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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*

ICS: 23.100.40; 77.140.75



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# Contents

Page

# 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.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is Technical Committee ISO/TC *131*, *Fluid power systems*, Subcommittee SC 4, *Connectors and similar products and components*.

This edition cancels and replaces the 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.

# 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 3304 (seamless precision steel tubes} and ISO 3305 (welded precision steel tubes). The nominal working pressures included in this standard 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 3304, *Plain end seamless precision steel tubes — Technical conditions for delivery*

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

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/

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

## 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 3304 and 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 pressures 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 reference 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 3304 and ISO 3305 | | | | | | | | | |
| 0.5 | 25,9 (259) | 20,1 (201) | 16,4 (164) | 12,0 (120) | 9,5 (95) | 7,8 (78) | 6,2 (62) | 5,8 (58) | ——— | ——— |
| 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 = 106 Pa; 1 MPa = 1 N/mm$^2$.

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

| 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 3304 and 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) | 4,4 (44) | 3,7 (37) |
| 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) | 9,4 (94) |
| 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) | 48,0 (480) | 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 (Rm) of 360 MPa.

[b] 1 bar = 0,1 MPa = 106 Pa; 1 MPa = 1 N/mm2.

## 6 Identification statement (Reference to this International Standard)

It is recommended to manufacturers to use the following statement in test reports, categories and sales literature when electing to comply with this International Standard:

"Sizes and working pressures for seamless and welded precision steel tubes in accordance with ISO 10763:2017, Hydraulic fluid power — Plain-end, seamless and welded precision steel tubes — Dimensions and nominal working pressures."