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

Transmissions hydrauliques — Tubes de précision en acier, soudés ou non, à extrémités lisses — Dimensions et pressions nominales de travail

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO 10763:1994), which has been technically revised.

The main changes compared to the previous edition are as follows:

— The complete document was reformatted, especially Table 1 to improve readability.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit.

Components may be connected through their ports by connections (fittings) and conduits. Tubes are rigid conduits.

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

1 Scope

This document specifies sizes and nominal working pressures for tubes with outside diameters in accordance with ISO 4397, and wall thicknesses and mechanical properties in accordance with ISO 3305 (seamless precision steel tubes} and ISO 3305 (welded precision steel tubes). The nominal working pressures included in this document reflect a design factor ratio of 4 to 1 applied to the calculated burst pressures.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3305, *Plain end welded precision steel tubes — Technical conditions for delivery*

ISO 4397, *Fluid power connectors and associated components — Nominal outside diameters of tubes and nominal hose sizes*

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

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Requirements

Steel tubes shall have outside diameters selected from the range presented in ISO 4397 and shall have the mechanical properties of grade R37 in normalized conditions (NBK), as specified in ISO 3305.

5 Nominal working pressures

The nominal working pressures for selected tube outside diameters and wall thicknesses are given in Table 1. The nominal working pressure values are based on a design factor ratio of 4 to 1 applied to the calculated burst pressures and are derived from the following formulae:

$$\text{Calculated Burst Pressure: } P_b = R_m \left(\ln \frac{D}{D-2t} \right) \quad (1)$$

$$\text{Nominal Working Pressure: } P_w = \frac{P_b}{4} \quad (2)$$

where

P_b is the calculated burst pressure in MPa (megapascals);

P_w is the nominal working pressure in MPa (megapascals);

R_m is the minimum tensile strength in MPa (megapascals);

ln is the natural logarithm, also referred to as $\log_e$;

D is the nominal tube outside diameter in millimetres (mm);

t is the nominal tube wall thickness in millimetres (mm).

Table 1 — Nominal working pressures for various tube wall thickness[a]

Tube wall thickness t (mm)	Tube outside diameter D (mm)									
	4	5	6	8	10	12	15	16	18	20
	Nominal working pressures (P_w) in MPa (bar)[b] for materials with mechanical properties of grade R37 in normalized conditions (NBK) as specified in ISO 3305									
0,5	25,9 (259)	20,1 (201)	16,4 (164)	12,0 (120)	———	———	———	———	———	———
0,8	46,0 (460)	34,7 (347)	27,9 (279)	20,1 (201)	15,7 (157)	12,9 (129)	10,2 (102)	9,5 (95)	———	———
1	62,4 (624)	46,0 (460)	36,5 (365)	25,9 (259)	20,1 (201)	16,4 (164)	12,9 (129)	12,0 (120)	10,6 (106)	9,5 (95)
1,5	———	———	62,4 (624)	42,3 (423)	32,1 (321)	25,9 (259)	20,1 (201)	18,7 (187)	16,4 (164)	14,6 (146)
2	———	———	98,9 (989)	62,4 (624)	46,0 (460)	36,5 (365)	27,9 (279)	25,9 (259)	22,6 (226)	20,1 (201)
2,5	———	———	———	88,3 (883)	62,4 (624)	48,5 (485)	36,5 (365)	33,7 (337)	29,3 (293)	25,9 (259)
3	———	———	———	———	———	62,4 (624)	46,0 (460)	42,3 (423)	36,5 (365)	32,1 (321)
3,5	———	———	———	———	———	———	———	51,8 (518)	44,3 (433)	38,8 (388)
4	———	———	———	———	———	———	———	62,4 (624)	52,9 (529)	46,0 (460)
5	———	———	———	———	———	———	———	———	———	62,4 (624)
6	———	———	———	———	———	———	———	———	———	———
7	———	———	———	———	———	———	———	———	———	———
8	———	———	———	———	———	———	———	———	———	———
10	———	———	———	———	———	———	———	———	———	———

[a] Based on a minimum tensile strength (R_m) of 360 MPa.

[b] 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.

Table 1 — Nominal working pressures for various tube wall thickness[a] *(continued)*

Tube wall thickness t (mm)	Tube outside diameter D (mm)								
	22	25	28	30	32	35	38	42	50
	Nominal working pressures (P_w) in MPa (bar)[b] for materials with mechanical properties of grade R37 in normalized conditions (NBK) as specified in ISO 3305								
0,5	———	———	———	———	———	———	———	———	———
0,8	———	———	———	———	———	———	———	———	———
1	8,6 (86)	7,5 (75)	6,7 (67)	6,2 (62)	5,8 (58)	5,3 (53)	4,9 (49)	———	———
1,5	13,2 (132)	11,5 (115)	10,2 (102)	9,5 (95)	8,9 (89)	8,1 (81)	7,4 (74)	6,7 (67)	5,6 (56)
2	18,1 (181)	15,7 (157)	13,9 (139)	12,9 (129)	12,0 (120)	10,9 (109)	10,0 (100)	9,0 (90)	7,5 (75)
2,5	23,2 (232)	20,1 (201)	17,7 (177)	16,4 (164)	15,3 (153)	13,9 (139)	12,7 (127)	11,4 (114)	9,5, (954)
3	28,7 (287)	24,7 (247)	21,7 (217)	20,1 (201)	18,7 (187)	16,9 (169)	15,5 (155)	13,9 (139)	11,5 (115)
3,5	34,5 (345)	29,6 (296)	25,9 (259)	23,9 (239)	22,2 (222)	20,1 (201)	18,3 (183)	16,4 (164)	13,6 (136)
4	40,7 (407)	34,7 (347)	30,3 (303)	27,9 (279)	25,9 (259)	23,4 (234)	21,3 (213)	19,0 (190)	15,7 (157)
5	54,6 (546)	46,0 (460)	39,8 (398)	36,5 (365)	33,7 (337)	30,3 (303)	27,5 (275)	24,5 (245)	20,1 (201)
6	———	———	50,4 (504)	46,0 (460)	42,3 (423)	37,8 (378)	34,2 (342)	30,3 (303)	24,7 (247)
7	———	———	———	———	51,8 (518)	46,0 (460)	41,4 (414)	36,5 (365)	29,6 (296)
8	———	———	———	———	62,4 (624)	55,0 (550)	49,2 (492)	43,2 (432)	34,7 (347)
10	———	———	———	———	———	———	67,2 (672)	58,2 (582)	46,0 (460)

[a] Based on a minimum tensile strength (R_m) of 360 MPa.

[b] 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.