BRITISH STANDARD

BS 3594-2:
1965

Specification for

Pipe wrenches —

Part 2: Footprint type wrenches

Confirmed
January 2011

Co-operating organizations

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and Industrial organizations:

Associated Offices' Technical Committee
Association of Consulting Engineers
Association of Mining Electrical and Mechanical Engineers
Board of Trade
British Chemical Plant Manufacturers' Association
British Compressed Air Society
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This British Standard, having been approved by the Mechanical Engineering Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on
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The following BSI references relate to the work on this standard:
Committee reference MEE/120
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Amendments issued since publication

Amd. No.	Date	Comments

Contents

Foreword

This standard makes reference to the following British Standards:

BS 427, *Method for Vickers hardness test — Part 1: Testing of metals.*

BS 970, *Wrought steels — En series.*

BS 1133, *Packaging code — Section 6: Temporary prevention of corrosion of metal surfaces (during transportation and storage).*

BS 1387, *Steel tubes and tubulars suitable for screwing to BS 21 pipe threads.*

This British Standard has been prepared under the authority of the Mechanical Engineering Industry Standards Committee. It forms a companion work to BS 3594-1, "*Stillson type wrenches*".

Apart from dimensional considerations, manufacturing requirements are laid down together with a proof torque test which the finished wrench should be capable of passing.

NOTE Tables from which metric equivalents can be calculated are given in an Appendix. The figures given in British units are to be regarded as the standard. More accurate conversions should be based on the tables in BS 350 "*Conversion factors and tables*".

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, 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 relates to the dimensions, quality, finish, testing and marking of pipe wrenches of the Footprint type as illustrated in Figure 1 in nominal sizes as follows:

6 in; 7 in; 9 in; 12 in and 14 inch.

2 Nomenclature and definitions

For the purposes of this British Standard the nomenclature of Figure 1 has been adopted together with the following definitions:

a) *Nominal size.* The overall length of the hook (see Figure 1).

b) *Maximum safe capacity.* A value which is equal to the maximum diameter of pipe that can be safely gripped (see Table 1).

3 Materials

The components of Footprint type wrenches shall be manufactured from the following materials:

a) Frame
b) Distance piece } from steel conforming to BS 970[a] En 43 J or G.
c) Hook

d) Rivets from low carbon steel

e) Pivot pin from steel conforming to BS 970[a] En 8.

[a] BS 970, "*Wrought steels. En series*".

4 Heat treatment and hardness

The heat treatment and hardness of Footprint type wrenches shall be as follows:

a) *Frame and distance piece.* The assembled frame and distance piece shall be normalized after machining and prior to hardening.

b) *Hook.* The hook shall be normalized after machining and prior to hardening.

c) *Jaws.* The teeth of the jaws of the frame assembly and the hook shall be locally hardened and tempered in order to provide hardness values within the range 550 to 620 HV30[1)] when measured at a spot nearest the apex of any one tooth. The hardness within this range shall not extend beyond a point defined as twice the height of tooth measured back from the tooth root. Beyond this point the hardness shall gradually reduce.

d) *Shanks.* At no point on the shank of the frame, nor on the shank of the hook shall hardness be in excess of 300 HV30.

e) *Pivot pin.* The pivot pin shall be normalized after machining.

[1)] BS 427, "*Method for Vickers hardness test*" — Part 1, "*Testing of metals*".

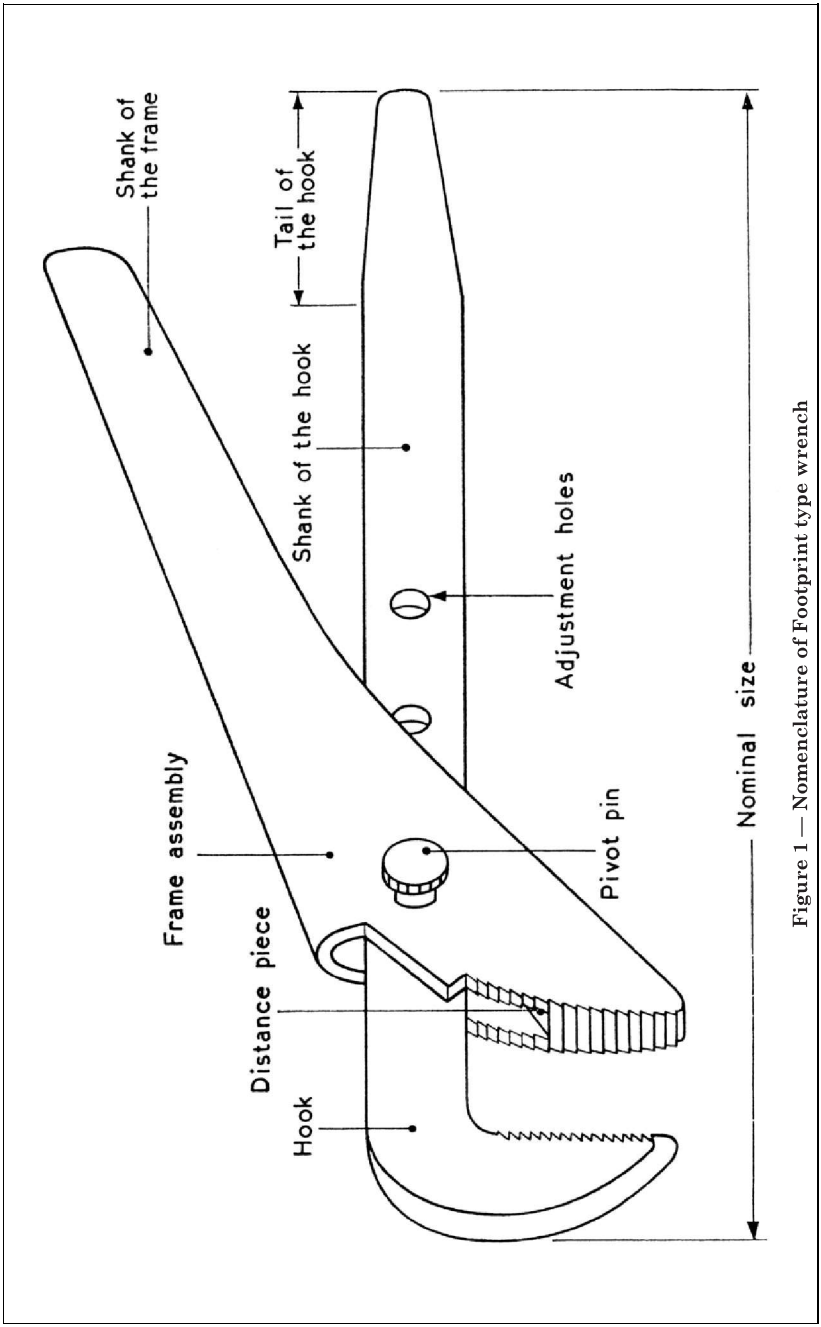

Figure 1 — Nomenclature of Footprint type wrench

5 Manufacture

Footprint type wrenches shall comply with the following requirements:

a) *Frame.* The frame shall consist of a formed pressing into the jaw end of which a distance piece, produced by drop forging, shall be inserted and positively and permanently fixed by means of rivets countersunk into the outer faces of the frame.

b) *Rivets.* The rivets shall be dressed flush with the outer faces of the frame.

c) *Hook.* The hook shall be produced by drop forging or alternatively formed from flat bar. The edges of the shank shall be rounded except at the tail. Adjustment holes shall be drilled or punched.

d) *Teeth.* The jaws of the frame assembly and the hook shall each have teeth formed by machining. The teeth shall be of appropriate pitch as indicated in Table 1; of adequate number and suitable form to enable the tool to meet the test requirements of Clause **9** without slipping, and to ensure positive gripping during normal operation when applied to any appropriate diameter of pipe within the maximum safe capacity. The teeth of the hook and frame shall be opposed so that when applied to a pipe and turned in a clockwise direction the teeth shall bite into the pipe.

e) *Pivot pin.* The pivot pin shall be of the type shown in Figure 2. One end of the pin shall be externally threaded to screw into the internally threaded locating hole in the frame; the other end shall have a knurled head with a plain shoulder, the shoulder being a sliding fit in the plain locating hole in the frame.

NOTE It is recognized that wrenches are available employing a modified form of pivot pin which provides quick action adjustment. Provided that such designs meet this British Standard in all other respects, they are permitted.

f) *All components.* All components shall be free from cracks, flaws and other deleterious defects.

g) *Adjustment and clearances on assembly.* The hook shall slide freely within the frame and the pivot pin shall be capable of being fully inserted as each adjustment hole comes into line with the locating holes in the frame.

The total clearance between the side faces of the hook and the inner side faces of the frame shall not exceed 0.040 in when measured adjacent to the pivot pin. The jaws shall not lock together when the wrench is in the fully closed position.

6 Dimensions and capacities

The dimensions and maximum capacities of Footprint type wrenches shall be as given in Table 1.

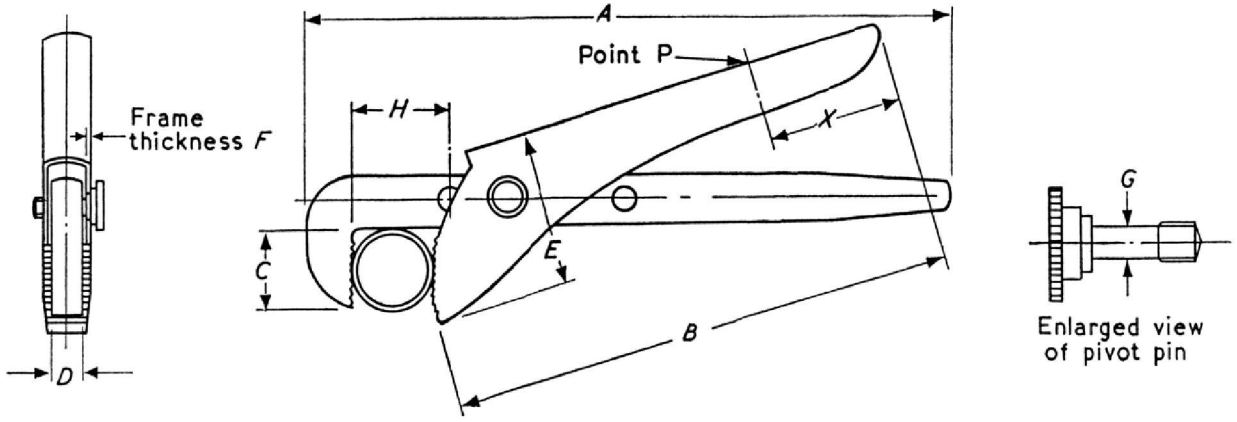

Figure 2 — Dimensions of Footprint type wrenches and test data

Table 1 — Dimensions, capacities and test loads of Footprint type wrenches

Dimensions in inches

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nominal size (overall length) *A*	**Length of frame** *B*	**Depth of jaw** *C*	**Thickness of jaw (min.)** *D*	**Frame width (max.)** *E*	**Tooth pitch per inch**	**Thickness of frame** *F*	**Pivot pin dia.** *G*	**Thread dia. UNC or Whit.**	**No. of adjusting holes in hook (min.)**	**Size of adjusting holes in hook (max.)**	**Jaw face to centre of 1 st hole** *H*	**Pitch of holes**	**Max. safe capacity**	**Proof torque** lbf/in	**Load position** *X*
6	$4^{7}/_{8}$	1	$^{1}/_{4}$	$1^{5}/_{8}$	16	0.080	0.218	$^{1}/_{4}$	4	$^{17}/_{64}$	$1^{3}/_{32}$	$^{3}/_{8}$	1.346	1 000	$1^{1}/_{2}$
7	6	1	$^{1}/_{4}$	$1^{3}/_{4}$	16	0.104	0.218	$^{1}/_{4}$	4	$^{17}/_{64}$	$1^{1}/_{8}$	$^{3}/_{8}$	1.687	1 200	$1^{1}/_{2}$
9	$7^{1}/_{4}$	$1^{1}/_{2}$	$^{3}/_{8}$	$2^{1}/_{2}$	10	0.116	0.277	$^{5}/_{16}$	4	$^{5}/_{16}$	$1^{11}/_{16}$	$^{5}/_{8}$	1.919	2 400	$1^{1}/_{2}$
12	$10^{5}/_{8}$	$1^{7}/_{8}$	$^{3}/_{8}$	3	8	0.128	0.337	$^{3}/_{8}$	5	$^{3}/_{8}$	2	$^{5}/_{8}$	2.394	5 000	$1^{1}/_{2}$
14	$12^{3}/_{4}$	$1^{7}/_{8}$	$^{3}/_{8}$	3	8	0.128	0.337	$^{3}/_{8}$	5	$^{3}/_{8}$	$2^{1}/_{8}$	$^{5}/_{8}$	3.014	7 000	$1^{1}/_{2}$

NOTE Dimensions are nominal with the exception of columns 4, 5 and 11. The values in column 14 are equal to the maximum outside diameter of tubes to BS 1387, "*Steel tubes and tubulars suitable for screwing to BS 21 pipe threads*".

7 Finish

All components of Footprint type wrenches shall be finished smooth, free from flashes, burrs and other imperfections and shall be chemically and/or thermally blued, or blacked.

Each finished tool shall be given suitable anti-corrosion treatment in accordance with BS 1133, Section 6[2)].

8 Marking

Each Footprint type wrench shall be plainly and indelibly marked in a prominent position with the manufacturers' name and/or trade mark, the nominal size of the wrench and the number of this British Standard, i.e. BS 3594-2.

With the exception of the certification mark (see note below) the application of any other mark shall be the subject of agreement between purchaser and manufacturer.

Application of the marks shall not cause stress concentration nor impair the efficiency of the tool.

NOTE The mark BS 3594-2 on or in relation to the product is a claim by the manufacturer that it complies with the requirements of the standard.

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9 Testing

Each Footprint type wrench shall be capable of passing the following test.

For the test a cylindrical steel test bar shall be rigidly mounted in a test rig such as that illustrated diagrammatically in Figure 3. Alternative designs of rig are equally permissible provided that identical test conditions are imposed.

The test bar shall be of diameter equal to the appropriate maximum safe capacity of the wrench under test, as given in Table 1. It shall be hardened and tempered to give hardness readings within the range 300 to 380 HV30 when measured at any point on its circumferential surface.

The wrench shall be mounted in the rig with the teeth in normal working engagement with the test bar (see Figure 3) and a load shall be applied sufficient to result in a proof torque at point P (see Figure 2) appropriate to the nominal size as given in Table 1, Column 15.

Following this test the wrench shall release freely when the direction of force is reversed and on removal from the test rig the wrench shall be capable of normal adjustment over the whole of its range. The adjustment and locating holes shall show no sign of elongation. The frame, hook and pivot pin shall not have suffered any measurable permanent set, nor shall examination with the naked eye reveal evidence of damage or displacement.

[2)] BS 1133, "*Packaging code*", Section 6, "*Temporary prevention of corrosion of metal surfaces (during transportation and storage*").

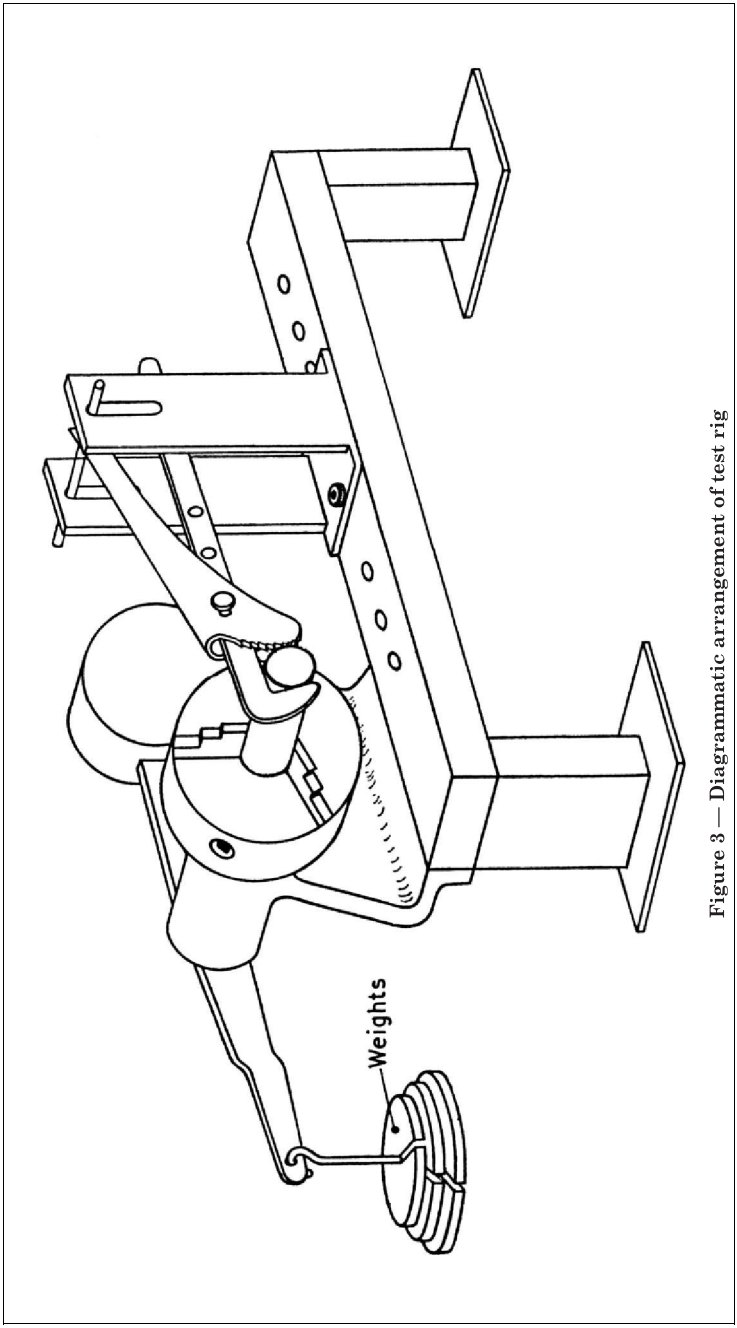

Figure 3 — Diagrammatic arrangement of test rig

Appendix Tables for conversion of inches to approximate millimetre equivalents

Fractions of an inch into millimetres

inch	mm	inch	mm
1/8	3.2	1	25.4
1/4	6.4	2	50.8
5/16	7.9	3	76.2
3/8	9.5	4	101.6
1/2	12.7	5	127.0
5/8	15.9	6	152.4
3/4	19.0	7	177.8
7/8	22.2	8	203.2
		9	228.6
		10	254.0

Example: Find $3\frac{5}{8}$ inches in millimetres: 3 inches = 76.2 millimetres; $\frac{5}{8}$ inch = 15.9 millimetres. Hence 76.2 + 15.9 = 92.1 millimetres = $3\frac{5}{8}$ inches.

Decimals of an inch into millimetres

inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0.001	0.025	0.140	3.56	0.360	9.14	0.580	14.73	0.800	20.32
0.002	0.051	0.150	3.81	0.370	9.40	0.590	14.99	0.810	20.57
0.003	0.076	0.160	4.06	0.380	9.65	0.600	15.24	0.820	20.83
0.004	0.102	0.170	4.32	0.390	9.91	0.610	15.49	0.830	21.08
0.005	0.127	0.180	4.57	0.400	10.16	0.620	15.75	0.840	21.34
0.006	0.152	0.190	4.83	0.410	10.41	0.630	16.00	0.850	21.59
0.007	0.178	0.200	5.08	0.420	10.67	0.640	16.26	0.860	21.84
0.008	0.203	0.210	5.33	0.430	10.92	0.650	16.51	0.870	22.10
0.009	0.229	0.220	5.59	0.440	11.18	0.660	16.76	0.880	22.35
0.010	0.254	0.230	5.84	0.450	11.43	0.670	17.02	0.890	22.61
0.020	0.508	0.240	6.10	0.460	11.68	0.680	17.27	0.900	22.86
0.030	0.762	0.250	6.35	0.470	11.94	0.690	17.53	0.910	23.11
0.040	1.016	0.260	6.60	0.480	12.19	0.700	17.78	0.920	23.37
0.050	1.270	0.270	6.86	0.490	12.45	0.710	18.03	0.930	23.62
0.060	1.524	0.280	7.11	0.500	12.70	0.720	18.29	0.940	23.88
0.070	1.778	0.290	7.37	0.510	12.95	0.730	18.54	0.950	24.13
0.080	2.032	0.300	7.62	0.520	13.21	0.740	18.80	0.960	24.38
0.090	2.286	0.310	7.87	0.530	13.46	0.750	19.05	0.970	24.64
0.100	2.540	0.320	8.13	0.540	13.72	0.760	19.30	0.980	24.89
0.110	2.794	0.330	8.38	0.550	13.97	0.770	19.56	0.990	25.15
0.120	3.048	0.340	8.64	0.560	14.22	0.780	19.81	1.000	25.40
0.130	3.320	0.350	8.89	0.570	14.48	0.790	20.07	—	—

Example: Find 0.856 inch in millimetres; 0.850 inch = 21.59 millimetres; 0.006 inch = 0.152 millimetre. Hence 21.59 + 0.152 = 21.742 millimetres = 0.856 inch.

Based on the conversion factor 1 inch = 25.400 millimetres

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