

CONFIRMED
DECEMBER 2007

Machine tapers —

Part 11: Specification for gauges

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Machine, Engineers and Hand Tool Standards Policy Committee (MTE/-) to Technical Committee MTE/7, upon which the following bodies were represented:

- Advanced Manufacturers Technology Research Institute
- Federation of British Engineers' Tool Manufacturers
- Gauge and Tool Makers' Association
- Institution of Production Engineers
- Milling Cutter Association
- Twist Drill and Reamer Association

This British Standard, having been prepared under the direction of the Machine, Engineers and Hand Tool Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 29 March 1991

© BSI 07-1999

The following BSI references relate to the work on this standard:
Committee reference MTE/7
Draft for comment 87/77517 DC

ISBN 0 580 19519 8

Amendments issued since publication

Amd. No.	Date	Comments

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Gauges	1
3 Marking	1
Appendix A Types of ring and plug gauges and their uses	2
Figure 1 — Type A shank length plug gauge: tanged	4
Figure 2 — Type C socket depth plug gauge: tanged	4
Figure 3 — Type B shank length plug gauge: plain	8
Figure 4 — Type D socket depth plug gauge: plain	8
Figure 5 — Plug gauge for milling machine spindle noses	10
Figure 6 — Type F ring gauge for tanged shanks	12
Figure 7 — Type G ring gauge for tapped and plain-end shanks	12
Figure 8 — Ring and feeler gauges for milling machine arbors	15
Table 1 — Dimensions of type A plug gauges for self-holding tapers (Morse)	3
Table 2 — Dimensions of type A plug gauges for self-holding tapers (metric 5 %)	5
Table 3 — Dimensions of type C plug gauges for self-holding tapers (Morse)	6
Table 4 — Dimensions of type C plug gauges for self-holding tapers (metric 5 %)	7
Table 5 — Dimensions of type B plug gauges for self-holding tapers (Morse)	9
Table 6 — Dimensions of type B plug gauges for self-holding tapers (metric 5 %)	9
Table 7 — Dimensions of type D plug gauges for self-holding tapers (Morse)	10
Table 8 — Dimensions of type D plug gauges for self-holding tapers (metric 5 %)	11
Table 9 — Dimensions of plug gauges for milling machine spindle noses	11
Table 10 — Dimensions of type F and G ring gauges for self-holding tapers (Morse)	13
Table 11 — Dimensions of type F and G ring gauges for self-holding tapers (metric 5 %)	14
Table 12 — Dimensions of ring and feeler gauges for milling machine arbors	16

Foreword

This Part of BS 1660 has been prepared under the direction of the Machine, Engineers and Hand Tool Standards Policy Committee.

The information given in this Part of BS 1660 was included in BS 1660:1972, which has been withdrawn. In this revision, non-preferred size 7 Morse taper shanks are not included.

Further Parts of BS 1660 are as follows.

- *Part 1: Specification for shanks and sockets with self-holding tapers (Morse and metric 5 %);*
- *Part 2: Specification for reduction sleeves and extension sockets for tools with Morse taper shanks;*
- *Part 3: Specification for turret sockets and reduction sleeves with tapped ends for tools with Morse taper shanks;*
- *Part 4: Specification for spindle noses and tool shanks with self-release 7/24 tapers;*
- *Part 5: Specification for adaptors with 7/24 internal and external tapers;*
- *Part 6: Specification for adaptors with external 7/24 tapers for tools with Morse taper shanks;*
- *Part 7: Specification for extension adaptors with external 7/24 tapers for tools with Morse taper shanks;*
- *Part 8: Specification for collar dimensions for 7/24 taper tool shanks and equipment;*
- *Part 9: Specification for cotter slots;*
- *Part 10: Specification for drill chuck tapers (Jacob and short Morse).*

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 16 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 BS 1660 specifies gauges for the manufacture and verification of the accuracy of self-holding and self-release tapers given in other Parts of BS 1660.

2 Gauges

NOTE Types of gauges and their uses are described in Appendix A and illustrated in Figure 1 to Figure 8.

2.1 Dimensions

The dimensions and tolerances of plug gauges shall be as given in Table 1 to Table 9, as appropriate.

The dimensions and tolerances of ring gauges shall be as given in Table 10 to Table 12, as appropriate.

2.2 Material

The gauges shall be made of steel, hardened and stabilized, and the working surfaces shall have a diamond pyramid hardness number between 750 and 850.

NOTE 1 Tool steels of grade 01 are suitable.

NOTE 2 The following method is recommended as a suitable stabilizing process. Before final grinding, heat the hardened gauges to, and maintain at, a temperature of 150 °C for 5 h then allow to cool slowly in the furnace.

2.3 Workmanship

Gauging or working surfaces shall be ground or lapped. Knurled surfaces shall not be so sharp as to injure the hands when the gauge is used continuously. Centres of plug gauges shall not be removed and shall be protected from damage by a small recess where practicable.

2.4 Gauge wear and wear allowance

A working plug gauge shall be permitted to wear by the following values below the lower limit of dimension D or D_1 given in Table 1 to Table 9, as appropriate.

Taper designation	Wear allowance
No.4 and No.6 (metric 5 %)	0.005 mm
No.0 up to and including No.3 (Morse)	0.005 mm
No.4 and No.5 (Morse)	0.008 mm
No.6 (Morse)	0.010 mm
No.80 up to and including No.200 (metric 5 %)	0.010 mm

A working ring gauge shall be permitted to wear by the following values above the upper limit of dimension D or D_1 given in Table 10 to Table 12, as appropriate.

Taper designation	Wear allowance
No.4 and No.6 (metric 5 %)	0.005 mm
No.0 up to and including No.3 (Morse)	0.005 mm
No.4 and No.5 (Morse)	0.008 mm
No.6 (Morse)	0.010 mm
No.80 up to and including No.200 (metric 5 %)	0.010 mm

Gauges outside the given wear allowances shall not be used for inspecting finished work.

NOTE Gauge users should watch for the effect of wear upon sizes of their gauges. Regular examination and measurement of gauges in use is essential so that a gauge which has worn outside its wear allowance is detected and withdrawn from service.

2.5 Tommy bar hole

One 15 mm diameter tommy bar hole shall be provided in all 40 mm diameter plug gauge handles at a centre distance of 25 mm from the free end of the handle for both lifting purposes and for turning when inserted in a bore.

3 Marking

Gauges shall be permanently and legibly marked with the following information:

- the size and type;
- the number and date of this British Standard, i.e. BS 1660-11:1991¹⁾;
- the maker's name and/or trade mark.

NOTE 1 Gauges intended for use as reference gauges should bear in addition a serial number and should be marked "For reference only", or "REF".

NOTE 2 It is desirable that all gauges should bear a serial number; such a number is usually required if the gauge is to be submitted to an inspecting authority for certification.

¹⁾ Marking BS 1160-11:1991 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Appendix A Types of ring and plug gauges and their uses

A.1 Plug gauges

A.1.1 *Type A shank length plug gauge: tanged* (see Figure 1)

This is a master gauge which represents a tanged shank of a tool made to basic dimensions.

It is intended for use by the toolmaker for setting and checking taper plate gauges, and may also be used to check ring gauges for wear. (For dimensions and tolerances, see Table 1 and Table 2.)

A.1.2 *Type C socket depth plug gauge: tanged* (see Figure 2)

This is a full form GO gauge which represents the virtual size of a shank of maximum size having a tang which is on the top limit, and eccentric by the maximum permissible amount. Its use is for the control and verification of the diameter at the mouth of a tapered hole in a machine tool spindle, reduction sleeve or extension socket or turret socket, and to ensure that the ejection slot will accept the tang. A limit step is provided to indicate the maximum and minimum limits of the hole diameter. (For dimensions and tolerances, see Table 3 and Table 4.)

A.1.3 *Type B shank length plug gauge: plain* (see Figure 3)

This is a master gauge which represents a tapped or plain-end type tool shank made to basic dimensions. Its uses are the same as those of type A plug gauges. (For dimensions and tolerances, see Table 5 and Table 6.)

A.1.4 *Type D socket depth plug gauge: plain* (see Figure 4)

This is a full form GO gauge for the control and verification of the diameter at the mouth of a tapered hole in a machine tool spindle or reduction sleeve, extension socket or turret socket intended for the reception of tapped or plain-end shanks. A limit step is provided to indicate the maximum and minimum limits of the hole diameter. (For dimensions and tolerances, see Table 7 and Table 8.)

A.1.5 *Plug gauge for milling machine spindle noses* (see Figure 5)

This is a master gauge which represents a milling machine spindle nose made to basic dimensions and is intended for use by the toolmaker for checking the taper in the spindle noses. (For dimensions and tolerances, see Table 9.)

A.2 Ring gauges

A.2.1 *Type F for tanged shanks* (see Figure 6)

This gauge is intended for the inspection of tanged type shanks. The limit steps at the small end face control and verify the length of the shank from the gauge plane, and those on the side of the small end check the combined effects of the thickness and eccentricity of the tang. (For dimensions and tolerances, see Table 10 and Table 11.)

A.2.2 *Type G for tapped and plain-end shanks* (see Figure 7)

This gauge is intended for the inspection of tapped and plain-end shanks. The limit step at the small end face controls and verifies the length of the shank from the gauge plane. (For dimensions and tolerances, see Table 10 and Table 11.)

A.2.3 *Ring gauge for milling machine arbors* (see Figure 8)

This gauge is intended for the inspection of the external taper of milling machine arbors. (For dimension and tolerances, see Table 12.)

Table 1 — Dimensions of type A plug gauges for self-holding tapers (Morse)

Type A. Shank length plug gauge: tanged (see Figure 1)													
Designation of taper	Rate of taper (on diameter per mm length)	Diameter at gauge plane	Taper tolerance over gauging length of plug (on diameter)	Gauge plane to end of tang	Gauge length	Step	Tang					Diameter of handle over knurl	Overall length
							Diameter	Length	Thickness	Radius	Length to tang radius centre		
		D	Fast ^a	l_3	l_4	Z	d_3	C	b	R	h	P	K
				Tolerance ± 0.025	Tolerance $+ 0$ $- 0.05$	Tolerance ± 0.025	Tolerance $+ 0$ $- 0.05$	Tolerance ± 0.2	Tolerance $+ 0.01$ $- 0$	Tolerance $+ 0$ $- 0.01$	Tolerance $+ 0$ $- 0.05$		
No. 0 Morse	0.052 05	mm 9.045 + 0.005 - 0	mm 0.004	mm 56.50	mm 59.50	mm 1.00	mm 6.00	mm 6.5	mm 3.90	mm 4.0	mm 5.60	mm 10	mm 140
No. 1 Morse	0.049 88	12.065 + 0.005 - 0	0.004	62.00	65.50	1.00	8.70	8.5	5.20	5.0	7.90	12	150
No. 2 Morse	0.049 95	17.780 + 0.005 - 0	0.006	75.00	80.00	1.00	13.50	10.0	6.30	6.0	9.50	16	170
No. 3 Morse	0.050 20	23.825 + 0.005 - 0	0.006	94.00	99.00	1.00	18.50	13.0	7.90	7.0	12.70	20	190
No. 4 Morse	0.051 94	31.267 + 0.008 - 0	0.008	117.50	124.00	1.50	24.50	16.0	11.90	8.0	14.30	25	220
No. 5 Morse	0.052 63	44.399 + 0.008 - 0	0.010	149.50	156.00	1.50	35.70	19.0	15.90	10.0	17.50	30	250
No. 6 Morse	0.052 14	63.348 + 0.010 - 0	0.012	210.00	218.00	2.00	51.00	27.0	19.00	13.0	25.40	35	320

^a A taper is said to be "fast" when the included angle is greater than the basic included angle.