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

Part 2:

**Flange connectors for use at pressures of
35 MPa (350 bar) to 40 MPa (400 bar), DN 13
to DN 51**

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

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*Partie 2: Raccordements à bride pour utilisation à des pressions de 35 MPa
(350 bar) à 40 MPa (400 bar), DN 13 à DN 51*



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Printed in Switzerland

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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 6162-2 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 6162-2 together with first edition of ISO 6162-1 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.

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

Part 2:

Flange connectors for use at pressures of 35 MPa (350 bar) to 40 MPa (400 bar), DN 13 to DN 51

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 35 MPa (350 bar¹) to 40 MPa (400 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 should 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)*

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3 Terms and definitions

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

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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:

- minimum yield strength: 331 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 in Table 1 or in 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. Burst and cyclic endurance tests shall be conducted on flange connections.

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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 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 6162-2".

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 6162-2 - FPS1×25

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

ISO 6162-2 - FPS2×25

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

ISO 6162-2 - FP1×25

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

ISO 6162-2 - FP2×25

Split flange clamp pair, metric series:

ISO 6162-2 - FCS1×25

Split flange clamp pair, inch series:

ISO 6162-2 - FCS2×25

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One-piece flange clamp, metric series:

ISO 6162-2 - FC1×25

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One-piece flange clamp, inch series:

ISO 6162-2 - FC2×25

Flange head without groove:

ISO 6162-2 - FH×25

Flange head with groove:

ISO 6162-2 - FHG×25

Flange head with groove and O-ring:

ISO 6162-2 - 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 6162-2:2002, *Hydraulic fluid power — Flange connectors with split or one-piece flange clamps and metric or inch screws — Part 2: Flange connectors for use at pressures of 35 MPa (350 bar) to 40 MPa (400 bar), DN 13 to DN 51.*”