

INTERNATIONAL
STANDARD

ISO
6162

First edition
1994-05-01

**Hydraulic fluid power — Four-screw
split-flange connections for use at
pressures of 2,5 MPa to 40 MPa (25 bar to
400 bar) — Type I metric series and type II
inch series**
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*Transmissions hydrauliques — Brides de raccordement fendues à quatre
vis pour des pressions d'utilisation de 2,5 MPa à 40 MPa (25 bar à
400 bar) — Type I série métrique et type II série en inches*



Reference number
ISO 6162:1994(E)

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.

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.

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

ISO 6162:1994

Annexes A and B of this International Standard are for information only.

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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 fitting ends.

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Hydraulic fluid power — Four-screw split-flange connections for use at pressures of 2,5 MPa to 40 MPa (25 bar to 400 bar) — Type I metric series and type II inch series

1 Scope

This International Standard gives complete general and dimensional specifications for flanged heads and split-flange clamp halves applicable to four-screw split-flange type tube and hose connections for use at pressures of 2,5 MPa to 40 MPa (25 bar¹⁾ to 400 bar).

For flange connections, a minimum design factor of 2,5 is valid with screws of property class 8.8, not including weld joints, for which special instructions exist. The design factor of the flange may be increased to 3,5 or better by using flange-head screws of property class 10.9 (see ISO 898-1).

This International Standard also includes appropriate references to the O-ring seals and their assembly components as well as recommended port dimensions and port design considerations.

It also recognizes the need to accommodate metric screw fasteners as well as to provide a means to utilize existing inch screw fasteners and, consequently, it provides type I and type II connections.

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

Surges of pressure higher than the nominal ratings will reduce the ability of the flange connections to retain the hydraulic fluid and this should be taken into account in the design of the hydraulic system.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 48:—²⁾, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD) (Combined revision of the second edition (ISO 48:1979), and ISO 1400:1975 and ISO 1818:1975).*

ISO 261:1973, *ISO general purpose metric screw threads — General plan.*

ISO 263:1973, *ISO inch screw threads — General plan and selection for screws, bolts and nuts — Diameter range 0.06 to 6 in.*

ISO 273:1979, *Fasteners — Clearance holes for bolts and screws.*

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

2) To be published.

ISO 724:1993, *ISO general-purpose metric screw threads — Basic dimensions.*

ISO 725:1978, *ISO inch screw threads — Basic dimensions.*

ISO 898-1:1988, *Mechanical properties of fasteners — Part 1: Bolts, screws and studs.*

ISO 3601-1:1988, *Fluid systems — Sealing devices — O-rings — Part 1: Inside diameters, cross-sections, tolerances and size identification code.*

ISO 3601-3:1987, *Fluid systems — Sealing devices — O-rings — Part 3: Quality acceptance criteria.*

ISO 5598:1985, *Fluid power systems and components — Vocabulary.*

ISO 9227:1990, *Corrosion tests in artificial atmospheres — Salt spray tests.*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 5598 apply.

4 Material

4.1 Use flanged heads made of steel.

4.2 Use split-flange clamp halves made from a quality of ferrous material with the following properties:

- a) 2,5 MPa to 35 MPa (25 bar to 350 bar), nominal flange size 13
 - lower yield stress: 221 N/mm²
 - minimum percentage elongation after fracture: 3
- b) 2,5 MPa to 35 MPa (25 bar to 350 bar), all other nominal flange sizes
 - lower yield stress: 414 N/mm²
 - minimum percentage elongation after fracture: 3
- c) 40 MPa (400 bar), all nominal flange sizes
 - minimum yield stress: 331 N/mm²

— minimum percentage elongation after fracture: 3

4.3 Use metric screws of property class 8.8 or 10.9 (ISO 898-1) or inch screws which have a minimum tensile strength of 827 N/mm².

4.4 Use metric or inch screws made from medium carbon steel, quenched and tempered.

5 General specifications

5.1 Select from tables 1 to 4 either type I (metric) or type II (inch) split-flange clamp halves and ports depending on whether metric or inch screw fasteners are required.

5.2 Ensure that all type I clamp halves and ports are permanently embossed or stamped with the letter M to denote use of metric screws.

5.3 Use either socket head cap screws or hexagon head screws of property class 8.8 or 10.9, as specified in ISO 898-1.

5.4 Provide workmanship which conforms to the best commercial practice to produce high-quality connection components.

6 Dimensions

The following specifications supplement the dimensional data contained in tables 1 and 2 with respect to all unspecified detail.

6.1 Select the nominal matching flange size clamp for the matching port size from figures 2 to 4 and table 1 or table 2. Specify 2,5 MPa to 35 MPa (25 bar to 350 bar) series or 40 MPa (400 bar) series.

6.1.1 Refer to figure 5 and table 3 for matching port dimensions and spacing for 2,5 MPa to 35 MPa (25 bar to 350 bar) series.

6.1.2 Refer to figure 5 and table 4 for matching port dimensions and spacing for 40 MPa (400 bar) series.

6.2 Select the size and pressure series for flanged heads, shown in figure 3 and tables 1 and 2, in accordance with the size and pressure series selected for the clamp halves and ports.

NOTE 1 The flange head selection is not affected by the difference in screw fasteners.

6.3 Use O-ring seals (see figure 2) that conform to the dimensions in ISO 3601-1, which are repeated in tables 1 and 2. They shall have a hardness of 90 ± 5 in accordance with ISO 48 and shall conform to grade N in ISO 3601-3. For equivalent O-rings in accordance with SAE J120, see annex A.

6.4 Select metric or inch screws for use with these connections for the sizes and lengths indicated in tables 1 and 2, and depending upon whether type I or type II clamp halves were chosen, as specified in 5.1.

Designate both thread size and length of screws.

6.5 Designate four-screw split-flange connection sizes by the nominal flange size which corresponds to the maximum diameter of the bore through the flanged head.

NOTE 2 Dimensions and tolerances given in the tables apply to the finished parts, plated or otherwise processed, as specified by the purchaser.

7 Tolerances

All dimensions for flanged heads, split-flange clamp halves and ports, not otherwise limited, shall be used with a tolerance of $\pm 0,4$ mm.

8 Finish

8.1 Unless otherwise specified by the purchaser, supply the flanged heads and split-flange clamp halves with one of the following finishes as specified:

- a) zinc plated, to a minimum thickness of 0,005 mm, followed by a chromate treatment. These parts shall meet the requirements of a 32 h salt spray test, in accordance with ISO 9227;
- b) phosphate coated, to a minimum weight of $0,01 \text{ kg/m}^2$ (oil finish). These parts shall meet the requirements of a 16 h salt spray test, in accordance with ISO 9227.

8.2 Phosphate coat (oil-finished) all screws.

8.3 Ensure that connection components are free from all hanging burrs, loose scale and slivers which might become dislodged in usage and all other defects which might affect their serviceability.

8.4 Provide smooth sealing surfaces; annular tool marks up to a value of $R_a \leq 3,2 \text{ }\mu\text{m}$ are acceptable.

9 Identification statement (Reference to this International Standard)

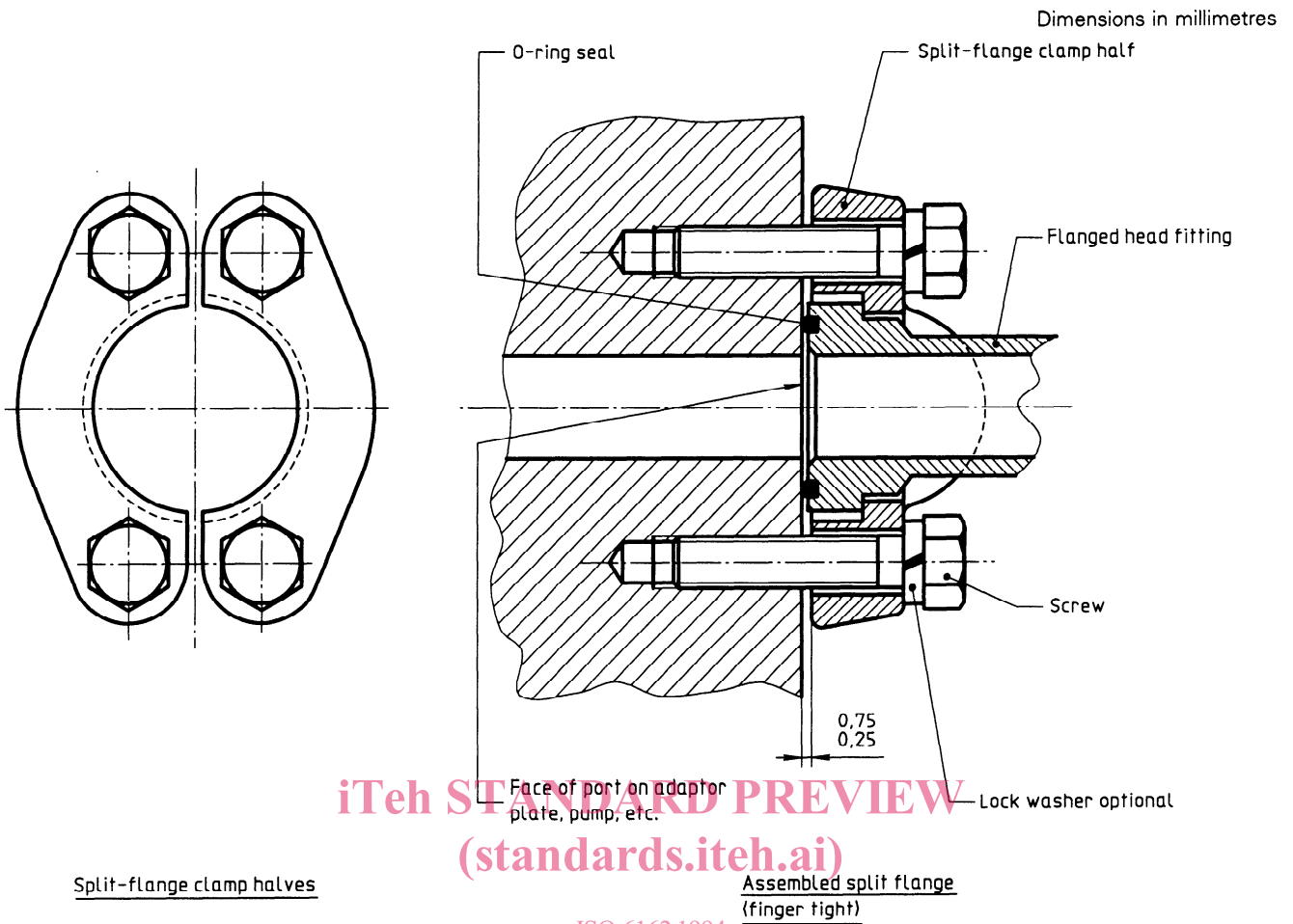
Use the following statement in test reports, catalogues and sales literature when electing to comply with this International Standard:

"Four-screw split-flange connections in accordance with ISO 6162:1994, *Hydraulic fluid power — Four-screw split-flange connections for use at pressures of 2,5 MPa to 40 MPa (25 bar to 400 bar) — Type I metric series and type II inch series.*"

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Figure 1 — Assembled split-flange connection

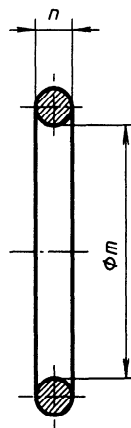


Figure 2 — O-ring

Dimensions in millimetres,
surface roughness in micrometres

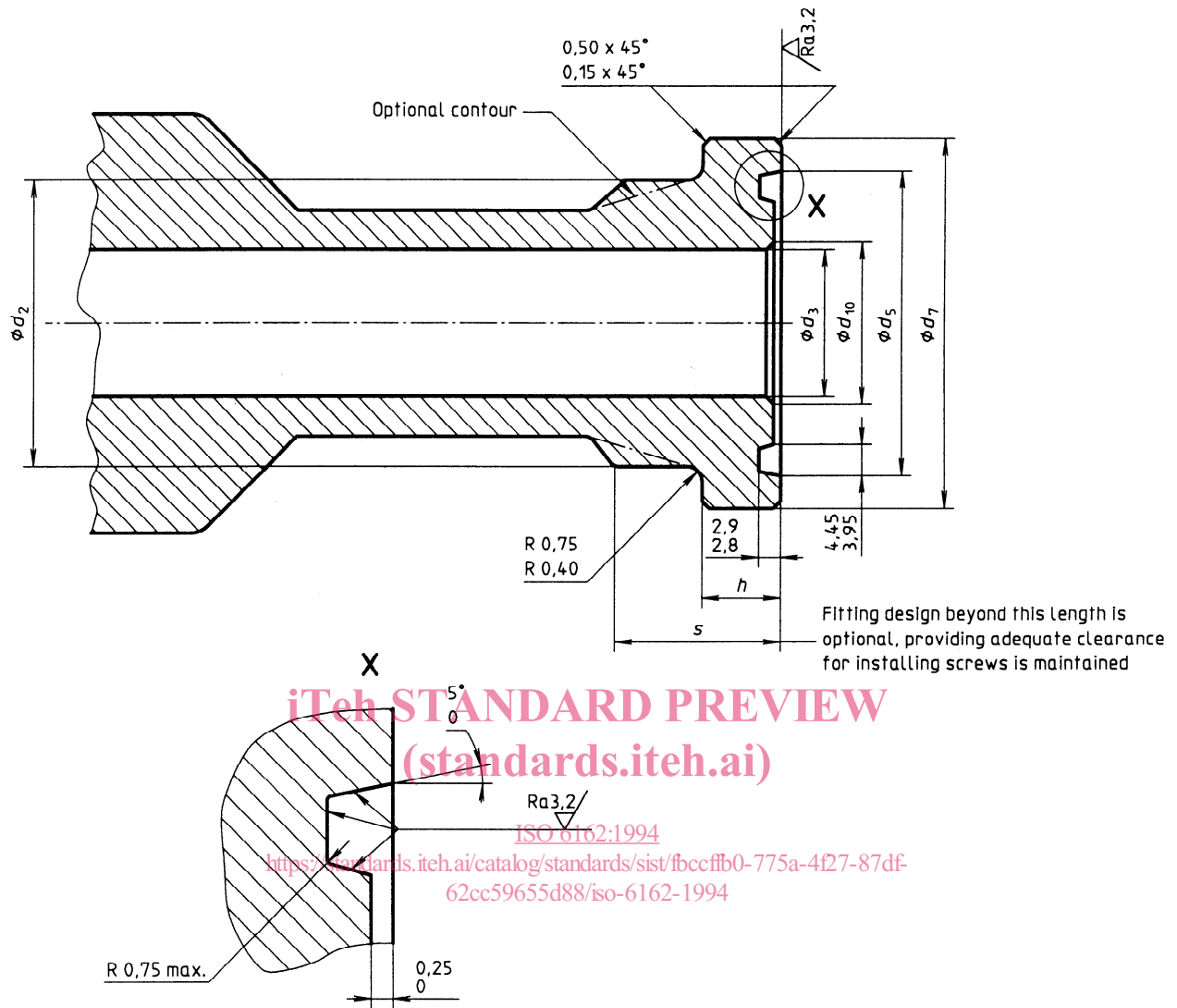
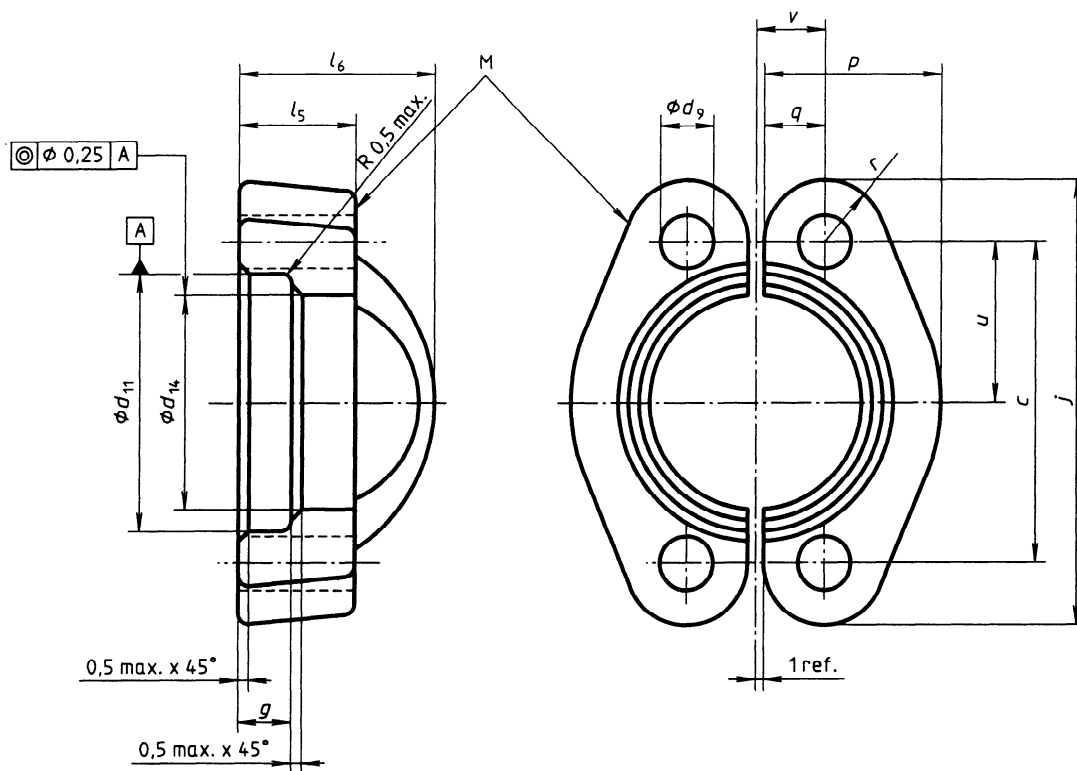


Figure 3 — Flanged head (see tables 1 and 2)

Dimensions in millimetres



NOTE — Type I clamp halves shall be marked with an "M" for identification. Letter height shall be 5 mm min. Location of the marking may differ from the example shown. Marking shall be on the top side or outside of the flange. No identification is required for type II clamp halves.

Figure 4 — Split-flange clamp half (see tables 1 and 2)

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Table 1 — Dimensions of hydraulic flange connections 2,5 MPa to 35 MPa (25 bar to 350 bar) series
Dimensions in millimetres [Dimensions in inches in brackets]

Nominal flange size DN	d_2 max.	d_3 max.	d_5		d_7 $\pm 0,25$	d_{10} max.	d_{11} $\pm 0,25$	d_{14} $\pm 0,25$	g $\pm 0,15$	h $\pm 0,15$	j		l_5	l_6	O-ring ¹⁾	
			max.	min.							max.	min.			m nom.	n nom.
13	24	13	25,65	25,50	30,2	14	31	24,3	6,2	6,8	54,9	53,1	13	19	19	3,55
19	31,5	19	31,75	31,60	38,1	21	38,9	32,2	6,2	6,8	65,8	64,3	14	22	25	3,55
25	38	25	39,25	39,10	44,45	27	45,3	38,5	7,5	8	70,6	69,1	16	22	32,5	3,55
32	43	32	44,15	44,00	50,8	33	51,6	43,7	7,5	8	80,3	78,5	14	24	37,5	3,55
38	50	38	53,9	53,7	60,35	40	61,1	50,8	7,5	8	94,5	93,0	16	25	47,5	3,55
51	62	51	62,75	62,50	71,4	52	72,3	62,8	9	9,6	103,1	100,1	16	26	56	3,55
64	74	64	75,5	75,3	84,1	65	84,9	74,9	9	9,6	115,8	112,8	19	38	69	3,55
76	90	76	91,3	91,1	101,6	78	102,4	90,9	9	9,6	136,7	133,4	22	41	85	3,55
89	102	89	103,6	103,4	114,3	90	115,1	102,4	10,7	11,3	153,9	150,9	22	28	97,5	3,55
102	114	102	117,5	117,3	127	103	127,8	115	10,7	11,3	163,6	160,3	25	35	112	3,55
127	140	127	141,9	141,7	152,4	129	153,2	140,5	10,7	11,3	185,7	182,6	28	41	136	3,55

Nominal flange size DN	c $\pm 0,25$	p $\pm 0,8$	q	r	s	u ref $\pm 0,25$	v	Working pressure MPa (bar ⁷⁾)	Screw and screw holes ²⁾							
									type I ³⁾			type II ⁴⁾				
									Screw		Screw torque ⁶⁾ N-m	Screw		Screw torque ⁶⁾ N-m		
									d_5 ⁵⁾	thread ⁸⁾		length	d_5		thread ⁹⁾	length
13	38,1	21,8	8	8	13	19,05	8,75	35 (350)	9	M8 × 1,25	25	25	8,74	[5/16-18]	32	25
19	47,6	24,9	10	9	14	23,8	11,15	35 (350)	11	M10 × 1,5	30	53	10,31	[3/8-16]	32	45
25	52,4	28,2	12	9	14	26,2	13,1	35 (350)	11	M10 × 1,5	30	53	10,31	[3/8-16]	32	45
32	58,7	35,3	14	10	14	29,35	15,1	25 (250)	11	M10 × 1,5	30	53	11,91	[7/16-14]	38	73
38	69,9	40,1	17	12	16	34,95	17,85	20 (200)	13,5	M12 × 1,75	35	95	13,49	[1/2-13]	38	110
51	77,8	47,2	21	12	16	38,9	21,45	20 (200)	13,5	M12 × 1,75	35	95	13,49	[1/2-13]	38	110
64	88,9	53,1	24	13	18	44,45	25,4	16 (160)	13,5	M12 × 1,75	40	95	13,49	[1/2-13]	44	110
76	106,4	64,3	30	14	19	53,2	30,95	10 (100)	17,5	M16 × 2	50	220	16,66	[5/8-11]	44	220
89	120,7	68,6	34	16	22	60,35	34,95	2,5 (25)	17,5	M16 × 2	50	220	16,66	[5/8-11]	51	220
102	130,2	74,9	38	16	25	65,1	38,9	2,5 (25)	17,5	M16 × 2	50	220	16,66	[5/8-11]	51	220
127	152,4	89,4	45	16	28	76,2	46,05	2,5 (25)	17,5	M16 × 2	55	220	16,66	[5/8-11]	57	220

1) These dimensions are taken from ISO 3601-1; see ISO 3601-1 for tolerances.
2) The other dimensions given in this table are common to both type I and type II flanges. Screw lengths are calculated for steel; use of other materials may require different screw lengths.
3) Each type I clamp half shall have the letter "M" marked as shown in figure 4.
4) This shall not be used for a new design.
5) In accordance with ISO 273, medium series.
6) These torque values are only a guide when using lubricated screws of property class 8.8, as specified in ISO 898-1, calculated with a coefficient of friction of 0,2. Net tightening torque depends on many factors, including lubrication, coating and surface finish. When flange head screws of property class 10.9 or class 10.9 screws with heat-treated washers are used to increase the design factor, the recommended torque values may be increased by 25 %.
CAUTION — It is important that all screws be lightly torqued before applying the final recommended torque values to avoid breaking the flange halves during installation.
7) 1 bar = 10⁵ Pa = 0,1 MPa
8) Coarse pitch thread in accordance with ISO 261 and ISO 724.
9) Coarse pitch thread in accordance with ISO 263 and ISO 725 (UNC-2A).