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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION
МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Hydraulic fluid power — Pressure-control valves (excluding pressure-relief valves), sequence valves, unloading valves, throttle valves and check valves — Mounting surfaces

Transmissions hydrauliques — Réducteurs de pression (à l'exception des limiteurs de pression), soupapes de séquence, soupapes de décharge, soupapes d'étranglement, clapets de non-retour — Plan de pose

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Reference number
ISO 5781 : 1987 (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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 5781 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Hydraulic fluid power — Pressure-control valves (excluding pressure-relief valves), sequence valves, unloading valves, throttle valves and check valves — Mounting surfaces

0 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 are hydraulic valves. These devices control flow direction, pressure or flow rate of liquids in the enclosed circuit.

1 Scope and field of application

This International Standard specifies the dimensions and other data relating to surfaces on which hydraulic pressure-control valves (excluding pressure-relief valves), sequence valves, throttle valves and check valves are mounted in order to ensure interchangeability.

It applies to mounting surfaces for pressure-control valves, sequence valves, throttle valves and check valves which represent current practice. They are generally applicable to industrial equipment.

2 References

ISO 468, *Surface roughness — Parameters, their values and general rules for specifying requirements*.

ISO 1101, *Technical drawings — Geometrical tolerancing — Tolerancing of form, orientation, location and run-out — Generalities, definitions, symbols, indications on drawings*.

ISO 1219, *Fluid power systems and components — Graphic symbols*.

ISO 1302, *Technical drawings — Method of indicating surface texture on drawings*.

ISO 4401, *Hydraulic fluid power — Four-port directional control valves — Mounting surfaces*.

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

ISO 5783, *Hydraulic fluid power — Code for identification of valve mounting surfaces*.

3 Definitions

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

4 Symbols

4.1 For the purposes of this International Standard, the following symbols apply:

- a) A, B, P, T, X and Y identify ports;
- b) F_1 , F_2 , F_3 , F_4 , F_5 and F_6 identify threaded holes for fixing bolts;
- c) G identifies the location of pin holes;
- d) D identifies the fixing bolt diameter;
- e) $r_{\max}$ identifies the mounting surface edge radius.

4.2 The graphical symbols used in figures 2, 4, 5, 7, 8, 10, 11, 13 and 14 are in accordance with ISO 1219.

4.3 The code system used in this International Standard is defined in ISO 5783.

NOTE — For size 03 mounting surfaces for all valves, the maximum diameter of main ports, which used to be 6,3 mm, has been increased to 7,5 mm in line with widespread usage. This amendment will be made to ISO 5783 at the next revision stage.

5 Tolerances

5.1 The following values shall be applied to the mounting surface, i.e. that area within the chain thick lines:

- Surface roughness: $R_a \leq 0,8 \mu\text{m}$ (see ISO 468 and ISO 1302)
- Surface flatness: 0,01 mm over a distance of 100 mm (see ISO 1101)
- Locating pin holes, tolerance for diameters: H12

5.2 The following tolerances shall be complied with along the x and y axes with respect to the origin:

- Pin holes: $\pm 0,1 \text{ mm}$

- Bolt holes: $\pm 0,1$ mm
- Port holes: $\pm 0,2$ mm

As for other dimensions, see the figures.

6 Dimensions

6.1 Mounting surface dimensions for hydraulic pressure-control valves, sequence valves, throttle valves and check valves shall be selected from the figures and tables specified in 6.2 to 6.6.

6.2 Mounting surface dimensions for pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 4 mm maximum port diameter (code ISO 5781 — AA — 02 — 4 — B) are given in figure 1.

6.3 Mounting surface dimensions for pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 7,5 mm maximum port diameter (code ISO 5781 — AB — 03 — 4 — B) are given in figure 3.

6.4 Mounting surface dimensions for pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 14,7 mm maximum port diameter (code ISO 5781 — AG — 06 — 2 — A) are given in figure 6.

6.5 Mounting surface dimensions for pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 23,4 mm maximum port diameter (code ISO 5781 — AH — 08 — 2 — A) are given in figure 9.

6.6 Mounting surface dimensions for pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 32 mm maximum port diameter (code ISO 5781 — AJ — 10 — 2 — A) are given in figure 12.

7 Port marking

7.1 The port symbols for hydraulic pressure-control valves, sequence valves, throttle valves and check valves shall be selected from the figures specified in 7.2 to 7.10.

7.2 Port symbols for directly operated pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 4 mm maximum port diameter (code ISO 5781 — AA — 02 — 4 — A) are given in figure 2.

7.3 Port symbols for directly operated pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 7,5 mm maximum port diameter (code ISO 5781 — AB — 03 — 4 — B) are given in figure 4.

7.4 Port symbols for pilot-operated pressure-control valves, sequence valves and unloading valves with main ports of 7,5 mm maximum port diameter (code ISO 5781 — AB — 03 — 4 — B) are given in figure 5.

7.5 Port symbols for directly operated pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 14,7 mm maximum port diameter (code ISO 5781 — AG — 06 — 2 — A) are given in figure 7.

7.6 Port symbols for pilot-operated pressure-control valves, sequence valves, and unloading valves with main ports of 14,7 mm maximum port diameter (code ISO 5781 — AG — 06 — 2 — A) are given in figure 8.

7.7 Port symbols for directly operated pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 23,4 mm maximum port diameter (code ISO 5781 — AH — 08 — 2 — A) are given in figure 10.

7.8 Port symbols for pilot-operated pressure-control valves, sequence valves, and unloading valves with main ports of 23,4 mm maximum port diameter (code ISO 5781 — AH — 08 — 2 — A) are given in figure 11.

7.9 Port symbols for directly operated pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 32 mm maximum port diameter (code ISO 5781 — AJ — 10 — 2 — A) are given in figure 13.

7.10 Port symbols for pilot-operated pressure-control valves, sequence valves, and unloading valves with main ports of 32 mm maximum port diameter (code ISO 5781 — AJ — 10 — 2 — A) are given in figure 14.

8 Modular stack valves

For modular stack valves, mounting surfaces and port marking shown in ISO 4401 shall be used.

9 Working pressure

For indication of the maximum limit of the working pressure, see note 5 to the figures.

10 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:

"Mounting surface dimensions conform to ISO 5781, *Hydraulic fluid power — Pressure-control valves (excluding pressure-relief valves), sequence valves, unloading valves, throttle valves and check valves — Mounting surfaces.*"

Bibliography

The following documents served as a reference in the preparation of this International Standard and will be helpful when using it :

ISO 129, *Technical drawings — Dimensioning — General principles, definitions, methods of execution and special indications.*

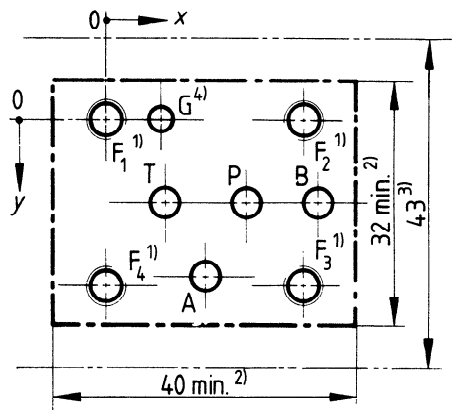
ISO 286, *ISO system of limits and fits.*¹⁾

ISO 965-1, *ISO general purpose metric screw threads — Tolerances — Part 1: Principles and basic data.*

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1) At present at the stage of draft. (Revision of ISO/R 286-1962.)

Code: ISO 5781 — AA — 02 — 4 — B



NOTE — See figure 2 for symbols.

Axis	P	A	T	B	G	F ₁	F ₂	F ₃	F ₄
	φ 4 max.	φ 4 max.	φ 4 max.	φ 4 max.	φ 4	M5	M5	M5	M5
x	18,3	12,9	7,5	27,8	7	0	25,8	25,8	0
y	10,7	20,6	10,7	10,7	0	0	0	21,4	21,4

Figure 1 — Mounting surface for pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 4 mm maximum port diameter (size 02)⁵⁾

1) The minimum thread depth is 1,5 times the bolt diameter, D . The recommended full thread depth is $2D + 6$ mm to facilitate interchangeability of valves and to reduce the number of fixing bolt lengths. The recommended engagement of fixing bolt thread for ferrous mountings is $1,25D$.

2) The dimensions specifying the area within the chain thick lines are the minimum dimensions for the mounting surface. The corners of the rectangle may be radiused to a maximum radius, r_{max} , equal to the thread diameter of the fixing bolts.

Along each axis the fixing holes are at equal distances to the mounting surface edges.

3) This dimension gives the minimum space required for a valve with this mounting surface. The dimension is also the minimum distance from centreline to centreline of two identical mounting surfaces placed on a manifold block.

The valve manufacturer's attention is drawn to the fact that no part of the width of the complete valve assembly shall exceed this dimension.

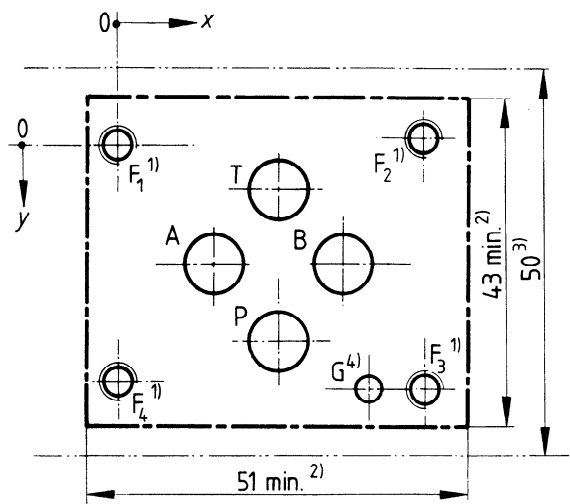
4) Blind hole in the mounting surface to accommodate the locating pin on the valves. The minimum depth is 4 mm.

5) The supplier shall establish the maximum working pressure for subplates or manifold blocks.

Description	External drain		Internal drain	
	Internal pilot	External pilot	Internal pilot	External pilot
Pressure-control valves				
Pressure-control valves with by-pass check valve				
Sequence valves				
Sequence valves with by-pass check valve				
Unloading valves				
Unloading valves with by-pass check valve				
Throttle valves				
Throttle valves with by-pass check valve				
Check valves				
Pilot-operated check valves				

Figure 2 — Directly operated pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 4 mm maximum port diameter (code: ISO 5781 — AA — 02 — 4 — B)

Code: ISO 5781 — AB — 03 — 4 — B



NOTE — See figures 4 and 5 for symbols.

Axis	P	A	T	B	G	F ₁	F ₂	F ₃	F ₄
	φ 7,5 max.	φ 7,5 max.	φ 7,5 max.	φ 7,5 max.	φ 4	M5	M5	M5	M5
x	21,5	12,7	21,5	30,2	33	0	40,5	40,5	0
y	25,9	15,5	5,1	15,5	31,75	0	−0,75	31,75	31

Figure 3 — Mounting surface for pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 7,5 mm maximum port diameter (size 03)⁵⁾

1) The minimum thread depth is 1,5 times the bolt diameter, D . The recommended full thread depth is $2D + 6$ mm to facilitate interchangeability of valves and to reduce the number of fixing bolt lengths. The recommended engagement of fixing bolt thread for ferrous mountings is $1,25D$.

2) The dimensions specifying the area within the chain thick lines are the minimum dimensions for the mounting surface. The corners of the rectangle may be radiused to a maximum radius, r_{max} , equal to the thread diameter of the fixing bolts.

Along each axis the fixing holes are at equal distances to the mounting surface edges.

3) This dimension gives the minimum space required for a valve with this mounting surface. The dimension is also the minimum distance from centreline to centreline of two identical mounting surfaces placed on a manifold block.

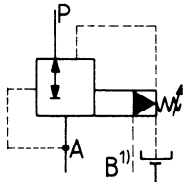
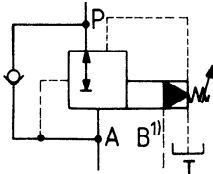
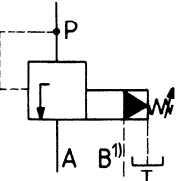
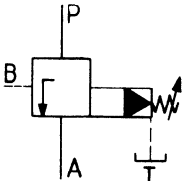
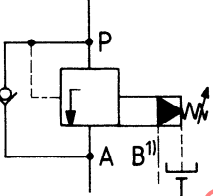
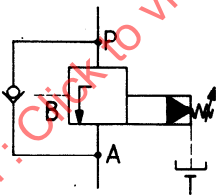
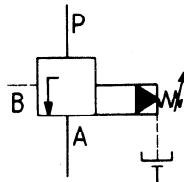
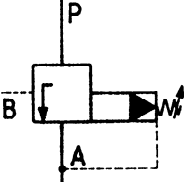
The valve manufacturer's attention is drawn to the fact that no part of the width of the complete valve assembly shall exceed this dimension.

4) Blind hole in the mounting surface to accommodate the locating pin on the valves. The minimum depth is 4 mm.

5) The supplier shall establish the maximum working pressure for subplates or manifold blocks.

Description	External drain		Internal drain	
	Internal pilot	External pilot	Internal pilot	External pilot
Pressure-control valves				
Pressure-control valves with by-pass check valve				
Sequence valves				
Sequence valves with by-pass check valve				
Unloading valves				
Unloading valves with by-pass check valve				
Throttle valves				
Throttle valves with by-pass check valve				
Check valves				
Pilot-operated check valves				

Figure 4 — Directly operated pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 7,5 mm maximum port diameter (code: ISO 5781 — AB — 03 — 4 — B)

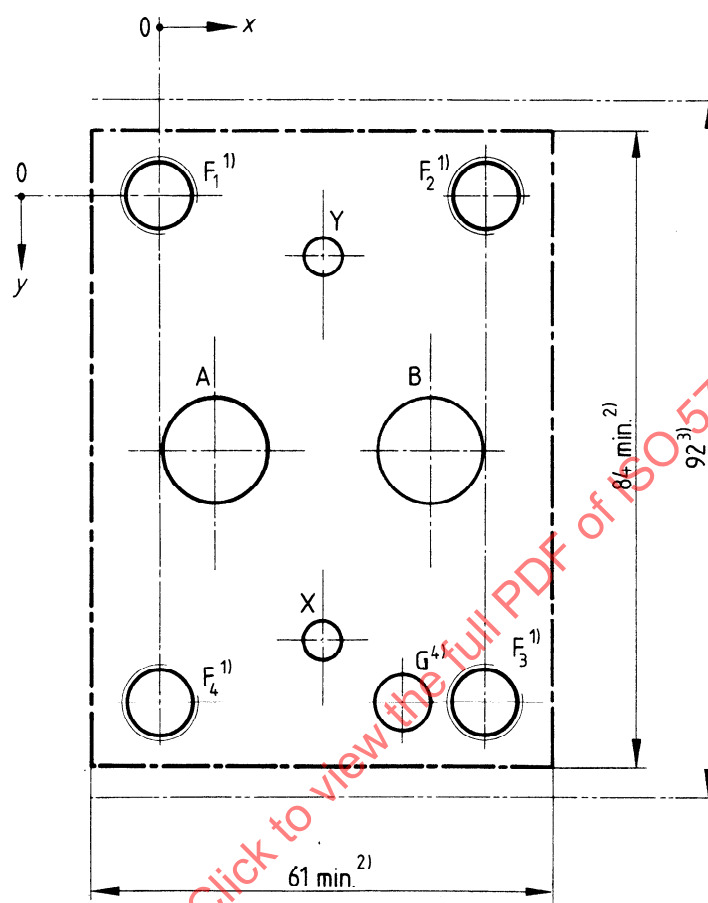
Description	External drain		Internal drain	
	Internal pilot	External pilot	Internal pilot	External pilot
Pressure-control valves				
Pressure-control valves with by-pass check valve				
Sequence valves				
Sequence valves with by-pass check valve				
Unloading valves				

1) Port for supplementary remote control; may be blocked if not needed.

Figure 5 — Pilot-operated pressure-control valves, sequence valves and unloading valves with main ports of 7,5 mm maximum port diameter (code: ISO 5781 — AB — 03 — 4 — B)

Dimensions in millimetres

Code: ISO 5781 — AG — 06 — 2 — A



NOTE — See figures 7 and 8 for symbols.

Axis	A	B	X	Y	G	F ₁	F ₂	F ₃	F ₄
	$\phi 14,7 \text{ max.}$	$\phi 14,7 \text{ max.}$	$\phi 4,8$	$\phi 4,8$	$\phi 7,5$	M10	M10	M10	M10
x	7,1	35,7	21,4	21,4	31,8	0	42,9	42,9	0
y	33,3	33,3	58,7	7,9	66,7	0	0	66,7	66,7

Figure 6 — Mounting surface for pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 14,7 mm maximum port diameter (size 06)⁵⁾

1) The minimum thread depth is 1,5 times the bolt diameter, D . The recommended full thread depth is $2D + 6$ mm to facilitate interchangeability of valves and to reduce the number of fixing bolt lengths. The recommended engagement of fixing bolt thread for ferrous mountings is $1,25D$.

2) The dimensions specifying the area within the chain thick lines are the minimum dimensions for the mounting surface. The corners of the rectangle may be radiused to a maximum radius, r_{max} , equal to the thread diameter of the fixing bolts.

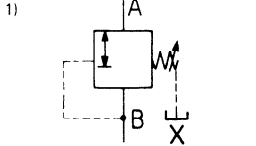
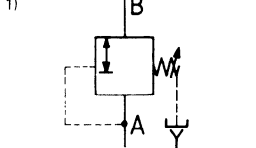
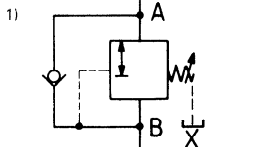
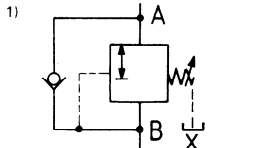
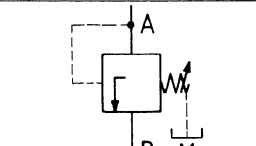
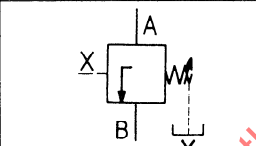
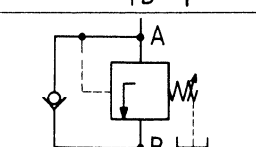
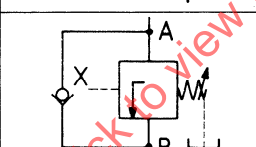
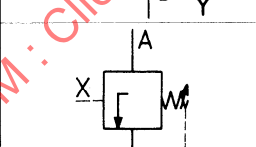
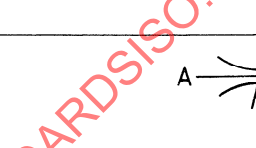
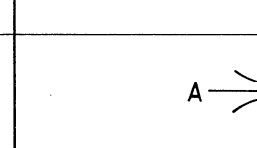
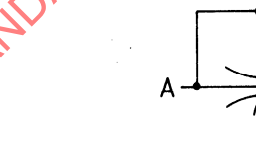
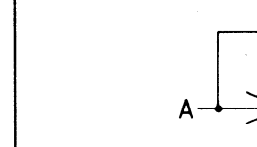
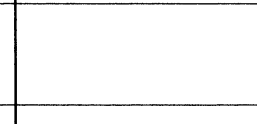
Along each axis the fixing holes are at equal distances to the mounting surface edges.

3) This dimension gives the minimum space required for a valve with this mounting surface. The dimension is also the minimum distance from centreline to centreline of two identical mounting surfaces placed on a manifold block.

The valve manufacturer's attention is drawn to the fact that no part of the width of the complete valve assembly shall exceed this dimension.

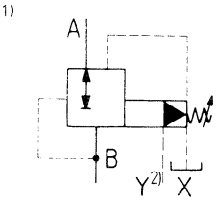
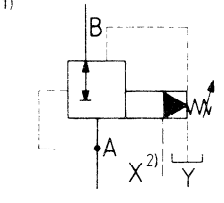
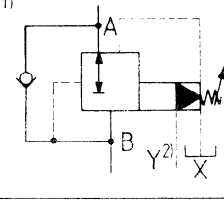
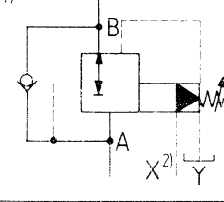
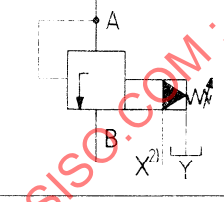
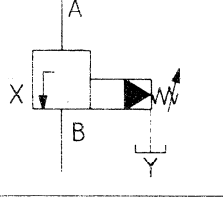
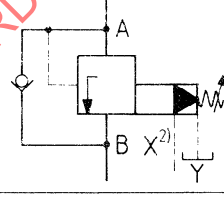
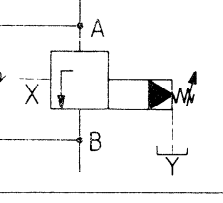
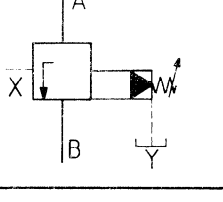
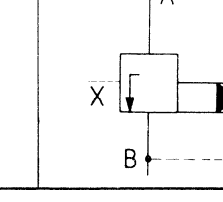
4) Blind hole in the mounting surface to accommodate the locating pin on the valves. The minimum depth is 8 mm.

5) The supplier shall establish the maximum working pressure for subplates or manifold blocks.

Description	External drain		Internal drain	
	Internal pilot	External pilot	Internal pilot	External pilot
Pressure-control valves	1) 			
	1) 			
Pressure-control valves with by-pass check valve	1) 			
	1) 			
Sequence valves				
Sequence valves with by-pass check valve				
Unloading valves				
Throttle valves				
Throttle valves with by-pass check valve				
Check valves				
Pilot-operated check valves				

1) The two port marking types correspond to current practice.

Figure 7 — Directly operated pressure-control valves, unloading valves, throttle valves and check valves with main ports of 14,7 mm, maximum port diameter (code: ISO 5781 — AG — 06 — 2 — A)

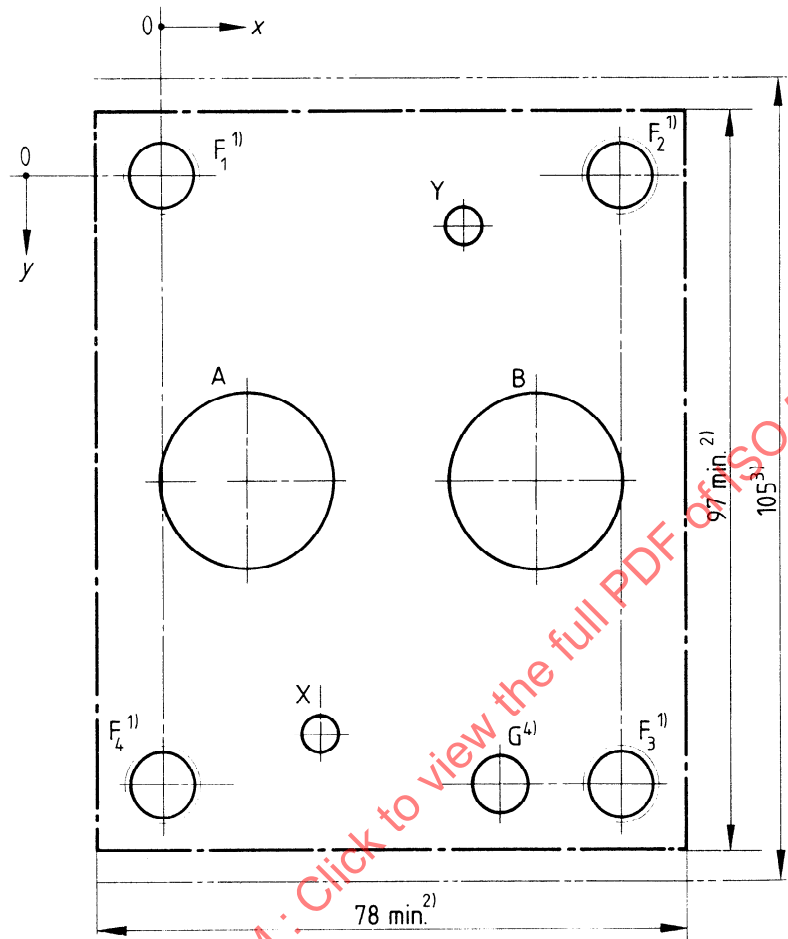
Description	External drain		Internal drain	
	Internal pilot	External pilot	Internal pilot	External pilot
Pressure-control valves	1) 			
	1) 			
Pressure-control valves with by-pass check valve	1) 			
	1) 			
Sequence valves				
Sequence valves with by-pass check valve				
Unloading valves				

1) The two port marking types correspond to current practice.

2) Port for supplementary remote control; may be blocked if not needed.

Figure 8 — Pilot-operated pressure-control valves, sequence valves and unloading valves with main ports of 14,7 mm maximum port diameter (code: ISO 5781 — AG — 06 — 2 — A)

Code: ISO 5781 — AH — 08 — 2 — A



NOTE — See figures 10 and 11 for symbols.

Axis	A	B	X	Y	G	F ₁	F ₂	F ₃	F ₄
	φ 23,4 max.	φ 23,4 max.	φ 4,8	φ 4,8	φ 7,5	M10	M10	M10	M10
x	11,1	49,2	20,8	39,7	44,5	0	60,3	60,3	0
y	39,7	39,7	73	6,4	79,4	0	0	79,4	79,4

Figure 9 — Mounting surface for pressure-control valves, sequence valves, unloading valves, throttle valves and check valves with main ports of 23,4 mm maximum port diameter (size 08)⁵⁾

1) The minimum thread depth is 1,5 times the bolt diameter, D . The recommended full thread depth is $2D + 6$ mm to facilitate interchangeability of valves and to reduce the number of fixing bolt lengths. The recommended engagement of fixing bolt thread for ferrous mountings is $1,25D$.

2) The dimensions specifying the area within the chain thick lines are the minimum dimensions for the mounting surface. The corners of the rectangle may be radiused to a maximum radius, $r_{\max}$, equal to the thread diameter of the fixing bolts.

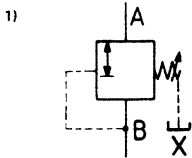
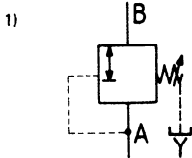
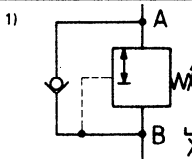
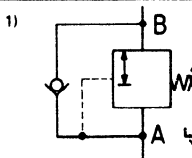
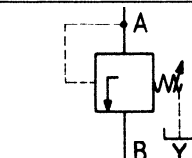
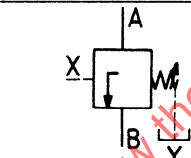
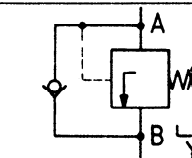
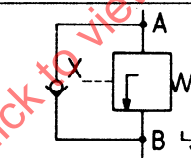
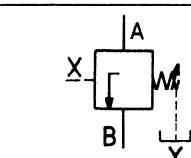
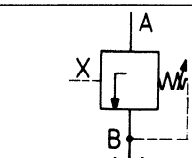
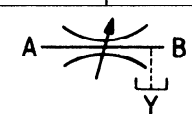
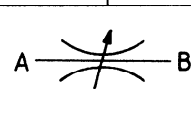
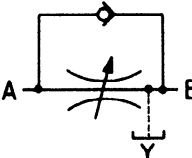
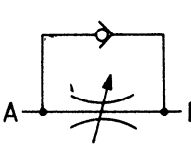
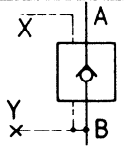
Along each axis the fixing holes are at equal distances to the mounting surface edges.

3) This dimension gives the minimum space required for a valve with this mounting surface. The dimension is also the minimum distance from centreline to centreline of two identical mounting surfaces placed on a manifold block.

The valve manufacturer's attention is drawn to the fact that no part of the width of the complete valve assembly shall exceed this dimension.

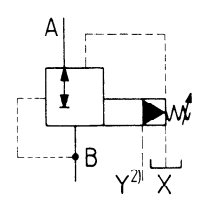
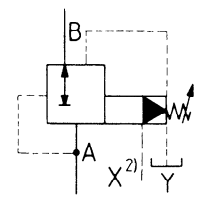
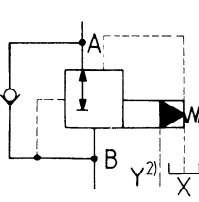
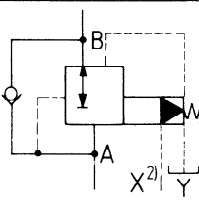
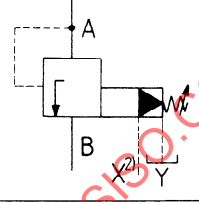
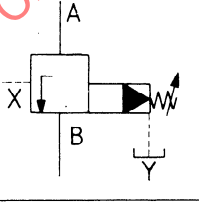
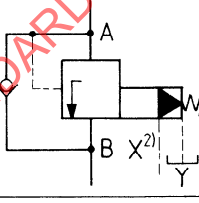
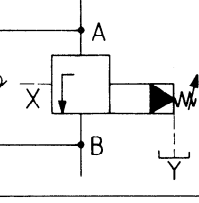
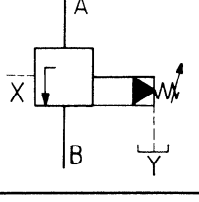
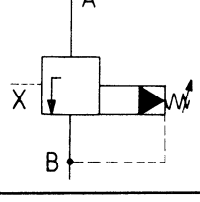
4) Blind hole in the mounting surface to accommodate the locating pin on the valves. The minimum depth is 8 mm.

5) The supplier shall establish the maximum working pressure for subplates or manifold blocks.

Description	External drain		Internal drain	
	Internal pilot	External pilot	Internal pilot	External pilot
Pressure-control valves	1) 			
	1) 			
Pressure-control valves with by-pass check valve	1) 			
	1) 			
Sequence valves				
Sequence valves with by-pass check valve				
Unloading valves				
Throttle valves				
Throttle valves with by-pass check valve				
Check valves				
Pilot-operated check valves				

1) The two port marking types correspond to current practice.

Figure 10 — Directly operated pressure-control valves, unloading valves, throttle valves and check valves with main ports of 23,4 mm maximum port diameter (code: ISO 5781 — AH — 08 — 2 — A)

Description	External drain		Internal drain	
	Internal pilot	External pilot	Internal pilot	External pilot
Pressure-control valves	1) 			
	1) 			
Pressure-control valves with by-pass check valve	1) 			
	1) 			
Sequence valves				
Sequence valves with by-pass check valve				
Unloading valves				

1) The two port marking types correspond to current practice.
2) Port for supplementary remote control; may be blocked if not needed.

Figure 11 — Pilot-operated pressure-control valves, sequence valves and unloading valves with main ports of 23,4 mm maximum port diameter (code: ISO 5781 – AH – 08 – 2 – A)