

Specification for

Screw gauge limits and tolerances —

Part 2: Gauges for screw threads of
Whitworth and BA forms

UDC 621.882.082:621.753:531.71

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This British Standard, having been approved by the Mechanical Engineering Industry Standards Committee, was published under the authority of the Executive Board on 9 November 1971

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First published, 1940
First revision, 1952
Second revision, 1971

The following BSI references relate to the work on this standard:
Committee reference MEE/57

SBN 580 06925 7

Amendments issued since publication

Amd. No.	Date	Comments

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Foreword

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 9,000, fully indexed and with a note of the contents of each, will be found in the BSI Catalogue which may be purchased from BSI Sales Department. The Catalogue may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

BS 84, *Parallel screw threads of Whitworth form.*

BS 811, *Cycle threads.*

BS 1044, *Gauge blanks.*

BS 2517, *Definitions for use in mechanical engineering.*

BS 919 was first published in 1940 and first revised in 1952. The most important difference between the two versions was the abolition of the concept of “inspection” and “workshop” gauges. The revision provided for General GO gauges with their tolerance zones inside the work limits and NOT GO effective diameter gauges with their tolerance zones outside the work limits to be used for both inspection and workshop purposes. Although Reference GO gauges with part of their tolerance zones outside the work limits were also provided, their use was restricted to the checking of Close class threads and control of the performance of General GO screw gauges; these gauges, which are retained in the present standard, should in no sense be regarded as the equivalent of the inspection gauge specified in the 1940 edition of BS 919.

In 1960 a standard covering gauges for screw threads of Unified form was published as BS 919-1 and an amendment was issued to remove all reference to Unified threads from the 1952 edition of BS 919 and change its title to BS 919-2, “Gauges for screw threads other than those of Unified form”. Since then, BS 919-3, “Gauges for ISO metric screw threads” has also been published, necessitating the deletion of all reference to metric (SI) threads.

It is accordingly felt that BS 919-2 should be brought up to date to include only the material relating to gauges for screw threads of Whitworth and BA forms. However, in view of the fact that BS 84 and BS 93 were rendered obsolescent in 1966, this standard should also be regarded as obsolescent and likely to be withdrawn when those two standards and any others relating to threads of those forms are made obsolete in due course.

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 28 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 Part of this British Standard relates to screw gauges for general and reference use and to setting plugs for screw ring and thread calliper gauges for checking threaded products.

The limits and tolerances recommended in this standard are intended to apply primarily to gauges for screw threads in the regular series such as BS Whit., BS Fine, BS Pipe (fastening threads), BA, BSC and BS Conduit. They may be applied also to gauges for any screw threads of Whitworth form. They are not applicable to gauges for Acme, buttress or round threads.

Provision is made for the following types of gauges and setting plugs:

- 1) *Screw gauges.*
 - a) Solid (non-adjustable) screw plug gauges, GO and NOT GO.
 - b) Solid and adjustable GO screw ring gauges.
 - c) Adjustable thread calliper gauges, GO and NOT GO.

NOTE NOT GO effective diameter ring gauges are also included since they have certain limited applications. In principle, however, their use is not recommended.

- 2) *Plain gauges.* Plain plug gauges and plain calliper gauges for the crests of threads.

NOTE Provision is made in the standard for both GO and NOT GO plain gauges, but GO plain gauges are normally required only in the case of threads where the corresponding GO screw gauges do not control the maximum metal condition at the crests of the threads of the product.

- 3) *Setting plugs.* Setting plugs for adjustable screw ring and thread calliper gauges, GO and NOT GO.

Recommendations are made regarding the designs of the gauges which form the subject of this standard.

No recommendations regarding the materials for gauges are made in this standard but for guidance a general note on hardness of gauges is included.

Information relating to the effective diameter equivalent of pitch and angle errors and to the thread form of NOT GO effective diameter gauges and setting plugs is given in appendices.

NOTE The titles of the British Standards referred to in this standard are listed on page ii.

2 Nomenclature

For definitions of terms, reference should be made to BS 2517.

3 Design

3.1 General. For general information on blanks suitable for both screw and plain gauges, reference should be made to BS 1044.

3.2 Feather edges. To avoid feather edges on screw plug and ring gauges and setting plugs, the partial thread at both ends of the gauge shall normally be removed to a blunt start. Not more than one complete turn of the thread shall be removed to the point where the full thread form is obtained.

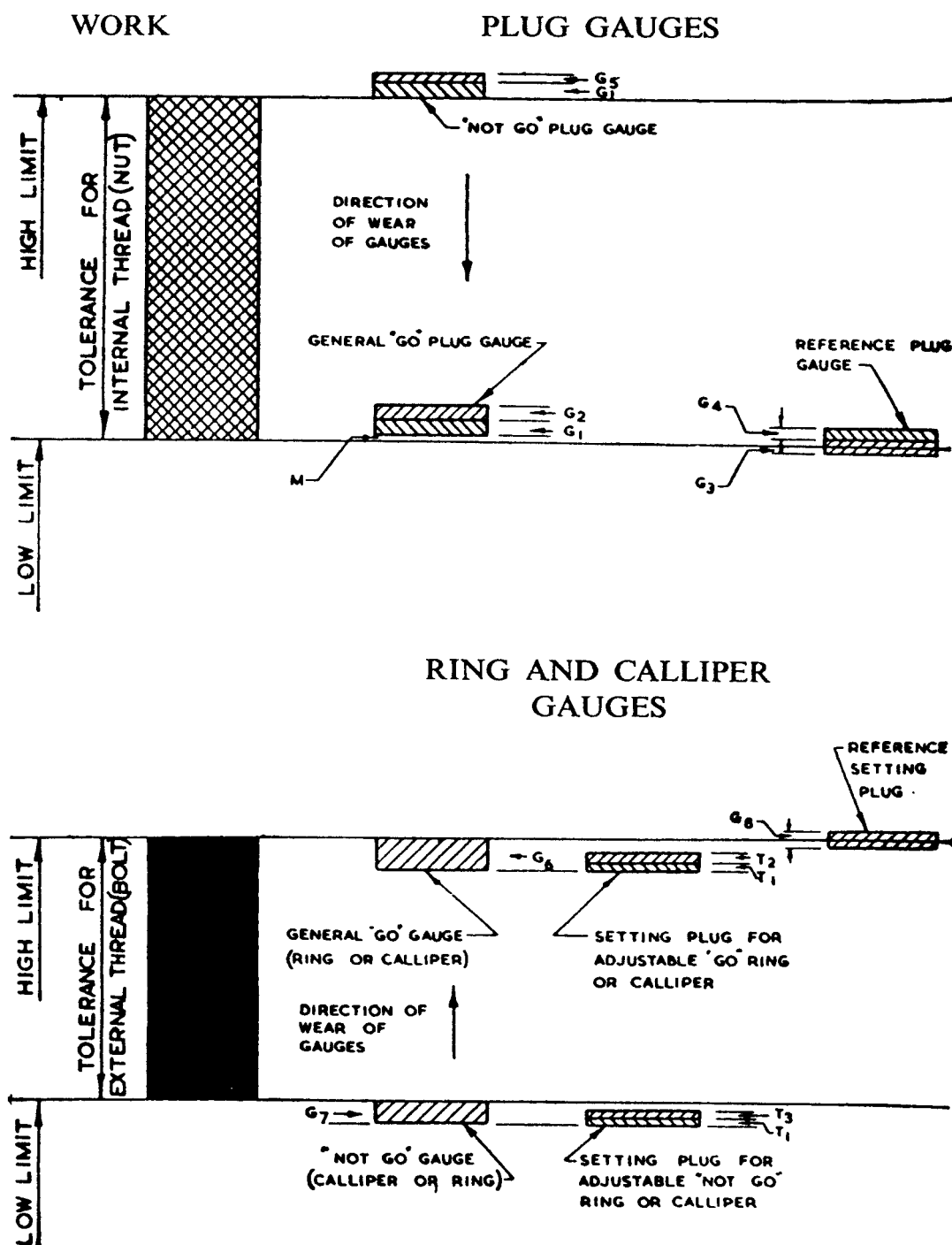
On screw ring gauges $\frac{1}{2}$ inch nominal size and smaller or with pitches of 20 threads per inch and finer and on all screw plug gauges and setting plugs with pitches of 28 threads per inch and finer, a 60° chamfer from the axis of the gauge is permitted in lieu of the removal of the partial thread.

On double length setting plugs with pitches of 28 threads per inch and coarser, where the truncated portion meets the full form portion, the feather edge shall be completely removed.

On screw plug gauges and setting plugs in sizes below 0.150 inch and/or with external cone centres, it is not considered necessary to remove the feather edge.

3.3 Dirt clearance grooves. When specified by the user, screw plug gauges shall have a dirt clearance groove cut axial to the thread to a depth slightly below the root of the thread. This groove should be cut at the position where the thread commences at its full section as described in **3.2**.

3.4 Removal of sharp edges. All undesirable sharp edges on the gauging portions and handles shall be removed.



M = margin for wear.

G_1 , G_3 and T_1 = tolerance on simple effective diameter.

G_5 and T_3 = tolerance on effective diameter equivalent of angle error.

G_2 , G_4 and T_2 = tolerance on effective diameter equivalent of pitch and angle errors.

G_6 , G_7 and G_8 = combined tolerance on effective diameter and effective diameter equivalent of pitch and angle errors.

Figure 1 — Disposition of effective diameter tolerance zones for screw gauges

4 Types of gauges and disposition of their tolerance zones

4.1 General GO screw gauges. General GO gauges, as their name implies, are intended for use both in the production and inspection of threaded work.

As shown in Figure 1, the tolerance zones for the effective diameter of General GO gauges are situated inside the corresponding zones of work tolerance. (See Appendix A for notes on the conventional method of showing tolerance zones.) A small margin within the work tolerance zone is provided for wear on GO screw plug gauges, and GO gauges should not be permitted to wear beyond the maximum metal limit for the work. General GO gauges are intended for use with all classes of threaded work except the following:

Whitworth, BS 84	Close fit.
BSC, BS 811	Close class.

GO gauges intended for checking the above classes of work should be made to the requirements specified for Reference gauges.

General GO gauges should be clearly marked “General” or more briefly “Gen”.

4.2 Reference GO screw gauges. Reference GO gauges are intended for use by manufacturers and inspectors as a control on the performance of their General GO screw gauges. Reference GO gauges are also intended for gauging work made to Close limits.

As shown in Figure 1, the Reference GO plug gauge limits and the Reference setting plug limits, for effective diameter, are disposed bilaterally about the maximum metal limits of the work (low limit for internal threads and high limit for external threads).

It is recommended that Reference GO screw ring gauges (solid or adjustable) and GO thread calliper gauges should be adjusted to size by fitting to Reference setting plugs. Such practice will render unnecessary any direct measurement of the diameter of the internal gauge.

No work should be rejected on final inspection unless it has failed to pass the Reference plug gauge in the case of internal threads, or a ring gauge set to a Reference setting plug in the case of external threads.

Reference GO gauges should be clearly marked “Reference” or more briefly “Ref”.

Reference type gauges are not considered necessary in the case of NOT GO screw gauges, plain plug and plain calliper gauges — GO and NOT GO.

4.3 NOT GO screw gauges. NOT GO gauges serve to ensure that the minimum metal limit prescribed for the work (high limit for internal threads and low limit for external threads) has not been exceeded.

The tolerance zones (effective diameter) for NOT GO effective diameter gauges are placed just outside the corresponding zones of work tolerance (see Figure 1). Any wear which NOT GO gauges may suffer will cause them to become gradually more stringent in the inspection of the work.

4.4 Setting plugs. Setting plugs are screw plug gauges to which adjustable screw ring gauges and thread calliper gauges are set. They have truncated crests and are cleared at the roots to ensure contact only on the flanks of the thread of the gauges. General setting plugs are provided for General GO gauges and Reference setting plugs for Reference GO gauges.

The tolerance zones for the effective diameters of both General and Reference setting plugs are shown in Figure 1.

Setting plugs should be clearly marked “General” or “Gen”, “Reference” or “Ref”, according to their purpose.

NOTE Too much emphasis cannot be laid on the importance of gauge users exercising vigilance in the effect of wear upon the sizes of gauges which they use. Adjustable screw ring and calliper gauges should be maintained within their limits by resetting to their setting plugs at suitable intervals.

5 Gauges for internal screw threads

5.1 GO screw plug gauges

5.1.1 Limits of tolerance. The limits of tolerance for General GO screw plug gauges are given in Table 1. The limits of tolerance for Reference GO screw plug gauges (and GO screw plug gauges for Close fits) are given in Table 2.

Table 1 and Table 2 show the effective diameter tolerance in two independent parts, one for the simple effective diameter and the other for the effective diameter equivalent of the errors present in the pitch and angle of gauges. This method of specifying the tolerance is adopted to ensure a reasonable life for the gauges.

NOTE Tables showing the effective diameter equivalent of errors in pitch and angle are given in Appendix B.

5.1.2 Form and length of thread. GO screw plug gauges should have the appropriate form of thread as shown in Figure 2.

The length of thread for normal purposes will be determined by the length given in BS 1044, unless the length of engagement of the components is exceptionally long, in which case the length of the gauge may be increased.

5.2 NOT GO effective diameter screw plug gauges

5.2.1 Limits of tolerance. The limits of tolerance for NOT GO effective diameter screw plug gauges for all classes of work are given in Table 3.

As in the case of GO screw plug gauges, the effective diameter tolerance is in two parts.

Ideally the NOT GO screw plug gauge should not enter the work. It may on occasion, however, at the discretion of the inspector, be permitted to enter, provided that on withdrawal disengagement takes place within two turns of thread.

5.2.2 Form and length of thread. The threads of NOT GO effective diameter screw plug gauges should be cleared at the crests and roots, as set out in Appendix C. The gauges shall be threaded over the full length of the appropriate blank, as given in BS 1044.

5.3 GO and NOT GO plain plug gauges

5.3.1 Limits of tolerance. The limits of tolerance for GO and NOT GO plain plug gauges for the minor (core) diameter of internal threads for all classes of work are given in Table 4.

NOTE GO plain plug gauges are not normally required for Whitworth and BA threads.

6 Gauges for external screw threads and their setting plugs

6.1 GO screw ring and thread calliper gauges

6.1.1 Limits of tolerance. The limits of tolerance for General GO screw ring gauges and GO thread calliper gauges are given in Table 5.

As already stated in Clause 4, it is recommended that Reference GO screw ring gauges (solid or adjustable) and GO thread calliper gauges should be adjusted to size by fitting to Reference setting plugs. A specific table of tolerances for Reference GO screw ring and thread calliper gauges has not therefore been provided. The tolerances shown in Table 2 for the effective diameter equivalent of pitch and angle errors for Reference GO screw plug gauges should be applied to Reference GO screw ring and thread calliper gauges.

6.1.2 Form and length of thread. GO screw ring and thread calliper gauges should have the appropriate form of thread as shown in Figure 2.

The length of thread of GO screw ring gauges for normal purposes will be determined by the length given in BS 1044, unless the length of engagement of the component is exceptionally long, in which case the length of the gauge may be increased.

6.2 NOT GO effective diameter screw ring and thread calliper gauges

6.2.1 Limits of tolerance. The limits of tolerance for NOT GO effective diameter screw ring and thread calliper gauges for all classes of work are given in Table 6.

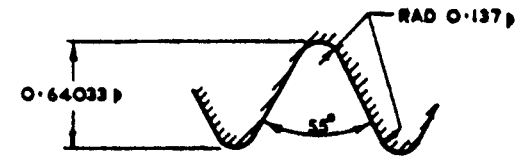
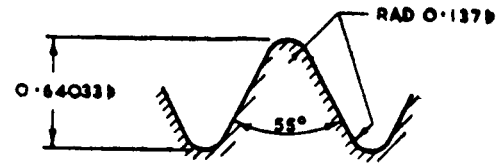
Ideally, the work should not enter the NOT GO screw ring gauge. It may on occasion, however, at the discretion of the inspector, be permitted to enter, provided that on withdrawal disengagement takes place within two turns of thread.

THREADS TO BE TESTED

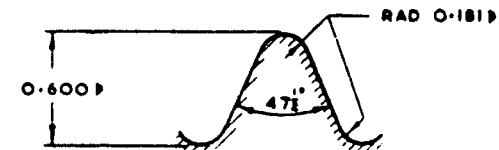
GO PLUG GAUGE

GO RING OR CALLIPER GAUGE

Whitworth
and
Truncated
Whitworth



B.A.



B.S.C.

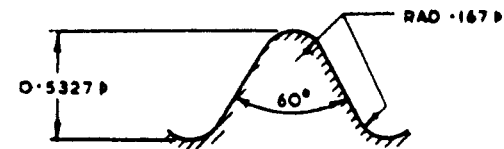
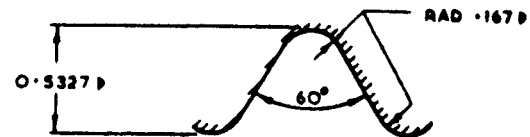


Figure 2 — Forms of thread of GO screw gauges

6.2.2 Form and length of thread. As in the case of the corresponding plug gauges, the threads of NOT GO effective diameter calliper and ring gauges should be cleared at the crests and roots (see Appendix C) and the length of thread should be limited to two or three pitches.

6.3 GO and NOT GO plain calliper gauges

6.3.1 Limits of tolerance. The limits of tolerance for General GO and NOT GO plain calliper gauges for the major (full) diameter of external threads for all classes of work are given in Table 7.

NOTE GO plain calliper gauges are not normally required for Whitworth and BA threads.

6.4 Setting plugs

6.4.1 Limits of tolerance. The effective diameter tolerances for setting plugs for General adjustable screw ring and thread calliper gauges are given in Table 8.

The effective diameter tolerances for setting plugs for Reference adjustable screw ring and thread calliper gauges are given in Table 9.

6.4.2 Form of thread. For form of thread, see Appendix C.

7 Marking

Gauges should be marked with the following particulars:

- 1) The size of the gauge, i.e. the actual limiting dimension of the work which it is intended to control.
- 2) The designation of the thread in accordance with the recommendations in the relevant screw thread standard. In the case of a screw gauge, if the thread is left hand, the symbol L.H. should follow the designation.
- 3) In the case of GO screw gauges and setting plugs, "General" or briefly "Gen", or "Reference" or briefly "Ref", as appropriate.
- 4) "GO" or "NOT GO".
- 5) The manufacturer's name or trade mark.
- 6) A serial number for record purposes.

Examples:

Class of gauge	Marking
GO screw plug gauges.	½ in BSF Ref., GO, EFF. 0.4600, X Co. No. 32.
NOT GO screw plug gauges.	½ in BSF Close, NOT GO, EFF. 0.4633, X Co. No. 51.
Plain plug gauges for minor diameter.	½ in BSF GO, 0.4200, X Co. No. 7..
	½ in BSF NOT GO, 0.4395, X Co. No. 17.
GO screw ring or thread calliper gauge.	½ in BSF Ref., GO, EFF. 0.4600, X Co. No. 24.
NOT GO thread calliper gauge.	½ in BSF Med., NOT GO, EFF. 0.4550, X Co. No. 33.
Plain calliper gauges for major diameter.	½ in BSF GO, 0.4985, X Co.
	½ in BSF NOT GO, 0.4910, X Co.

In the case of plug gauges of the renewable-end type, the marking should, where practicable, be on the end of the gauge member itself.

Where the size of the gauge is such that this cannot be done, the marking may be on the taper shank.

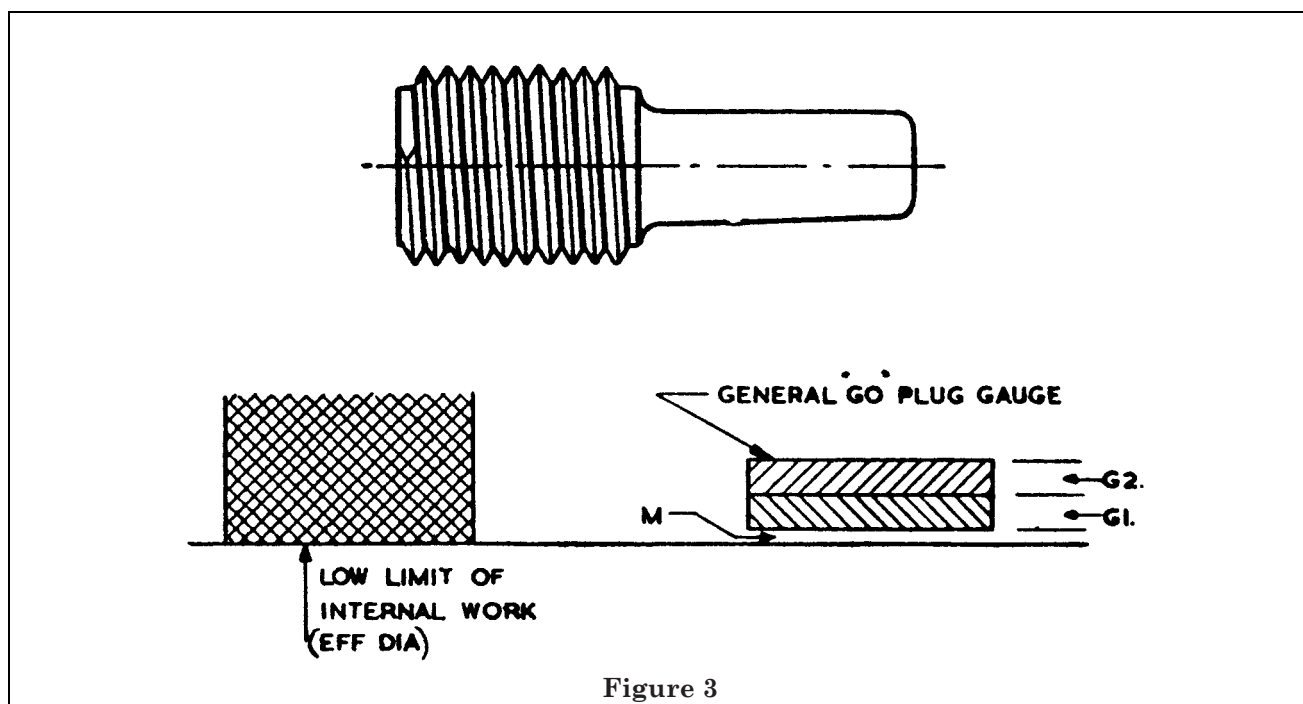
Handles for the renewable-end type of gauge or setting plug should be marked with same markings as the gauging members.

8 Hardness

In order to obtain the best results in service, a gauge should be hardened to the figure most appropriate to its type, size, number of threads per inch and to the steel from which it is made. Experience has shown that if the hardness of steel gauges is kept within the range 650 HV to 800 HV (57 HRC to 62 HRC) the threads do not easily burr, nor are they brittle.

Experience has also shown that the gauging surfaces of plain plug and plain calliper gauges should be hardened within the range 750 HV to 850 HV (61 HRC to 63 HRC).

Table 1 — General GO screw plug gauges



Limits of tolerance

Unit = 0.0001 in

Nominal size of gauge		Major diameter	Simple effective diameter (G1, Figure 3)	Effective diameter equivalent of pitch and angle errors (G2, Figure 3) (see Appendix B)						Minor diameter
Above	Up to and including			Any pitch	56-22 t.p.i.	20-13 t.p.i.	12-8 t.p.i.	7 and 6 t.p.i.	5-4 t.p.i.	
in	in									
	0.1	+ 5 + 2	+ 5 + 2	2						+ 5 - 2
0.1	0.5	+ 6 + 2	+ 6 + 2		3	4	5			+ 6 - 4
0.5	1.5	+ 7 + 2	+ 7 + 2		3	4	5	5		+ 7 - 5
1.5	3.0	+ 9 + 3	+ 9 + 3		4	5	6	6	7	+ 9 - 6
3.0	5.0	+ 10 + 3	+ 10 + 3			5	6	7	8	+ 10 - 7
5.0	8.0	+ 12 + 4	+ 12 + 4			5	6	7	8	+ 12 - 8
8.0	12.0	+ 14 + 5	+ 14 + 5				6	7	8	+ 14 - 8