

Hydraulic fluid power — Flange connectors with split or one-piece flange clamps and metric or inch screws —

**Part 1: Flange connectors for use at
pressures of 3,5 MPa (35 bar) to
35 MPa (350 bar), DN 13 to DN 127**

ICS 23.100.40

National foreword

This British Standard reproduces verbatim ISO 6162-1:2002 and implements it as the UK national standard, including Technical Corrigendum November 2004. Together with BS ISO 6162-2:2002 it supersedes BS 7796:1995 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee MCE/18, Fluid power systems and components, to Subcommittee MCE/18/-/4, Connectors and associated components, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

This British Standard, having been prepared under the direction of the Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 16 December 2002

Summary of pages

This document comprises a front cover, an inside front cover, the ISO title page, pages ii to v, a blank page, pages 1 to 18, an inside back cover and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments
15490 Technical Corrigendum No. 1	10 December 2004	Change to Table 2

INTERNATIONAL STANDARD

ISO 6162-1

First edition
2002-12-01

Incorporating Technical Corrigendum No. 1
2004-11-01

Hydraulic fluid power — Flange connectors with split or one-piece flange clamps and metric or inch screws —

Part 1:

**Flange connectors for use at pressures of
3,5 MPa (35 bar) to 35 MPa (350 bar), DN 13
to DN 127**

*Transmissions hydrauliques — Raccordements à bride avec demi-bridés ou
bride monobloc et vis métriques ou en inches —*

*Partie 1: Raccordements à bride pour utilisation à des pressions de 3,5 MPa
(35 bar) à 35 MPa (350 bar), DN 13 à DN 127*



Reference number
ISO 6162-1:2002(E)

Contents

	Page
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Material	2
5 General specifications	3
6 Dimensions	3
7 Tolerances	3
8 Finish	3
9 Pressure/temperature requirements	4
10 Marking	4
11 Designation of flange connections and their parts	4
12 Identification statement (Reference to this part of ISO 6162)	5

Annexes

A Equivalent SAE O-rings	16
B Equivalent inch screw strengths.....	17
Bibliography.....	18

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 6162 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 6162-1 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 4, *Connectors and similar products and components*.

This first edition of ISO 6162-1 together with the first edition of ISO 6162-2 cancel and replace the first edition of ISO 6162:1994, which has been technically revised.

ISO 6162 consists of the following parts, under the general title *Hydraulic fluid power — Flange connectors with split or one-piece flange clamps and metric or inch screws*:

- *Part 1: Flange connectors for use at pressures of 3,5 MPa (35 bar) to 35 MPa (350 bar), DN 13 to DN 127*
- *Part 2: Flange connectors for use at pressures of 35 MPa (350 bar) to 40 MPa (400 bar), DN 13 to DN 51*

Annexes A and B of this part of ISO 6162 are for information only.

Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit. Components are interconnected through their ports and associated fluid conductor connector ends.

Hydraulic fluid power — Flange connectors with split or one-piece flange clamps and metric or inch screws —

Part 1:

Flange connectors for use at pressures of 3,5 MPa (35 bar) to 35 MPa (350 bar), DN 13 to DN 127

WARNING — Users of this part of ISO 6162 shall ensure that suitable material is chosen for the port to maintain the required working pressure, if carbon steel is not used. Also, the tube material and wall thickness depend on the selected working pressure and tube diameter. Tube dimensions shall be calculated in accordance with ISO 10763.

1 Scope

This part of ISO 6162 specifies complete general and dimensional characteristics for flange heads, split flange clamps (FCS), one-piece flange clamps (FC) and ports applicable to four-screw, split and one-piece flange clamp type tube and hose connectors for use at pressures of 3,5 MPa (35 bar¹⁾) to 35 MPa (350 bar). It also specifies the dimensions of the seals to be used, as well as the grooves to house the seal.

This part of ISO 6162 also recognizes the need to accommodate metric (type 1) screw fasteners, as well as to provide a means to use existing inch (type 2) screw fasteners.

These connectors are intended for application in hydraulic systems on industrial and commercial products, where it is desired to avoid the use of threaded connectors.

Surges of pressure higher than the nominal ratings will reduce the ability of the flange connectors to retain the hydraulic fluid. This shall be taken into account in the design of the hydraulic system.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 6162. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 6162 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

ISO 261, *ISO general-purpose metric screw threads — General plan*

ISO 263, *ISO inch screw threads — General plan and selection for screws, bolts and nuts — Diameter range 0.06 to 6 in*

ISO 273, *Fasteners — Clearance holes for bolts and screws*

1) 1 bar = 0,1 MPa = 10⁵ Pa; 1 Pa = 1 N/m².

ISO 724, *ISO general-purpose metric screw threads — Basic dimensions*

ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs*

ISO 2768-1, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

ISO 3601-1, *Fluid power systems — O-rings — Part 1: Inside diameters, cross-sections, tolerances and size identification code*

ISO 3601-3, *Fluid power systems — O-rings — Part 3: Quality acceptance criteria*

ISO 5598, *Fluid power systems and components — Vocabulary*

ISO 8434-5, *Metallic tube connections for fluid power and general use — Part 5: Test methods for threaded hydraulic fluid power connections*

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 10763, *Hydraulic fluid power — Plain-end, seamless and welded precision steel tubes — Dimensions and nominal working pressures*

ASME/B1.1, *Unified Inch Screw Threads (UN and UNR Thread Form)*

3 Terms and definitions

For the purposes of this part of ISO 6162, the terms and definitions given in ISO 5598 apply.

4 Material

4.1 Split flange clamp halves (see Figure 3) and one-piece flange clamps (see Figure 4) shall be made from ferrous material with the following properties:

For nominal flange size 13:

- minimum yield strength: 221 N/mm²;
- minimum elongation at fracture: 3 %;

and for all other nominal flange sizes:

- minimum yield strength: 414 N/mm²;
- minimum elongation at fracture: 3 %.

4.2 Use flange heads made from ferrous material with:

- minimum yield strength: 215 N/mm²;
- minimum elongation at fracture: 10 %.

4.3 Use hex head metric screws of property class 8.8 or 10.9, as specified in ISO 898-1, or equivalent inch screws (see annex B).

4.4 Unless otherwise specified, the O-rings shall be made of NBR (nitrile) with a hardness of (90 ± 5) IRHD, measured in accordance with ISO 48, for use at the pressure and temperature requirements given in clause 9 and Table 1 or Table 2, and for testing. The O-rings shall conform to the dimensions given in Table 4 and shall meet or exceed the O-ring quality acceptance criteria for grade N of ISO 3601-3.

NOTE For higher temperatures, use sealing materials that meet the higher requirements.

5 General specifications

5.1 Select from Tables 1 or 2 and Table 3 either type 1 (metric) or type 2 (inch), split (FCS) or one-piece (FC) flange clamps and ports, depending on whether metric or inch screw fasteners are required.

5.2 Use hexagon head screws, unless otherwise specified. Table 1 lists pressures and torques when property class 8.8 (in accordance with ISO 898-1) screws are chosen. These screws should be used for severe vibration applications, e.g. for rigid piping. Table 2 lists pressures and torques when property class 10.9 (in accordance with ISO 898-1) screws are chosen. In this case, the surface pressure on the screw head and between flange clamp and flange head shall be considered. Hardened flat washers may be used.

5.3 If socket head cap screws are necessary and screws of property classes 8.8 or 10.9 are not available, use screws of property class 12.9 in accordance with ISO 898-1 (see annex B for equivalent inch screws).

6 Dimensions

The following specifications supplement the dimensional data contained in Tables 1 to 4 with respect to all unspecified details.

- a) Select the nominal matching flange size clamp for the matching port size from Figures 3 to 5 and Table 3.
- b) Select the size for flange heads, shown in Figure 6 and Table 4, in accordance with the size selected for the flange clamps and ports.

NOTE The flange head selection is not affected by the difference in metric or inch screw fasteners.

- c) Use O-ring seals (see Figure 7) that conform to the dimensions in ISO 3601-1, which are repeated in Table 4 of this part of ISO 6162. For equivalent SAE O-rings, see annex A.
- d) Select metric or inch screws corresponding to the sizes and lengths indicated in Tables 1 or 2 and, depending upon whether type 1 or type 2 flange clamps were chosen, as specified in 5.1 and 5.2.
- e) Designate both thread size and length of screws.
- f) Designate four-screw split-flange or one-piece flange connector sizes by the nominal flange diameter that corresponds to the maximum diameter of the bore through the flanged head.

7 Tolerances

All dimensions for flange clamps and flange heads which are not otherwise limited shall be in accordance with ISO 273, medium series, and ISO 2768-1, class m.

NOTE Dimensions and tolerances given in the Tables apply to the finished parts, plated or otherwise processed, as specified by the purchaser.

8 Finish

8.1 The external surface on all flanges, except weld-on flange heads, shall be protected with an appropriate coating to pass a minimum 72-h salt spray test in accordance with ISO 9227, unless otherwise agreed upon by the supplier and purchaser.

Weld-on flange heads shall be protected from corrosion by an oil film, phosphate coating or by other means that do not negatively affect weldability to meet a 16-h neutral salt spray test in accordance with ISO 9227, unless otherwise agreed upon by the supplier and purchaser.

8.2 Flange clamps shall meet the requirements of a 32-h salt spray test in accordance with ISO 9227, unless otherwise agreed upon by the supplier and purchaser.

8.3 Screws and washers shall meet the requirements of a 16-h salt spray test in accordance with ISO 9227. All screws of property class 10.9 shall be phosphate coated with an oil finish.

8.4 Any appearance of red rust during the above salt spray tests shall be considered failure, except for the following:

- all internal passages;
- edges such as hex points, serrations and crests of threads where there may be mechanical deformation of the plating or coating typical of mass-produced parts or shipping effects;
- areas where there is mechanical deformation of the plating or coating caused by crimping, flaring, bending and other post-plate metal forming operations;
- areas where the parts are suspended or affixed in the test chamber and condensate can accumulate.

8.5 All connection components shall be free from hanging burrs, loose scale and slivers that might become dislodged in use, and from all other defects that might affect their serviceability. All machined surfaces shall have a surface roughness value of $Ra \leq 6,3 \mu\text{m}$, except where otherwise specified.

8.6 A smooth sealing surface shall be provided. Annular tool marks up to a surface roughness value, Ra , of $3,2 \mu\text{m}$ shall be permitted.

8.7 For more specific finish requirements, see Figures 1 to 6.

9 Pressure/temperature requirements

9.1 Testing shall be conducted in accordance with ISO 8434-5 to determine that flange connectors conforming to this part of ISO 6162 meet the specified pressure/temperature requirements. For flange connections of nominal sizes up to and including DN 51, the burst test and cyclic endurance tests shall be conducted. For flange connections of nominal sizes larger than DN 51, the supplier and purchaser shall agree upon the test requirements or calculation methods to be used to verify that the flange connectors meet requirements.

9.2 Flange connectors complying with this part of ISO 6162 and made of carbon steel shall be suitable for use at the working pressures given in Tables 1 and 2 when used at fluid temperatures between $-20\text{ }^{\circ}\text{C}$ and $+120\text{ }^{\circ}\text{C}$. Such connectors shall be suitable for use in hydraulic systems at ambient temperatures from $-40\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$.

NOTE The temperature range of connectors with elastomeric seals depends on the limits of the temperature range of the seal.

9.3 Flange connectors complying with this part of ISO 6162 and made of stainless steel shall be suitable for use at the working pressures given in Tables 1 and 2 when used at temperatures between $-60\text{ }^{\circ}\text{C}$ and $+50\text{ }^{\circ}\text{C}$. Working pressure for connectors made from stainless steel and used at elevated temperatures shall be reduced by 4 % above $+50\text{ }^{\circ}\text{C}$, 11 % above $+100\text{ }^{\circ}\text{C}$ and 20 % above $+200\text{ }^{\circ}\text{C}$.

10 Marking

10.1 The flange head shall be permanently marked, at the minimum, with the manufacturer's name or trademark and "ISO 6162-1".

10.2 Type 1 clamp halves and one-piece flange clamps shall be permanently marked with an "M" for identification, to denote use of metric screws. Letter height shall be 5 mm minimum. Location of the marking may differ from the location shown in Figure 3. Marking shall be on the top side or outside of the flange. No identification is required for type 2 clamp halves or for one-piece flange clamps.

10.3 Type 1 ports shall be permanently marked with an "M" for identification to denote use of metric screws. Letter height shall be 3 mm minimum. The "M" shall be imprinted and located on the centreline, between holes defined by l_{11} (see Figure 5) and shall not extend into the O-ring sealing area. No identification is required for type 2 ports.

11 Designation of flange connections and their parts

Flange connections and their parts shall be designated according to the following examples, given for DN 25:

Split flange clamp port assembly, metric series (including screws and O-ring):

ISO 6162-1 - FPS1×25

Split flange clamp port assembly, inch series (including screws and O-ring):

ISO 6162-1 - FPS2×25

One-piece flange clamp port assembly, metric series (including screws and O-ring):

ISO 6162-1 - FP1×25

One-piece flange clamp port assembly, inch series (including screws and O-ring):

ISO 6162-1 - FP2×25

Split flange clamp pair, metric series:

ISO 6162-1 - FCS1×25

Split flange clamp pair, inch series:

ISO 6162-1 - FCS2×25

One-piece flange clamp, metric series:

ISO 6162-1 - FC1×25

One-piece flange clamp, inch series:

ISO 6162-1 - FC2×25

Flange head without groove:

ISO 6162-1 - FH×25

Flange head with groove:

ISO 6162-1 - FHG×25

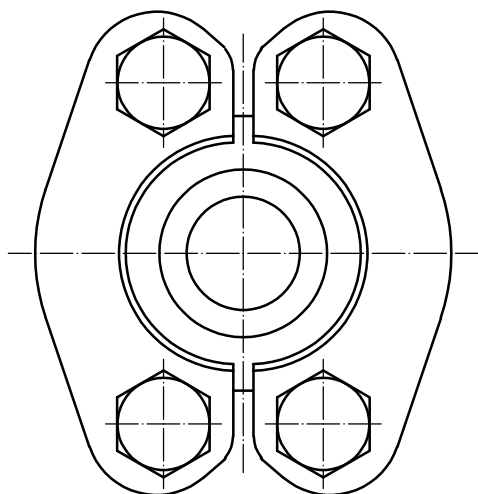
Flange head with groove and O-ring:

ISO 6162-1 - FHGO×25

12 Identification statement (Reference to this part of ISO 6162)

Manufacturers are strongly recommended to use the following statement in test reports, catalogues and sales literature when electing to comply with this part of ISO 6162:

“Flange connectors in accordance with ISO 6162-1:2002, *Hydraulic fluid power — Flange connectors with split or one-piece flange clamps and metric or inch screws — Part 1: Flange connectors for use at pressures of 3,5 MPa (35 bar) to 35 MPa (350 bar), DN 13 to DN 127.*”

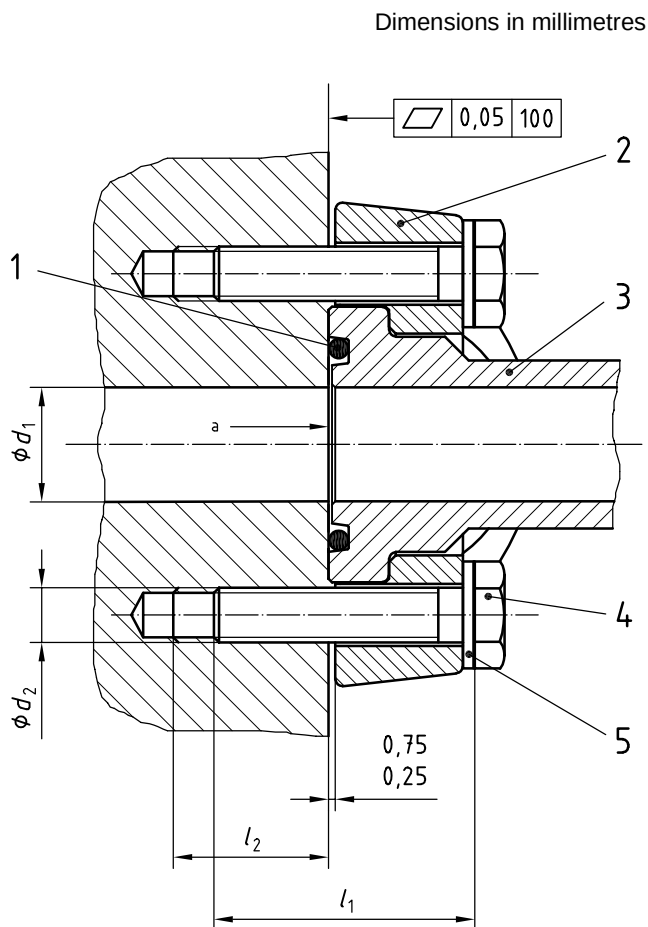


a) Split flange clamp halves

Key

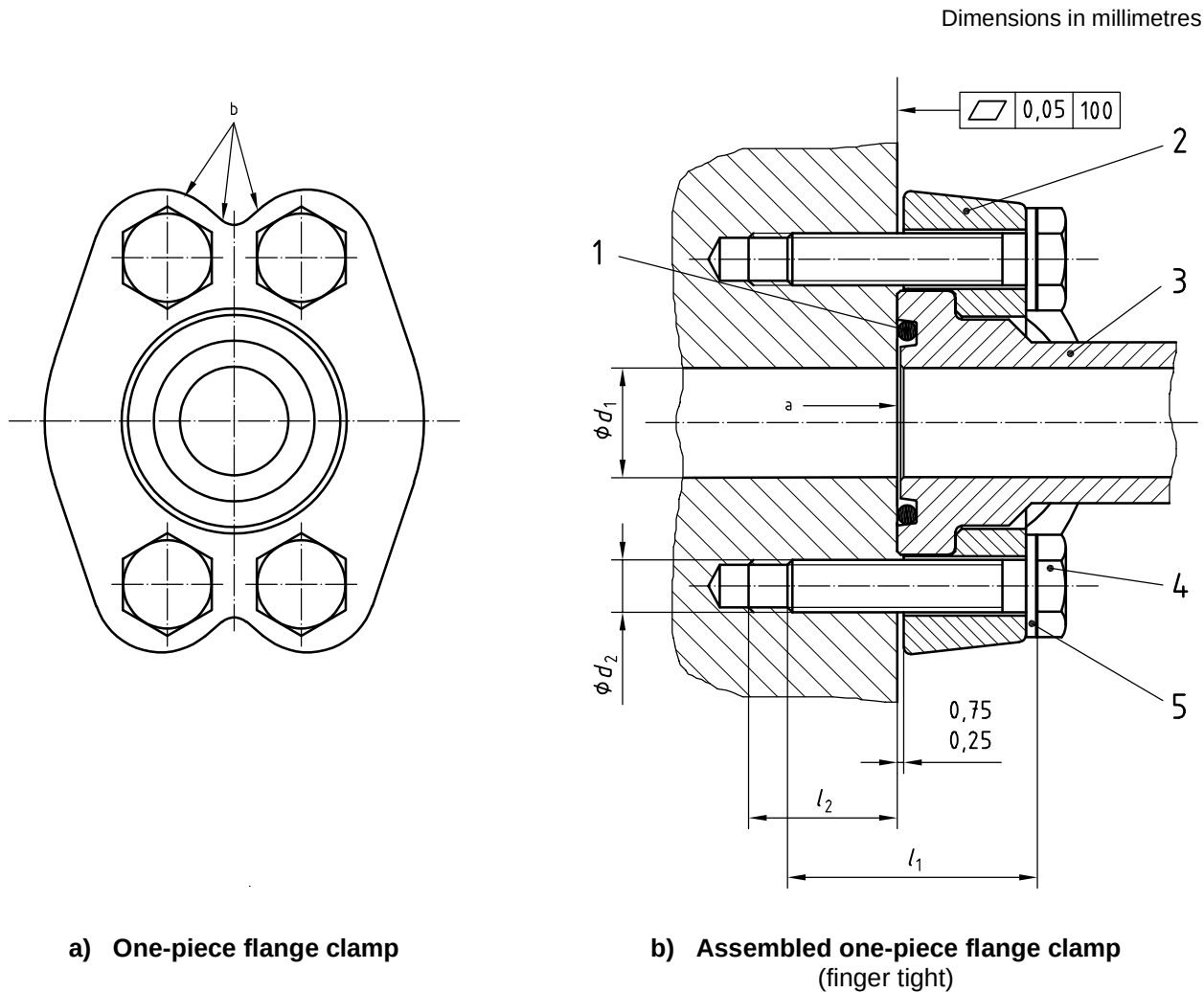
- 1 O-ring seal
- 2 Split flange clamp half
- 3 Flange head
- 4 Screw
- 5 Washer (optional)

^a Face of port on adapter plate, pump, etc.



b) Assembled split flange (finger tight)

Figure 1 — Assembled flange connector with split flange clamp (FCS) (see Tables 1 and 2)



Key

- 1 O-ring seal
- 2 One-piece flange clamp
- 3 Flange head
- 4 Screw
- 5 Washer (optional)
- ^a Face of port on adapter plate, pump, etc.
- ^b Shape optional

Figure 2 — Assembled flange connector with one-piece flange clamp (FC) (see Tables 1 and 2)

Table 1 — Dimensions, screw torques and pressures of flanged port assemblies when using medium strength metric screws (property class 8.8 screw strength per ISO 898-1) (or grade 5 inch screws — see annex B)

Dimensions in millimetres

Nominal flange size ^b DN	d_1 max.	Type 1				Type 2 ^a				Working pressure MPa (bar)	Minimum burst pressure MPa (bar)
		d_2^c Metric	l_1^d Screw length	l_2^e min.	Screw torque ^f N · m $+10_0\%$	d_2^g UNC	l_1^d Screw length	l_2^e min.	Screw torque ^f N · m $+10_0\%$		
13	13	M8	25	14	24	5/16-18	32	24	24	35 (350)	140 (1 400)
19	19	M10	30	18	50	3/8-16	32	22	43	35 (350)	140 (1 400)
25	25	M10	30	16	50	3/8-16	32	22	43	25 (250)	100 (1 000)
32	32	M10	30	22	50	7/16-14	38	28	70	20 (200)	80 (800)
38	38	M12	35	21	92	1/2-13	38	27	105	20 (200)	80 (800)
51	51	M12	35	21	92	1/2-13	38	27	105	16 (160)	64 (640)
64	64	M12	40	23	92	1/2-13	44	30	105	10 (100)	40 (400)
76	76	M16	50	30	210	5/8-11	44	30	210	10 (100)	40 (400)
89	89	M16	50	30	210	5/8-11	51	33	210	3,5 (35)	14 (140)
102	102	M16	50	27	210	5/8-11	51	30	210	3,5 (35)	14 (140)
127	127	M16	55	29	210	5/8-11	57	33	210	3,5 (35)	14 (140)

WARNING — It is important that all screws be lightly torqued before applying the final recommended torque values, to avoid breaking the flange clamp halves or one-piece flange clamps during installation.

WARNING — The working pressure of the flange assembly shall be the lower of the pressures given for its nominal diameter or taken from the relevant tube specification (see ISO 10763).

^a This type of port shall not be used for new design.

^b See annex A for equivalent inch tube nominal diameters.

^c Coarse pitch thread in accordance with ISO 261 and ISO 724.

^d Screw lengths are calculated for steel. Use of other materials may require different screw lengths.

^e Dimension l_2 is the minimum full thread.

^f These torque values are only a guide when using lubricated screws, calculated with a coefficient of friction of 0,17. Net tightening torque depends on many factors, including lubrication, coating and surface finish.

^g Coarse pitch thread in accordance with ISO 263 and ASME/B1.1 (UNC-2A for screw threads, UNC-2B for port threads).

Table 2 — Dimensions, screw torques and pressures of flanged port assemblies when using high strength metric screws (property class 10.9 screw strength per ISO 898-1) (or grade 8 inch screws — see annex B)

Dimensions in millimetres

Nominal flange size ^b DN	d_1 max.	Type 1				Type 2 ^a				Working pressure MPa (bar)	Minimum burst pressure MPa (bar)
		d_2^c Metric	l_1^d Screw length	l_2^e min.	Screw torque ^f N · m +10 % 0	d_2^g UNC	l_1^d Screw length	l_2^e min.	Screw torque ^f N · m +10 % 0		
13	13	M8	25	14	32	5/16-18	32	24	32	35 (350)	140 (1 400)
19	19	M10	30	18	70	3/8-16	32	22	60	35 (350)	140 (1 400)
25	25	M10	30	16	70	3/8-16	32	22	60	31,5 (315)	126 (1 260)
32	32	M10	30	18	70	7/16-14	38	28	92	25 (250)	100 (1 000)
38	38	M12	35	21	130	1/2-13	38	27	150	20 (200)	80 (800)
51	51	M12	35	21	130	1/2-13	38	27	150	20 (200)	80 (800)
64	64	M12	40	23	130	1/2-13	44	30	150	16 (160)	64 (640)
76	76	M16	50	30	295	5/8-11	44	30	295	16 (160)	64 (640)
89	89	M16	50	30	295	5/8-11	51	33	295	3,5 (35)	14 (140)
102	102	M16	50	27	295	5/8-11	51	30	295	3,5 (35)	14 (140)
127	127	M16	55	29	295	5/8-11	57	33	295	3,5 (35)	14 (140)

WARNING — It is important that all screws be lightly torqued before applying the final recommended torque values, to avoid breaking the flange clamp halves or one-piece flange clamps during installation.

WARNING — The working pressure of the flange assembly shall be the lower of the pressures given for its nominal diameter or taken from the relevant tube specification (see ISO 10763).

^a This type of port shall not be used for new design.

^b See annex A for equivalent inch tube nominal diameters.

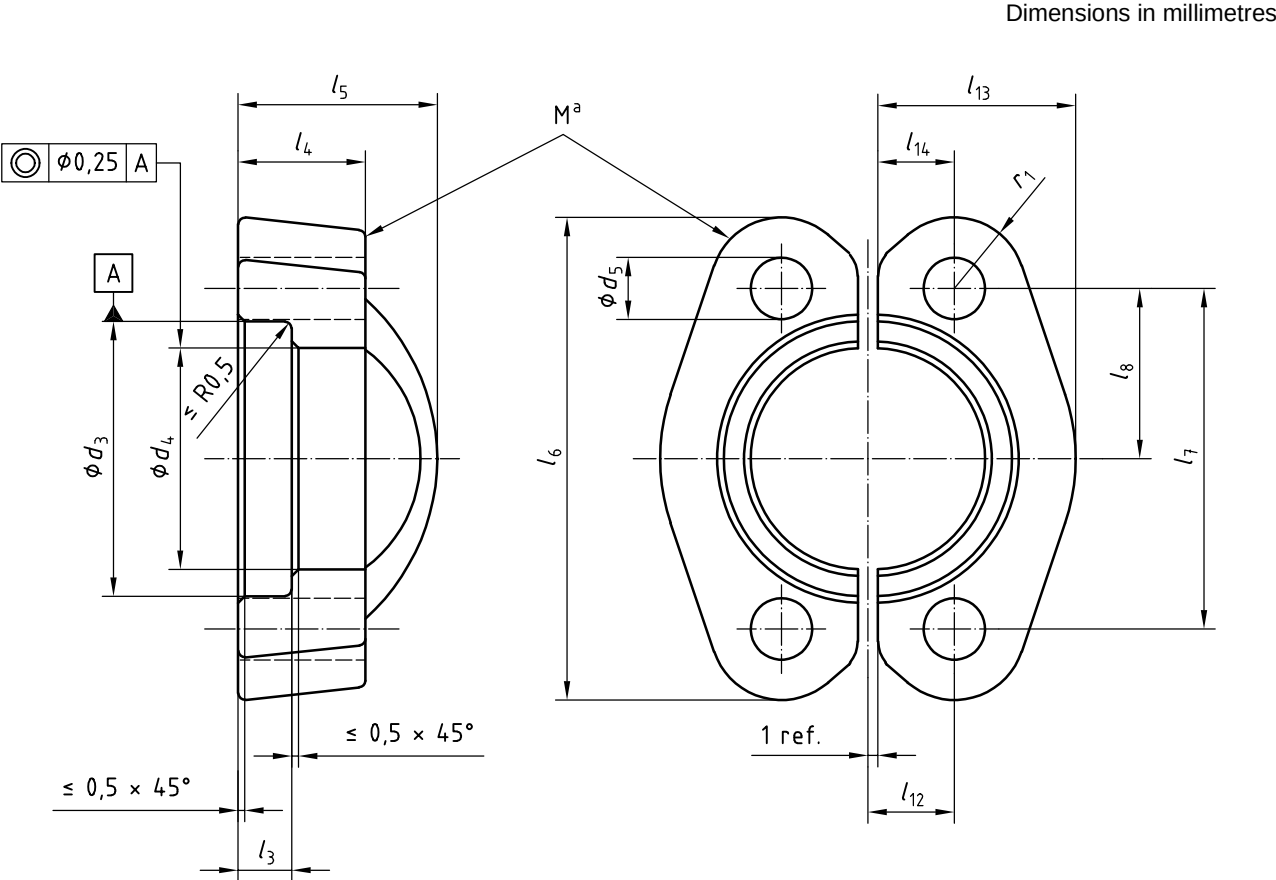
^c Coarse pitch thread in accordance with ISO 261 and ISO 724.

^d Screw lengths are calculated for steel. Use of other materials may require different screw lengths.

^e Dimension l_2 is the minimum full thread.

^f These torque values are only a guide when using lubricated screws, calculated with a coefficient of friction of 0,17. Net tightening torque depends on many factors, including lubrication, coating and surface finish.

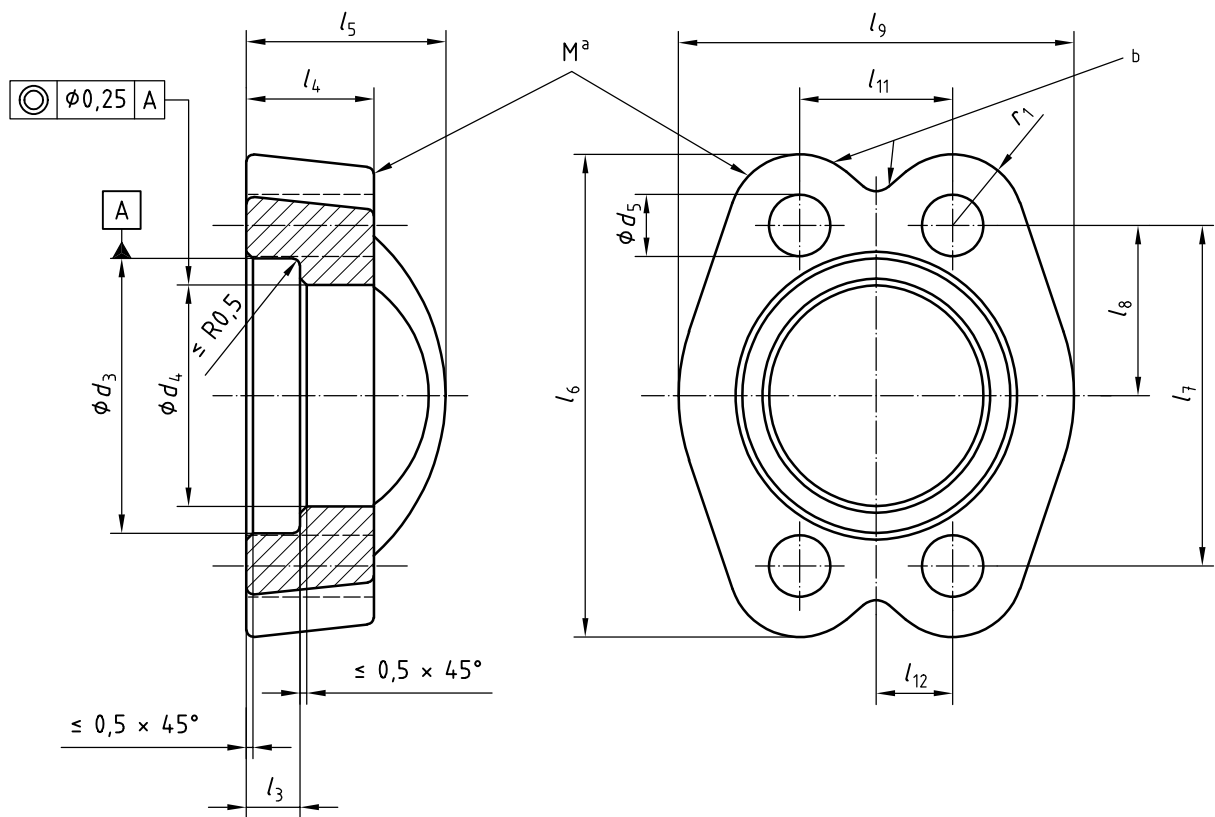
^g Coarse pitch thread in accordance with ISO 263 and ASME/B1.1 (UNC-2A for screw threads, UNC-2B for port threads).



^a Metric marking for type 1 clamp

Figure 3 — Split flange clamp half (FCS) (see Table 3)

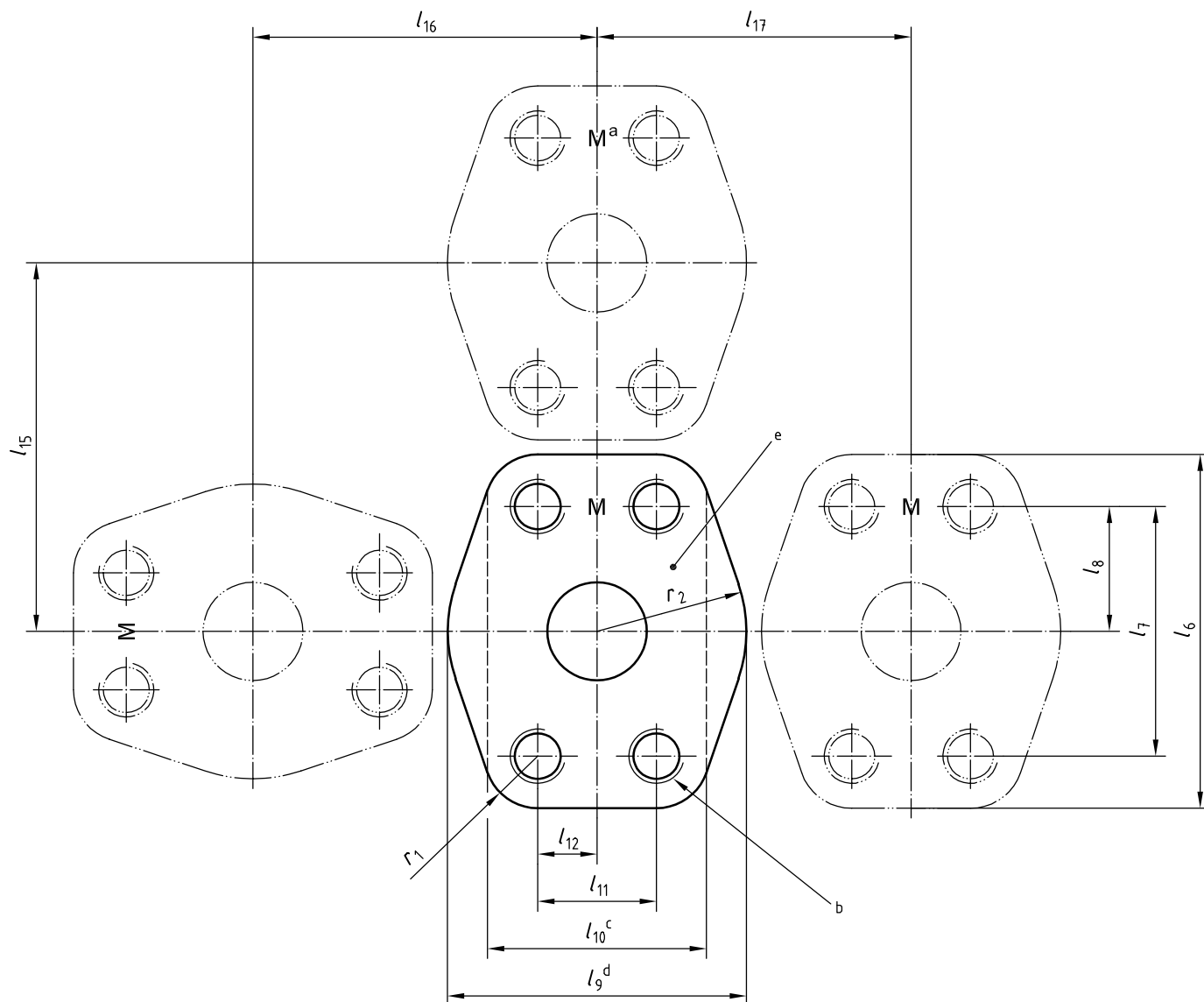
Dimensions in millimetres



- ^a Metric marking for type 1 clamp
- ^b Shape optional with the manufacturer

Figure 4 — One-piece flange clamp (FC) (see Table 3)

Dimensions in millimetres
Surface roughness in micrometres



- a Metric marking for type 1 ports
- b 4 threaded holes $\varnothing d_2$ on the port with full thread length l_2
- c Minimum flange pad width
- d Recommended flange pad width
- e Surface roughness of port face $Ra\ 3,2$

Figure 5 — Port dimensions for flange connections — Minimum and recommended flange pad widths
(see Table 3)

Table 3 — Dimensions of flange clamps and ports

Dimensions in millimetres

Nominal flange size DN	d_3	d_4	d_5		l_3	l_4	l_5	l_6		l_7	l_8
	$\pm 0,25$	$\pm 0,25$	Type 1 $\pm 0,25$	Type 2 $\pm 0,25$	$\pm 0,15$	$\pm 0,4$	$\pm 0,4$	max.	min.	$\pm 0,25$	$\pm 0,25$
13	31	24,3	9	8,74	6,2	13	19	54,9	53,1	38,1	19,05
19	38,9	32,2	11	10,31	6,2	14	22	65,8	64,3	47,6	23,8
25	45,3	38,5	11	10,31	7,5	16	24	70,6	69,1	52,4	26,2
32	51,6	43,7	11	11,91	7,5	14 ^b	22 ^c	80,3	78,5	58,7	29,35
38	61,1	50,8	13	13,49	7,5	16	25	94,5	93,0	69,9	34,95
51	72,3	62,8	13	13,49	9	16	26	103,1	100,1	77,8	38,90
64	84,9	74,9	13	13,49	9	19	38	115,8	112,8	88,9	44,45
76	102,4	90,9	17	16,66	9	22	41	136,7	133,4	106,4	53,2
89	115,1	102,4	17	16,66	10,7	22	28	153,9	150,9	120,7	60,35
102	127,8	115	17	16,66	10,7	25	35	163,6	160,3	130,2	65,1
127	153,2	140,5	17	16,66	10,7	28	41	185,7	182,6	152,4	76,2
Nominal flange size DN	l_9 $\pm 0,8$	l_{10} min.	l_{11} $\pm 0,25$	l_{12} $\pm 0,25$	l_{13} $\pm 0,8$	l_{14} $\pm 0,4$	r_1 $\pm 0,4$	r_2 $\pm 0,8$	l_{15}^a min.	l_{16}^a min.	l_{17}^a min.
13	46	33	17,5	8,75	21,8	8	8	23	56	52	49
19	52	41	22,3	11,15	24,9	10	9	26	68	61	55
25	59	48	26,2	13,1	28,2	12	9	29	72	67	61
32	73	54	30,2	15,1	35,3	14	10	37	82	78	75
38	83	64	35,7	17,85	40,1	17	12	41	96	90	85
51	97	76	42,9	21,45	47,2	21	12	49	104	102	99
64	109	89	50,8	25,4	53,1	24	13	54	117	114	111
76	131	106	61,9	30,95	64,3	30	14	66	137	136	133
89	140	119	69,9	34,95	68,6	34	16	70	155	148	142
102	152	132	77,8	38,9	74,9	38	16	76	164	160	155
127	181	151	92,1	46,05	89,4	45	16	90	186	185	183

^a Dimensions l_{15} , l_{16} and l_{17} provide 1,5 mm clearance between flanges, with dimensions on the upper limit when the same size flanges are used on adjacent ports. These dimensions do not apply when more than one size of flanges are used on adjacent ports.

^b 16 mm is also acceptable.

^c 24 mm is also acceptable.

Figure 6 — Flanged head (see Table 4)

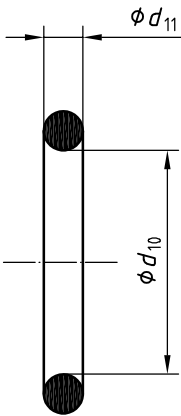


Figure 7 — O-ring (see Table 4)

Table 4 — Dimensions of flange heads and O-rings

Dimensions in millimetres										
Nominal flange size DN	d_1	d_6	d_7	d_8		d_9	d_{10}^a	d_{11}^a	l_{18}	l_{19}
	max.	max.	$\pm 0,25$	max.	min.	max.	nominal	nominal	reference	$\pm 0,15$
13	13	24	30,2	25,65	25,50	15	19	3,55	13	6,8
19	19	31,5	38,1	31,75	31,60	21	25	3,55	14	6,8
25	25	38	44,45	39,25	39,10	27	32,5	3,55	14	8
32	32	43	50,8	44,15	44,00	33	37,5	3,55	14	8
38	38	50	60,35	53,9	53,7	40	47,5	3,55	16	8
51	51	62	71,4	62,75	62,50	52	56	3,55	16	9,6
64	64	74	84,1	75,5	75,3	65	69	3,55	18	9,6
76	76	90	101,6	91,3	91,1	78	85	3,55	19	9,6
89	89	102	114,3	103,6	103,4	91	97,5	3,55	22	11,3
102	102	114	127	117,5	117,3	103	112	3,55	25	11,3
127	127	140	152,4	141,9	141,7	129	136	3,55	28	11,3

^a These dimensions are taken from ISO 3601-1; see ISO 3601-1 for tolerances. For equivalent inch O-rings, see annex A.

Annex A (informative)

Equivalent SAE O-rings

Table A.1 lists the O-rings conforming to Society of Automotive Engineers SAE J515 which are equivalent to the O-rings specified in this part of ISO 6162 and which correspond to ISO 3601-1 O-rings.

Table A.1 — O-ring dimensions

Dimensions in millimetres

Nominal flange size DN	Nominal inch tube size DN (in inches)	O-ring ISO 3601-1	O-ring SAE J515	O-ring size number SAE J515
13	1/2	19 × 3,55	18,64 × 3,53	210
19	3/4	25 × 3,55	24,99 × 3,53	214
25	1	32,5 × 3,55	32,92 × 3,53	219
32	1 1/4	37,5 × 3,55	37,69 × 3,53	222
38	1 1/2	47,5 × 3,55	47,22 × 3,53	225
51	2	56 × 3,55	56,74 × 3,53	228
64	2 1/2	69 × 3,55	69,44 × 3,53	232
76	3	85 × 3,55	85,32 × 3,53	237
89	3 1/2	97,5 × 3,55	98,02 × 3,53	241
102	4	112 × 3,55	110,72 × 3,53	245
127	5	136 × 3,55	136,12 × 3,53	253

Annex B
(informative)

Equivalent inch screw strengths

Table B.1 lists the grades and minimum tensile strength (stress) of inch screws conforming to SAE J429, which are equivalent to the metric screw property classes of ISO 898-1 specified in this part of ISO 6162.

Table B.1 — Screw strengths

ISO 898-1 metric screw		SAE J429 inch screw	
Property class	Minimum tensile (stress)	Grade	Minimum tensile (stress)
8.8	800 MPa	5	827 MPa
10.9	1 040 MPa	8	1 034 MPa
12.9 ^a	1 220 MPa	12 ^a	$d \leq 1/2$ in: 1 240 MPa $d \geq 5/8$ in: 1 171 MPa

^a Socket head cap screws. SAE J429 does not provide an equivalent material specification for inch screws. See ASTM A574 for material specifications and ASME B18.3 for product specifications.

Bibliography

- [1] ASME B18.3:1998, *Socket Cap, Shoulder and Set Screws (Inch Series)*
- [2] ASTM A574:2000, *Standard Specification for Alloy Steel Socket Head Cap Screws*
- [3] ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*
- [4] ISO 1101, *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*
- [5] ISO 1302, *Geometrical Product Specifications (GPS) — Indication of surface texture in technical product documentation*
- [6] ISO 6164, *Hydraulic fluid power — Four-screw, one-piece square-flange connections for use at pressures of 25 MPa and 40 MPa (250 bar and 400 bar)*
- [7] ISO 6708, *Pipework components — Definition and selection of DN (nominal size)*
- [8] ISO 6892, *Metallic materials — Tensile testing at ambient temperature*
- [9] SAE J429, JAN99, *Mechanical and Material Requirements for Externally Threaded Fasteners*
- [10] SAE J515, Rev. JAN97, *Specification for Hydraulic O-Ring Materials, Properties, and Sizes for Metric and Inch Stud Ends, Face Seal Fittings and Four-Screw Flange Tube Connections*

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at <http://www.bsi-global.com>.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001. Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at <http://www.bsi-global.com/bsonline>.

Further information about BSI is available on the BSI website at <http://www.bsi-global.com>.

Copyright

Copyright subsists in all BSI publications. BSI also holds the copyright, in the UK, of the publications of the international standardization bodies. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI.

This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any other purpose than implementation then the prior written permission of BSI must be obtained.

Details and advice can be obtained from the Copyright & Licensing Manager. Tel: +44 (0)20 8996 7070. Fax: +44 (0)20 8996 7553. Email: copyright@bsi-global.com.