

Specification for

Hand operated square drive socket wrenches and accessories

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Committees responsible for this British Standard

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- British Coal Corporation
- British Telecommunications plc
- Consumer Policy Committee of BSI
- Federation of British Engineers' Tool Manufacturers
- Federation of British Hand Tool Manufacturers
- Handle Manufacturers' Association
- Institute of Carpenters
- Institute of Trading Standards Administration
- Ministry of Defence

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Foreword

This British Standard has been prepared under the direction of the Machine, Engineers and Hand Tools Standards Policy Committee.

The main features of this revision are:

- a) rationalization of drive and socket sizes has been made to align with the International Organization for Standardization (ISO);
- b) torque values have been aligned with ISO;
- c) types included reflect the demand for the improved design of socket now available.

This standard supersedes BS 4006:1987 which is withdrawn.

Socket wrenches and accessories are identified and specified by their drive size in metric units. To avoid any confusion therefore, the inch drive size in each of the tables is placed alongside in brackets.

When selecting socket wrenches and accessories for a particular operation, care should be taken to ensure that the drive size is adequate for the load requirement and that either the single or the bi-hexagonal socket is defined. In this respect note should be taken of the proof loads specified in the tables. Guidance on the safe usage of sockets and accessories is given in Annex B.

Ratchet handles should not be used for final tightening or initial releasing of tightened fasteners, since overloading can damage the internal mechanism. For precision tightening a torque wrench is recommended.

The illustrations in this standard are examples only and are not intended to affect manufacturers' designs.

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 to iv, pages 1 to 34, an inside back cover 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 British Standard specifies dimensional, testing and design requirements for hand operated square drive socket wrenches and accessories.

The across flats tolerances specified are in accordance with ISO 691:1983.

2 Normative references

This British Standard incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this British Standard only when incorporated in it by updating or revision.

3 Definitions

For the purposes of this British Standard, the following definitions apply.

3.1

socket

a steel component of cylindrical form having at one end an internal form to suit the head of a screwed fastener and at the other end an internal square form for the receipt of an external square on a driving component

3.2

drive

an arrangement whereby an external driving square fits into an internal square in such a manner that abutment between the surfaces of the external square and corresponding internal square prevents either member from rotating separately and enables torque applied to one member to be transmitted to the other member

3.3

socket wrench

a wrench consisting of the assembly of a socket with its driving components, designed solely for the purpose of applying a torque to screwed fasteners with hexagonal or square heads

3.4

bi-hexagon

two internal hexagons formed coaxially at 30° radial displacement to each other

3.5

bi-square

two internal squares formed coaxially at 45° radial displacement to each other

3.6

retaining device

a means of ensuring that the socket is retained on the driving square when a socket wrench is assembled

NOTE Two types can be used.

a) A detachable retaining device, consisting of a spring loaded ball fitted to one face of the external square drive and engaging in a groove or hole in the driven square of the socket and detached in accordance with 6.1.3.

b) A lock-on retaining device, consisting of a spring loaded plunger fitted to one face of the external square drive and engaging in a hole in the internal square of the driven socket, thus giving a positive lock-on facility detachable only by depressing the plunger through the hole in the side of the socket to obtain release in accordance with 6.1.4.

3.7

“T” handle

an external driving square having an eye through which a handle slides

3.8

swivel handle nut spinner

an external driving square to which a steel bar is hinged

3.9

extension bar

a bar having an external driving square at one end and an internal driven square at the other, the component being designed to form an extension coupling piece between a socket and a drive

3.10

flexible extension

an extension intended to serve a similar purpose to an extension bar, but so designed that the driving ends are joined to a flexible extension component

3.11

universal joint square drive

a universal joint, one component of which has an internal driven square and the other a driving square

3.12

speed brace

a cranked bar having an external driving square at one end for driving a socket, and a hand grip at the other. The axis of the hand grip is coincidental with the driving square

3.13

ratchet handle

a means of applying a driving torque in one direction so that, when the handle is rotated in the opposite direction, no significant reverse torque is applied

3.14 spinner handle

a component consisting of a bar having an external driving square formed at one end and a hand grip at the other

3.15 adaptor

a component for connecting different drive sizes

4 Materials

Hand operated square drive sockets and accessories shall be manufactured from any alloy steel having the mechanical properties required to ensure that the sockets and accessories satisfy the requirements of this standard.

5 Hardness

Sockets and accessories shall have hardness values within the range 39 HRC to 46 HRC inclusive.

Where boron steel is used, the hardness value shall be increased within the range 44 HRC to 48 HRC.

NOTE This improves strength and surface hardness without increased brittleness.

6 Design and manufacture

6.1 General

6.1.1 The sockets and all accessories shall be free from cracks, flashes, scale and other deleterious defects.

6.1.2 The socket openings shall be formed centrally within the body of the socket.

NOTE The outer end of the hexagon, bi-hexagon or bi-square opening may be chamfered at a 120° inclusive angle from the across corners dimension to facilitate engagement onto a fastener.

6.1.3 Form A detachable sockets and accessories shall be so designed and manufactured that the external square drive can be readily inserted into the corresponding internal square drive. Each external square drive shall be fitted with a retaining device in the form of a spring loaded ball or plunger and each internal square drive shall have a hole or groove in one or more faces to accept the locking ball.

The retaining device shall be positively fitted so as to prevent unintentional detachment of the socket.

The minimum force required to detach a socket from a component of corresponding drive size shall be in accordance with Table 1. The minimum detachment force shall be met with the locking device engaged under any combination of the specified dimensions (see Table 2).

Table 1 — Minimum detachment forces for nominal size of drive

Nominal size of drive		Minimum detachment force
mm	in	N
6.3	¼	9
10	⅜	18
12.5	½	27
20	¾	44
25	1	53

NOTE The force values do not include the weight of the socket or component.

6.1.4 Form B lock-on sockets and accessories shall be so designed and manufactured that the external square drive can be readily inserted into the corresponding internal square drive. Each external square drive shall be fitted with a retaining device in the form of a spring loaded plunger and each internal square drive shall have a hole in one or more faces, for the purpose of accepting the locking device and ensuring that the socket can only be detached by depressing the plunger through the hole in the side of the socket to obtain release.

6.2 Accessories

6.2.1 “T” handle square drive

The driving member shall have a hole bored at 90° relative to the longitudinal axis of the external square drive to accept the handle.

6.2.2 Swivel handle

The handle shall be permanently hinged to the driving member in such a manner that torque can be transmitted to an attached socket through 360° when the handle is offset from the longitudinal axis of the driving member and socket by any amount not exceeding 90°.

6.2.3 Extension bar

The extension bar shall have an external square drive at one end and an internal square drive at the other.

6.2.4 Flexible extension

The extension shall have an external square drive at one end and an internal square drive at the other, and shall be so designed and manufactured that torque can be transmitted through 360° to an attached socket when either drive member is offset from the common longitudinal axis of the extension by any amount up to 45°.

The extension shall be capable of being bent through 90° and returned to the free position without suffering permanent distortion or damage.

6.2.5 Universal joint

The joint shall have an external square at one end hinged to an internal square at the other and shall be so designed and manufactured that torque can be transmitted through 360° to an attached socket when the drive is offset from the common axis of the joint components by any amount not exceeding 45°.

6.2.6 Speed brace

The brace shall have an external square drive at one end and a handgrip at the other.

NOTE The handgrip may be of tubular rotating form. The cranked portion of the brace may also carry a rotatable handgrip.

6.2.7 Ratchet handle

The ratchet mechanism shall be either integral with, or detachable from, the handle. Where the mechanism comprises a ratchet and pawls, they shall be hardened and totally enclosed. The gear and pawls shall be totally enclosed. The mechanism shall be designed to permit torque to be applied in either direction of rotation.

7 Finish

All sharp edges shall be removed and wrenches shall be free from cracks, burrs and any other defects which may adversely affect the performance of the wrench or may, during proper use of the wrench, give rise to the risk of injury to the operator. Any protective finish shall, where applicable, be in accordance with the appropriate British Standard.

8 Dimensions and tolerances

8.1 The dimensions and tolerances of sockets shall be as specified in the following tables.

External square drives Table 2

Internal square drives Table 3

Sockets with 6.3 mm (¼ in) square drives

Metric Table 4 Range 3.2 to 15.0

Unified Table 5 Range $\frac{3}{16}$ to $\frac{1}{2}$

BS and Whitworth Table 6 Range $\frac{1}{4}$ to $\frac{5}{16}$ BS

BA Table 7 Range 0 to 8

Sockets with 10 mm (⅜ in) square drives

Metric Table 8 Range 7 to 22

Unified Table 9 Range $\frac{5}{16}$ to $\frac{7}{8}$

BS and Whitworth Table 10 Range $\frac{1}{4}$ to $\frac{1}{2}$ BS

Sockets (deep) with 10 mm (⅜ in) square drives

Metric Table 11 Range 7 to 22

Unified Table 12 Range $\frac{3}{8}$ to $\frac{13}{16}$

Sockets with 12.5 mm (½ in) square drives

Metric Table 13 Range 10 to 32

Unified Table 14 Range $\frac{3}{8}$ to $1\frac{1}{4}$

BS and Whitworth Table 15 Range $\frac{1}{4}$ to $\frac{7}{8}$ BS

Sockets (deep) with 12.5 mm (½ in) square drives

Metric Table 16 Range 10 to 32

Unified Table 17 Range $\frac{1}{2}$ to $1\frac{1}{4}$

BS and Whitworth Table 18 Range $\frac{1}{4}$ to $1\frac{1}{16}$ BS

Bi-square sockets with 12.5 mm (½ in) square drives

Unified Table 19 Range $\frac{3}{8}$ to $1\frac{5}{16}$

Sockets with 20 mm (¾ in) square drives

Metric Table 20 Range 21 to 55

Unified Table 21 Range $\frac{3}{4}$ to $2\frac{1}{4}$

BS and Whitworth Table 22 Range $\frac{7}{16}$ to $1\frac{1}{2}$ BS

Sockets with 25 mm (1 in) square drives

Metric Table 23 Range 36 to 80

Unified Table 24 Range $1\frac{5}{16}$ to $2\frac{15}{16}$

BS and Whitworth Table 25 Range $\frac{7}{8}$ to $2\frac{1}{4}$ BS

NOTE The dimensions and tolerances of the various types of socket are shown in Figure 1 to Figure 24.

8.2 The dimensions of driving handles and components shall be as specified in the following tables.

“T” handle square drive Table 26

Swivel handle nut spinners Table 27

Extension bars Table 28

Flexible extensions Table 29

Flexible joint square drives Table 30

Speed braces Table 31

Ratchet handles Table 32

Spinner handles Table 33

Ratchet unit adaptors Table 34

Convertors Table 35

NOTE The dimensions of the various components are shown in Figure 25 to Figure 34.

9 Torque

When tested in accordance with Annex A, sockets and accessories shall show no sign of distortion and visual examination shall reveal no sign of cracks, damage or other defects.

10 Gauging

Across flats dimensions of bi-hexagonal and hexagonal sockets and driving accessories shall be measured by means of a hexagon go/no go plug gauge and square and bi-square sockets and driving accessories shall be measured by a square go/no go plug gauge.

11 Designation and marking

Each socket and driving component shall be plainly and indelibly marked with the manufacturer's name or trademark.

Sockets shall also be marked with the designating size in accordance with the following.

- a) Sockets for metric or unified hexagons and squares. The marking shall be the nominal size across flats of the hexagon, in millimetres or imperial as appropriate, e.g. metric: 10 mm; or imperial: $\frac{1}{2}$.

- b) All sockets for BSF and BSW hexagons conforming to BS 1083:1965 and BS 916:1953 shall be marked with a fraction representing the nominal diameter of a bolt having a head the dimensions of which are specified in either BS 1083:1965 or BS 916:1953. This shall be followed by the symbol BS, e.g. $\frac{3}{8}$ BS.

In addition, it is permissible to mark BSF and BSW hexagons with a second fraction representing the nominal diameter of a bolt having a head, the dimensions of which correspond with those of the Whitworth hexagon sizes. This shall be followed by the symbol W, e.g. $\frac{3}{8}$ BS, $\frac{5}{16}$ W.

- c) Sockets for BA hexagons conforming to BS 57:1951 shall be marked with the appropriate designating number followed by the symbol BA, e.g. 2 BA, 6 BA.

Annex A (normative)

Torque test

A.1 Test blocks and bars

All test blocks and bars shall be heat treated to give a hardness of not less than 55 HRC.

The across flats size of test blocks shall be equal to the nominal dimensions across flats of the bolt head, as specified in Table 4 to Table 25.

The across flats size of test bars shall be equal to the maximum across flats dimension of the appropriate external square drive as specified in Table 2.

A.2 Sockets

Place the socket on a rigidly held test block of hexagonal or square section, whichever is appropriate.

Insert a square test bar into the driving square of the socket and apply the proof torque appropriate to the nominal size of socket as given in Table 4 to Table 25 to the socket through the medium of the test bars.

A.3 Accessories

A.3.1 General

Insert the external square drive of each accessory into an internal square formed in a rigidly held test block.

The across flats dimensions and depth of the internal square shall be equal to the maximum dimensions appropriate to the nominal size of internal square of the socket for which the accessory under test is suitable (see Table 3). Apply the proof torque appropriate to the type and size of accessory, as given in Table 26 to Table 35, in both directions of rotation to the accessory through whichever of the media described in A.3.2 to A.3.9 is applicable; with handled devices the load shall be applied at the extremity of the handle.

A.3.2 Attachments having an external square drive at one end and an internal square drive at the other

Apply the torque through the medium of a test bar inserted into the internal square drive.

A.3.3 Flexible extensions and universal joints

Apply the torque as described in A.3.2 with the internal and external components of the attachment offset at the maximum operating angle as given in 6.2.4 and 6.2.5.

A.3.4 Attachments having an external drive at one end and a handle hole at the other

Apply the torque through the medium of a bar of appropriate length inserted into the hole.

A.3.5 "T" handle square drive

Apply the torque by means of the handle with the handle slid to its maximum extension.

A.3.6 Spinner handle

Apply the torque through the medium of a handle rigidly clamped to the handgrip.

A.3.7 Speed brace

Apply the torque by direct application to the cranked portion of the brace, with the rotating handgrip firmly supported.

A.3.8 Swivel handle nut spinner flex head

Apply the torque by means of the handle. The load shall be applied with the handle at the maximum operating angle as given in 6.2.2.

A.3.9 Ratchet handle

Apply the torque by means of the handle which forms part of the tool.

Annex B (informative)

Guidance on the safe use of sockets and accessories

The following list gives guidance on the safe use of sockets and accessories.

- a) Always select a socket with an opening that fits the nut or bolt.
- b) Always seat the socket fully around the nut or bolt head.
- c) Adopt a firm stance to prevent a fall should the tool slip.
- d) Never use a tube or any other form of extension to increase leverage.
- e) Remember that it is possible to strip a thread by the application of excessive torque.
- f) Never expose sockets and/or accessories to excessive heat since this may soften the tools and ruin their strength.
- g) Never grind or otherwise try to rework sockets and/or accessories to alter their shape.
- h) Never use sockets or accessories other than for their designed purpose.
- i) Where a "frozen" nut or bolt is involved, use a special purpose striking face ring wrench or alternatively a heavy duty wrench. Note that the prior application of penetrating oil will normally help.
- j) Inspect sockets and accessories periodically for any sign of damage or wear and discard if damage and/or wear is evident.
- k) Take extreme care not to confuse ordinary plastic dipped handles (designed for comfort) with tools having electrical insulating properties and which will be so marked.

l) Pay attention to the proper maintenance of tools. Their storage in a clean condition and proper environment will pay dividends in extended tool life and efficiency.

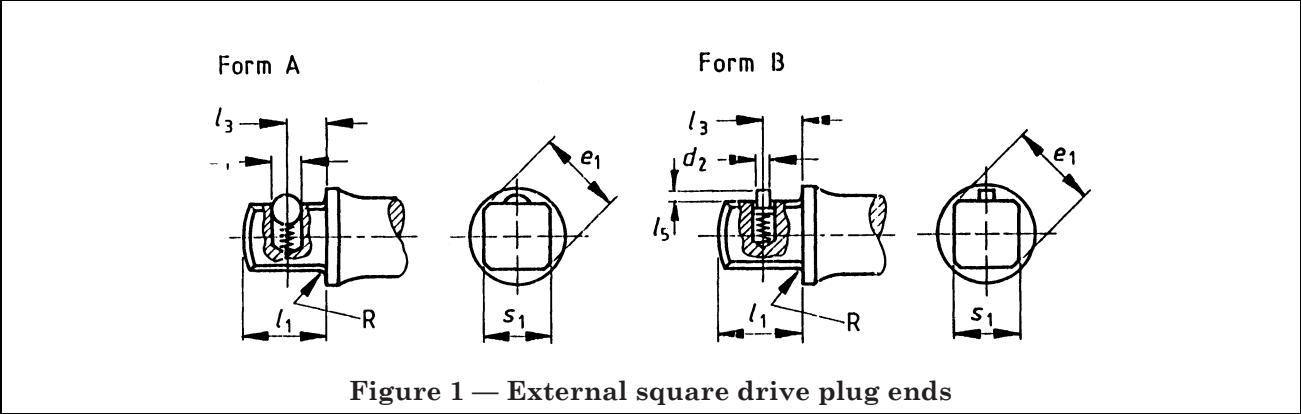


Table 2 — Dimensions of external square drive plug ends

1	2	3	4	5	6	7	8	9	10	11	12	13
Nominal size	Across flats s_1		Across corners e_1		Length l_1		Retainer to shoulder l_3		Form A ball diameter d_1	Form B plunger diameter d_2 l_5		Radius
mm (in)	min. mm	max. mm	min. mm	max. mm	min. mm	max. mm	min. mm	max. mm	mm	max. mm	min. mm	mm
6.3 (¼)	6.260	6.350	8.0	8.4	7.1	7.75	3.82	4.188	3	2.0	1.3	0.5
10 (⅜)	9.435	9.525	12.2	12.7	10.3	11.0	5.32	5.68	5	2.6	2.0	0.6
12.5 (½)	12.590	12.700	16.3	16.9	14.3	15.5	7.78	8.22	6	3.0	2.3	0.8
20 (¾)	18.920	19.050	24.4	25.4	19.0	23.0	9.93	10.47	7	4.3	2.5	1.2
25 (1)	25.270	25.400	32.4	34.0	25.4	28.0	14.73	15.27	7	5.0	3.0	1.6

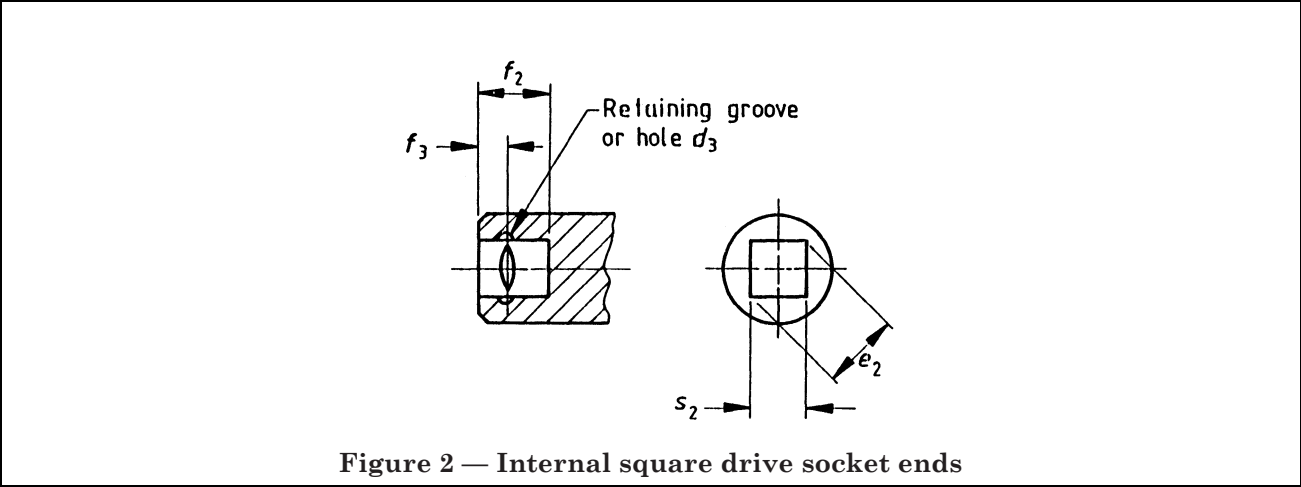


Table 3 — Dimensions of internal square drive socket ends

1	2	3	4	5	6	7	8
Nominal size across flats	Across flats s_2		Across corners e_2	Full square depth f_2	Face to hole or groove f_3		Hole diameter for lock on d_3
mm (in)	min. mm	max. mm	min. mm	min. mm	min. mm	max. mm	min. mm
6.3 (¼)	6.405	6.625	8.5	8.0	3.82	4.18	2.65
10 (⅜)	9.580	9.800	12.9	11.5	5.32	5.68	4.30
12.5 (½)	12.755	13.025	17.1	16.0	7.78	8.22	5.60
20 (¾)	19.105	19.435	25.6	24.0	9.93	10.47	6.00
25 (1)	25.455	25.785	34.3	29.0	14.73	15.27	6.50

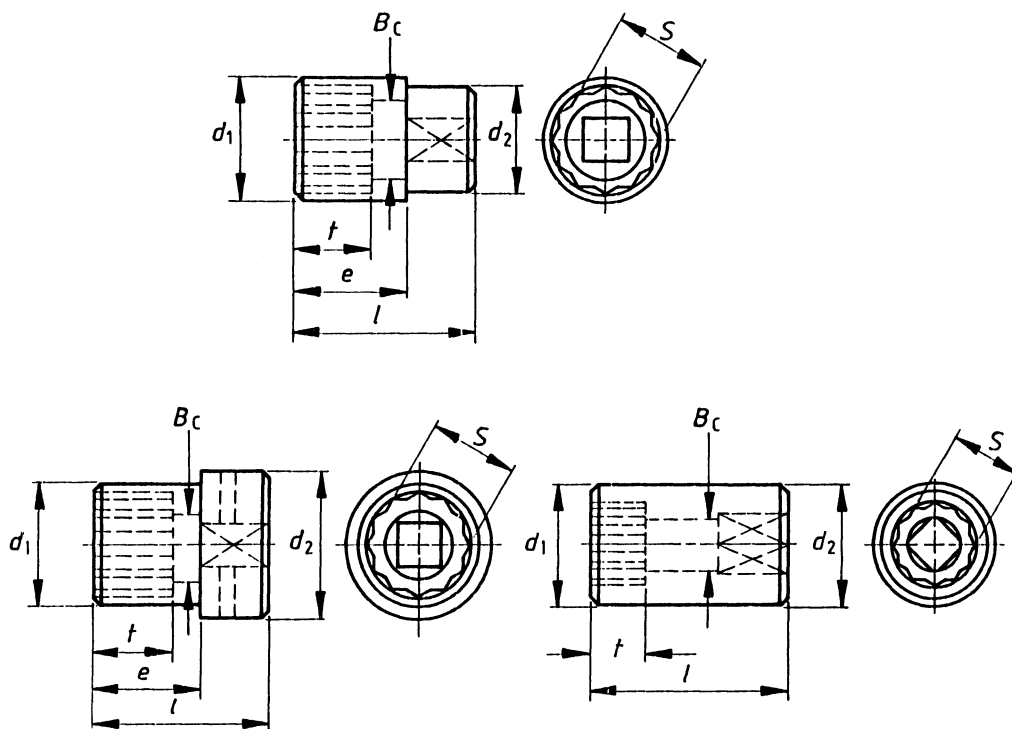


Figure 3 — Metric sockets with 6.3 mm (¼ in) square drives