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**Hydraulic fluid power — Two, three- and  
four-port screw-in cartridge valves —  
Cavities**

*Transmissions hydrauliques — Distributeurs à cartouche à visser à deux,  
trois et quatre orifices — Logements*

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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.

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 7789 was prepared by technical committee ISO/TC 5, *Fluid power systems*, Subcommittee SC 5, *Control products and components*.

Annex A forms an integral part of this International Standard. Annex B is 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. Typical components found in such systems include hydraulic valves. These devices control flow direction, pressure or flow rate liquids in the enclosed circuit.

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# Hydraulic fluid power — Two-, three- and four-port screw-in cartridge valves — Cavities

## 1 Scope

This International Standard specifies the dimensions and provides other data relating to cavities in which two-, three- and four-port, screw-in cartridge valves are mounted in order to ensure interchangeability.

It is applicable to two-, three- and four-port screw-in cartridge valves generally used in industrial, agricultural, mining and mobile equipment.

## 2 Normative references

The following standards contain provisions which, through reference of 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 5598:1985, *Fluid power systems and components — Vocabulary.*

ISO 5783:1995, *Hydraulic fluid power — Code for identification of valve mounting surfaces and cartridge cavities.*

ISO 6149-1:1993, *Connections for fluid power and general use — Ports and stud ends with ISO 261 thread and O-ring sealing — Part 1: Ports with O-ring seal in truncated housing.*

ISO 9461:1992, *Hydraulic fluid power — Identification of valve ports, subplates, control devices and solenoids.*

## 3 Definitions

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

## 4 Dimensions

4.1 The dimensions of cavities for hydraulic screw-in cartridge valves with two-, three- and four-port shall be selected from the tables specified in 4.2 to 4.10.

**4.2** The dimensions of cavities for two-port valves (excluding main system pressure relief valves) with 5 mm to 20,5 mm maximum port diameter are shown in figure 1 and given in table 1a).

**4.3** The dimensions of cavities for two-port main system pressure relief valves with 5 mm to 20,5 mm maximum port diameter and with flow direction from port 1 to port 2, are shown in figure 2 and given in table 2a).

**4.4** The dimensions of cavities for two-port main system pressure relief valves with 6 mm to 20,5 mm maximum port diameter and with flow direction from port 2 to port 1, are shown in figure 3 and given in table 3a).

**4.5** The dimensions of cavities for three-port valves with 6 mm to 20,5 mm maximum port diameter are shown in figure 4 and given in table 4a).

**4.6** The dimensions of cavities for four-port valves with 6 mm to 20,5 mm maximum port diameter are shown in figure 5 and given in table 5a).

**4.7** The dimensions of cavities for two-port valves (excluding main system pressure relief valves) with 10,5 mm to 20,5 mm maximum main port diameter and one pilot port are shown in figure 6 and given in table 6a).

**4.8** The dimensions of cavities for two-port main system pressure relief valves with 10,5 mm to 20,5 mm maximum main port diameter, one pilot port and with flow direction from port 1 to port 2 are shown in figure 7 and given in table 7a).

**4.9** The dimensions of cavities for two-port main system pressure relief valves with 10,5 mm to 20,5 mm maximum main port diameter, one pilot port and with flow direction from port 2 to port 1 are shown in figure 8 and given in table 8a).

**4.10** The dimensions of cavities for three-port valves with 10,5 mm to 20,5 mm maximum main port diameter and one pilot port are shown in figure 9 and given in table 9a).

## 5 Tolerances

Tolerances values for all dimensions and surface roughnesses are given in figures 1 to 9 and in tables 1a), 2a), 3a), 4a), 5a), 6a), 7a), 8a) and 9a), in accordance with ISO 1101 and ISO 1302.

## 6 Ports usage and identification

**6.1** Interchangeability of cartridge valves in the cavities defined by this International Standard requires uniform identifications and functions of the valve ports. Symbols for the valve types intended for use in each cavity are shown in tables 1b), 2b), 3b), 4b), 5b), 6b), 7b), 8b) and 9b). Port usage and identification (1, 2, 3 and 4) are shown on the symbols.

**6.2** The tabulated symbols illustrate general types of valves. Variations within each type shall be conform to the port usage convention shown for that type.

**6.3** Some of the tabulated symbols are commonly combined with other graphic elements to represent complete valve. For example four-port directional control valve shown in figure 10 normally includes operators such as solenoids or springs. Interchangeability of such complete valves requires that the combined symbols, including the added elements, be identical as to port connection in each operator condition.

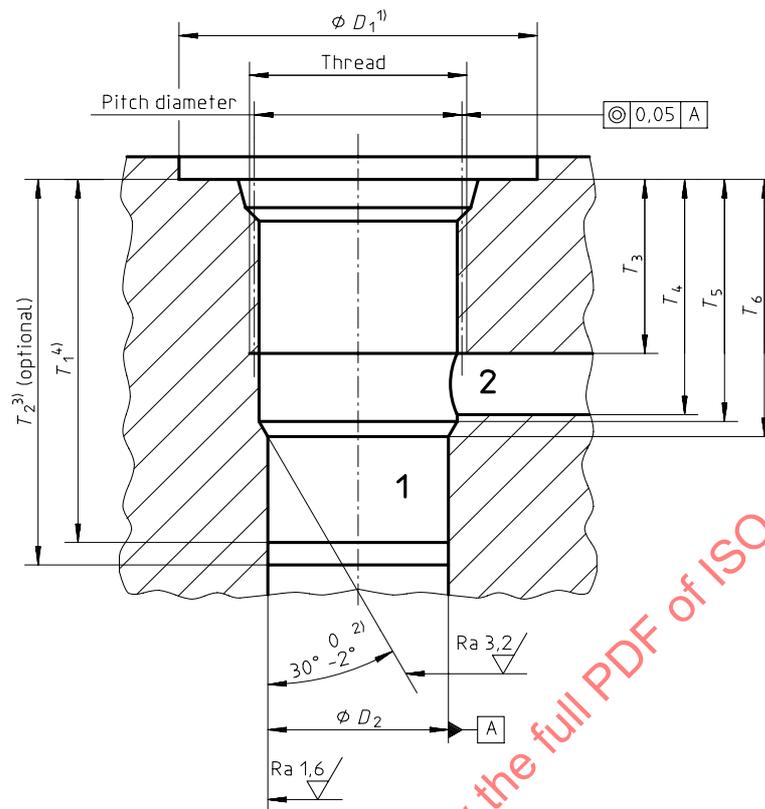
## 7 Identification statement (Reference to this International Standard)

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

"Cavity dimensions and port usage are in accordance with ISO 7789:1998, *Hydraulic fluid power — Two-, three- and four-port screw-in cartridge valves — Cavities.*"

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Tolerances in millimetres,  
surface roughness in micrometres



NOTE — For footnotes 1) to 4), see page 22.

**Figure 1 — Cavities for two-port valves (to excluding main system pressure relief valves) with 5 mm to 20,5 mm maximum port diameter**

**Table 1a) — Dimensions**

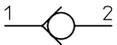
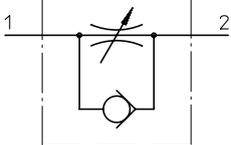
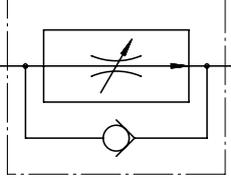
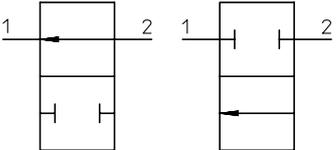
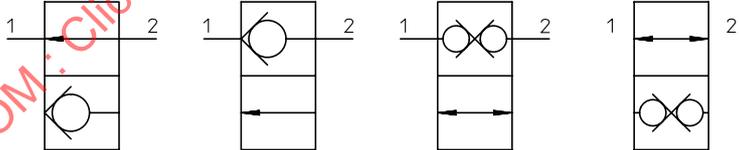
Dimensions in millimetres

Codification <sup>1)</sup>	7789					
	18-01-0-98	20-01-0-98	22-01-0-98	27-01-0-98	33-01-0-98	42-01-0-98
Thread <sup>2)</sup>	M18×1,5	M20×1,5	M22×1,5	M27×2	M33×2	M42×2
$D_1$ min.	32	38	42	48	58	74
$D_2$ H8	15	17	19	23	29	38
$T_1$ min.	29,5	30,5	38,5	46,5	50	56
$T_2$ $\begin{smallmatrix} +1 \\ 0 \end{smallmatrix}$	31	32	40	48	52	58
$T_3$ min.	14,5	14,5	17	22	22	23
$T_4$ max.	19,5	20,5	27,5	35	38,5	43,5
$T_5$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	20	21	28	35,5	39	44
$T_6$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	21,3	22,3	29,3	37,2	40,7	45,7

1) Codification is in accordance with ISO 5783.

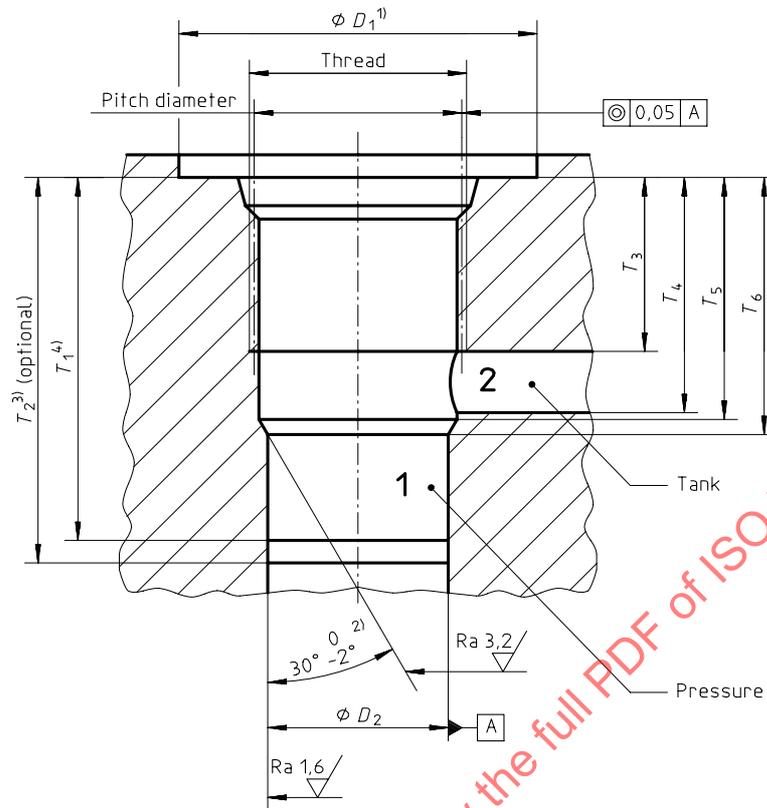
2) The port is in accordance with ISO 6149-1.

Table 1b) — Symbols for valves entering the cavities shown in figure 1

Description	Symbol	Description	Symbol
Non-return valve		Throttle non-return valve	
Flow control valve with free flow return check		Pressure-compensated flow control valve	
Pressure-compensated flow control valve with free flow return check		Two-port directional control valve	
Two-port directional control poppet (seat) valve			

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Tolerances in millimetres,  
surface roughness in micrometres



NOTE — For footnotes 1) to 4), see page 22.

**Figure 2 — Cavities for two-port main system pressure relief valves with 5 mm to 20,5 mm maximum port diameter and with flow direction from port 1 to port 2**

**Table 2a) — Dimensions**

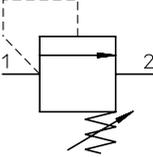
Dimensions in millimetres

Codification <sup>1)</sup>	7789					
	18-02-0-98	20-02-0-98	22-02-0-98	27-02-0-98	33-02-0-98	42-02-0-98
Thread <sup>2)</sup>	M18×1,5	M20×1,5	M22×1,5	M27×2	M33×2	M42×2
$D_1$ min.	32	38	42	48	58	74
$D_2$ H8	13,5	15,5	17,5	21,5	27	36
$T_1$ min.	30,5	31,5	40	48	52	58
$T_2$ $\begin{smallmatrix} +1 \\ 0 \end{smallmatrix}$	32	33	41,5	49,5	54	60
$T_3$ min.	14,5	14,5	17	22	22	23
$T_4$ max.	19,5	20,5	27,5	35	38,5	43,5
$T_5$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	20	21	28	35,5	39	44
$T_6$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	22,6	23,6	30,6	38,5	42,5	47,5

1) Codification is in accordance with ISO 5783.

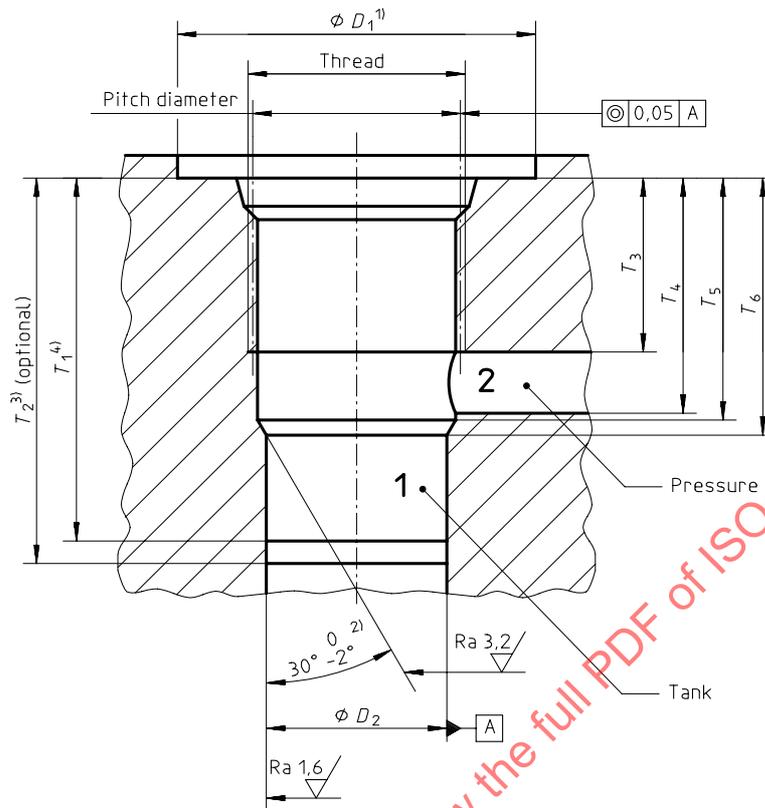
2) The port is in accordance with ISO 6149-1.

Table 2b) — Symbol for valves entering the cavities shown in figure 2

Description	Symbol
Pressure relief valve	

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Tolerances in millimetres,  
surface roughness in micrometres



NOTE — For footnotes 1) to 4), see page 22.

Figure 3 — Cavities for two-port main system pressure relief valves with 6 mm to 20,5 mm maximum port diameter and with flow direction from port 2 to port 1

Table 3a) — Dimensions

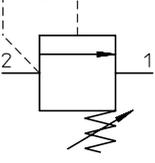
Dimensions in millimetres

Codification <sup>1)</sup>	7789				
	20-03-0-98	22-03-0-98	27-03-0-98	33-03-0-98	42-03-0-98
Thread <sup>2)</sup>	M20×1,5	M22×1,5	M27×2	M33×2	M42×2
$D_1$ min.	38	42	48	58	74
$D_2$ H8	14	16	20	25	34
$T_1$ min.	33	41	49	53,5	59,5
$T_2$ $\begin{smallmatrix} +1 \\ 0 \end{smallmatrix}$	34,5	42,5	50,5	55,5	61,5
$T_3$ min.	14,5	17	22	22	23
$T_4$ max.	20,5	27,5	35	38,5	43,5
$T_5$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	21	28	35,5	39	44
$T_6$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	24,9	31,9	39,8	44,2	49,2

1) Codification is in accordance with ISO 5783.

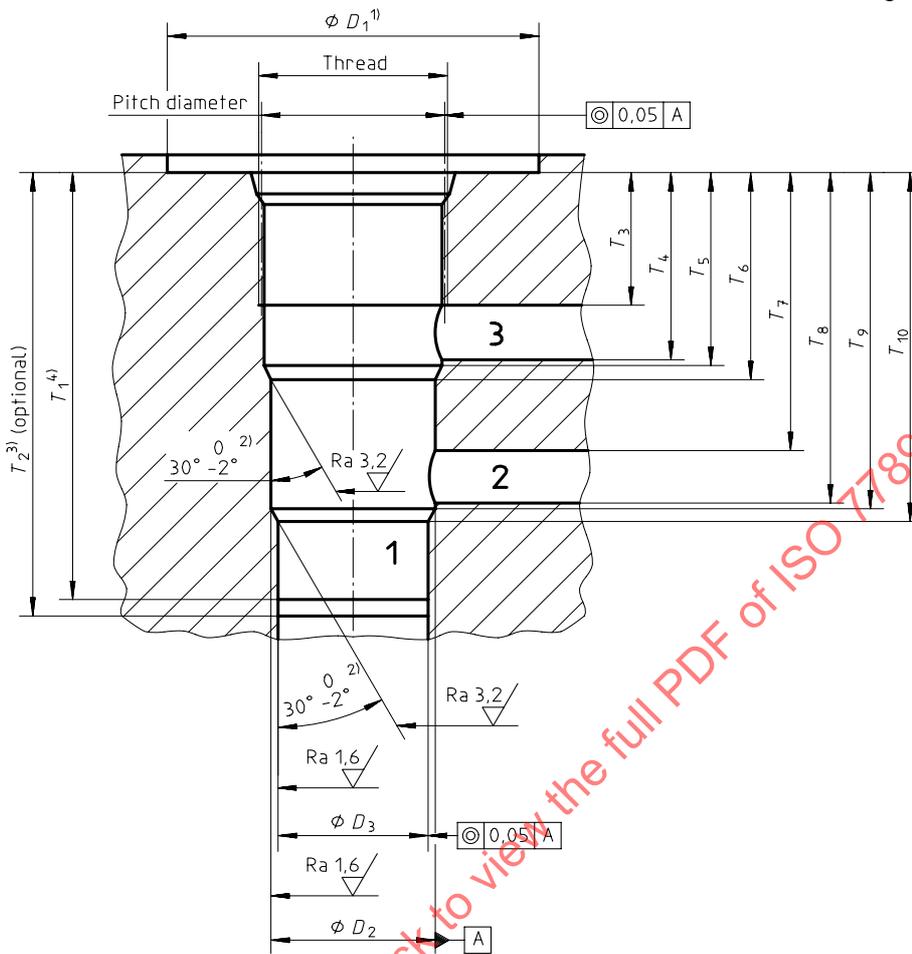
2) The port is in accordance with ISO 6149-1.

Table 3b) — Symbol for valves entering the cavities shown in figure 3

Description	Symbol
Pressure relief valve	

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Tolerances in millimetres,  
surface roughness in micrometres



NOTE — For footnotes 1) to 4), see page 22.

Figure 4 — Cavities for three-port valves with 6 mm to 20,5 mm maximum port diameter

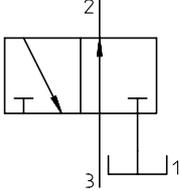
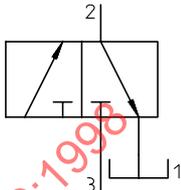
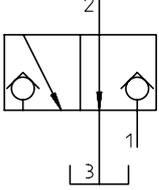
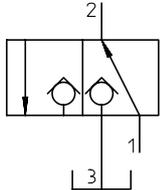
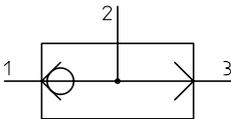
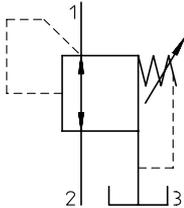
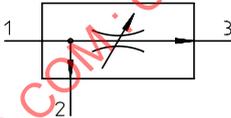
Table 4a) — Dimensions

Dimensions in millimetres

Codification <sup>1)</sup>	7789				
	20-04-0-98	22-04-0-98	27-04-0-98	33-04-0-98	42-04-0-98
Thread <sup>2)</sup>	M20×1,5	M22×1,5	M27×2	M33×2	M42×2
$D_1$ min.	38	42	48	58	74
$D_2$ H8	17	19	23	29	38
$D_3$ H8	15,5	17	21	27	36
$T_1$ min.	46,5	60,5	71	78	89
$T_2$ $\begin{smallmatrix} +1 \\ 0 \end{smallmatrix}$	48	62	72,5	80	91
$T_3$ min.	14,5	17	22	22	23
$T_4$ max.	20,5	27,5	35	38,5	43,5
$T_5$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	21	28	35,5	39	44
$T_6$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	22,3	29,3	37,2	40,7	45,7
$T_7$ min.	30,5	38,5	46,5	50	56
$T_8$ max.	36,5	49	59,5	66,5	76,5
$T_9$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	37	49,5	60	67	77
$T_{10}$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	38,3	51,2	61,7	68,7	78,7

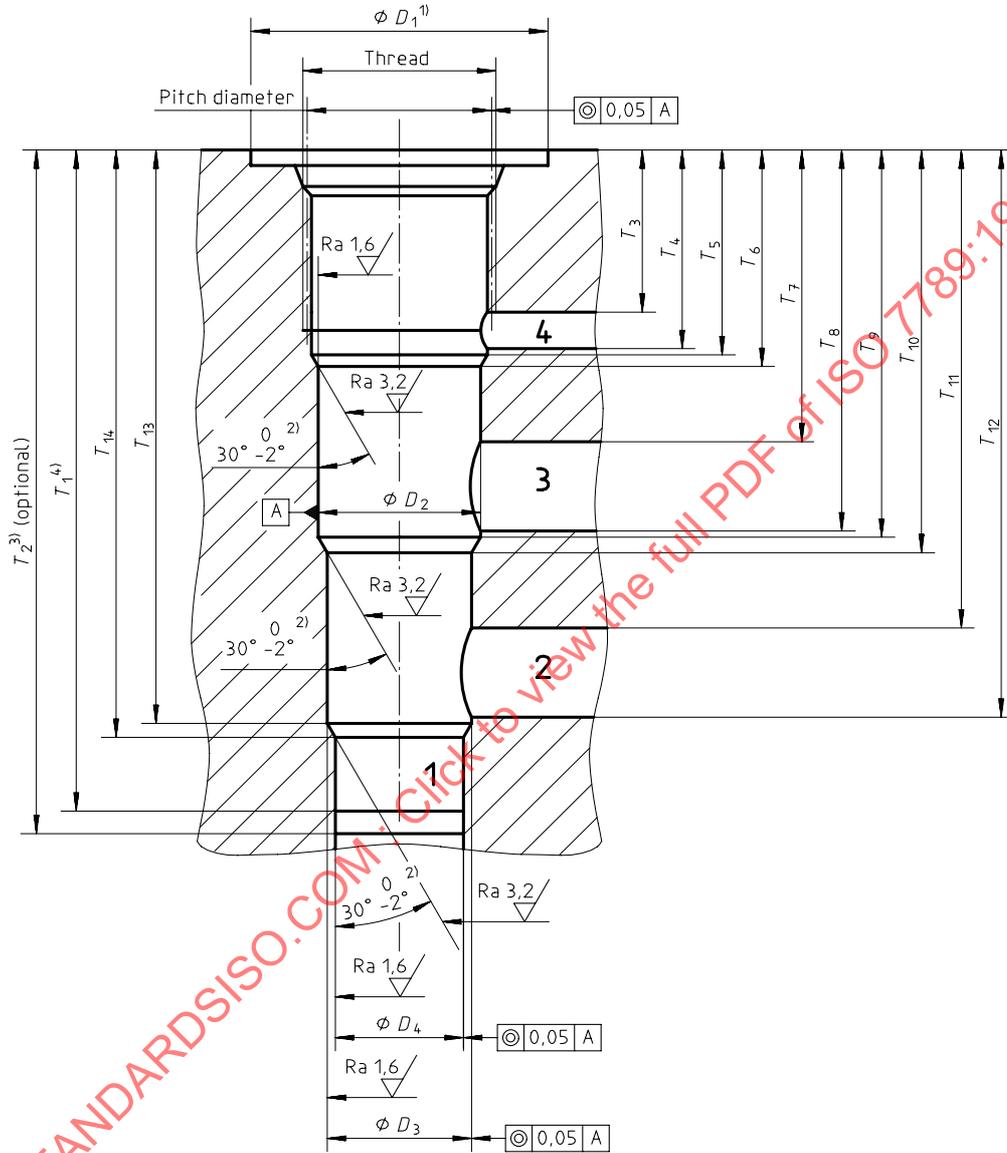
1) Codification is in accordance with ISO 5783.  
2) The port is in accordance with ISO 6149-1.

Table 4b) — Symbols for valves entering the cavities shown in figure 4

Description	Symbol	Description	Symbol
Three-port directional control valve		Three-port directional control valve	
Three-port directional control poppet (seat) valve		Three-port directional control poppet (seat) valve	
Shuttle valve		Pressure reducing valve with relief	
Three-port flow control valve			

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Tolerances in millimetres,  
surface roughness in micrometres



NOTE — For footnotes 1) to 4), see page 22.

Figure 5 — Cavities for four-port valves with 6 mm to 20,5 mm maximum port diameter

Table 5a) — Dimensions

Dimensions in millimetres

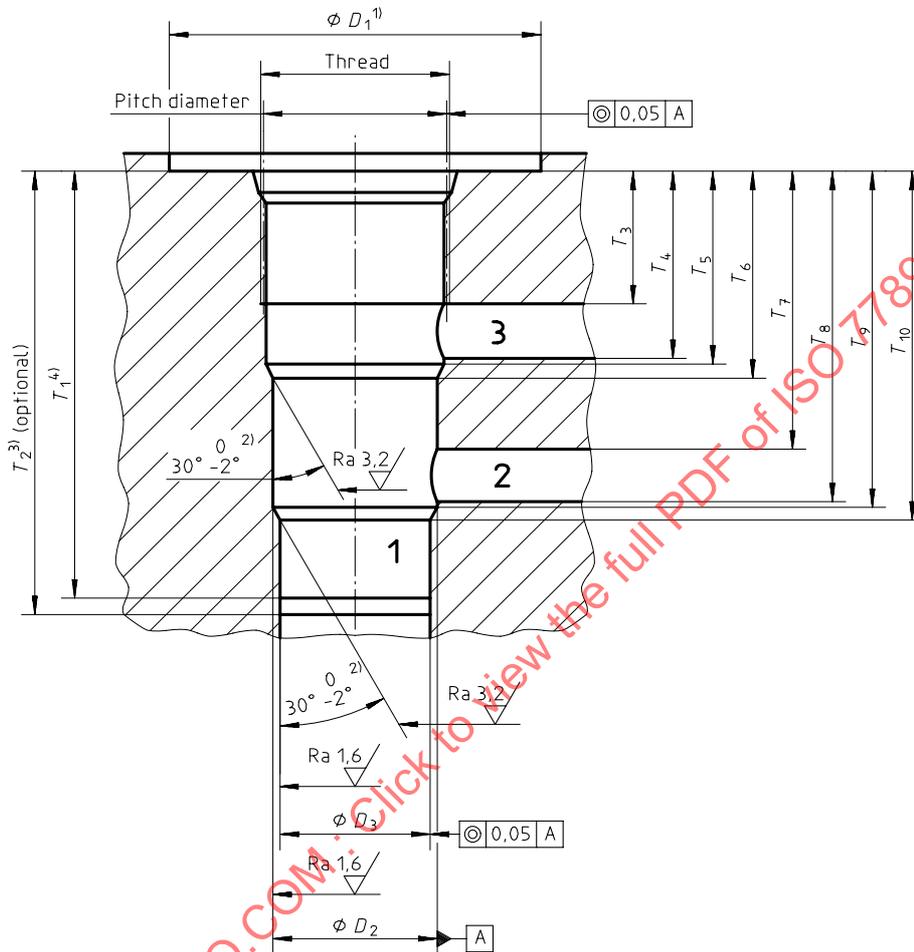
Codification <sup>1)</sup>	7789				
	20-05-0-98	22-05-0-98	27-05-0-98	33-05-0-98	42-05-0-98
Thread <sup>2)</sup>	M20×1,5	M22×1,5	M27×2	M33×2	M42×2
$D_1$ min.	38	42	48	58	74
$D_2$ H8	17	19	23	29	38
$D_3$ H8	15,5	17	21	27	36
$D_4$ H8	14	15	19	25	34
$T_1$ min.	62,5	82,5	95,5	106	122
$T_2$ $\begin{smallmatrix} +1 \\ 0 \end{smallmatrix}$	64	84	97	108	124
$T_3$ min.	14,5	17	22	22	23
$T_4$ max.	20,5	27,5	35	38,5	43,5
$T_5$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	21	28	35,5	39	44
$T_6$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	22,3	29,3	37,2	40,7	45,7
$T_7$ min.	30,5	38,5	46,5	50	56
$T_8$ max.	36,5	49	59,5	66,5	76,5
$T_9$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	37	49,5	60	67	77
$T_{10}$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	38,3	51,2	61,7	68,7	78,7
$T_{11}$ min.	46,5	60,5	71	78	89
$T_{12}$ max.	52,5	71	84	94,5	109,5
$T_{13}$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	53	71,5	84,5	95	110
$T_{14}$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	54,3	73,2	86,2	96,7	111,7

1) Codification is in accordance with ISO 5783.  
2) The port is in accordance with ISO 6149-1.

Table 5b) — Symbols for valves entering the cavities shown in figure 5

Description	Symbol	Description	Symbol
Four-port directional control valve		Diverter valve	
Divider-combiner valve			

Tolerances in millimetres,  
surface roughness in micrometres



NOTE — For footnotes 1) to 4), see page 22.

Figure 6 — Cavities for two-port valves (excluding main system pressure relief valves) with 10,5 mm to 20,5 mm maximum main port diameter and one pilot port

Table 6a) — Dimensions

Dimensions in millimetres

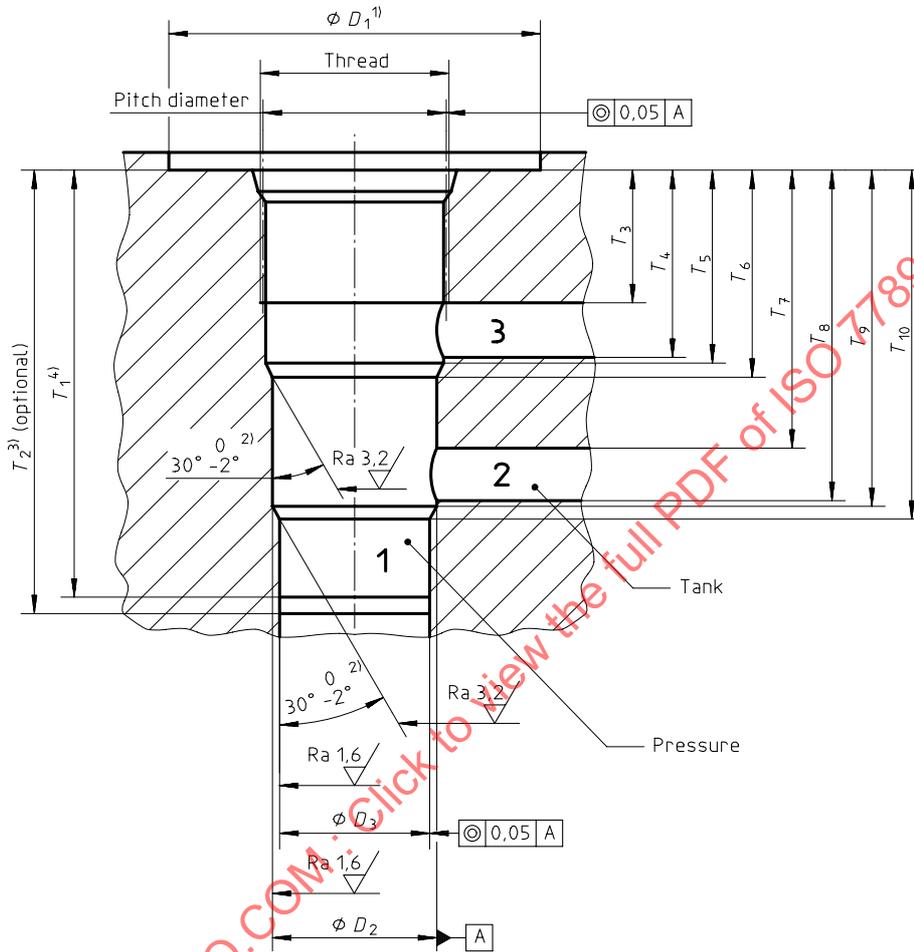
Codification <sup>1)</sup>	7789			
	22-06-0-98	27-06-0-98	33-06-0-98	42-06-0-98
Thread <sup>2)</sup>	M22×1,5	M27×2	M33×2	M42×2
$D_1$ min.	42	48	58	74
$D_2$ H8	19	23	29	38
$D_3$ H8	17	21	27	36
$T_1$ min.	54,5	62	65	71,5
$T_2$ $\begin{smallmatrix} +1 \\ 0 \end{smallmatrix}$	56	63,5	67	73,5
$T_3$ min.	17	21,5	21	21,5
$T_4$ max.	21,5	26	25,5	26
$T_5$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	22	26,5	26	26,5
$T_6$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	23,3	28,2	27,7	28,2
$T_7$ min.	32,5	37,5	37	38,5
$T_8$ max.	43	50,5	53,5	59
$T_9$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	43,5	51	54	59,5
$T_{10}$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	45,2	52,7	55,7	61,2

1) Codification is in accordance with ISO 5783.  
2) The port is in accordance with ISO 6149-1.

Table 6b) — Symbols for valves entering the cavities shown in figure 6

Description	Symbol	Description	Symbol
Sequence valve		Pressure reducing valve	
Accumulator unloading valve		Non-return valve, pilot controlled	

Tolerances in millimetres,  
surface roughness in micrometres



NOTE — For footnotes 1) to 4), see page 22.

Figure 7 — Cavities for two-port main system pressure relief valves with 10,5 mm to 20,5 mm maximum port diameter, one pilot port and flow direction from port 1 to port 2

Table 7a) — Dimensions

Dimensions in millimetres

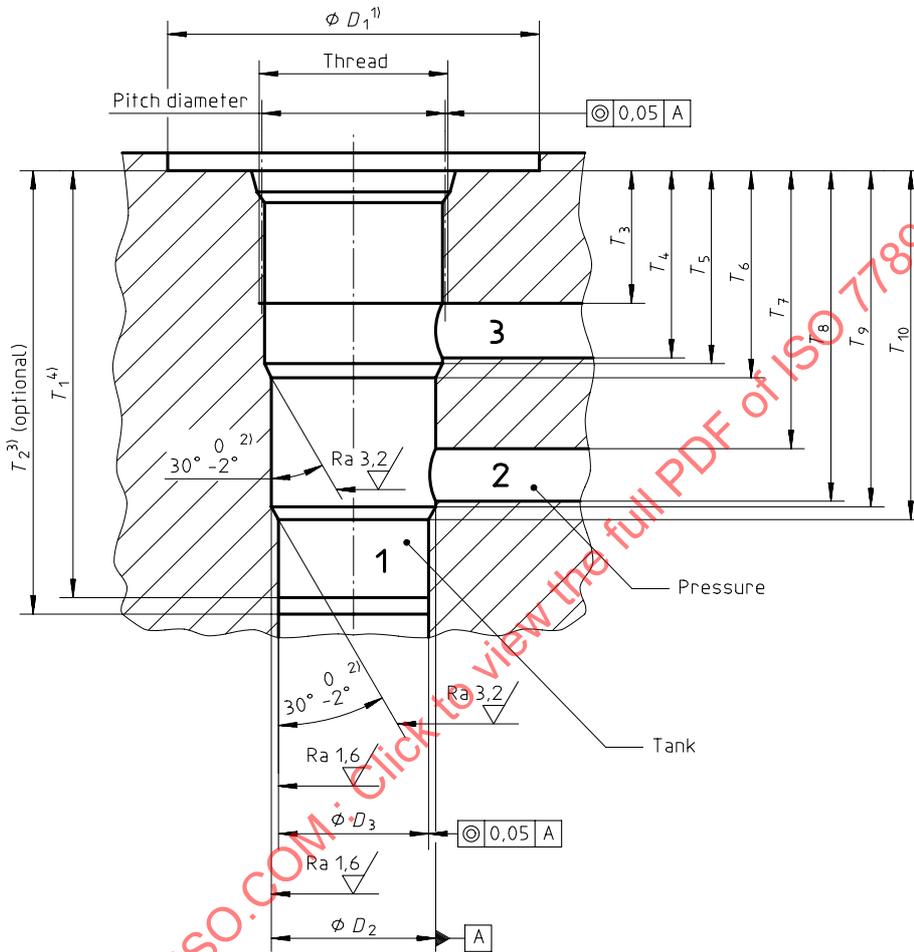
Codification <sup>1)</sup>	7789			
	22-07-0-98	27-07-0-98	33-07-0-98	42-07-0-98
Thread <sup>2)</sup>	M22×1,5	M27×2	M33×2	M42×2
$D_1$ min.	42	48	58	74
$D_2$ H8	19	23	29	38
$D_3$ H8	15,5	19,5	25	34
$T_1$ min.	56	63,5	67	73,5
$T_2$ $\begin{smallmatrix} +1 \\ 0 \end{smallmatrix}$	57,5	65	69	75,5
$T_3$ min.	17	21,5	21	21,5
$T_4$ max.	21,5	26	25,5	26
$T_5$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	22	26,5	26	26,5
$T_6$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	23,3	28,2	27,7	28,2
$T_7$ min.	32,5	37,5	37	38,5
$T_8$ max.	43	50,5	53,5	59
$T_9$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	43,5	51	54	59,5
$T_{10}$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	46,5	54	57,5	63

1) Codification is in accordance with ISO 5783.  
2) The port is in accordance with ISO 6149-1.

Table 7b) — Symbol for valves entering the cavities shown in figure 7

Description	Symbol
Two-stage pressure relief valve with pilot port	

Tolerances in millimetres,  
surface roughness in micrometres



NOTE — For footnotes 1) to 4), see page 22.

Figure 8 — Cavities for two-port main system pressure relief valves with 10,5 mm to 20,5 mm maximum main port diameter, one pilot port and flow direction from port 2 to port 1

Table 8a) — Dimensions

Dimensions in millimetres

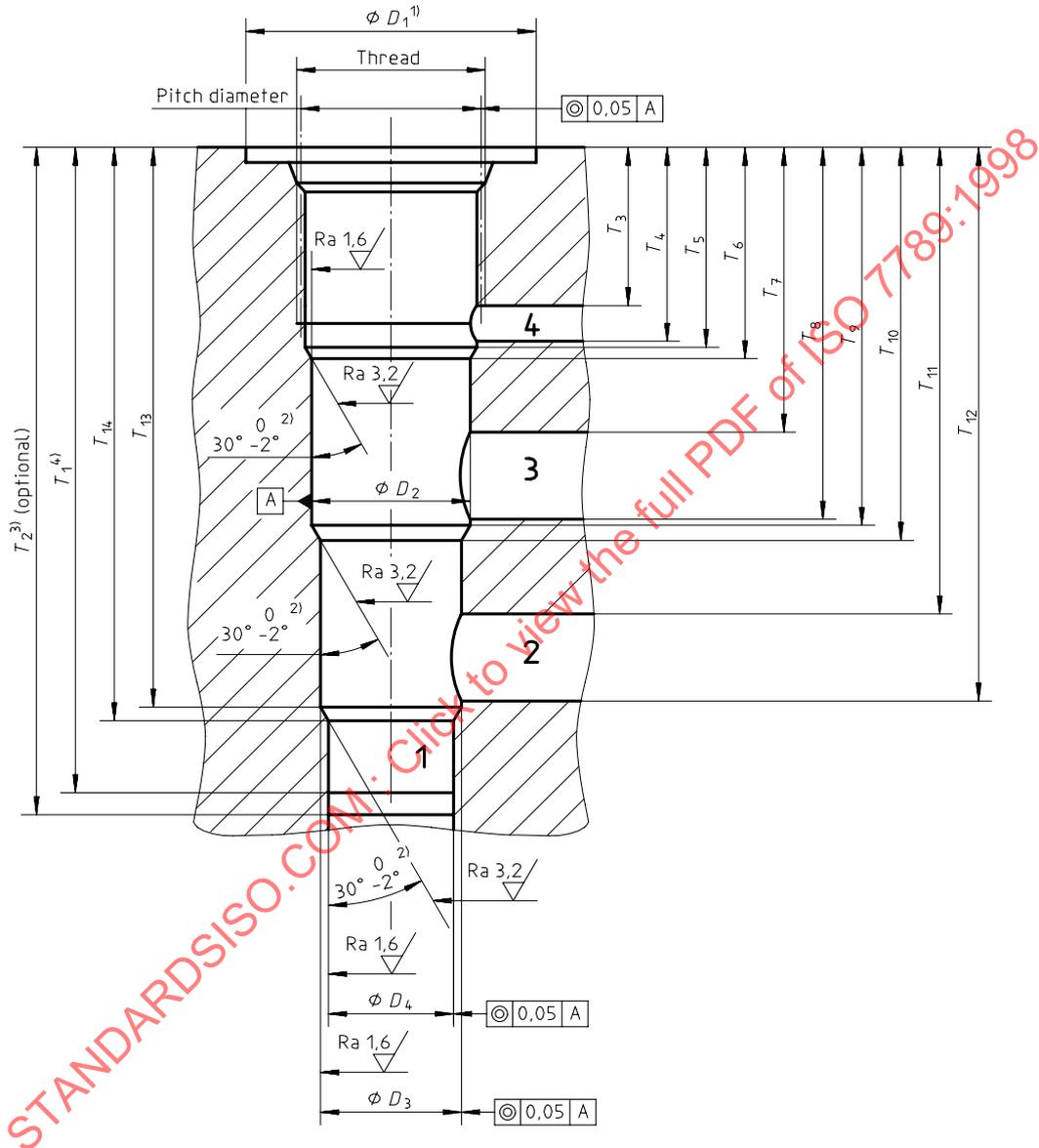
Codification <sup>1)</sup>	7789			
	22-08-0-98	27-08-0-98	33-08-0-98	42-08-0-98
Thread <sup>2)</sup>	M22×1,5	M27×2	M33×2	M42×2
$D_1$ min.	42	48	58	74
$D_2$ H8	19	23	29	38
$D_3$ H8	14	18	23	32
$T_1$ min.	57	64,5	68,5	75
$T_2$ $\begin{smallmatrix} +1 \\ 0 \end{smallmatrix}$	58,5	66	70,5	77
$T_3$ min.	17	21,5	21	21,5
$T_4$ max.	21,5	26	25,5	26
$T_5$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	22	26,5	26	26,5
$T_6$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	23,3	28,2	27,7	28,2
$T_7$ min.	32,5	37,5	37	38,5
$T_8$ max.	43	50,5	53,5	59
$T_9$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	43,5	51	54	59,5
$T_{10}$ $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	47,8	55,3	59,2	64,7

1) Codification is in accordance with ISO 5783.  
2) The port is in accordance with ISO 6149-1.

Table 8b) — Symbol for valves entering the cavities shown in figure 8

Description	Symbol
Two-stage pressure relief valve with pilot port	

Tolerances in millimetres,  
surface roughness in micrometres



NOTE — For footnotes 1) to 4), see page 22.

Figure 9 — Cavities for three-port valves with 10,5 mm to 20,5 mm maximum port diameter and one pilot port