

Specification for

Staple type connectors for hydraulic fluid power applications

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Mechanical Engineering Standards Committee (MEE/-) to Technical Committee MEE/186 upon which the following bodies were represented:

- Association of British Mining Equipment Companies
- Association of Hydraulic Equipment Manufacturers
- British Compressed Air Society
- British Hydromechanics Research Association
- British Steel Corporation
- British Telecommunications
- Department of Trade and Industry (National Engineering Laboratory)
- Electricity Supply Industry in England and Wales
- Federation of Manufacturers of Construction Equipment and Cranes
- Health and Safety Executive
- Institution of Mechanical Engineers
- Machine Tool Industry Research Association
- Ministry of Defence
- National Coal Board

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- British Industrial Truck Association
- British Rubber Manufacturers' Association
- British Steel Industry
- Engineering Equipment and Materials Users' Association
- Hydraulic Press Manufacturers' Association

This British Standard, having been prepared under the direction of the Mechanical Engineering Standards Committee, was published under the authority of the Board of BSI and comes into effect on 31 December 1984

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Foreword

This British Standard has been prepared under the direction of the Mechanical Engineering Standards Committee and is based upon initial proposals prepared by the National Coal Board. It relates to a series of metal connectors secured by staples to enable hydraulic engineers to connect rigid and flexible tubing to fluid power system components.

The design of fittings specified in this standard has been proof tested in association with type 2 hoses specified in ISO DIS 6805-2¹⁾, which will be published as a British Standard, and in accordance with the test method described in BS 5173-2.

It is the duty of the designer and/or manufacturer to ensure that unspecified dimensions, materials and production processes are compatible with rated pressure and service conditions, e.g. fluids to be employed, etc.

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.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, 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⁾ In preparation.

1 Scope

This British Standard specifies the dimensions of the male to female interface of a range of staple type connectors and adaptors used with rigid and flexible tubing in fluid power systems, primarily in the mining and other heavy industries. Methods and materials of construction to withstand specific pressures are also specified.

The standard also illustrates and specifies leading dimensions for a basic range of connector types, examples of which are illustrated, having bodies which are forged, fabricated or machined from solid bar, but with no restriction as to the form of additional connectors, including adaptors designed to interface with threaded systems.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Designation

The connectors shall be designated by the nominal sizes listed in Table 1 and subsequent Table 2 to Table 8.

3 Pressure rating

The rated pressure for which each connector is suitable shall be as specified in Table 1.

Table 1 — Range of nominal sizes and their pressure ratings

Nominal size ^a		Design dynamic pressure rating, ^c
Metric	Imperial ^b	
mm	in	bar
6.3	¼	450
10	⅜	380
12.5	½	310
16	⅝	280
19	¾	280
25	1	280
31.5	1 ¼	170

^a Nominal size relates to the nominal bore of associated tubing or hoses.

^b Inch sizes listed for information only.

^c Based upon a minimum safety factor of 3 : 1 on burst pressure at 55 °C. 1 bar = 10⁵ N/m² = 100 kPa.

4 Component construction

4.1 Assembly

The connectors shall comprise the components shown assembled in Figure 1 and detailed in 4.2 to 4.5.

4.2 Female body (swivel or fixed), and male body

4.2.1 Dimensions. The interface dimensions of these components shall be in accordance with Table 2 and Figure 2.

NOTE 1 The dimensions specified in Table 2 are after-plating dimensions; actual machining dimensions will therefore have to take account of plating thicknesses in order to achieve the specified finished dimensions.

NOTE 2 Alternative fastening of swivel collars to that shown in Figure 2 may be used providing the performance meets, or exceeds, the values stated in Table 1 and that interchangeability is not affected.

4.2.2 Material. The material used in the manufacture of these components shall be a wrought steel complying with section 2.1 or section 2.2 of BS 970-1:1983, having the following minimum mechanical properties:

$$R_m = 360 \text{ N/mm}^2 \text{ } ^2)$$

$$R_e = 250 \text{ N/mm}^2 \text{ } ^2)$$

$$HB = 103$$

The use of lead additives shall be at the discretion of the manufacturer.

NOTE Type 220M07 carbon free cutting steel meets this requirement.

4.2.3 Manufacture. The components shall be:

- manufactured from forgings;
- machined from bar stock; or
- fabricated by welding, silver brazing or copper fusion.

Forgings shall be normalized and de-scaled. Welding shall be carried out in accordance with the relevant requirements specified in BS 5135.

Fabrication by silver brazing and copper fusion shall be carried out in accordance with the relevant requirements of BS 1723; copper fusion being performed in a controlled atmosphere.

4.2.4 Surface treatment. The components shall be zinc plated and fully chromate passivated in accordance with the requirements of BS 1706, class B (Zn3).

NOTE A higher standard of protection may be necessary, if service conditions are severe. See also 4.2.1 note 1.

4.2.5 Surface texture. The surface texture of the sealing surfaces shall not exceed the values shown in Figure 2, measured in accordance with BS 1134-1.

4.3 “O”-ring seal

4.3.1 Dimensions. The dimensions and the tolerances of the “O”-ring seals shall be in accordance with Table 3 and Figure 3.

²⁾ 1 N/mm² = 1 MPa.

4.3.2 Surface imperfections. The acceptable limits for surface imperfections shall be in accordance with BS 6442.

4.3.3 Material. “O”-rings shall be manufactured from elastomeric materials that are compatible with the fluid contained by the seal and have a hardness of $90^\circ \pm 5^\circ$ IRHD.

NOTE “O”-rings are normally supplied in nitrile rubber, but may also be produced in other elastomers.

4.4 Back-up ring

4.4.1 Dimensions. The dimensions of the back-up rings shall be in accordance with Table 4 and Figure 4.

4.4.2 Material. The back-up rings shall be manufactured from acetal homopolymer, polyamide or PTFE.

4.5 Staple

4.5.1 Dimensions. The dimensions of the staples shall be in accordance with Table 5 and Figure 5 for round section staples or in accordance with Table 6 and Table 7, and Figure 6 and Figure 7 for square section staples.

4.5.2 Material. The staples shall be manufactured from the following materials.

a) *Round section*, corrosion-resisting steel, bright drawn and heat treated to condition R to give a tensile strength, R_m , of 700 N/mm² to 850 N/mm² (see note 1).

b) *Square section*, either:

1) corrosion-resisting steel, type 420S37 bright drawn and heat treated to condition R to give a tensile strength, R_m , of 700 N/mm² to 850 N/mm² (see note 1);

or

2) spring steel, type 070A72 bright drawn and heat treated to provide a hardness of 45 ± 5 HRC and a tensile strength, R_m , of 1 480 N/mm² to 1 520 N/mm².

NOTE 1 Steel type 420S45 (En 56D), formerly in BS 970-4, is suitable.

NOTE 2 The chemical compositions of the above steel types are specified in the following standards:

type 420S37 in BS 970-1:1983 (formerly EN 56C);

type 070A72 in BS 970-5:1972 (formerly EN 42C grade 2).

4.5.3 Protective treatment. Spring steel staples shall be given a protective coating, i.e. phosphate in accordance with BS 3189.

5 Connector assemblies

5.1 Construction

All connectors shall be a combination of the components specified in clause 4.

5.2 Assembly

The connector assembly shall comprise any suitable combination of female body (swivel or fixed) and male body, examples of which are shown in Figure 8.

NOTE If connectors with configurations different to those shown in Figure 8 are required they should still comply with 5.1 and 5.3.

5.3 Envelope dimensions

The maximum envelope dimensions for the connector assemblies shall comply with the relevant dimensions specified in Table 8.