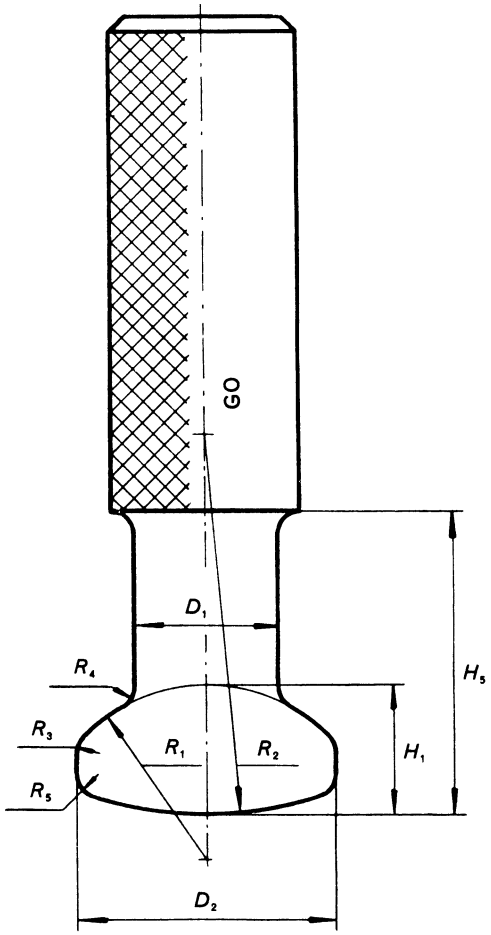
Designated size of coupling	d_1	d_4	h_4	h_5
11	10,800 ± 0,009	15,0 ± 0,5	12,0 ± 0,5	1,0 ± 0,3
16	15,800 ± 0,010	20,0 ± 0,5	15,0 ± 0,5	1,0 ± 0,3
20	19,700 ± 0,012	25,0 ± 0,5	18,0 ± 0,5	1,0 ± 0,3
24	23,600 ± 0,012	30,0 ± 0,5	23,0 ± 0,5	1,0 ± 0,3
28[a]	27,500 ± 0,013	35,0 ± 0,5	27,0 ± 0,5	1,0 ± 0,3
28B[a]	27,500 ± 0,013	34,0 ± 0,5	25,0 ± 0,5	1,0 ± 0,3
32	31,400 ± 0,014	40,0 ± 0,5	31,0 ± 0,5	1,0 ± 0,3

[a] See Note to Clause **4**.

B.10 Socket "GO" gauge for entry height, entry width and neck width



Coupling 11, 16A, 24, 28B[a]



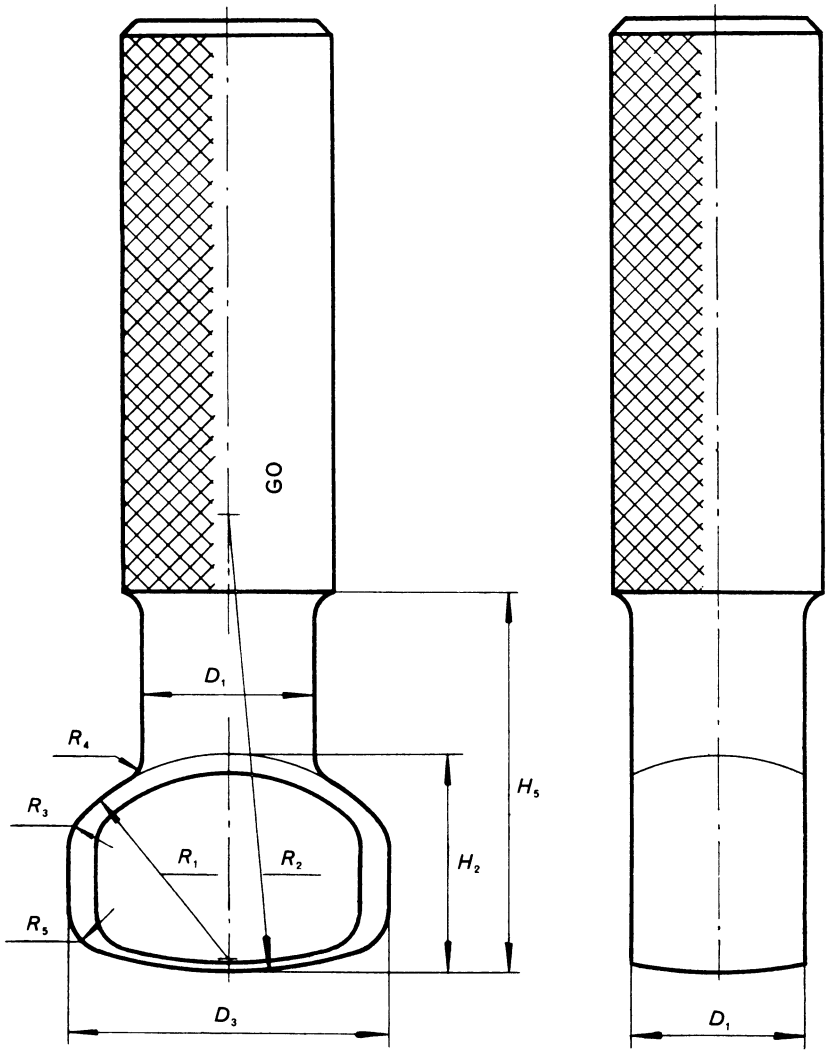
Coupling 16B, 20, 28, 32

[a] See Note to Clause 4.

Designed size of coupling	Gauge		D_1	D_2	H_1	H_5	R_1	R_2	R_3	R_4	R_5
11	New	Max. contour[a]	12,584	24,590	10,596	30,5	35,048	35,048	4,222	1,458	—
		Nominal contour	12,572	24,578	10,580	30,0	35,040	35,040	4,213	1,464	—
		Min. contour[a]	12,560	24,556	10,564	29,5	35,032	35,032	4,205	1,470	—
		Worn[c]	12,500	24,500	10,500	29,0	35,000	35,000	4,173	1,500	—
16A[b]	New	Max. contour[a]	19,294	34,602	14,608	40,5	23,054	50,054	3,338	2,953	—
		Nominal contour	19,280	34,588	14,588	40,0	23,044	50,044	3,325	2,960	—
		Min. contour[a]	19,266	34,574	14,568	39,5	23,034	50,034	3,311	2,967	—
		Worn[c]	19,200	34,500	14,500	39,0	23,000	50,000	3,281	3,000	—
16B[a]	New	Max. contour[a]	19,294	34,602	17,108	40,5	23,054	50,054	3,051	2,953	3,051
		Nominal contour	19,280	34,588	17,088	40,0	23,044	50,044	3,044	2,960	3,044
		Min. contour[a]	19,266	34,574	17,068	39,5	23,034	50,034	3,037	2,967	3,037
		Worn[c]	19,200	34,500	17,000	39,0	23,000	50,000	3,000	3,000	3,000
20	New	Max. contour[a]	23,116	42,630	20,632	50,5	27,066	60,066	6,065	3,442	5,565
		Nominal contour	23,098	42,610	20,606	50,0	27,053	60,053	6,055	3,451	5,555
		Min. contour[a]	23,080	42,590	20,580	49,5	27,040	60,040	6,045	3,460	5,545
		Worn[c]	23,000	42,500	20,500	49,0	27,000	60,000	6,000	3,500	5,500
24	New	Max. contour[a]	27,630	51,150	23,652	55,5	40,076	70,076	7,898	3,935	—
		Nominal contour	27,610	51,126	23,622	55,0	40,061	70,061	7,881	3,945	—
		Min. contour[a]	27,590	51,102	23,592	54,5	40,046	70,046	7,864	3,955	—
		Worn[c]	27,500	51,000	23,500	54,0	40,000	70,000	7,821	4,000	—
28[d]	New	Max. contour[a]	32,144	59,166	26,170	60,5	55,085	80,085	8,083	4,429	10,083
		Nominal contour	32,122	59,138	26,135	60,0	55,067	80,068	8,069	4,440	10,069
		Min. contour[a]	32,100	59,110	26,100	59,5	55,050	80,050	8,055	4,451	10,055
		Worn[c]	32,000	59,000	26,000	59,0	55,000	80,000	8,000	4,500	10,000
28B[d]	New	Max. contour[a]	31,640	58,166	23,652	55,5	50,090	100,090	7,667	4,935	—
		Nominal contour	31,620	58,140	23,622	55,0	50,075	100,075	7,650	4,945	—
		Min. contour[a]	31,000	58,114	23,592	54,5	50,060	100,060	7,663	4,955	—
		Worn[c]	31,500	58,000	23,500	54,0	50,000	100,000	7,590	5,000	—
32	New	Max. contour[a]	36,158	67,680	30,190	70,5	70,095	90,095	10,090	4,923	11,890
		Nominal contour	36,134	67,650	30,150	70,0	70,075	90,075	10,075	4,935	11,875
		Min. contour[a]	36,110	67,620	30,110	69,5	70,055	90,055	10,060	4,947	11,860
		Worn[c]	36,000	67,500	30,000	69,0	70,000	90,000	10,000	5,000	11,800

[a] The contour of the new gauge should fall between the maximum and minimum contours.
[b] See Note to Clause **5**.
[c] See Clause **B.1**.
[d] See Note to Clause **4**.

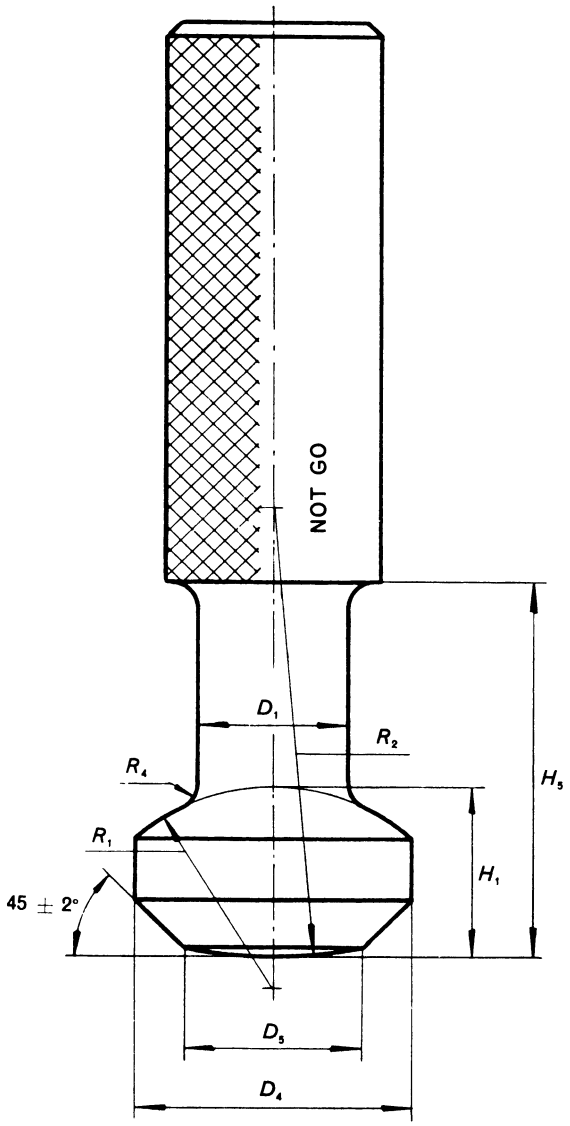
B.11 Socket "GO" gauge for internal height and internal diameter



Designed size of coupling	Gauge		D_1	D_3	H_2 with W-clip	H_2[d] standard split-pin	H_5	R_1	R_2	R_3	R_4	R_5
11	New	Max. contour[a]	12,584	24,590	15,596	16,396	30,5	35,048	35,048	4,045	1,458	4,045
		Nominal contour	12,572	24,578	15,580	16,380	30,0	35,040	35,040	4,039	1,464	4,039
		Min. contour[a]	12,560	24,566	15,564	16,364	29,5	35,032	35,032	4,033	1,470	4,033
	Worn[c]		12,500	24,500	15,500	16,300	29,0	35,000	35,000	4000	1,500	4,000
16A[b]	New	Max. contour[a]	19,294	34,602	20,608	21,708	40,5	23,054	50,054	3,051	2,953	3,051
		Nominal contour	19,280	34,588	20,588	21,688	40,0	23,044	50,044	3,044	2,960	3,044
		Min. contour[a]	19,266	34,574	20,568	21,668	39,5	23,034	50,034	3,037	2,967	3,037
	Worn[c]		19,200	34,500	20,500	21,600	39,0	23,000	50,000	3,000	3,000	3,000
16B[b]	New	Max. contour[a]	19,294	34,602	25,108	25,608	40,5	23,054	50,054	3,051	2,953	3,051
		Nominal contour	19,280	34,588	25,088	25,588	40,0	23,044	50,044	3,044	2,960	3,044
		Min. contour[a]	19,266	34,574	25,068	25,568	39,5	23,034	50,034	3,037	2,967	3,037
	Worn[c]		19,200	34,500	25,000	25,500	39,0	23,000	50,000	3,000	3,000	3,000
20	New	Max. contour[a]	23,116	42,630	28,632	29,432	50,5	27,066	60,066	6,065	3,442	6,065
		Nominal contour	23,098	42,610	28,606	29,406	50,0	27,053	60,053	6,055	3,451	6,055
		Min. contour[a]	23,080	42,590	28,580	29,380	49,5	27,040	60,040	6,045	3,460	6,045
	Worn[c]		23,000	42,500	28,500	29,300	49,0	27,000	60,000	6,000	3,500	6,000
24	New	Max. contour[a]	27,630	51,150	32,652	33,652	55,5	40,076	70,076	5,075	3,935	8,075
		Nominal contour	27,610	51,126	32,622	33,622	55,0	40,061	70,061	5,063	3,945	8,063
		Min. contour[a]	27,590	51,102	32,592	33,592	54,5	40,046	70,046	5,051	3,955	8,051
	Worn[c]		27,500	51,000	32,500	33,500	54,0	40,000	70,000	5,000	4,000	8,000
28[e]	New	Max. contour[a]	32,144	59,166	36,670	37,570	60,5	55,085	80,085	8,083	4,429	8,083
		Nominal contour	32,122	59,138	36,635	37,535	60,0	55,067	80,068	8,069	4,440	8,069
		Min. contour[a]	32,100	59,110	36,600	37,500	59,5	55,050	80,050	8,055	4,451	8,055
	Worn[c]		32,000	59,000	36,500	37,400	59,0	55,000	80,000	8,000	4,500	8,000
28B[e]	New	Max. contour[a]	31,640	58,166	32,652	—[e]	55,5	50,090	100,090	5,075	4,935	—
		Nominal contour	31,620	58,140	32,622	—[e]	55,0	50,075	100,075	5,063	4,945	—
		Min. contour[a]	31,600	58,114	32,592	—[e]	54,5	50,060	100,060	5,051	4,955	—
	Worn[c]		31,500	58,200	32,500	—[e]	54,0	50,000	100,000	5,000	5,000	—
32	New	Max. contour[a]	36,158	67,680	42,190	43,190	70,5	70,095	90,095	10,090	4,923	10,090
		Nominal contour	36,134	67,650	42,150	43,150	70,0	70,075	90,075	10,075	4,935	10,075
		Min. contour[a]	36,110	67,620	42,110	43,110	69,5	70,055	90,055	10,060	4,967	10,060
	Worn[c]		36,000	67,500	42,000	43,000	69,0	70,000	90,000	10,000	5,000	10,000

[a] The contour of the new gauge should fall between the maximum and minimum contours.
[b] See Note to Clause **5**.
[c] See Clause **B.1**.
[d] When gauging sockets for use with standard split-pins, the gauge designed for checking sockets with W-clips may be used, supplimented by a flat gauge such that the total height corresponds to the value of H_2 with split-pin.
[e] See Note to Clause **4**.

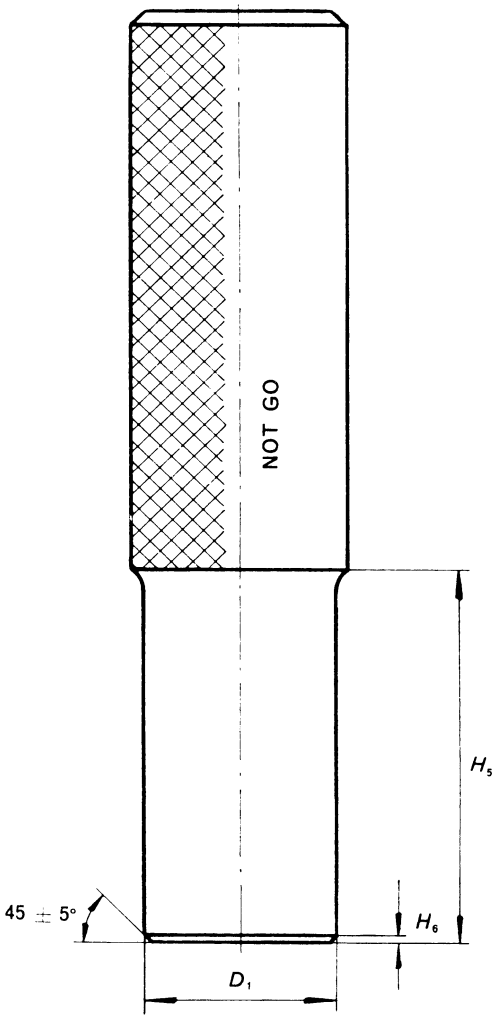
B.12 Socket "NOT GO" gauge for entry height



Designated size of coupling	Gauge	D_1	D_4	D_5	H_1	H_5	R_1	R_1	R_4
11	Max. contour[a]	10,9	17,05	12,3	11,816	30,5	35,008	35,008	1,8
	Nominal contour	10,8	17,00	12,0	11,800	30,0	35,000	35,000	1,5
	Min. contour[a]	10,7	16,95	11,7	17,784	29,5	34,992	34,992	1,2
16A	Max. contour[a]	15,9	30,1	18,3	16,120	40,5	23,010	50,010	3,3
	Nominal contour	15,8	30,0	18,0	16,100	40,0	23,000	50,000	3,0
	Min. contour[a]	15,7	29,9	17,7	16,080	39,5	22,990	49,990	2,7
16B	Max. contour[a]	15,9	30,1	18,3	18,620	40,5	23,010	50,010	3,3
	Nominal contour	15,8	30,0	18,0	18,600	40,0	23,000	50,000	3,0
	Min. contour[a]	15,7	29,9	17,7	18,580	39,5	22,990	49,990	2,7
20	Max. contour[a]	19,8	36,1	23,3	22,626	50,5	27,013	60,013	3,8
	Nominal contour	19,7	36,0	23,0	22,600	50,0	27,000	60,000	3,5
	Min. contour[a]	19,6	35,9	22,7	22,574	49,5	26,987	59,987	3,2
24	Max. contour[a]	23,7	42,1	28,3	26,030	55,5	40,015	70,015	4,3
	Nominal contour	23,6	42,0	28,0	26,000	55,0	40,000	70,000	4,0
	Min. contour[a]	23,5	41,9	27,7	25,970	54,5	39,985	69,985	3,7
28[b]	Max. contour[a]	27,6	47,1	32,3	28,935	60,5	55,018	80,018	4,8
	Nominal contour	27,5	47,0	32,0	28,900	60,0	55,000	80,000	4,5
	Min. contour[a]	27,4	46,9	31,7	28,865	59,5	54,982	79,982	4,2
28B[b]	Max. contour[a]	27,7	48,1	32,3	26,030	55,5	50,015	100,015	5,3
	Nominal contour	27,6	48,0	32,0	26,000	55,0	50,000	100,000	5,0
	Min. contour[a]	27,5	47,9	31,7	25,970	54,5	49,985	99,985	4,7
32	Max. contour[a]	31,5	52,1	36,3	33,340	70,5	70,020	90,020	5,3
	Nominal contour	31,4	52,0	36,0	33,300	70,0	70,000	90,000	5,0
	Min. contour[a]	31,3	51,9	35,7	33,260	69,5	69,980	89,980	4,7

[a] The contour of the new gauge should fall between maximum and minimum contours.
[b] See Note to Clause **4**.

B.13 Socket "NOT GO" gauge for neck width



Designated size of coupling	D_1	H_5	H_6
11	13,800 ± 0,011	30,0 ± 0,5	1,0 ± 0,3
16	20,800 ± 0,014	40,0 ± 0,5	1,0 ± 0,3
20	25,100 ± 0,018	50,0 ± 0,5	1,0 ± 0,3
24	30,000 ± 0,020	55,0 ± 0,5	1,0 ± 0,3
28[a]	34,900 ± 0,023	60,0 ± 0,5	1,0 ± 0,3
28B[a]	34,000 ± 0,020	55,0 ± 0,5	1,0 ± 0,3
32	39,300 ± 0,026	70,0 ± 0,5	1,0 ± 0,3
[a] See Note to Clause **4**.			

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