

International Standard



3670

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Blanks for plug gauges and handles (taper lock and trilock) and ring gauges — Design and general dimensions

Ébauches de calibres-tampons (à assemblage conique et à trois tenons d'assemblage) et de calibres-bagues — Conception et dimensions

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FOREWORD

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3670 was developed by Technical Committee ISO/TC 3, *Limits and fits*, and was circulated to the member bodies in February 1975.

It has been approved by the member bodies of the following countries :

Australia	India	Portugal
Belgium	Italy	Romania
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Finland	Mexico	Sweden
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Czechoslovakia
Switzerland
USSR

Blanks for plug gauges and handles (taper lock and trilock) and ring gauges — Design and general dimensions

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the characteristics of blanks and handles for plain and screw plug gauges of taper lock and trilock design and blanks for plain and screw ring gauges.

The types of gauges are described and illustrated and recommended blank and handle sizes are given in the tables. Those features of design necessary to ensure interchangeability are specified in some detail and general information on other features is included for guidance in the manufacture of these gauges.

It should be noted that the dimensions in the tables apply to the blanks for gauging members when completed but before they are finished to final gauge size.

Although this International Standard deals with blanks for taper lock and trilock plug gauges, it is recognized that solid gauges may sometimes be required, and their use is not precluded.

NOTE — Blanks for other types of gauges and handles, for example collet-type plug gauges, alternatives to trilock gauges and, possibly, shorter series of blanks and calliper gauges will be dealt with in future supplements to this International Standard.

2 REFERENCES

ISO 68, *ISO general purpose screw threads — Basic profile.*

ISO 262, *ISO general purpose metric screw threads — Selected sizes for screws, bolts and nuts.*

ISO 965/2, *ISO general purpose metric screw threads — Tolerances — Limits of sizes for commercial bolt and nut threads — Medium quality.*

3 TAPER LOCK PLUG GAUGES (DIAMETERS FROM 1 UP TO AND INCLUDING 50 mm)

3.1 General

The taper lock design is particularly suitable for the smaller sizes of plug gauges. This type of gauge is economical to produce and maintain. General details of construction are illustrated in figures 1 and 2.

It is a feature of the taper lock system that the gauging members are locked firmly in the handles by engagement of the taper shanks in the taper holes and, when properly made and assembled, they have the rigidity of solid gauges.

Dimensions and tolerances for the mating parts of gauging members and handles have been chosen to ensure full interchangeability of these parts wherever manufactured.

A drift slot or hole is provided near one end of the handle to enable the gauging member to be removed when replacement is necessary. In the case of double-ended gauges, the second member is removed by running a rod through the hollow handle.

Details of gauges for use in the manufacture and testing of taper lock shanks and the taper bore of handles are given in the annex.

3.2 Handles

It is recommended that, for general applications for plain cylindrical gauging members, the handles be made from light alloy or other suitable material. For some special applications it may be necessary to use mild steel.

The tapers shall be made to fit the appropriate size of taper plug gauge shown in the annex. The end face of the handle shall lie between the end face of the taper plug gauge and the step face when the plug is firmly assembled in the taper of the handle.

All handles shall be so made at both ends that they are suitable for double-ended limit gauges but may be used for single-ended gauges where necessary.

It is customary to insert the GO member in the end of the handle with the drift hole or slot.

In sizes up to and including 6 mm (handles Nos. 1 and 2), a groove is provided near one end of the handle to indicate the NOT GO end, as the length of the GO member in this range is often insufficient to distinguish it clearly from the NOT GO member.

The general dimensions of the handles shall be in accordance with table 1 and 3.2.2.

TABLE 1 — General dimensions for handles

Dimensions in millimetres										
Handle No.	D_2^*	d_2	d_3	f	L	s	$e \approx$	j	i	$h \times g$
1	2,5	2,2	5	3	40	5	5,8	11	—	2 × 6
2	4	3,7	7	4	48	7	8	14	—	2,4 × 8
3	5,5	5,1	9	5	56	9	10	17	—	3 × 9
4	7	6,5	11	6	63	11	12,5	23	—	3 × 12
5	9	8,5	13,5	7	70	14	16	23	6	—
6	12	11,5	17,5	8	80	17	19,5	26	9	—
7	16	15,3	25	9	90	22	25	28	11	—

* Controlled by gauge (see annex).

3.2.1 General arrangement

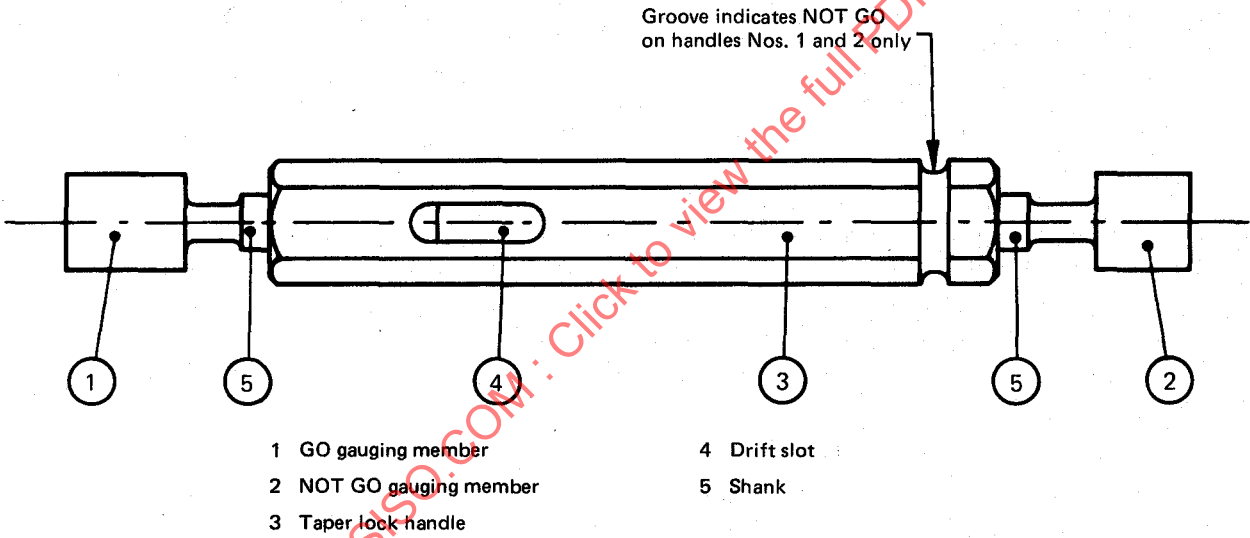


FIGURE 1 — Handles Nos. 1, 2, 3 and 4 with drift slot

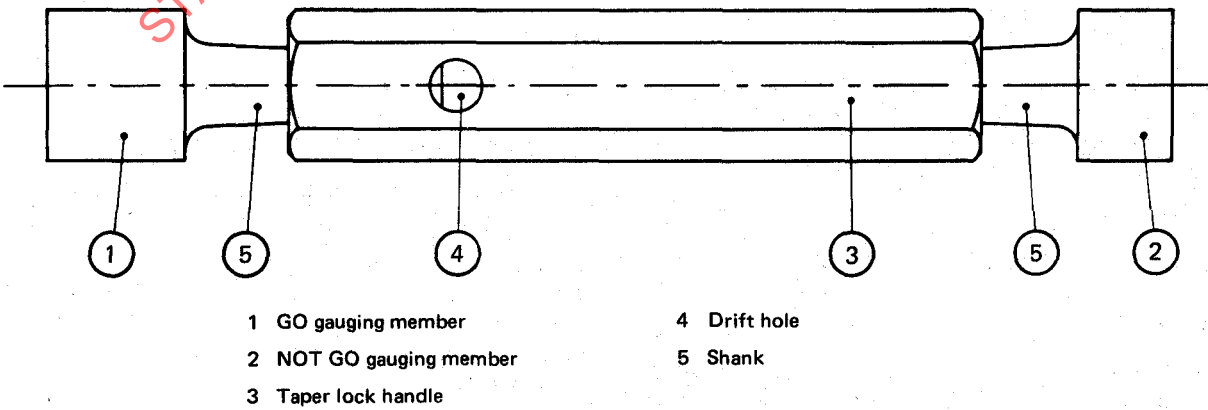


FIGURE 2 — Handles Nos. 5, 6 and 7 with drift hole

3.2.2 Dimensions for taper lock handles Nos. 1 to 7

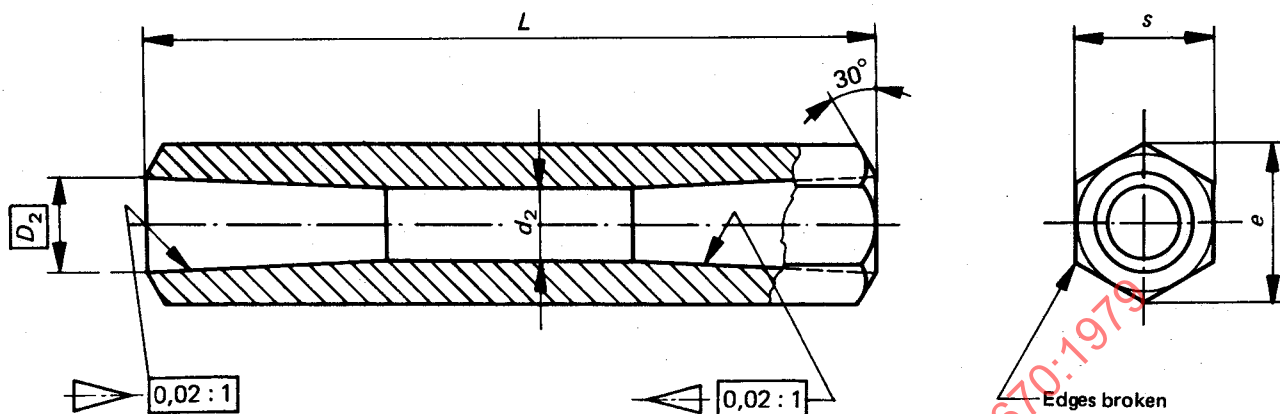


FIGURE 3 — Hexagonal type

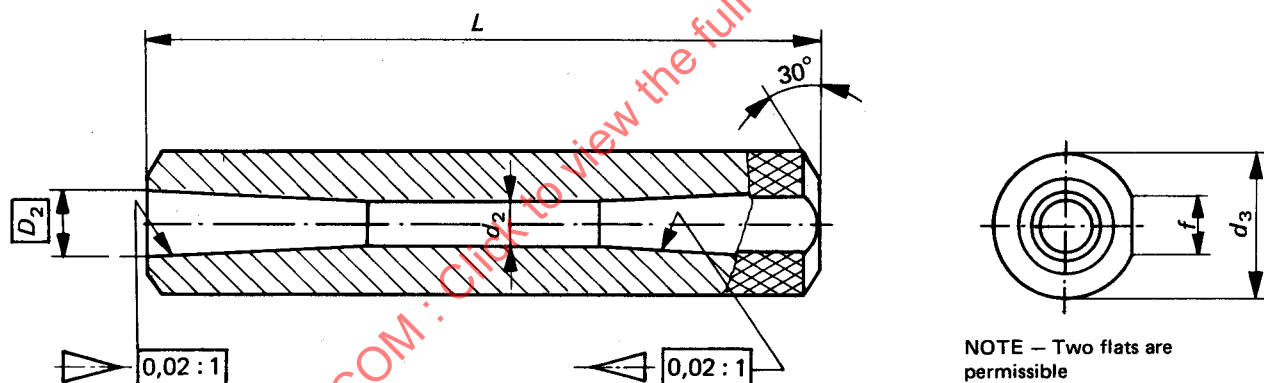


FIGURE 4 — Knurled type

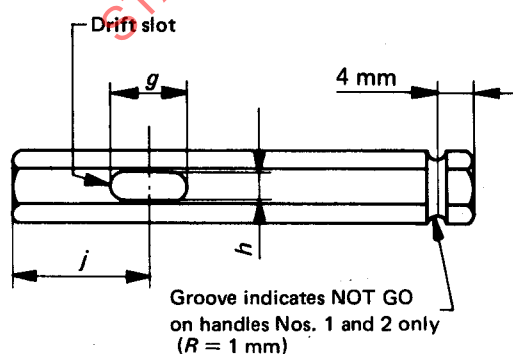


FIGURE 5 — Handles Nos. 1 to 4

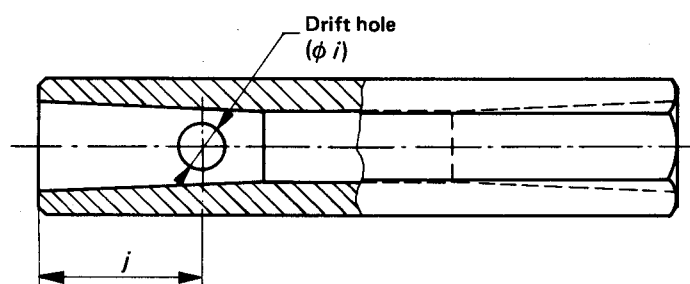


FIGURE 6 — Handles Nos. 5 to 7

3.3 Taper lock plain cylindrical plug gauging members

Gauging members shall be made of good quality steel and machined to the general dimensions specified in table 2, with a finishing allowance where necessary.

The dimensions and tolerances shown below apply to gauging members that have been hardened and finished on the taper shanks, but left oversize on the gauging diameter for subsequent completion to the required size. The amount of excess material left to allow for finishing to size is at the discretion of the gauge manufacturer.

Gauging members up to and including 3 mm diameter may be provided with a ground 60° external centre at each end as shown in figure 7. The centre point may be removed from the shank end after the gauging member has been finished to size but it is not necessary to remove the point

at the gauging end unless the gauge is to be used for checking blind holes.

Gauging members of all other sizes shall have an internal centre, well finished and of suitable size, at each end. On sizes above 14 mm nominal diameter, a small protection recess is desirable.

NOT GO gauging members may be relieved to enable them to check ovality if specified by the purchaser.

The taper shank shall have a good finish and be made to fit the taper ring gauge applicable to its size as specified in the annex. The small end face of the taper shank shall lie between the end face of the ring gauge and the step face. In the case of gauging members with external centres, the junction of the centre angle and the shank shall lie between the small end face of the ring gauge and the step face.

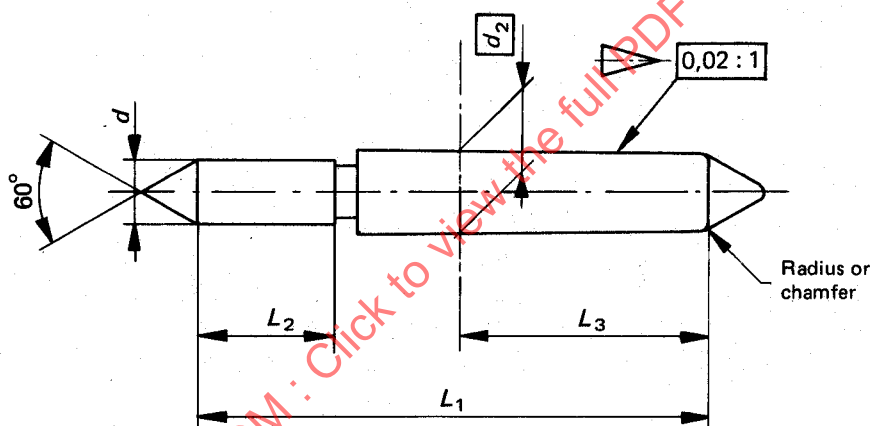


FIGURE 7 — Go and NOT GO gauging members :
from 1 mm up to and including 3 mm diameter

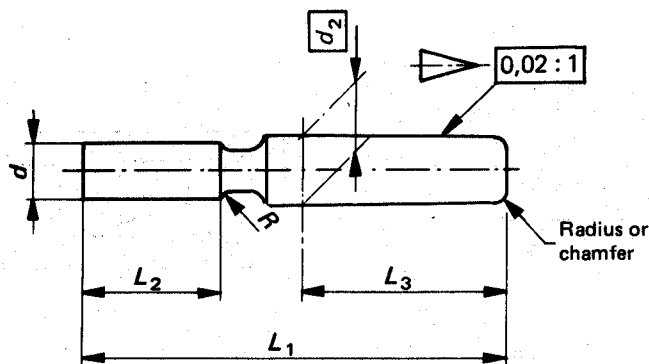


FIGURE 8 — GO and NOT GO gauging members :
above 3 mm up to and including 6 mm diameter

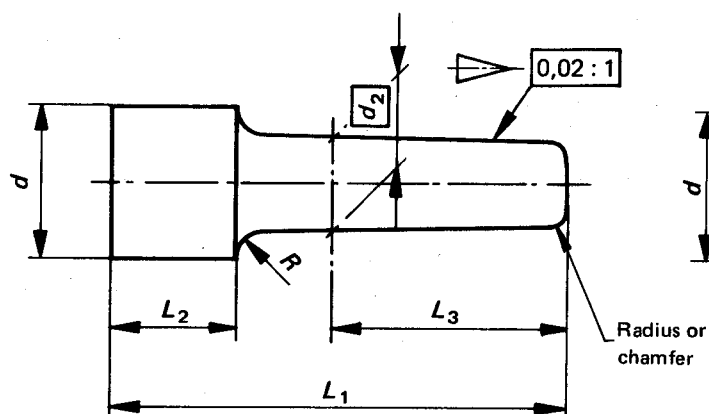


FIGURE 9 – GO and NOT GO gauging members :
above 6 mm up to and including 50 mm diameter

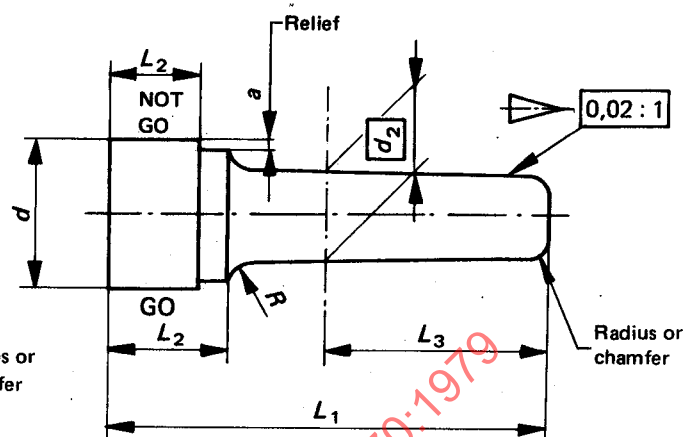


FIGURE 10 – Alternative for NOT GO gauge made from GO blank :
above 6 mm up to and including 50 mm diameter

TABLE 2 – General dimensions for taper lock plain cylindrical plug gauging members

Dimensions in millimetres

Nominal diameter d		L_1 $+0,3$ 0		L_2 0 $-0,3$		L_3 $+1$ 0	R	d_2 basic	a	Handle No.
		GO	NOT GO	GO	NOT GO					
1*	3	22	20	6,5	4,5	10	—	2,5	0,1	1
3	6	26	24	8	6	12	1	4	0,2	2
6	10	32	29	10	7	15	1,6	5,5	0,5	3
10	14	40	36	12	8	20	2	7	0,5	4
14	18	46	42	14	10	22	2,5	9	1	5
18	24	52	48	16	12	24	2,5	12	1	6
24	30	54	50	18	14	24	2,5	12	1	6
30	40	60	55	20	15	25	4	16	1,5	7
40	50	68	61	25	18	25	4	16	1,5	7

* Included

3.4 Taper lock screw plug gauging members

The dimension and tolerances shown below apply to gauging members that have been finished on the taper shank but left oversize on the gauging diameter for subsequent finishing to the required size. The amount of excess material left to allow for finishing to size is at the discretion of the gauge manufacturer.

Gauging members up to and including 3 mm¹⁾ diameter may be provided with a ground 60° external centre at each end as shown in figure 11. The centre point may be removed from the shank end after the threads have been finished but it is not necessary to remove the point at the gauging end unless the gauge is to be used for checking blind holes.

Gauging members of all sizes greater than 3 mm shall have an internal centre, well finished and of suitable size, at each end. On sizes above 14 mm nominal diameter, a small protection recess is desirable.

The taper shank shall have a good ground finish and be made to fit the taper ring gauge applicable to its size as specified in the annex. The small end face of the taper shank shall lie between the small end of the ring gauge and the step face.

In the case of gauging members with external centres, the junction of the centre angle and the shank shall lie between the small end face of the ring gauge and the step face.

The lengths of the blanks shown in table 3 are suitable for GO gauges of the pitches shown. If a blank is used for a finer pitch, the rear end of the blank may be relieved as shown in figure 14 if the number of threads is excessive.

Incomplete threads shall be removed from each end of all gauges.

Blanks for NOT GO gauges shall be selected from the short or medium series so that there are not less than four completed threads. The blank may be relieved as shown in figure 14 if necessary.

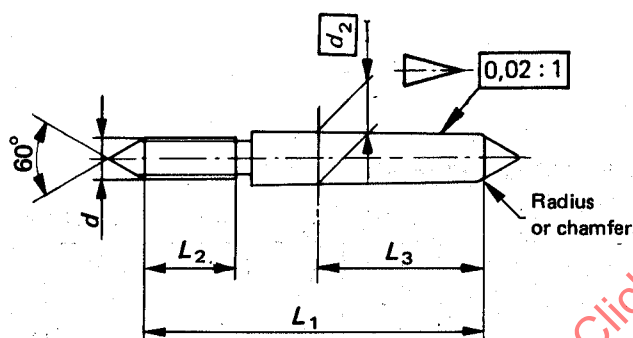


FIGURE 11 — GO and NOT GO gauging members :
from 1 mm up to and including 3 mm diameter

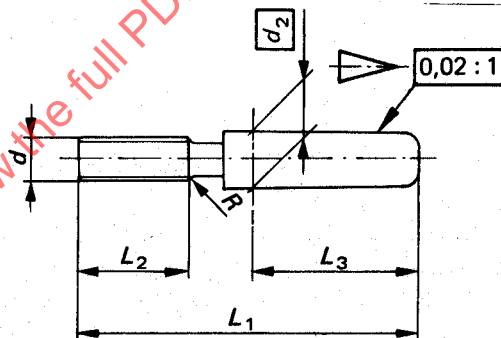


FIGURE 12 — GO and NOT GO gauging members :
above 3 mm up to and including 6 mm diameter

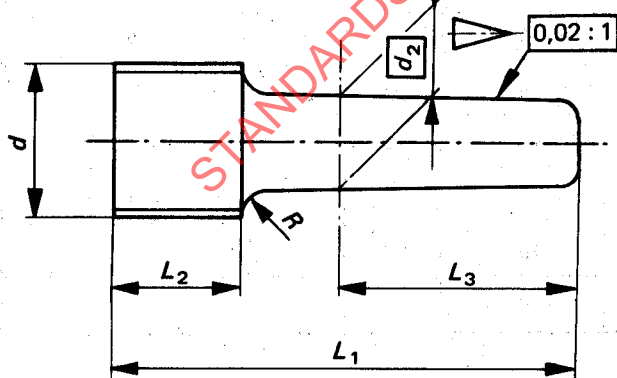


FIGURE 13 — GO and NOT GO gauging members :
above 6 mm up to and including 50 mm diameter

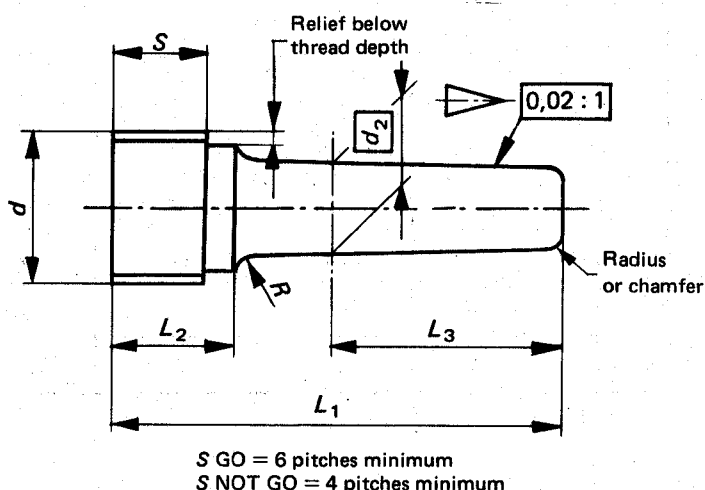


FIGURE 14 — Alternative for NOT GO or fine pitches :
above 6 mm up to and including 50 mm diameter

1) This may be extended to gauges up to 4,0 mm nominal diameter at the discretion of the gauge manufacturer.

TABLE 3— General dimensions for taper lock screw plug gauging members

Dimensions in millimetres

Nominal diameter d above up to (incl.)	Handle No.	L_3 $+1$ 0	R	d_2 basic	Blank b_0 (Short series)			Blank b_1 (Medium series)			Blank b_2 (Long series)			Blank b_3 (Extra long series)		
					Pitches for GO gauges	L_1 $+0,3$ 0	L_2 0 $-0,3$	Pitches for GO gauges	L_1 $+0,3$ 0	L_2 0 $-0,3$	Pitches for GO gauges	L_1 $+0,3$ 0	L_2 0 $-0,3$	Pitches for GO gauges	L_1 $+0,3$ 0	L_2 0 $-0,3$
1*	3	10	—	2,5				All	20	4,5						
3	6	12	1	4				Up to 0,75	24	6	Up to 0,75	26	8			
6	10	15	1,6	5,5		28	6	0,75	29	7	1 and 1,25	32	10	1,5	34	12
10	14	20	2	7		34	6	0,75 and 1	36	8	1,25 and 1,5	40	12	1,75 and 2	44	16
14	18	22	2,5	9		40	8	1	42	10	1,5	46	14	2 and 2,5	52	20
18	24	24	2,5	12	1	48	12	1,5 and 2	52	16	2,5	56	20	3	60	24
24	30	24	2,5	12	1 to 1,5	50	14	2	54	18	3	60	24	3,5	64	28
30	40	25	4	16	1,5	55	15	2	60	20	3	64	24	3,5 and 4	72	32
40	50	25	4	16	1,5 to 2	61	18	3	68	25	4	75	32	4,5 and 5	83	40

* Included.

4 TRILOCK PLUG GAUGES (DIAMETERS ABOVE 40 UP TO AND INCLUDING 120 mm)

4.1 General

Trilock gauges extend the interchangeable end system to the larger size and overlap with the taper lock type in the 40 to 50 mm diameter range.

An additional advantage of this type of gauge is that the gauging members can be reversed when the entering end is worn.

The wedge-shape prongs on the handle are engaged with corresponding grooves in the gauging member by a single screw providing a self-centring support with a positive lock and a degree of rigidity equivalent to that of a solid gauge.

Complete dimensions have been established for the mating parts of gauging members and handles, thus ensuring absolute interchangeability of gauging members and handles wherever manufactured.

Double-ended handles may be used for size 8 but the size and weight of gauging members make them unsuitable for size 9.

It is customary to use a single-ended handle for GO or NOT GO gauging members as required and to rely on marking or physical characteristics to identify the NOT GO member. A groove on the NOT GO handle is not considered necessary but may be provided if requested.

4.2 Trilock handles

It is recommended that, for general applications for plain cylindrical gauging members, the handles be made from light alloy or other suitable material. For some special applications it may be necessary to use mild steel.

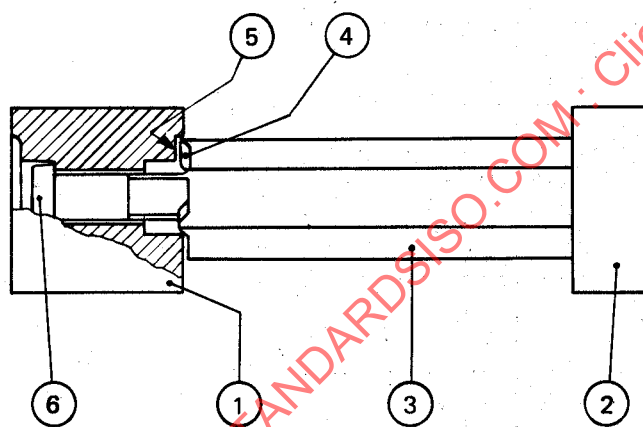
A cross-pin hole is provided in single end handles to enable a loose mild steel bar to be inserted to obtain leverage if a gauge end should become a tight fit in a hole.

The screw threads shall be to 6H tolerances.

The general dimensions of the handles shall be in accordance with table 4 and 4.2.2 and fixing screws shall be as shown in 4.2.3.

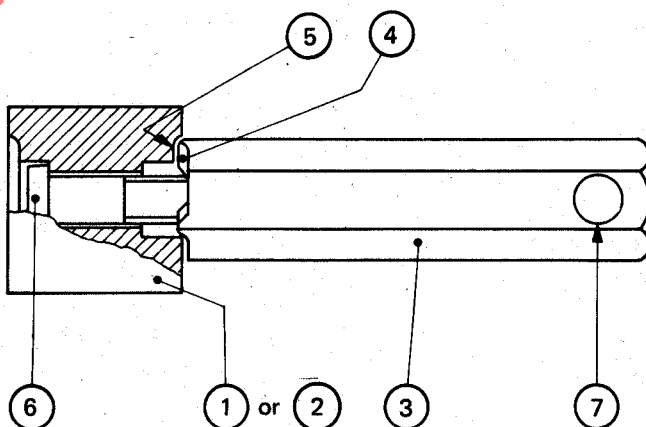
4.2.1 General arrangement

See figures 15 and 16.



- 1 GO gauging member
- 2 NOT GO gauging member
- 3 Double-end trilock handle
- 4 Locking prong
- 5 Locking groove
- 6 Fixing screw

FIGURE 15 — Double-end trilock gauge handle (size No. 8 only)



- 1 GO gauging member
- 2 NOT GO gauging member
- 3 Single-end trilock handle
- 4 Locking prong
- 5 Locking groove
- 6 Fixing screw
- 7 Cross-pin hole

FIGURE 16 — Single-end trilock gauge handle (sizes Nos. 8 and 9)

4.2.2 Dimensions of trilock handles Nos. 8 and 9

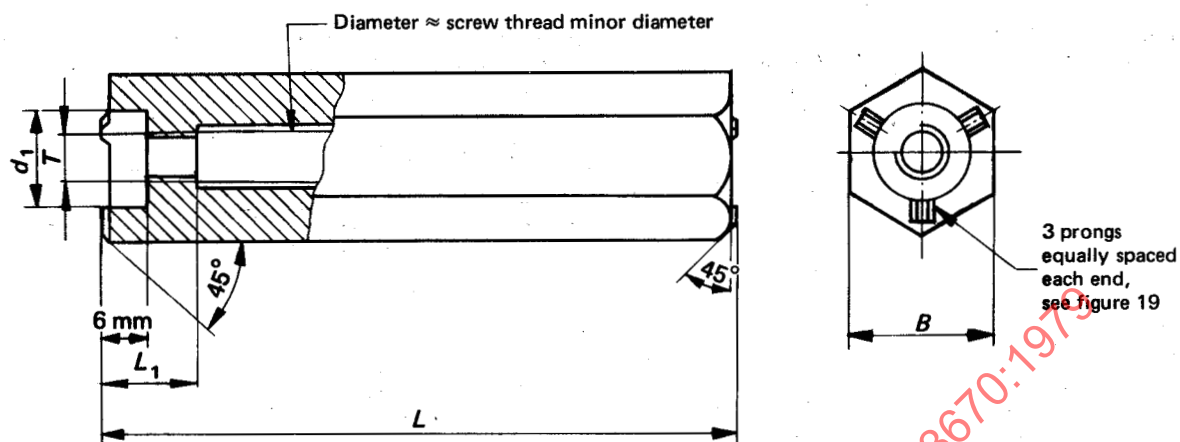


FIGURE 17 — Double-ended handle (size No. 8 only)

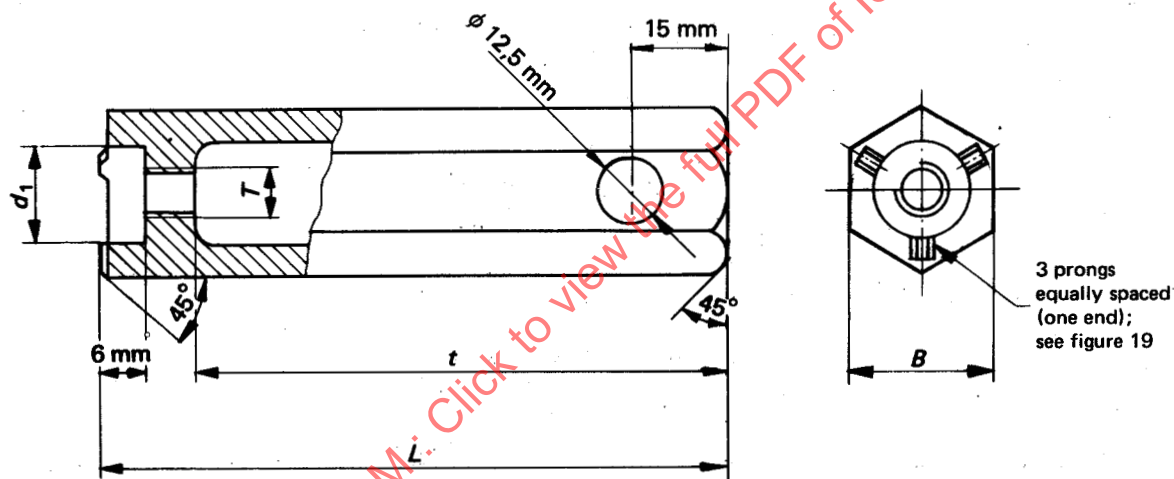


FIGURE 18 — Single-ended handles (sizes 8 and 9)

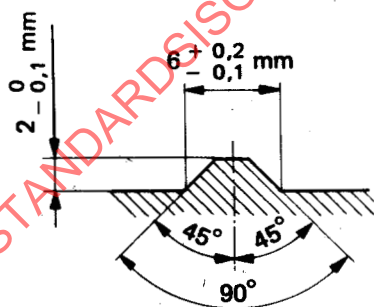


FIGURE 19 — Dimensions of prongs

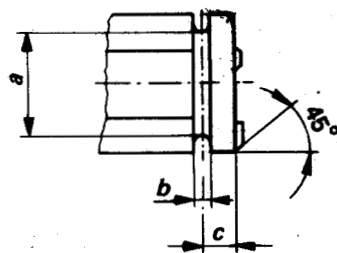


FIGURE 20 — Optional groove for NOT GO handles

TABLE 4 — General dimensions for handles

Dimensions in millimetres

Handle No.	B	L	t	d ₁	a	b	c	Thread T × pitch	L ₁
8	29	125	105	21	28	3	8	M12 × 1,25	31
9	32	150	120	24	31	3	16	M22 × 1,5	36

4.2.3 Fixing screws

The overall dimensions of the fixing screws shall be as given in table 5, except that other types of slots are permissible in place of the hexagon socket. The screws may be provided with clearance holes if required. The screw threads shall be made to 6g tolerances.

TABLE 5 — General dimensions for fixing screws

Dimensions in millimetres

Screw thread <i>d</i> × pitch	<i>D</i>	<i>k</i>	<i>s</i> *	<i>e</i> ≈	<i>t</i>	<i>R</i> ₁	<i>R</i> ₂	<i>b</i> min.	<i>L</i> min.
M12 × 1,25	18	4	6	7	5	0,6	1	25	40
M22 × 1,5	33	7	10	11,7	8	0,8	2	30	45

* A slot is permissible (see 4.2.3.)

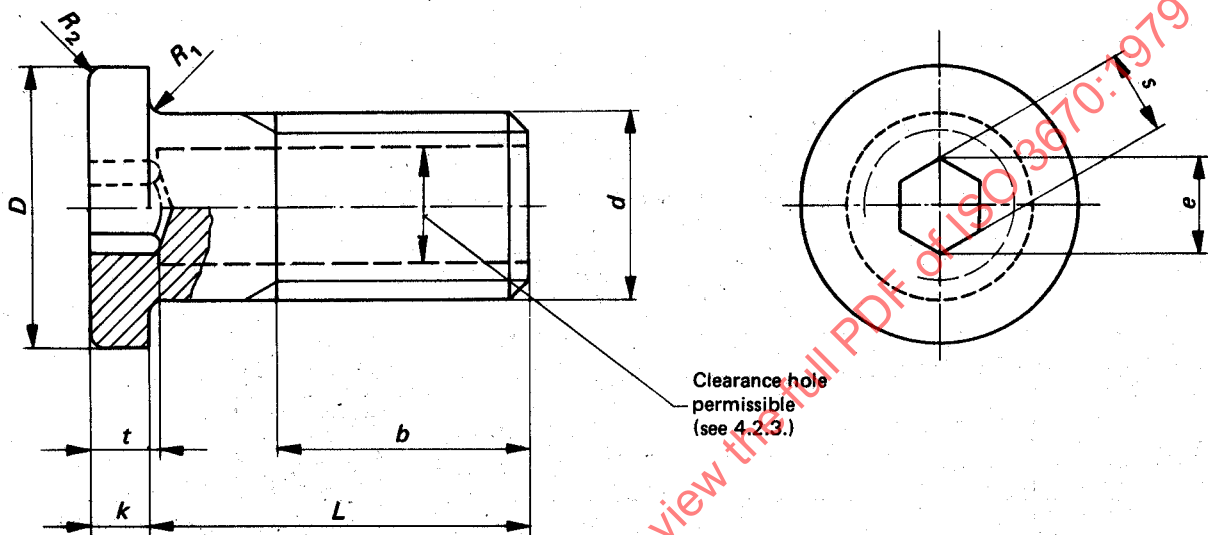


FIGURE 21 — Fixing screws

4.3 Trilock plain cylindrical plug gauging members

Gauging members shall be made of good quality steel and may be supplied in the soft or hard condition. Hardened blanks, more particularly those of the larger sizes, should be stabilized before they are completed.

The gauging members shall be machined to the general dimensions specified in table 6 with a finishing allowance where necessary. The amount of excess material left to allow for finishing to size is at the discretion of the manufacturer.

NOTE — When blanks are required hardened throughout, this should be specified by the purchaser.

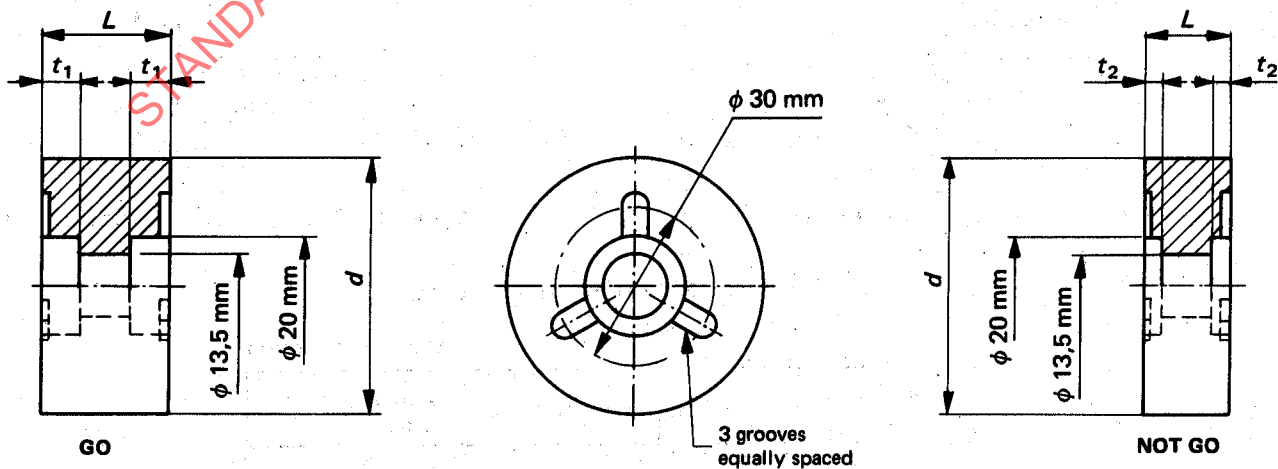


FIGURE 22 — GO and NOT GO gauging members :
above 40 mm up to and including 65 mm diameter

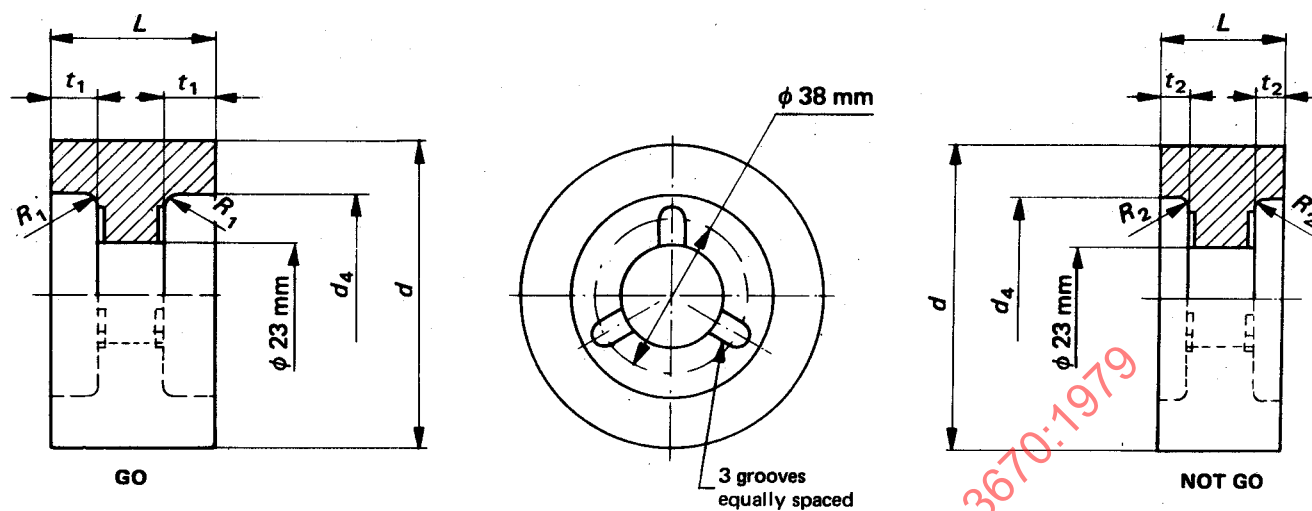


FIGURE 23 — GO and NOT GO gauging members:
above 65 mm up to and including 120 mm diameter

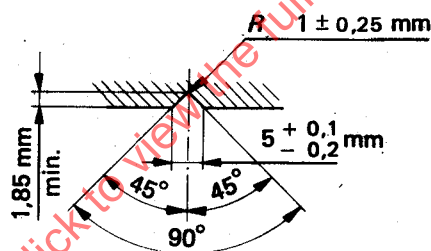


FIGURE 24 — Dimensions of grooves

TABLE 6 — General dimensions for trilock plain cylindrical plug gauging members

Dimensions in millimetres

Nominal diameter d		Handle No.	GO			NOT GO			d_4	Fixing screw thread $d \times \text{pitch}$
above	up to (incl.)		L	t_1	R_1	L	t_2	R_2		
(40)	50	8	25	8	—	18	5	—	—	M12 $\times$ 1,25
50	65	8	30	8	—	18	5	—	—	M12 $\times$ 1,25
65	80	9	35	10	5	25	8	5	48	M22 $\times$ 1,5
80	90	9	35	10	5	25	8	5	55	M22 $\times$ 1,5
90	95	9	35	10	5	25	8	5	60	M22 $\times$ 1,5
95	100	9	35	10	5	25	8	5	65	M22 $\times$ 1,5
100	110	9	35	10	5	25	8	5	75	M22 $\times$ 1,5
110	120	9	40	10	5	25	8	5	85	M22 $\times$ 1,5

4.4 Trilock screw plug gauging members

Gauging members shall be made of good quality steel and may be supplied in the soft or hard condition. Hardened blanks, more particularly those of the larger sizes, should be stabilized before they are completed.

NOTE — When blanks are required hardened throughout, for example for threading this should be specified by the purchaser.

The gauging members shall be machined to the general dimensions specified in table 7 with a finishing allowance

where necessary. The amount of excess material left to allow for finishing to size is at the discretion of the manufacturer.

The lengths of the blanks shown in table 7 are suitable for GO gauges of the pitches shown. If a blank is used for a finer pitch, the ends may be relieved if the number of threads is excessive. Blanks for NOT GO gauges shall be selected from the short or medium series so that there are not less than four complete threads when finished. The blank may be relieved at the ends if necessary. Lightening holes may be provided on sizes above 100 mm.

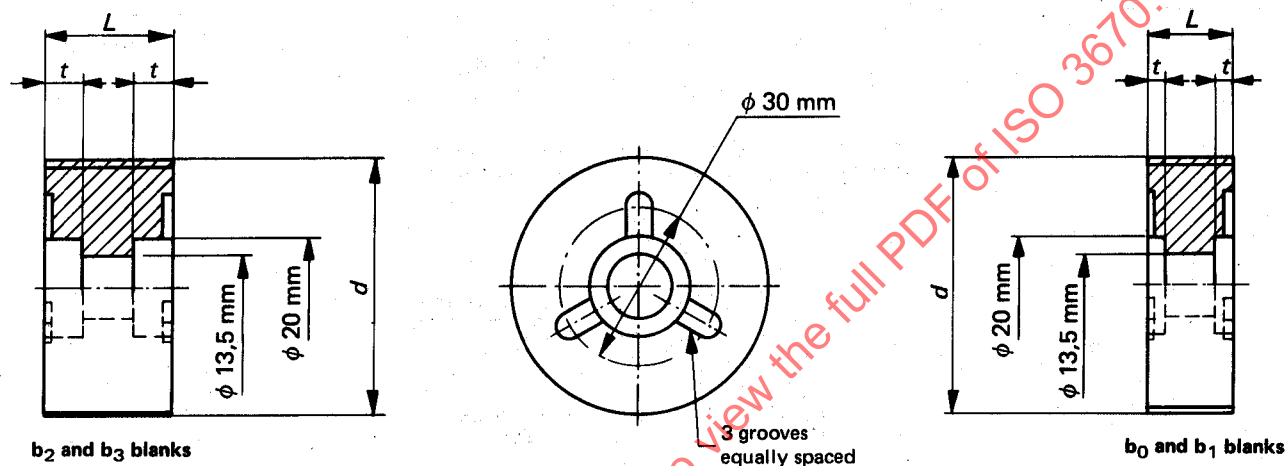


FIGURE 25 — GO and NOT GO gauging members :
above 39,5 mm up to and including 62 mm diameter

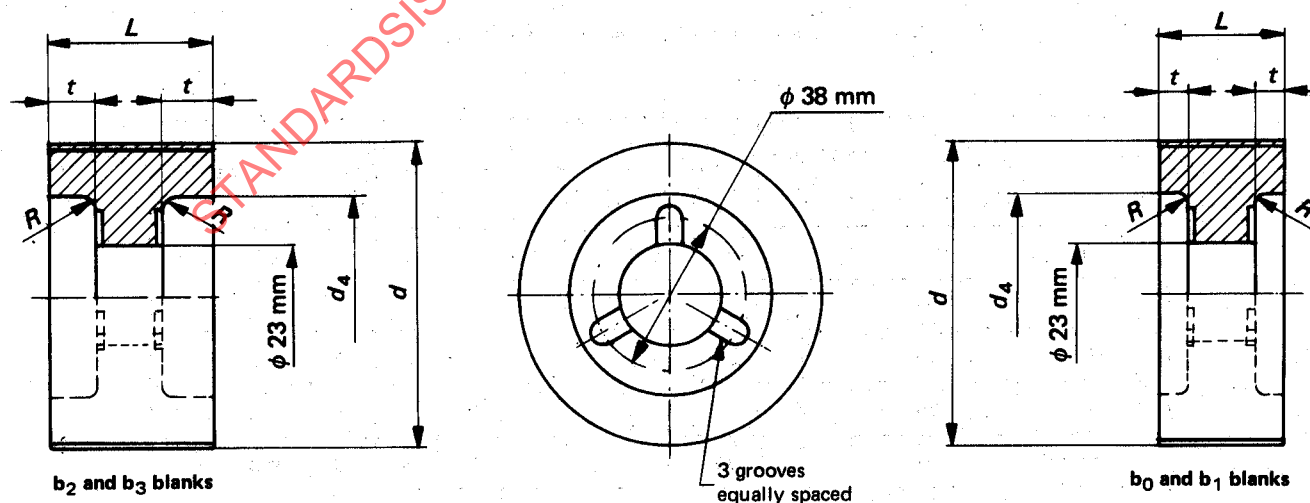


FIGURE 26 — GO and NOT GO gauging members :
above 62 mm up to and including 120 mm diameter

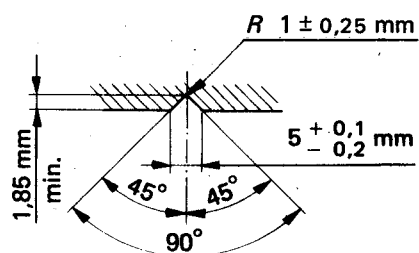


FIGURE 27 — Dimensions of grooves

TABLE 7 — General dimensions for trilock screw plug gauging members

Dimensions in millimetres

Nominal diameter d above up to (incl.)		Handle No.	Recess diameter d_4	R	Blank b_0 (Short series)			Blank b_1 (Medium series)			Blank b_2 (Long series)			Blank b_3 (Extra long series)		
					Pitches for GO gauges	L	t	Pitches for GO gauges	L	t	Pitches for GO gauges	L	t	Pitches for GO gauges	L	t
39,5	50	8	—		1,5 to 2	16	5	3	25	5	4	32	8	4,5 and 5	40	10
50	62	8	—		1,5 to 2	16	5	3	25	5	4	32	10	5 and 5,5	45	10
62	80	9	48	5	1,5 to 2	16	5	3	25	5	4	35	10	6	50	12
80	90	9	55	5	2	16	5	3	25	5	4	35	10	6	50	12
90	100	9	60	5	2	16	5	3	25	5	4	35	10	6	50	12
100	110	9	75	5	2	16	5	3	25	5	4	35	10	6	50	12
110	120	9	85	5	2	16	5	3	25	5	4	35	10	6	50	12

5 RING GAUGES

5.1 Plain ring gauges

The blanks shall be made of good quality steel and may be supplied in the soft or hard condition. Hardened blanks, more particularly those of the larger sizes, should be stabilized before they are completed.

NOTE — When blanks are required hardened throughout, this should be specified by the purchaser.

The blanks shall be machined to the general dimensions specified in table 8 with a finishing allowance where necessary. The amount of excess material left to

allow for finishing to size is at the discretion of the gauge manufacturer.

The blanks, the general dimensions of which are specified in table 8, are intended for general purpose gauges and for master gauges used as standards for reference purposes or for the setting of measuring instruments.

Two thicknesses are shown for each diameter range, the choice of thickness depending upon the application of the gauge. For example, in some circumstances it may be necessary to adhere strictly to the Taylor principle and use a GO ring gauge of a thickness equal to the length to be checked.

It is customary for a NOT GO gauge to be identified by means of a circular groove as shown in figure 29.

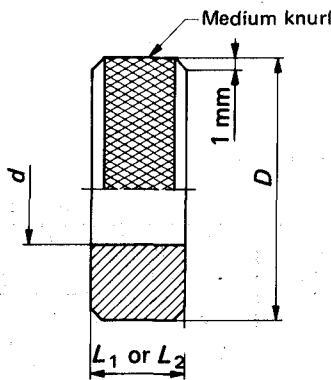


FIGURE 28 — GO gauge

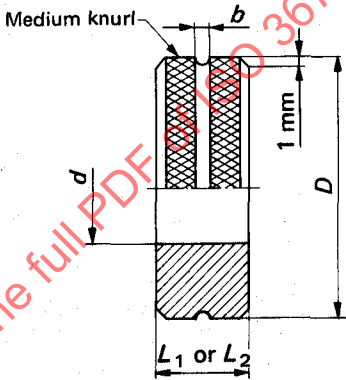


FIGURE 29 — Identification for NOT GO gauge

TABLE 8 — General dimensions for plain ring gauge blanks

Dimensions in millimetres

Nominal diameter <i>d</i>		External diameter <i>D</i>	Thickness <i>L</i> ₁	Thickness <i>L</i> ₂	<i>b</i> (NOT GO only)
above	up to (incl.)				
1*	2,5	16	4	6	1
2,5	5	22	5	10	1
5	10	32	8	12	1
10	15	38	10	14	2
15	20	45	12	16	2
20	25	53	14	18	2
25	32	63	16	20	2
32	40	71	18	24	2
40	50	85	20	32	3
50	60	100	20	32	3
60	70	112	24	32	3
70	80	125	24	32	3
80	90	140	24	32	3
90	100	160	24	32	3

* Included.

5.2 Screw ring gauges (solid type)

The blanks shall be made of good quality steel and machined to the general dimensions shown below with a finishing allowance where necessary.

Blanks up to and including 15 mm nominal diameter are left unhardened for thread cutting. Blanks above 15 mm diameter may be left unhardened for thread cutting or hardened and ground for completion by thread grinding. Blanks that are hardened shall be finished on the end faces and left undersize in the bore. The amount by which the bore is left undersize is at the discretion of the gauge manufacturer.

The lengths of blanks specified in table 9 are suitable for GO gauges of the pitches shown. If a blank is used for a finer pitch, it may be reduced in thickness or relieved if the number of threads would be excessive.

Blanks for NOT GO gauges shall be selected from the short or medium series so that there are not less than four complete threads when finished. The blank may be reduced in thickness or relieved if necessary.

It is customary for a NOT GO gauge to be identified by a circular groove as shown in figure 31.

Blanks for screw gauges up to and including 2,5 mm diameter with thickness *b*₀ or *b*₁ may be made from *L*₂ plain ring blanks reduced in thickness or relieved to leave not less than three complete threads on NOT GO gauges.