

Australian Standard

DESIGNS FOR

GEOMETRIC LIMIT GAUGES

**(PLAIN AND SCREWED IN INCH
UNITS)**

The following scientific, industrial and governmental organizations and departments were officially represented on the committee entrusted with the preparation of this standard:

American Society of Tool and Manufacturing Engineers
Associated Chambers of Manufactures
Australian and New Zealand Railways Conferences
Department of the Army
Department of Supply
Division of Applied Physics, CSIRO
Electricity Supply Association of Australia
Federal Chamber of Automotive Industries
Metal Trades Employers Association
Petroleum Refinery Engineers Advisory Committee
The Institution of Engineers, Australia
The Institution of Production Engineers
The Tractor, Farm Machinery and Construction Equipment Association of Australia
Universities
Weapons Research Establishment

This standard, prepared by Committee ME/27, Metrology, was approved by the Mechanical Engineering Industry Standards Committee on behalf of the Council of the Standards Association of Australia on 16th November 1967.

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This standard was issued in draft form for public review as Doc. 903.

Australian Standard

DESIGNS FOR GEOMETRIC LIMIT GAUGES (PLAIN AND SCREWED IN INCH UNITS)

First issued (endorsement of BS 1044:1942)	1955
Revised	1968

PUBLISHED BY STANDARDS AUSTRALIA
(STANDARDS ASSOCIATION OF AUSTRALIA)
1 THE CRESCENT, HOMEBUSH, NSW 2140

PREFACE

This Australian standard was prepared by the Association’s Metrology Committee as a revision of AS B129—1955 which was the endorsement of BS 1044:1952, Recommended Designs for Plug, Ring and Gap Gauges. With the issue of BS 1044: Part 1:1964, Gauge Blanks: Part 1—Plug, Ring and Calliper Gauges, a proposal was circulated for public review that that standard be endorsed as a revised edition of AS B129. Because of the extent of the technical alterations that would have been necessary to meet Australian requirements, the committee decided against endorsement of BS 1044: Part 1, and agreed that a self-contained Australian standard should be prepared which would embrace material from both BS 1044 and the corresponding American standard USAS B47.1.

Whilst all the gauges in this standard, except adjustable gap and length gauges, are in agreement with BS 1044 and the latter types are from USAS B47.1, the text and the general arrangements of the material in the standard vary considerably from those two standards. The committee believes that the arrange-

ment adopted, which is based on logical groupings of gauges and their components, will greatly facilitate use of the standard.

The title of this standard differs from that of both BS 1044: Part 1 and USAS B47.1, and is closer to the tide of BS 1044:1952. The change was made because the committee considered that the expression “blank” used in the title of the British and American standards was a misnomer in relation to the variety of complex gauges specified in the standards.

Additions to this standard include an extensive series of definitions of gauges and components, and recommendations on the fields of use of particular types of gauge.

Detailed information on gauge manufacture and on verification of gauge accuracy is given in the publications “Notes on Gauge Making and Measuring” and “Notes on Screw Gauges”, prepared by the National Physical Laboratory U.K., and issued by Her Majesty’s Stationery Office under the authority of the Department of Scientific and Industrial Research.

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NOTE: It is intended to add sections on adjustable calliper screw gauges and on form gauges, which are now in course of preparation.

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
DESIGNS FOR
GEOMETRIC LIMIT GAUGES
(Plain and Screwed in Inch Units)

SECTION 1. GENERAL

1.1 SCOPE. This standard describes types and design features of commonly used limit gauges and specifies their main parameters and minimum quality requirements.

Only the features absolutely necessary to ensure interchangeability of parts, rigidity and stability of construction and ease and reliability of gauges in use are specified, further design details being left to individual designers.

The finished design of gauging members, including limits and tolerances, is outside the scope of this standard, and reference should be made to the following Australian standards:

- AS B195 Plain Limit Gauges, Limits and Tolerances
- AS B121 Screw Gauge Limits and Tolerances
- Part 1 Gauges for Screw Threads of Unified Form
- Part 2 Gauges for Screw Threads other than those of Unified Form
- Part 3 Gauges for ISO Metric Screw Threads*
- Part 4 Limits of Sizes for Gauges for Screw Threads of Unified Form; Diameters $\frac{1}{4}$ inch and larger.

1.2 TERMS AND DEFINITIONS.

1.2.1 Gauge—a tool or an instrument for the assessment of the magnitude and/or the correctness of various physical quantities, e.g. length, pressure, temperature, geometric form, strain.

1.2.2 Limit Gauge—a gauge designed in such a manner that it permits the assessment of whether a particular parameter of a particular product (or of a process) is within or outside the established limiting value (maximum or minimum).

1.2.3 Geometric Gauge—a gauge for the assessment of the correctness of a geometric form and/or a linear distance in relation to established allowable deviations (limiting sizes or enveloping surfaces).

1.2.4 GO and NOT GO Gauges. These are geometric limit gauges as defined in 1.2.2 and 1.2.3 above.

GO gauges are for verification of maximum material condition, which corresponds to maximum limiting sizes for shafts and minimum limiting sizes for holes.

NOT GO gauges are for verification of minimum material condition, which corresponds to minimum limiting sizes for shafts and maximum limiting sizes for holes.

1.2.5 Progressive Gauge—a geometric limit gauge in which GO and NOT GO are arranged in a manner permitting verification of both limits (maximum and minimum) in one measuring operation (one short movement).

1.2.6 Internal Gauge—a gauge for the assessment of correctness of an internal surface (including holes and internal threads).

1.2.7 External Gauge—a gauge for the assessment of correctness of an external surface (including shafts and external threads).

1.2.8 Gauging Surface—the working surface of the gauge, i.e. that surface of the gauge which is intended to control the dimension or form of the product subject to verification.

1.2.9 Gauging Member—the part of the gauge which incorporates the gauging surface.

1.2.10 Solid Gauge—a gauge made either from one piece of material or from permanently connected pieces of material.

1.2.11 Renewable Gauge—a composite gauge in which gauging member(s), handle and locking device are made as separate parts which can be easily joined together in a rigid assembly.

1.2.12 Adjustable Gauge—a renewable gauge with a provision allowing for adjustment (within a limited range) of the magnitude of the gauging distance.

1.2.13 Plug Gauge—an internal gauge of cylindrical or conical form, plain or screwed, used for verification of holes and internal threads, respectively. Plug gauges for larger holes and internal threads are mainly of the “annular” type.

1.2.14 Ring Gauge—an external gauge of cylindrical or conical form, plain or screwed, used for verification of shafts and external threads, respectively.

1.2.15 Segmental Gauge—a variation of the plug gauge comprising two diametrically opposite parts (comparatively small) of the gauging surface integrated into one rigid unit.

1.2.16 Rod (Pin) Gauge—an internal gauge in the form of a rod with spherical-ended gauging surfaces for gauging of a distance between two points of the same surface (e.g. diameter) or between two different surfaces.

1.2.17 Gap Gauge—an external gauge allowing for gauging of a distance between two points of the same surface (e.g. diameter) or between two different surfaces; may also be designed for gauging of curved profiles at a given distance (e.g. external screw threads).

1.2.18 Calliper Gauge—a term often used in application to gap gauges, particularly of the adjustable type.

1.2.19 Adjustable Length Gauge—a variation of the adjustable calliper gauge, suitable mainly for larger dimensions; may be either external or internal but usually the former.

* In course of preparation.

1.3 CLASSIFICATION OF GAUGES.

1.3.1 General. The gauges may be conveniently grouped in two major categories, gauges for internal measurements, and gauges for external measurements, with a further sub-division for types and styles, depending on their design features.

Most of the gauges may be used alternatively for gauging of plain cylindrical surfaces, or distances between two faces (or points), or surfaces with curved profiles (e.g. screw threads), depending on gauging surfaces (gauging members) employed. Some of the types, however, are of limited application for gauging of either plain or curved surfaces only.

1.3.2 Main Types of Internal Gauges. Internal gauges are most commonly used for gauging cylindrical holes or internal screw threads. Accordingly, the gauging members of these gauges are customarily made in the form of plain cylindrical or screwed plugs.

NOTE: In the past such plug gauges have often been made from one piece of metal, but these gauges are no longer commonly used, and are not included in this standard.

The gauging portion (gauging member) and the handle of the plug gauge are separate parts that can be joined together to form a rigid assembly secured by a suitable locking device. Such gauges are sometimes called renewable-end type gauges and, as the name implies, can be used for a range of gauging members.

The renewable gauges allow for easy change of gauging members in the case of damage, modification, and the like, without discarding the whole assembly. A further advantage lies in the fact that the handle need not be made of metal but may be of a suitable plastics material, thus reducing the weight and the cost of the gauge and the risk of heat transference.

For holes of larger diameters gauges of the plug type are too heavy and inconvenient in use; consequently, segmental gauges and rod-type gauges are used for such applications.

1.3.3 Main Types of External Gauges. As external gauges are most often used to assess the correctness (or otherwise) of cylindrical shafts, pins, and the like, and of external threads, their logical shape is that of ring or calliper gauges (plain or screwed) depending on whether they are GO or NOT GO gauges respectively.

It is, however, not always convenient to adopt the logical shape of gauge and NOT GO ring gauges and GO calliper gauges are often used.

Both ring gauges and calliper gauges may be of the solid or adjustable type. For large dimensions adjustable calliper gauges are used and these are commonly referred to as adjustable length gauges.

1.3.4 GO, NOT GO and Progressive Gauges. All geometric limit gauges are made for the assessment of either maximum or minimum limits of the part being gauged.

Depending on the type and design of the gauge it can incorporate a provision for gauging only one limit, gauging both limits in two separate movements (using two ends of the gauge), or gauging both limits in one movement (progressive gauges, i.e. GO and NOT GO on one side of the gauge).

Such gauges as solid plug and ring types, as well as segmental and rod type gauges, represent the varieties allowing for incorporation of one limit only.

The renewable end plug gauges and solid gap gauges are adaptable for either single limit or both limit gauges, one at each end.

The adjustable gap (calliper) gauges and length gauges are usually made as progressive gauges but can also be used for gauging one of the limits only.

1.3.5 Gauging Surface and Gauging. There is considerable difference in gauging by full plug or ring gauge compared with gauging by segmental gauge and an even greater difference when a rod-type or a gap gauge is used, but it is not the purpose of this standard to interpret the results of gauging in connection with various types of gauging surfaces and methods of gauging.

1.3.6 Standard Range of Gauges. Various types and styles of gauges are described and illustrated in Sections 2 and 3. A list of varieties and their main applications are given in Table 1 and more detailed information for each particular type is given in Sections 2 and 3.

1.4 GENERAL REQUIREMENTS.

1.4.1 Removal of Sharp Edges. All sharp edges should be blunted by chamfering or rounding unless they are specifically required to be sharp for purposes of gauging.

1.4.2 Centres. Centres for machining cylindrical parts of gauges should be kept undamaged and the mouth of the internal centre wherever practicable should be protected by a small recess $\frac{1}{32}$ in or $\frac{1}{16}$ in deep, as shown in Fig. 1.

1.4.3 Completeness on Delivery. Gauges may be supplied either in completely finished condition or finished with the exception of gauging members which may then be supplied in hard or soft condition.

NOTES:

1. When blanks of gauging members are required to be hardened throughout, e.g. for threading, this should be specified by the purchaser.
2. When ordering completely finished gauges the purchaser must also specify the appropriate relevant gauging details such as flatness of gauging surfaces, thread form, parallelism of gauging surfaces, squareness of gauging surfaces, hardness, surface finish, gauge limits and tolerances, etc.

1.4.4 Stabilization. When supplied in finished condition or as hardened blanks the gauges should be stabilized.

A recommended stabilizing treatment is to heat the gauges to 150°C and maintain them at this temperature for approximately 10 hours followed by slow cooling.

1.4.5 Dirt Grooves. It is necessary for plug screw gauges to have a dirt clearing groove cut parallel with the axis of the thread to a depth of slightly below the root of the thread. This groove should be cut at the point where the full depth thread commences.

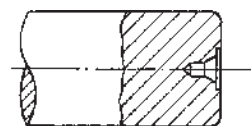


Fig. 1. PROTECTED CENTRE

Table 1. LIST OF STANDARD GAUGES AND THEIR MAIN CHARACTERISTICS

1	2	3	4	5	6	7	8	9	10	11	12
GROUP	Type	For Gauging the Following Surfaces					Suitable for			Usual Range of Nominal Sizes (inches)	
		Cylindrical		Conical*		Flat and Parallel	Single Limit Gauges	Both Limits on One Gauge	Pro- gressive Gauges		
		Plain	Screwed	Plain	Screwed					Plain Gauge	Screw Gauge
INTERNAL GAUGES	Collet	Yes	Yes	Yes	Yes	No	Yes	Yes	No	0.015-0.760	0.030-0.760
	Taper Lock	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	0.059-2.510	
	Trilock	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	1.510-8.010	
	Annular	Yes	Yes	Yes	Yes	No	Yes†	No	No	8.010-12.010	
	Segmental	Yes	No	No	No	No	Yes	No	No	1.260-8.010	—
	Spherical Ended Rod‡	No	No	No	No	Yes	Yes	No	No	0.510-12.010	—
EXTERNAL GAUGES	Solid Ring	Yes	Yes	Yes	Yes	No	Yes	No	No	Up to 12.260	
	Adjustable Ring	No	Yes	No	No	No	Yes	No	No	—	0.059-8.010
	Solid Gap	Yes	No	No	No	No	Yes	Yes	Yes	0.250-10.760	—
	Adjustable Calliper	Yes	Yes	No	No	No	Yes	Yes	Yes	Up to 12.000	
	Adjustable Length	No	No	No	No	Yes	Yes	Yes	Yes	—	—

* No details are given in this standard for the design of conical gauging members owing to the infinite variations possible. The design of conical gauging members must be agreed between purchaser and manufacturer for each specific application.

† Not recommended for NOT GO plain cylindrical gauges.

‡ Sometimes made as an adjustable gauge.

SECTION 2. INTERNAL GAUGES

2.1 COLLET PLUG GAUGES (range 0.015-0.760 in)

2.1.1 Use and Range of Collet Gauges. For details of the uses and range of collet type gauges see Table 1.

2.1.2 General Features. The collet type design of plug gauge is convenient and economical for small diameters.

The gauge consists of a wire type gauging member (or members) held firmly in a collet type handle of suitable proportions. The gauging member may be extended from the handle and reversed to increase the useful life of the gauge.

Dimensions and tolerances have been established for handles and collets to accommodate any diameter of plugs, within the range, together with normal lengths for given ranges of diameters of wire type plugs.

When gauging members are worn out or discarded for any other reason, new gauging members may be fitted to the handles.

NOTE: This is an economical feature since, with reasonable care, the handles will last indefinitely.

2.1.3 Handles. Handles for collet type gauges are hexagonal with clamping nuts and are provided in both single end and double end types. They may be of unhardened steel, light alloy or plastics material, but plastics handles should be provided with steel sleeves.

The lengths recommended for the handles of plug gauges are those suitable for gauges for normal applications.

Where gauges have to be used in confined situations, longer or shorter handles may be desirable.

2.1.4 Collets. It is recommended that collets for collet type gauges in sizes 1W and 2W be made of brass and those for the larger sizes of aluminium.

2.1.5 Details of Construction. Basic data for design details of collet type gauges are given in the following figures and tables:

Fig. 2—Double-end type.

Fig. 3—Single-end type converted from double-end type.

Fig. 4—Single-end type.

Table 2—Plug gauge handles—designations, ranges, main dimensions.

Fig. 5 and Table 3—Double-end type handle body.

Fig. 6 and Table 4—Single-end type handle body.

Fig. 7 and Table 5—Clamping nut.

Fig. 8 and Table 6—Collet-bushing.

Fig. 9 and Table 7—Capping nut.

Fig. 10 and Table 8—Cylindrical plug gauging member.

Fig. 11 and Table 9—Screw plug gauging member.

COLLET PLUG GAUGES

WITH PLAIN PLUG GAUGING MEMBERS
Range: Above 0.015 in up to and including 0.760 in

WITH SCREW PLUG GAUGING MEMBERS
Range: Above 0.030 in up to and including 0.760 in

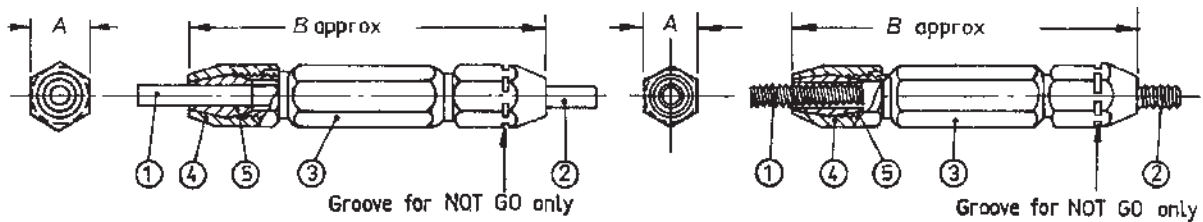


Fig. 2. DOUBLE-END TYPE

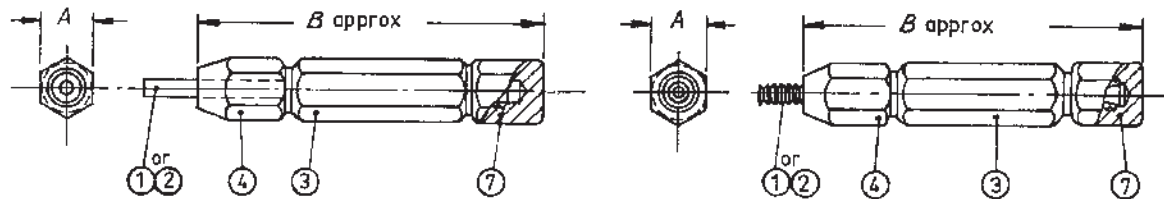


Fig. 3. SINGLE-END TYPE CONVERTED FROM DOUBLE-END

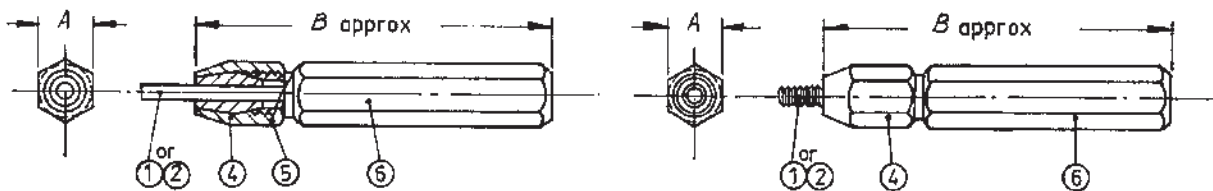


Fig. 4. SINGLE-END TYPE

LEGEND TO FIGS 2, 3 and 4

- | | |
|----------------------------------|----------------------------------|
| 1. GO gauging member | 4. Clamping nut |
| 2. NOT GO gauging member | 5. Collet bushing |
| 3. Double-end collet type handle | 6. Single-end collet type handle |
| 7. Capping nut | |

Table 2. COLLET TYPE PLUG GAUGE HANDLES—
DESIGNATIONS, RANGES, MAIN DIMENSIONS

INCHES						
1	2	3	4	5	6	7
Handle size No.			Size range, nominal		A	B
Double end	Single end S*	Single end A†	Above	Up to and including		
1W	1W-S	1W-A	0.015	0.075	1/4	1 ²⁹ / ₃₂
2W	2W-S	2W-A	0.075	0.180	3/8	2 ¹⁵ / ₃₂
3W	3W-S	3W-A	0.180	0.281	9/16	3 ¹ / ₈
4W	4W-S	4W-A	0.281	0.406	1 ¹ / ₁₆	3 ¹⁹ / ₃₂
5W	5W-S	5W-A	0.406	0.510	1 ³ / ₁₆	4 ³ / ₁₆
6W	6W-S	6W-A	0.510	0.635	1 ⁵ / ₁₆	4 ¹⁷ / ₃₂
7W	7W-S	7W-A	0.635	0.760	1 ¹ / ₁₆	4 ²¹ / ₃₂

* Style "S" is single-end only.

† Style "A" is converted from double-end gauge.

COLLET PLUG GAUGES (continued)

DOUBLE-END TYPE HANDLE BODY

Fig. 5

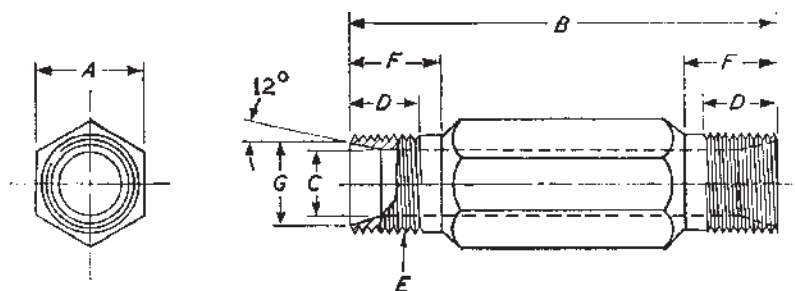


Table 3

INCHES

1	2	3	4	5	6	7	8	9	10
Handle size No.	Size range, nominal		A	B	C	D	E	F	G
	Above	Up to and including							
1W	0.015	0.075	$\frac{1}{4}$	$\frac{15}{16}$	$\frac{3}{32}$	$\frac{9}{32}$	12-32 UNEF-2A	$\frac{21}{64}$	0.151
2W	0.075	0.180	$\frac{3}{8}$	$1\frac{27}{32}$	$\frac{3}{16}$	$\frac{5}{16}$	$\frac{5}{16}$ -32 UNEF-2A	$\frac{7}{16}$	0.235
3W	0.180	0.281	$\frac{9}{16}$	$2\frac{1}{8}$	$\frac{19}{64}$	$\frac{13}{32}$	$\frac{1}{2}$ -28 UNEF-2A	$\frac{1}{2}$	0.348
4W	0.281	0.406	$\frac{11}{16}$	$2\frac{19}{32}$	$\frac{27}{64}$	$\frac{7}{16}$	$\frac{5}{8}$ -28 UN-2A	$\frac{5}{8}$	0.473
5W	0.406	0.510	$\frac{13}{16}$	$3\frac{1}{16}$	$\frac{33}{64}$	$\frac{5}{8}$	$\frac{3}{4}$ -28 UN-2A	$\frac{3}{4}$	0.588
6W	0.510	0.635	$\frac{15}{16}$	$3\frac{1}{4}$	$\frac{41}{64}$	$\frac{5}{8}$	$\frac{7}{8}$ -28 UN-2A	$\frac{3}{4}$	0.740
7W	0.635	0.760	$1\frac{1}{16}$	$3\frac{3}{8}$	$\frac{49}{64}$	$\frac{5}{8}$	1-28 UN-2A	$\frac{3}{4}$	0.865

SINGLE-END TYPE HANDLE BODY

Fig. 6

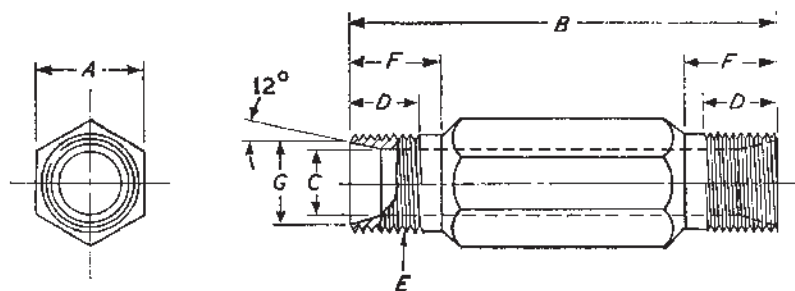


Table 4

INCHES

1	2	3	4	5	6	7	8	9	10
Handle size No.	Size range, nominal		A	B	C	D	E	F	G
	Above	Up to and including							
1W-S	0.015	0.075	$\frac{1}{4}$	$1\frac{5}{8}$	$\frac{3}{32}$	$\frac{9}{32}$	12-32 UNEF-2A	$\frac{21}{64}$	0.151
2W-S	0.075	0.180	$\frac{3}{8}$	$2\frac{5}{32}$	$\frac{3}{16}$	$\frac{5}{16}$	$\frac{5}{16}$ -32 UNEF-2A	$\frac{7}{16}$	0.235
3W-S	0.180	0.281	$\frac{9}{16}$	$2\frac{5}{8}$	$\frac{19}{64}$	$\frac{13}{32}$	$\frac{1}{2}$ -28 UNEF-2A	$\frac{1}{2}$	0.348
4W-S	0.281	0.406	$\frac{11}{16}$	$3\frac{3}{32}$	$\frac{27}{64}$	$\frac{7}{16}$	$\frac{5}{8}$ -28 UN-2A	$\frac{5}{8}$	0.473
5W-S	0.406	0.510	$\frac{13}{16}$	$3\frac{5}{8}$	$\frac{33}{64}$	$\frac{5}{8}$	$\frac{3}{4}$ -28 UN-2A	$\frac{3}{4}$	0.588
6W-S	0.510	0.635	$\frac{15}{16}$	$3\frac{7}{8}$	$\frac{41}{64}$	$\frac{5}{8}$	$\frac{7}{8}$ -28 UN-2A	$\frac{3}{4}$	0.740
7W-S	0.635	0.760	$1\frac{1}{16}$	4	$\frac{49}{64}$	$\frac{5}{8}$	1-28 UN-2A	$\frac{3}{4}$	0.865

COLLET PLUG GAUGES (continued)

CLAMPING NUT

Fig. 7

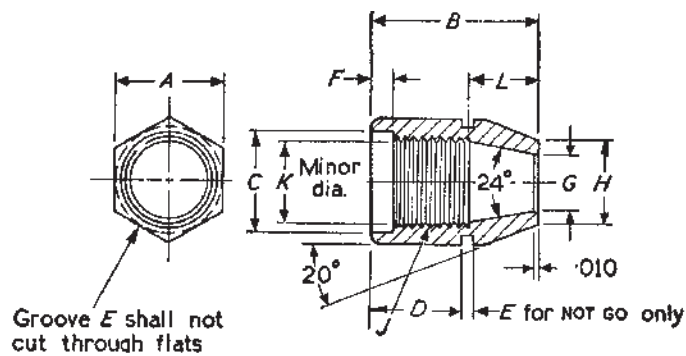


Table 5

INCHES

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Handle size No.	Size range, nominal		A	B	C	D	E	F	G	H	J	K	L
	Above	Up to and including											
1W	0.015	0.075	1/4	9/16	0.220 0.230	11/32	1/32	3/32	0.083 0.078	7/32	12-32 UNEF-2B	0.182 2 0.189 5	5/32
2W	0.075	0.180	3/8	11/16	0.316 0.326	7/16	1/32	1/8	0.190 0.185	5/16	5/16-32 UNEF-2B	0.278 7 0.286 1	7/32
3W	0.180	0.281	9/16	15/16	0.504 0.514	1/2	1/16	1/8	0.290 0.285	7/16	1/2-28 UNEF-2B	0.461 3 0.469 7	13/32
4W	0.281	0.406	11/16	1 1/16	0.630 0.640	5/8	1/16	1/4	0.417 0.412	9/16	5/8-28 UN-2B	0.586 3 0.594 7	7/16
5W	0.406	0.510	13/16	1 1/4	0.755 0.765	3/4	1/16	3/16	0.520 0.515	21/32	3/4-28 UN-2B	0.711 3 0.719 7	1/2
6W	0.510	0.635	15/16	1 9/32	0.880 0.890	13/16	1/16	3/16	0.645 0.640	3/4	7/8-28 UN-2B	0.836 3 0.844 7	1/2
7W	0.635	0.760	1 1/16	1 9/32	1.005 1.015	13/16	1/16	3/16	0.770 0.765	7/8	1-28 UN-2B	0.961 3 0.969 7	1/2

COLLET PLUG GAUGES (continued)

COLLET BUSHING

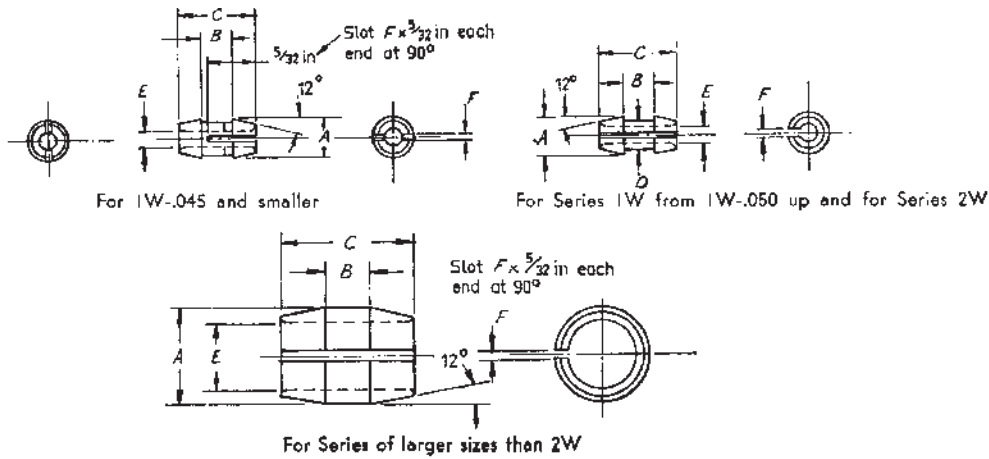


Table 6

INCHES

1	2	3	4	5	6	7	1	2	3	4	5	6	7
Collet No. (E dia.)	Size range nom.	A	B	C	D	F	Collet No. (E dia.)	Size range nom.	A	B	C	D	F
		min. max.	min. max.			min. max.			min. max.	min. max.			min. max.
1W-.020	0.015-0.020						4W-.291	0.281-0.291					
1W-.025	0.020-0.025						4W-.301	0.291-0.301					
1W-.030	0.025-0.030	0.162	0.059	17/64	3/32	0.010	4W-.311	0.301-0.311					
1W-.035	0.030-0.035	0.168	0.065			0.020	4W-.321	0.311-0.321					
1W-.040	0.035-0.040						4W-.331	0.321-0.331					
1W-.045	0.040-0.045						4W-.341	0.331-0.341	0.512	0.153	17/32	—	0.038
1W-.050	0.045-0.050						4W-.351	0.341-0.351	0.518	0.159			0.058
1W-.055	0.050-0.055						4W-.361	0.351-0.361					
1W-.060	0.055-0.060	0.162	0.059	17/64	1/8	0.015	4W-.371	0.361-0.371					
1W-.065	0.060-0.065	0.168	0.065			0.035	4W-.382	0.371-0.382					
1W-.070	0.065-0.070						4W-.394	0.382-0.394					
1W-.075	0.070-0.075						4W-.406	0.394-0.406					
2W-.082	0.075-0.082						5W-.420	0.406-0.420					
2W-.089	0.082-0.089						5W-.436	0.420-0.436					
2W-.096	0.089-0.096	0.237	0.184	13/32	5/32	0.025	5W-.450	0.436-0.450					
2W-.103	0.096-0.103	0.243	0.190			0.045	5W-.465	0.450-0.465	0.637	0.153	19/32	—	0.052
2W-.110	0.103-0.110						5W-.480	0.465-0.480	0.643	0.159			0.072
2W-.117	0.110-0.117						5W-.495	0.480-0.495					
2W-.124	0.117-0.124						5W-.510	0.495-0.510					
2W-.131	0.124-0.131						6W-.532	0.510-0.532					
2W-.138	0.131-0.138						6W-.547	0.532-0.547					
2W-.145	0.138-0.145	0.237	0.184	13/32	7/32	0.025	6W-.563	0.547-0.563					
2W-.152	0.145-0.152	0.243	0.190			0.045	6W-.579	0.563-0.579	0.782	0.168	11/16	—	0.052
2W-.159	0.152-0.159						6W-.594	0.579-0.594	0.788	0.174			0.072
2W-.166	0.159-0.166						6W-.610	0.594-0.610					
2W-.173	0.166-0.173						6W-.625	0.610-0.625					
2W-.180	0.173-0.180						6W-.640	0.625-0.640					
3W-.188	0.180-0.188						7W-.656	0.640-0.656					
3W-.196	0.188-0.196						7W-.672	0.656-0.672					
3W-.204	0.196-0.204						7W-.688	0.672-0.688					
3W-.212	0.204-0.212						7W-.704	0.688-0.704	0.903	0.168	11/16	—	0.115
3W-.220	0.212-0.220						7W-.719	0.704-0.719	0.909	0.174			0.135
3W-.228	0.220-0.228	0.392	0.153	9/16	—	0.038	7W-.735	0.719-0.735					
3W-.236	0.228-0.236	0.398	0.159			0.058	7W-.750	0.735-0.750					
3W-.244	0.236-0.244						7W-.760	0.750-0.765					
3W-.252	0.244-0.252												
3W-.261	0.252-0.261												
3W-.271	0.261-0.271												
3W-.281	0.271-0.281												

NOTE. Collets to be adjustable for any plug within the respective size ranges tabulated.

COLLET PLUG GAUGES (continued)

CAPPING NUT

Table 7

INCHES

1	2	3	4	5	6	7	8	9	10
Handle size No.	Size range, nominal		A	B	C	D	F	J	K (minor diameter)
	Above	Up to and including							
1W-A	0.015	0.075	1/4	5/8	0.220 0.230	5/16	3/32	12-32 UNEF-2B	0.182 2 0.189 5
2W-A	0.075	0.180	3/8	11/16	0.316 0.326	3/8	1/8	5/16-32 UNEF-2B	0.278 7 0.286 1
3W-A	0.180	0.281	9/16	15/16	0.504 0.514	7/16	1/8	1/2-28 UNEF-2B	0.461 3 0.469 7
4W-A	0.281	0.406	11/16	1 1/16	0.630 0.640	9/16	1/4	5/8-28 UN-2B	0.586 3 0.594 7
5W-A	0.406	0.510	13/16	1 1/4	0.755 0.765	11/16	3/16	3/4-28 UN-2B	0.711 3 0.719 7
6W-A	0.510	0.635	15/16	1 9/32	0.880 0.890	11/16	3/16	7/8-28 UN-2B	0.836 3 0.844 7
7W-A	0.635	0.760	1 1/16	1 9/32	1.005 1.015	1 1/16	3/16	1-28 UN-2B	0.961 3 0.969 7

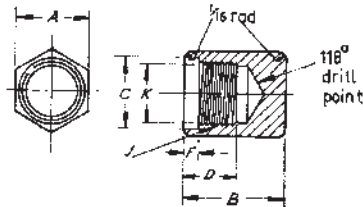


Fig. 9

CYLINDRICAL PLUG GAUGING MEMBER
 Range: Above 0.015 in up to and including 0.760 in

Table 8

INCHES

1	2	3	4
Size range, nominal		GO and NOT GO length A	Handle No.
Above	Up to and including		
0.015	0.075	1*	1W, 1W-S or 1W-A
0.075	0.180	1 1/4*	2W, 2W-S or 2W-A
0.180	0.281	1 1/2*	3W, 3W-S or 3W-A
0.281	0.406	1 3/4*	4W, 4W-S or 4W-A
0.406	0.510	2	5W, 5W-S or 5W-A
0.510	0.635	2	6W, 6W-S or 6W-A
0.635	0.760	2	7W, 7W-S or 7W-A

* These are minimum lengths; commercially available lengths exceeding these values are acceptable as alternatives.

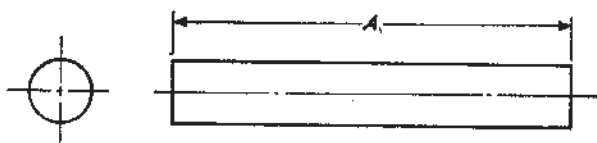


Fig. 10

SCREW PLUG GAUGING MEMBER
 Range: Above 0.030 in up to and including 0.760 in

Table 9

INCHES

1	2	3	4	5
Size range, nominal		Length A*		Handle No.
Above	Up to and including	GO	NOT GO	
0.030	0.075	1/2	1/2	1W, 1W-S or 1W-A
0.075	0.130	5/8	5/8	2W, 2W-S or 2W-A
0.130	0.180	3/4	3/4	2W, 2W-S or 2W-A
0.180	0.281	7/8	7/8	3W, 3W-S or 3W-A
0.281	0.320	1	1	4W, 4W-S or 4W-A
0.320	0.406	1 1/8	1 1/8	4W, 4W-S or 4W-A
0.406	0.450	1 1/4	1 1/4	5W, 5W-S or 5W-A
0.450	0.510	1 3/8	1 3/8	5W, 5W-S or 5W-A
0.510	0.635	1 1/2	1 3/8	6W, 6W-S or 6W-A
0.635	0.760	1 3/4	1 3/8	7W, 7W-S or 7W-A

* These lengths apply to standard and special diameter/pitch combinations not covered by Table 13. Lengths shown for A in the ranges up to and including 0.510 in are minimum lengths; commercially available lengths exceeding these values are acceptable as alternatives.

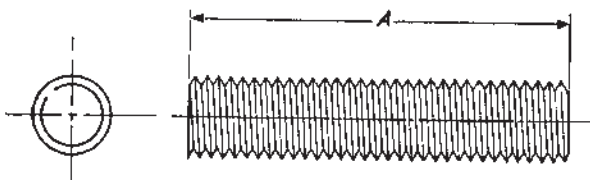


Fig. 11

NOTE. Centres (external or internal) to be retained.

2.2 TAPER LOCK PLUG GAUGES (range 0.059-2.510 in)

2.2.1 Use and Range of Taper Lock Gauges. For details of the uses and range of taper lock gauges, see Table 1.

2.2.2 General Features. The gauging member has a taper shank which is fitted into a taper hole in the handle. When properly made and assembled, the taper lock gauge possesses the rigidity of a solid gauge and is entirely free of shake. A drift slot or hole is provided near one end of each handle to enable the gauging members 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.

In sizes up to and including 0.240 in a groove is provided near one end of the handle to designate 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 groove is omitted as being unnecessary in sizes above 0.240 in.

2.2.3 Interchangeability of Parts. 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.*

2.2.4 Handles. Handles for taper lock gauges are hexagonal and are provided in both single-end and double-end types. They may be of unhardened steel, light alloy or plastics material, but plastics handles should be provided with steel sleeves.

2.2.5 Details of Construction. Basic data for design details of taper lock gauges are given in the following figures and tables:

Figs 12 and 13—Plain cylindrical plug type.

Fig. 14—Screw gauge type assembly.

Figs 15 and 16—Handles.

Table 10—Handles—designations, ranges, main dimensions.

Figs 17 to 21 and Table 11—Plain cylindrical plug gauging member.

Figs 22 to 24 and Table 12—Screw plug and single length setting plug gauging members.

Figs 25 to 27 and Table 13—Fine pitch instrument thread plug gauging members.

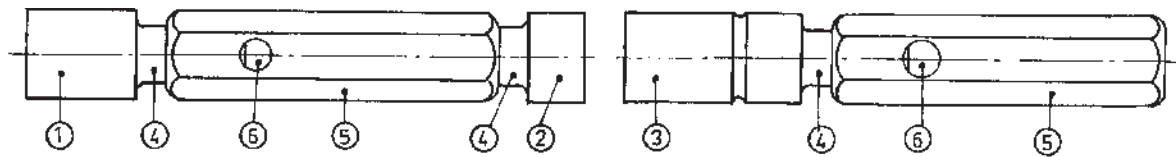
Fig. 28 and Table 14—Double length setting plug gauging members.

* For check gauges for taper lock gauging members and handles see Appendix A.

TAPER LOCK PLUG GAUGES

PLAIN CYLINDRICAL AND SCREW PLUG GAUGES

Range: Above 0.059 in up to and including 2.510 in



Figs 12 and 13. PLAIN CYLINDRICAL TYPE

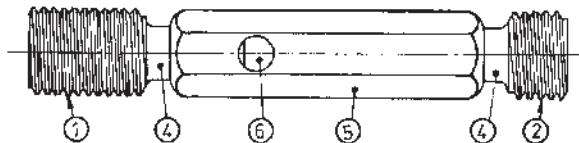


Fig. 14. SCREW TYPE

LEGEND TO FIGS 12, 13 AND 14

- | | |
|-------------------------------|-----------------------|
| 1. GO gauging member | 4. Shank |
| 2. NOT GO gauging member | 5. Taper lock handle |
| 3. Progressive gauging member | 6. Drift slot or hole |

TAPER LOCK HANDLES

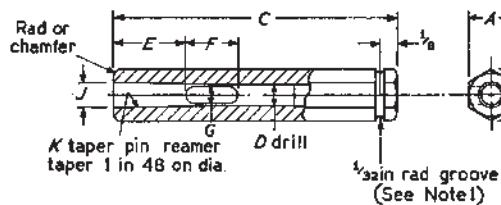


Fig. 15. HANDLES Nos. 000, 00, 0 AND 1

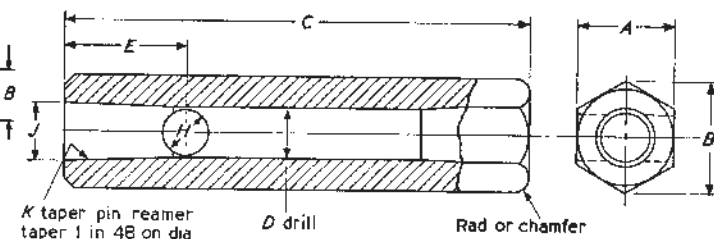


Fig. 16. HANDLES Nos. 2, 3, 4 and 5

Table 10. TAPER LOCK GAUGE HANDLES—DESIGNATIONS, RANGES, MAIN DIMENSIONS

INCHES														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Handle No.	Size range, nominal		General dimensions											
	Above	Up to and including	A (See Note 2)		B max.	C	D Drill size	E	F	G	H dia.	J		K Nom. size of standard taper pin reamer (see Note 3)
												min.	max.	
000	0.059	0.105	3/16	0.193	0.223	1 1/2	2.8 mm	7/16	1/4	5/64	—	0.125	0.126	1/8
00	0.105	0.150	1/4	0.248	0.289	1 3/4	3.5 mm	15/32	5/16	3/32	—	0.155	0.156	5/32
0	0.150	0.240	5/16	0.324	0.374	2	4.1 mm	1/2	3/8	1/8	—	0.180	0.181	3/16
1	0.240	0.365	3/8	0.365	0.433	2 3/4	7/32 in	17/32	1/2	1/8	—	0.239	0.240	1/4
2	0.365	0.510	1/2	0.525	0.604	3	7.4 mm	25/32	—	—	15/64	0.309	0.310	5/16
3	0.510	0.825	11/16	0.710	0.820	3 1/4	25/64 in	27/32	—	—	11/32	0.409	0.410	—
4	0.825	1.135	7/8	0.920	1.062	3 5/8	37/64 in	1	—	—	3/8	0.609	0.610	—
*5	1.135	2.510	1 1/8	1.100	1.299	4	25/32 in	1 1/8	—	—	7/16	0.809	0.810	—

* See Table 15 for an alternative trilock handle for gauges in the size range above 1.510 in up to and including 2.510 in.

NOTES:

1. This groove is machined only in handles Nos. 000, 00, and 0. Its purpose is to distinguish the NOT GO end of the gauge.
2. The dimensions given in column 4 are in accord with those of the American standard. The dimensions given in column 5 are those of standard hexagon bars as specified in BS 970, Wrought Steels, and may be used as an alternative to the dimensions given in column 4.
3. Particulars of standard taper pin reamers of these sizes are given in AS B43, Milling Cutters and Reamers.

PLAIN CYLINDRICAL PLUG GAUGING MEMBERS
Range: Above 0.059 in up to and including 2.510 in

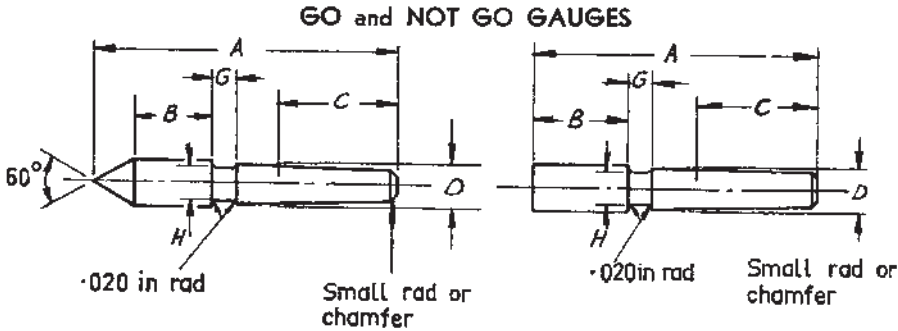


Fig. 17. UP TO AND INCLUDING 0.150 in DIA.

Fig. 18. ABOVE 0.150 in TO AND INCLUDING 0.510 in DIA.

- NOTES:
- 1. Shank taper in all cases 1 in 48 on dia.
 - 2. Dimensions G and H on all gauges: as required.

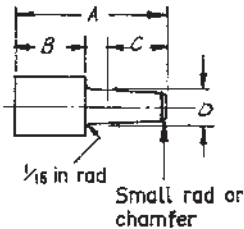


Fig. 19. ABOVE 0.510 in TO AND INCLUDING 2.510 in DIA.

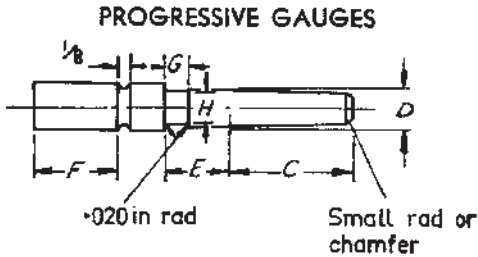


Fig. 20. ABOVE 0.240 in TO AND INCLUDING 0.510 in DIA.

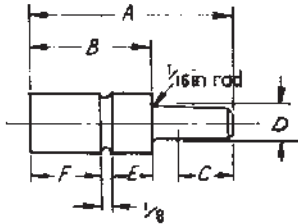


Fig. 21. ABOVE 0.510 in TO AND INCLUDING 2.510 in DIA.

Table 11

INCHES

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Size range, nominal		General dimensions																		Handle No.
Above	Up to and including	GO						NOT GO						Progressive						
		A	B	C	D		A	B	C	D		A	B	C	D		E	F		
					max.	min.				max.	min.				max.	min.				
0.059	0.105	1 ⁵ / ₃₂	3 ⁸ / ₈	1 ² / ₂	0.126	0.125	3 ¹ / ₃₂	3 ¹⁶ / ₁₆	1 ² / ₂	0.126	0.125	—	—	—	—	—	—	—	000	
0.105	0.150	1 ¹¹ / ₃₂	7 ¹⁶ / ₁₆	9 ¹⁶ / ₁₆	0.156	0.155	1 ¹ / ₈	7 ³² / ₃₂	9 ¹⁶ / ₁₆	0.156	0.155	—	—	—	—	—	—	—	00	
0.150	0.240	1 ¹⁵ / ₃₂	19 ³² / ₃₂	5 ⁸ / ₈	0.181	0.180	1 ⁵ / ₃₂	9 ³² / ₃₂	5 ⁸ / ₈	0.181	0.180	—	—	—	—	—	—	—	0	
0.240	0.365	1 ³ / ₄	3 ⁴ / ₄	3 ⁴ / ₄	0.240	0.239	1 ⁵ / ₁₆	5 ¹⁶ / ₁₆	3 ⁴ / ₄	0.240	0.239	2 ³ / ₁₆	1 ³ / ₁₆	3 ⁴ / ₄	0.240	0.239	5 ¹⁶ / ₁₆	3 ⁴ / ₄	1	
0.365	0.510	2	1	3 ⁴ / ₄	0.310	0.309	1 ³ / ₈	3 ⁸ / ₈	3 ⁴ / ₄	0.310	0.309	2 ¹ / ₂	1 ¹ / ₂	3 ⁴ / ₄	0.310	0.309	3 ⁸ / ₈	1	2	
0.510	0.825	2 ¹ / ₄	1 ¹ / ₄	3 ⁴ / ₄	0.410	0.409	1 ¹ / ₂	1 ² / ₂	3 ⁴ / ₄	0.410	0.409	2 ⁷ / ₈	1 ⁷ / ₈	3 ⁴ / ₄	0.410	0.409	1 ² / ₂	1 ¹ / ₄	3	
0.825	1.135	2 ⁹ / ₁₆	1 ³ / ₈	7 ⁸ / ₈	0.610	0.609	1 ¹³ / ₁₆	5 ⁸ / ₈	7 ⁸ / ₈	0.610	0.609	3 ⁵ / ₁₆	2 ¹ / ₈	7 ⁸ / ₈	0.610	0.609	5 ⁸ / ₈	1 ³ / ₄	4	
1.135	1.510	2 ⁷ / ₈	1 ¹ / ₂	1	0.810	0.809	2 ¹ / ₈	3 ⁴ / ₄	1	0.810	0.809	3 ³ / ₄	2 ³ / ₈	1	0.810	0.809	3 ⁴ / ₄	1 ¹ / ₂	5	
1.510	2.510	2 ⁷ / ₈	1 ¹ / ₂	1	0.810	0.809	2 ¹ / ₈	3 ⁴ / ₄	1	0.810	0.809	—	—	—	—	—	—	—	5	

* Alternative to Trilock design for this range.

TAPER LOCK PLUG GAUGES (continued)
SCREW PLUG AND SINGLE LENGTH SETTING PLUG GAUGING MEMBERS
 Range: Above 0.059 in up to and including 2.510 in

GO AND NOT GO GAUGES

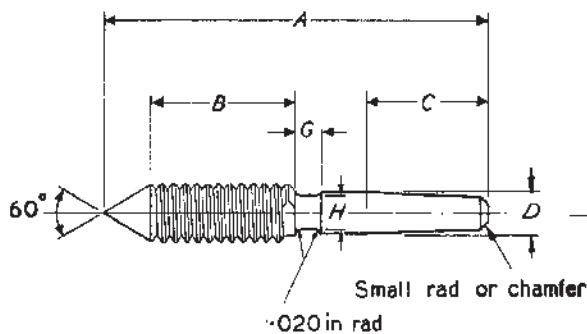
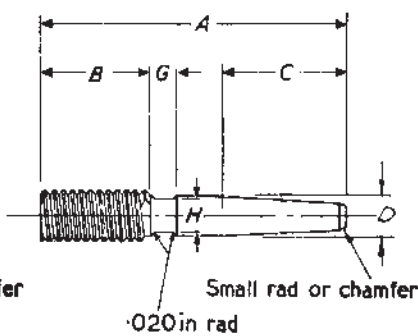
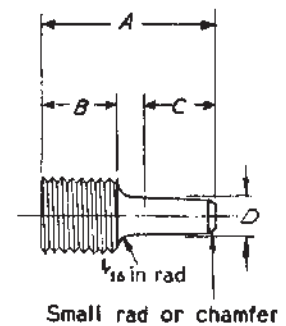


Fig. 22. UP TO AND INCLUDING 0.150 in DIA.

Fig. 23. ABOVE 0.150 in
UP TO AND
INCLUDING
0.510 in DIA.Fig. 24. ABOVE 0.510 in
UP TO AND
INCLUDING
2.510 in DIA.

NOTES:

1. Shank taper in all cases 1 in 48 on diameter.
2. Dimensions G and H on all gauges: As required.
3. H to be undercut to root of thread when thread is formed.

Table 12

INCHES

1	2	3	4	5	6	7	8	9	10	11	12	13
Size range, nominal		General dimensions										Handle No.
Above	Up to and including	GO					NOT GO					
		A	B	C	D		A	B	C	D		
					max.	min.				max.	min.	
0.030	0.105	1 ¹ / ₃₂	1 ¹ / ₄	1 ¹ / ₂	0.126	0.125	3 ¹ / ₃₂	3 ¹ / ₁₆	1 ¹ / ₂	0.126	0.125	000
0.105	0.150	1 ⁷ / ₃₂	5 ⁵ / ₁₆	9 ⁹ / ₁₆	0.156	0.155	1 ¹ / ₈	7 ⁷ / ₃₂	9 ⁹ / ₁₆	0.156	0.155	00
0.150	0.240	1 ⁹ / ₃₂	13 ¹³ / ₃₂	5 ⁵ / ₈	0.181	0.180	1 ⁵ / ₃₂	9 ⁹ / ₃₂	5 ⁵ / ₈	0.181	0.180	0
0.240	0.365	1 ¹ / ₂	1 ¹ / ₂	3 ³ / ₄	0.240	0.239	1 ⁵ / ₁₆	5 ⁵ / ₁₆	3 ³ / ₄	0.240	0.239	1
0.365	0.510	1 ³ / ₄	3 ³ / ₄	3 ³ / ₄	0.310	0.309	1 ³ / ₈	3 ³ / ₈	3 ³ / ₄	0.310	0.309	2
0.510	0.825	1 ⁷ / ₈	7 ⁷ / ₈	3 ³ / ₄	0.410	0.409	1 ¹ / ₂	1 ¹ / ₂	3 ³ / ₄	0.410	0.409	3
0.825	1.135	2 ³ / ₁₆	1	7 ⁷ / ₈	0.610	0.609	1 ¹³ / ₁₆	5 ⁵ / ₈	7 ⁷ / ₈	0.610	0.609	4
1.135	2.510	2 ³ / ₈ *	1*	1	0.810	0.809	2 ¹ / ₈	3 ³ / ₄	1	0.810	0.809	5

* For pitches coarser than 12 t.p.i. these lengths are increased to 2⁵/₈ in and 1¹/₄ in respectively.

TAPER LOCK PLUG GAUGES (continued)
FINE PITCH INSTRUMENT THREAD PLUG GAUGING MEMBERS
 Range: Above 0.059 in up to and including 2.510 in

GO AND NOT GO GAUGES

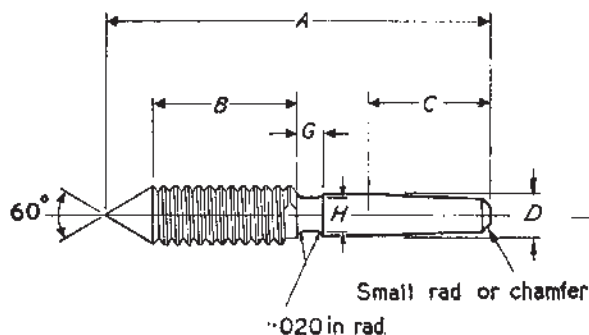


Fig. 25. UP TO AND INCLUDING 0.150 in DIA.

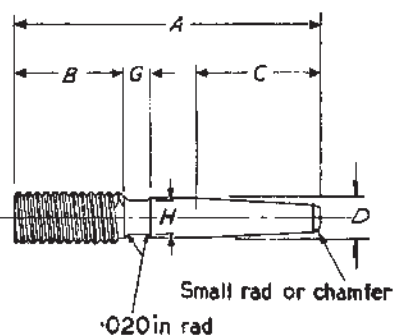


Fig. 26. ABOVE 0.150 in
UP TO AND
INCLUDING
0.510 in DIA.

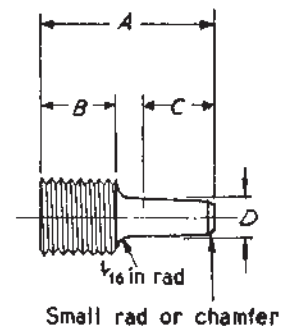


Fig. 27. ABOVE 0.510 in
UP TO AND
INCLUDING
2.510 in DIA.

NOTES:

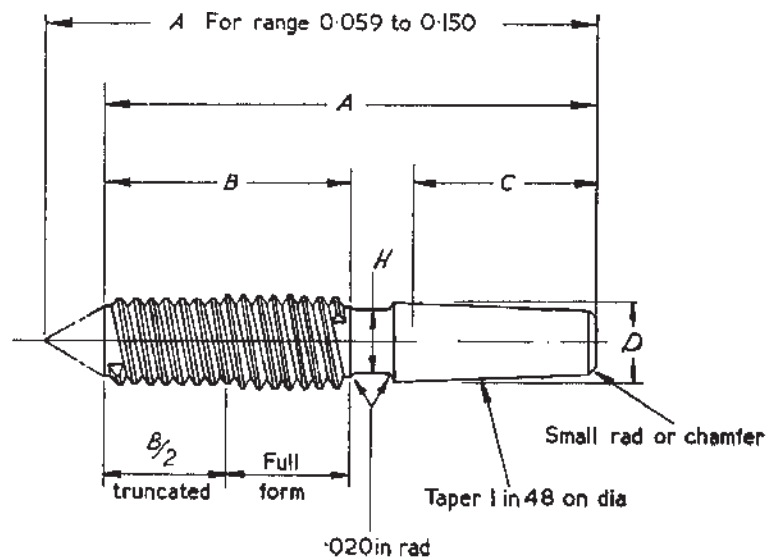
1. Shank taper in all cases 1 in 48 on diameter.
2. Dimensions *G* and *H* on all gauges: As required.
3. *H* to be undercut to root of thread when thread is formed.

Table 13

INCHES														
1	2	3		4	5	6	7	8	9	10	11	12	13	14
Diameters and pitches				General dimensions										Handle No.
Size range, nominal		No. of threads per inch or metric pitch		GO					NOT GO					
Above	Up to and including			A	B	C	D		A	B	C	D		
		max.	min.				max.	min.						
0.059	0.105	80 t.p.i.	0.3 mm	31/32	3/16	1/2	0.126	0.125	29/32	1/8	1/2	0.126	0.125	000
0.105	0.150	60 t.p.i.	0.4 mm	1 1/8	7/32	9/16	0.156	0.155	1 1/16	5/32	9/16	0.156	0.155	00
0.150	0.240	48 t.p.i.	0.5 mm	1 5/32	9/32	5/8	0.181	0.180	1 3/32	7/32	5/8	0.181	0.180	0
0.240	0.365	40 t.p.i.	0.6 mm	1 5/16	5/16	3/4	0.240	0.239	1 1/4	1/4	3/4	0.240	0.239	1
0.365	0.510	36 t.p.i.	0.7 mm	1 3/8	3/8	3/4	0.310	0.309	1 5/16	5/16	3/4	0.310	0.309	2
0.510	0.825	32 t.p.i.	0.8 mm	1 1/2	1/2	3/4	0.410	0.409	1 3/8	3/8	3/4	0.410	0.409	3
0.825	1.135	28 t.p.i.	0.9 mm	1 13/16	5/8	7/8	0.610	0.609	1 5/8	7/16	7/8	0.610	0.609	4
1.135	2.510	28 t.p.i.	0.9 mm	2 1/8	3/4	1	0.810	0.809	1 7/8	1/2	1	0.810	0.809	5

TAPER LOCK PLUG GAUGES (continued)
DOUBLE LENGTH SETTING PLUG GAUGING MEMBERS
 Range: Above 0.059 in up to and including 2.510 in dia.

Fig. 28



NOTE: Dimension H as required, and is to be undercut to root of thread when thread is formed.

Table 14

INCHES

1	2	3	4	5	6	7		8	9	10	11	12	13
Size range, nominal		General dimensions											Handle No.
Above	Up to and including	For thin rings		For thick rings		For fine pitch instrument thread rings			C	D			
		A	B	A	B	No. of threads per inch or metric pitch	A	B		max.	min.		
						Finer than							
0.059	0.090	1	7/32	—	—	—	—	—	—	1/2	0.126	0.125	000
0.090	0.105	15/32	3/8	—	—	—	—	—	—	1/2	0.126	0.125	000
0.105	0.150	19/32	3/8	—	—	—	—	—	—	9/16	0.156	0.155	00
0.150	0.240	19/32	13/32	—	—	—	—	—	—	5/8	0.181	0.180	0
0.240	0.365	13/4	3/4	—	—	40 t.p.i.	0.6 mm	19/16	9/16	3/4	0.240	0.239	1
0.365	0.510	2	1	—	—	36 t.p.i.	0.7 mm	111/16	11/16	3/4	0.310	0.309	2
0.510	0.825	21/4	11/4	27/8	17/8	32 t.p.i.	0.8 mm	2	1	3/4	0.410	0.409	3
0.825	1.135	211/16	11/2	35/16	21/8	28 t.p.i.	0.9 mm	25/16	11/8	7/8	0.610	0.609	4
1.135	1.510	3	15/8	33/4	23/8	28 t.p.i.	0.9 mm	211/16	15/16	1	0.810	0.809	5
1.510	2.010	31/4	17/8	41/4	27/8	28 t.p.i.	0.9 mm	211/16	15/16	1	0.810	0.809	5
2.010	2.510	33/8	2	43/8	3	28 t.p.i.	0.9 mm	213/16	17/16	1	0.810	0.809	5

2.3 TRILOCK PLUG GAUGES (range 1.510-8.010 in)

2.3.1 Use and Range of Trilock Gauges. Recommendations for the use of trilock plug gauges and their range of sizes are given in Table 1.

2.3.2 General Features. Considerations of rigidity of construction and long life make the choice of the trilock design with reversible GO gauging members especially suitable for the larger sizes up to 8 in.

With this construction there is no chance for shake to interfere with the sensitive feel so necessary in gauges of this type. Three wedge-shaped locking prongs on the handle are engaged into corresponding grooves in the gauging member by a single through-screw, thus providing a self-centring support with a positive lock, and resulting in a degree of rigidity equivalent to that of a solid gauge. The useful life of the GO plugs is furthermore materially increased, as when the entering end is worn, the plug can be reversed.

2.3.3 Interchangeability. The construction is protected by carefully worked out limits of size, and interchangeability is ensured between gauging members and handles wherever manufactured.

2.3.4 Handles. Handles for trilock plug gauges are hexagonal and are provided in both single-end and double-end types. They may be of unhardened steel, light alloy or plastics material, but plastics handles

should be provided with steel sleeves.

The lengths recommended for the handles of plug gauges are those suitable for gauges for normal applications. Where gauges have to be used in confined situations, longer or shorter handles may be desirable.

2.3.5 Details of Construction. Basic data for design details of trilock plug gauges are given in the following figures and tables:

Figs 29 and 30—Double-end type assembly.

Figs 31 and 32—Single-end type assembly.

Figs 33 and 34 and Table 15—Single-end and double-end handles.

Figs 35 and 36 and Table 16—Locking screws Nos. 1 and 2.

Figs 37 to 40 and Table 17—Plain cylindrical plug gauging members.

Figs 41 to 44 and Table 18—Screw plug gauging members.

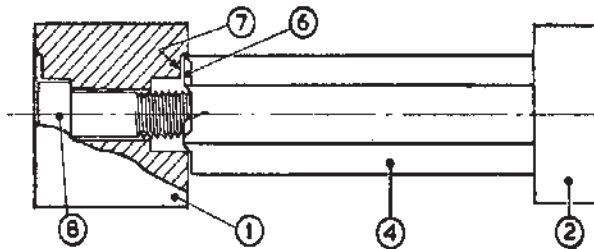
Figs 45 and 46 and Table 19—Fine pitch instrument thread plug gauging members.

Figs 47 and 48 and Table 20—Double length setting plug gauging members.

TRILOCK PLUG GAUGES

DOUBLE-END TYPE

Plain Cylindrical Gauges



Screw Gauges

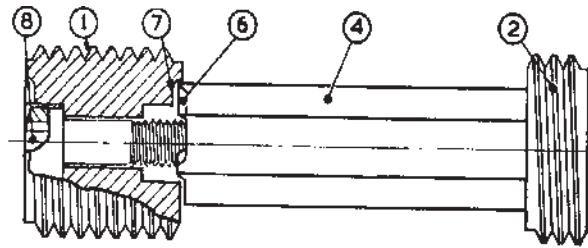


Fig. 29. ABOVE 1.510 in UP TO AND INCLUDING 2.510 in

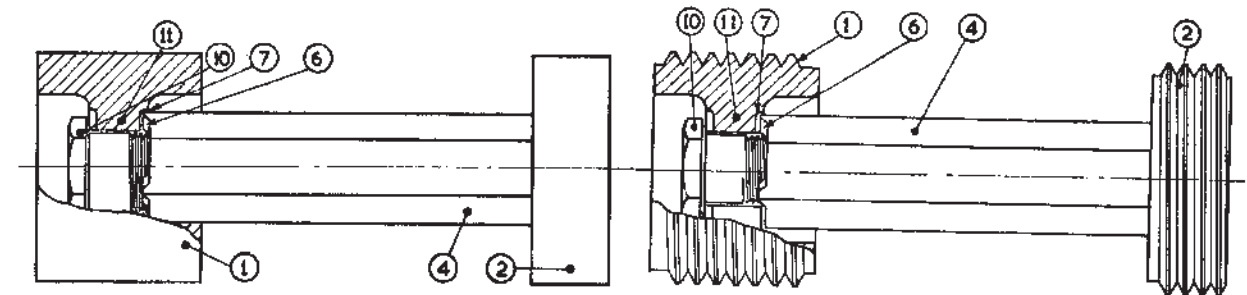
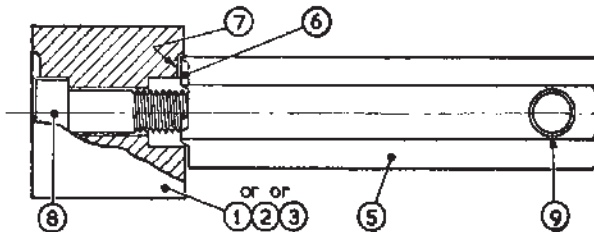


Fig. 30. ABOVE 2.510 in UP TO AND INCLUDING 8.010 in

SINGLE-END TYPE

Plain Cylindrical Gauges



Screw Gauges

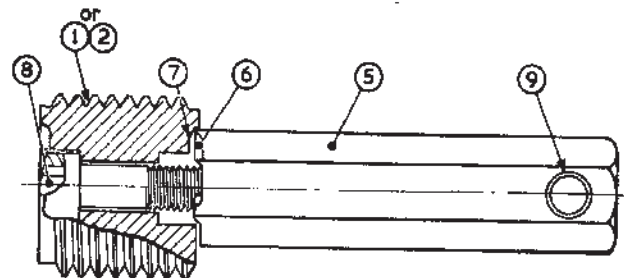


Fig. 31. ABOVE 1.510 in UP TO AND INCLUDING 2.510 in

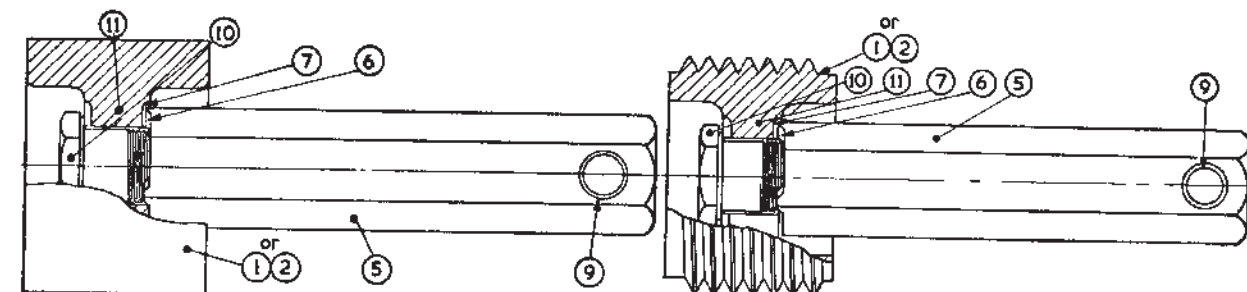


Fig. 32. ABOVE 2.510 in UP TO AND INCLUDING 8.010 in

LEGEND TO FIGS 29, 30, 31 AND 32

- | | |
|-------------------------------|----------------------------------|
| 1. GO gauging member | 6. Locking prong |
| 2. NOT GO gauging member | 7. Locking groove |
| 3. Progressive gauging member | 8. Socket head screw |
| 4. Double-end trilock handle | 9. Cross-pin hole |
| 5. Single-end trilock handle | 10. Hexagon or socket head screw |
| | 11. Web |