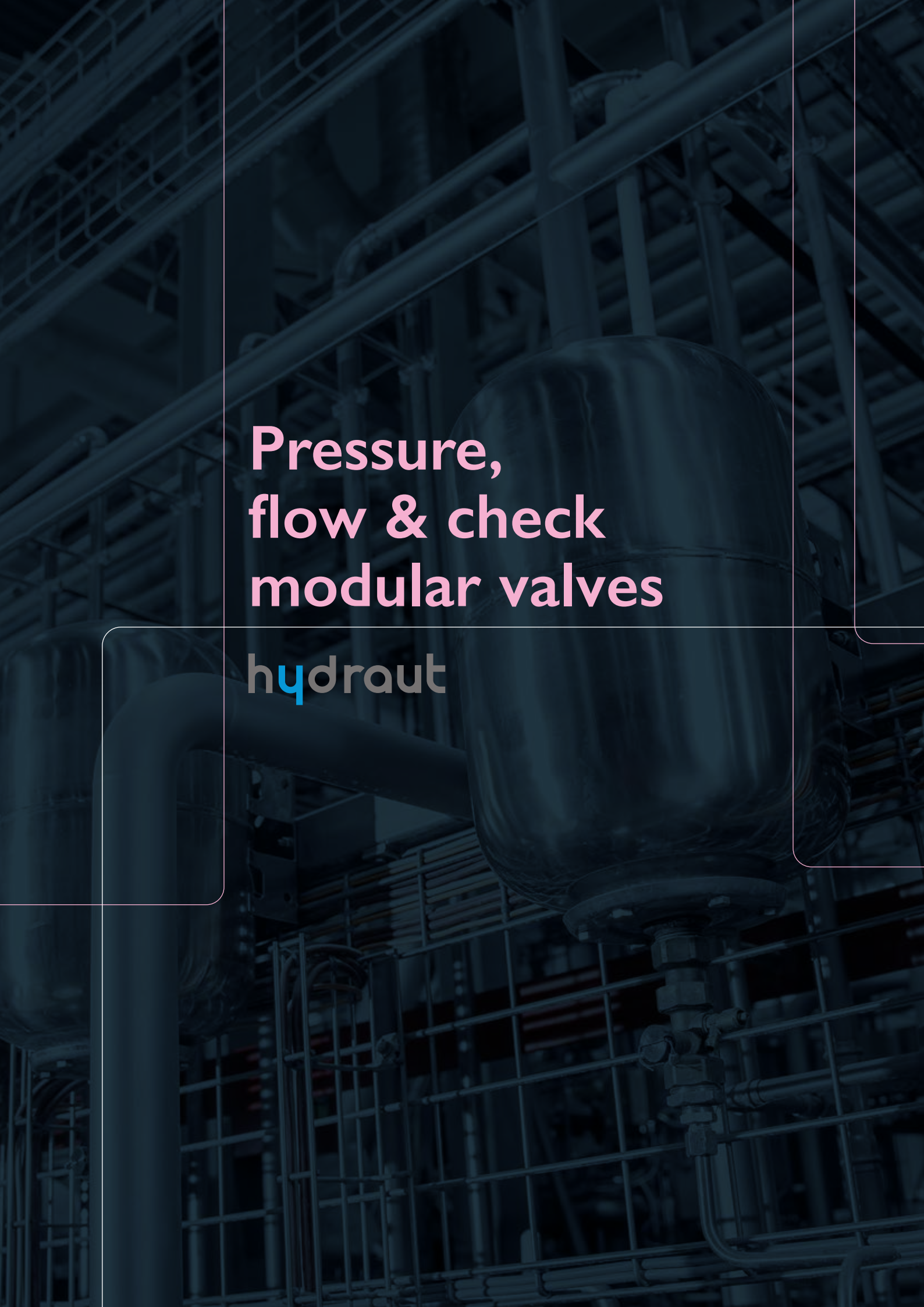


# Pressure, flow & check modular valves



hydrout

The background is a dark, monochromatic photograph of an industrial facility. It features a complex network of pipes, valves, and structural beams, creating a dense, geometric pattern. The lighting is low, highlighting the metallic textures and the intricate layout of the machinery. A large, spherical valve or component is prominent in the center-right of the frame.

# Pressure, flow & check modular valves

hydraut

# Summary



CHECK VALVES 04



PRESSURE REDUCING VALVES 24



THROTTLE CHECK VALVES 40



PRESSURE RELIEF VALVES 58

## TYPE Z2S6

CHECK VALVE, PILOT OPERATED



NG 6

Component series 6X

Maximum operating pressure 350 bar

Maximum flow 60 l/min

### FEATURES

- Sandwich plate valve for use in vertical stackings
- Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (with or without locating hole)

ORDERING CODE

01	02	03	04	05	06	07	08	09	10
Z2S	6			-	6X	/			*

01	Check valve, sandwich plate	Z2S
----	-----------------------------	-----

02	Size 6	6
----	--------	---

**Leakage-free blocking**

03	In channel A and B	-	✳
	In channel A	A	
	In channel B	B	

**Cracking pressure**

04	1.5 bar	1	✳
	3 bar	2	
	6 bar	3	
	110 bar	4	

05	Component series 60 to 69 (60 to 69: Unchanged installation and connection dimensions)	6X
----	--	----

**Seal material**

06	NBR seals	no code
	FKM seals	V

**Corrosion resistance (outside)**

07	None (valve housing primed)	no code
	Improved corrosion protection (240 h salt spray test according to EN ISO 9227)	J3

**Locating hole**

08	Without locating hole	no code
	With locating hole	/60

**Special versions**

09	Without special version	no code
----	-------------------------	---------

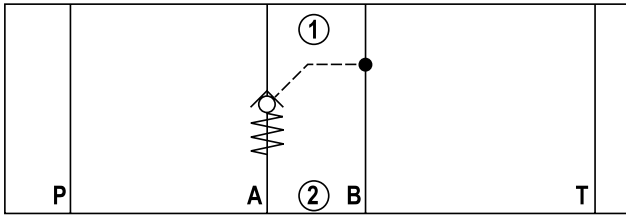
10	Further details in the plain text	
----	-----------------------------------	--

✳ Standard type

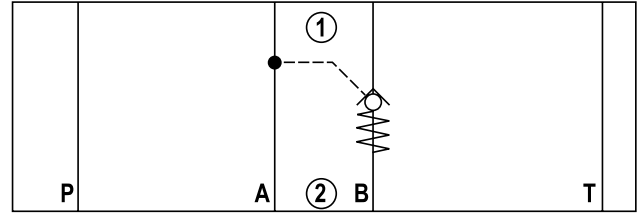
**SYMBOLS**

① = component side, ② = plate side

**Type Z2S 6 A...**



**Type Z2S 6 B...**



**FUNCTION, SECTIONS, CIRCUIT EXAMPLE**

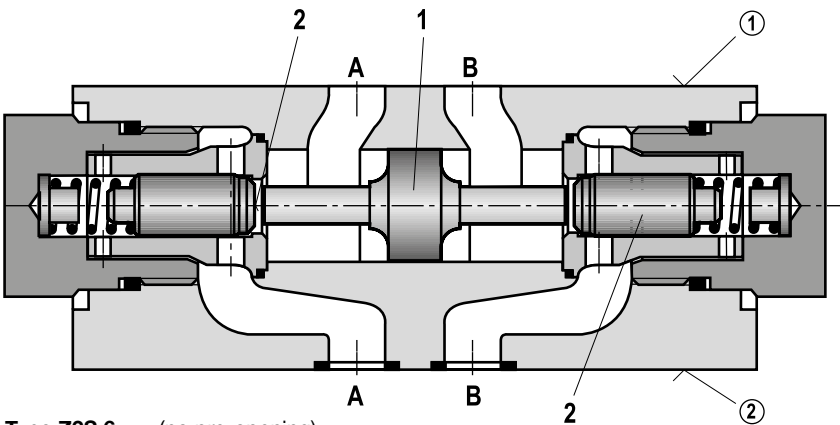
The isolator valve type Z2S is a releasable check valve in sandwich plate design. It is used for the leakage-free blocking of one or two actuator ports, even for long standstill times. In direction A① to A② or B① to B②, there is a free flow; in the opposite direction, the flow is blocked.

If, for example, there is a flow through the valve in direction A① to A②, control spool (1) is moved in direction B side and pushes the poppet (2) off its seat. Hydraulic fluid can now flow from B② to B①.

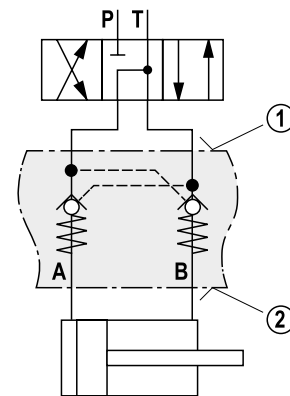
In order to allow the poppets to be safely closed (2), the control spool (1) must be hydraulically unloaded (see circuit example).

**Pre-opening**

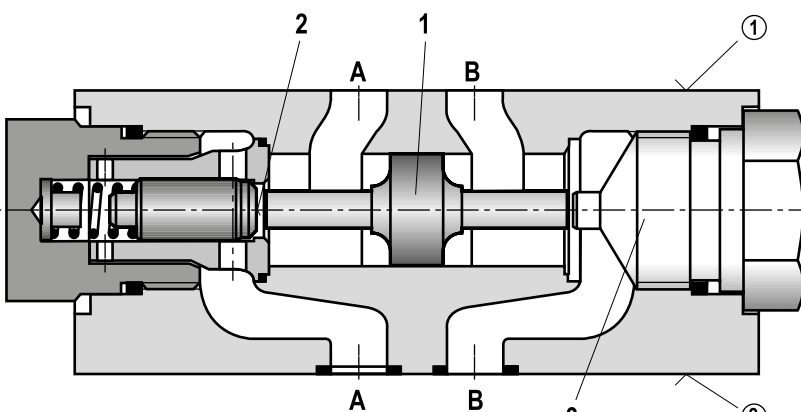
- The two-stage set-up with an increased control open ratio means even low pilot pressure can be released securely.
- Avoidance of switching shocks due to dampened decompression of the pressure volume on the actuator side.



**Type Z2S 6 -... (no pre-opening)**



**Circuit example, schematic**



**Type Z2S 6 A...**

① = component side  
② = plate side

- 1 Control spool, area A2
- 2 Poppet, area A1
- 3 Stop

TECHNICAL DATA

(for applications outside these parameters, please consult us!)

General		
Weight	kg [lbs]	Approx. 0.8
Installation position		Any
Ambient temperature range	°C [°F]	-30 ... +80 (NBR seals) -20 ... +80 (FKM seals)
Storage temperature range		see operating instructions 07600-B
MTTF <sub>D</sub> values according to EN ISO 13849	years	150 ... 1200 (for more information see data sheet 08012)

Hydraulic		
Maximum operating pressure	bar [psi]	350
Cracking pressure in free direction		see characteristic curves page
Maximum flow	l/min	60
Direction of flow		see symbols
Hydraulic fluid		see table below
Hydraulic fluid temperature range (at the valve working ports)	°C	-30 ... +80 (NBR seals) -20 ... +80 (FKM seals)
Viscosity range	mm <sup>2</sup> /s [SUS]	2.8 ... 500
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)		Class 20/18/15 <sup>1)</sup>
Area ratio	• Without pre-opening	A <sub>1</sub> /A <sub>2</sub> ~ 1/3.5 (see sectional drawing page)
	• With pre-opening	A <sub>3</sub> /A <sub>2</sub> ~ 1/12.5 (see sectional drawing page)
	• Version "SO60"	A <sub>1</sub> /A <sub>4</sub> ~ 1/7 (see sectional drawing page)

Hydraulic fluid	Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils	HL, HLP, HLPD, HVL, HVLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	• insoluble in water	HETG	ISO 15380	90221
		HEES		
	• soluble in water	HEPG	ISO 15380	
Flame-resistant	• water-free	HFDU (glycol base)	ISO 12922	90222
		HFDU (ester base)		
		HFDR		
	• containing water	HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	ISO 12922	90223

**Important information on hydraulic fluids:**

- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.

**Flame-resistant – containing water:**

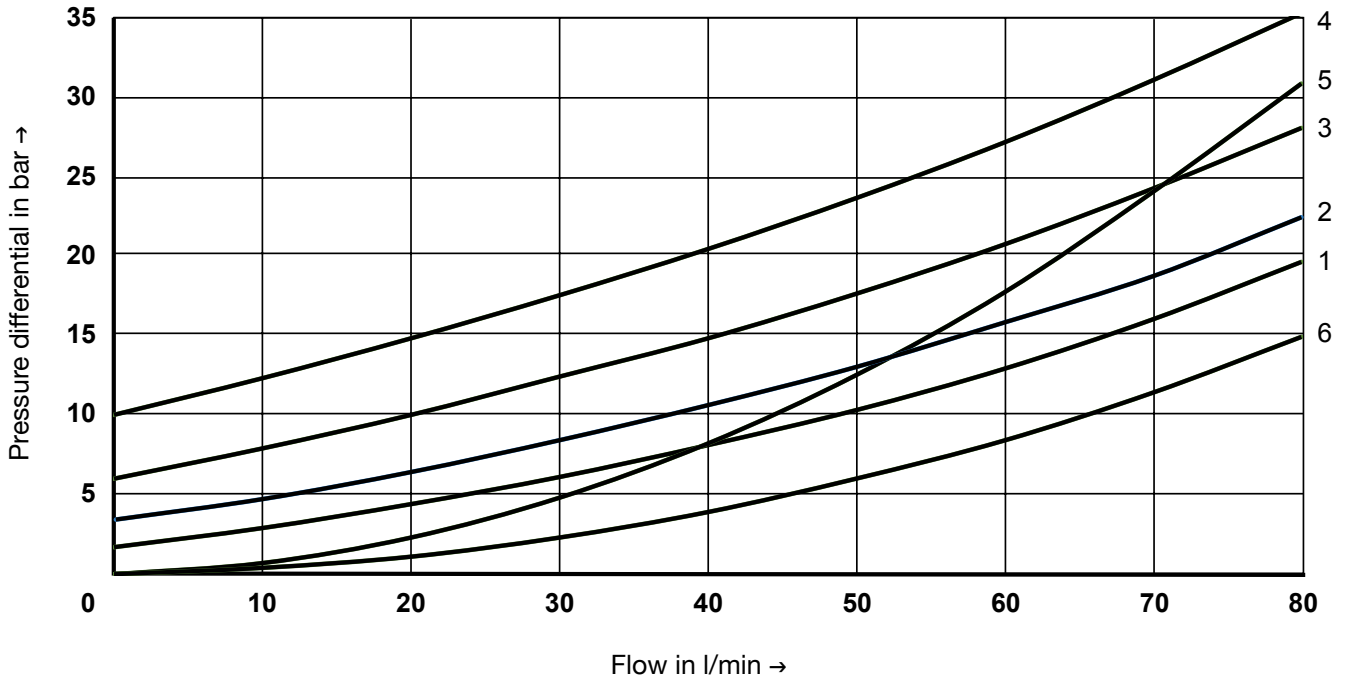
Due to the increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended - if possible specific to the installation - to back up the return flow pressure in ports T to approx. 20% of the pressure differential at the component.

<sup>1)</sup> The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and simultaneously increases the life cycle of the components.

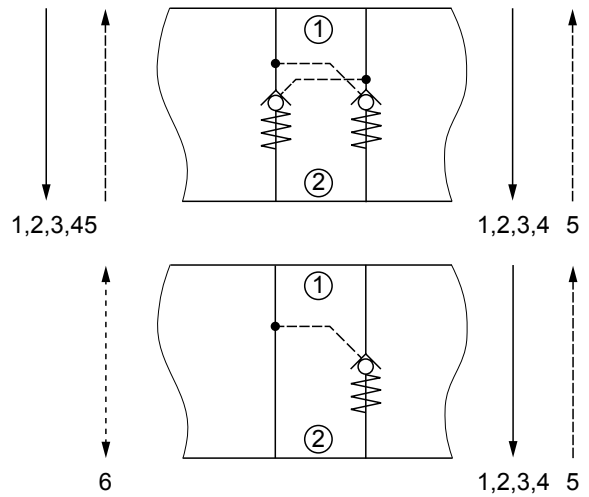
# CHARACTERISTIC CURVES

(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$  averages)

$\Delta p$ - $q_v$ -characteristic curves



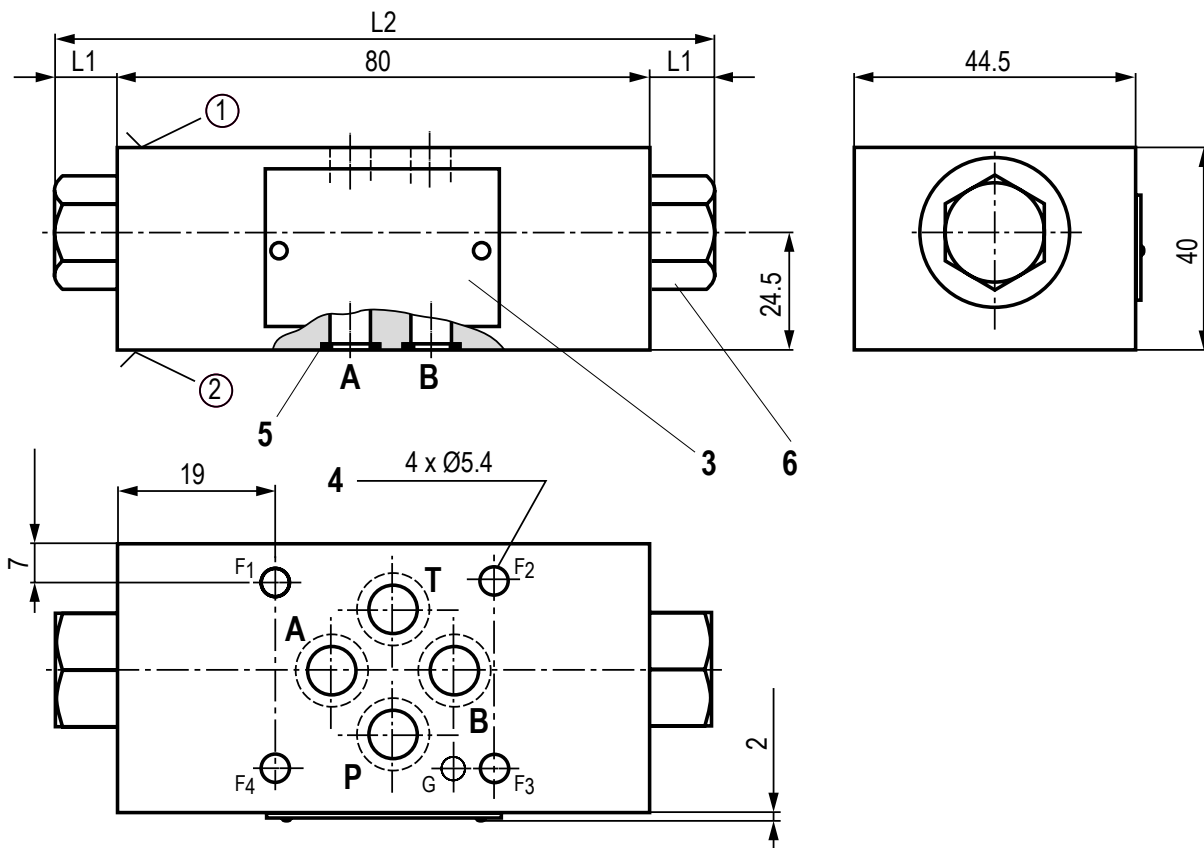
1. 1.5 bar
2. 3 bar
3. 6 bar
4. 10 bar
5. Check valve controlled open via control spool
6. Free flow (without check valve use), version "A" and "B"





**DIMENSIONS**

(dimensions in mm)



CHECK VALVES

**Notice:**

The dimensions are nominal dimensions which are subject to tolerances.

	"no code"	"A"	"B"
L1	11	21.5 <sup>1)</sup>	21.5 <sup>1)</sup>
L2	102	123	112.5

- ① component side – porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole Ø4 x 4 mm deep or **without** locating hole)
- ② plate side – porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locking pin ISO 8752-3x8-St, design "/60" or **without** locating hole)

- 3. Name plate
- 4. Through hole for valve mounting
- 5. Identical seal rings for ports A, B, P, T
- 6. Plug screw SW22

- Valve mounting screws (separate order)**
- 4 hexagon socket head cap screws ISO 4762 - M5 - 10.9**
- 4 hexagon socket head cap screws 10-24 UNC**

# TYPE Z1S6

## CHECK VALVE



NG 6

Component series 4X

Maximum operating pressure 350 bar

Maximum flow 35 l/min

### FEATURES

- Sandwich plate valve for use in vertical stackings
  - as angle valve
  - as straight-through valve
- Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03

ORDERING CODE

01	02	03	04	05	06	07	08	09	10			
Z1S	6			-	4X	/	V		/		*	

01	Check valve, sandwich plate	Z1S
----	-----------------------------	-----

02	Size 6	6
----	--------	---

Direction of flow

03	Straight-through valve (in the channel)	
	A (A2 → A1)	A
	B (B2 → B1)	B
	P (P2 → P1)	P
	T (T1 → T2)	T

Cracking pressure

04	0.5 bar [7.25 psi]	05
	1.5 bar [21.76 psi]	15
	3.0 bar [43.51 psi]	30
	5.0 bar [72.52 psi]	50

05	Component series 40 ... 49 (40 ... 49: Unchanged installation and mounting dimensions)	4X
----	--	----

Seal material

06	FKM seals	V
	Observe compatibility of seals with hydraulic fluid used. (Other seals upon request)	

Corrosion resistance (outside; thick film passivated according to DIN 50979 Fe//Zn8//Cn//T0)

07	None (valve housing primed)	no code
----	-----------------------------	---------

08	Without locating hole	no code
----	-----------------------	---------

Special versions

09	Standard version	no code
----	------------------	---------

10	Further details in the plain text	
----	-----------------------------------	--

CHECK VALVES

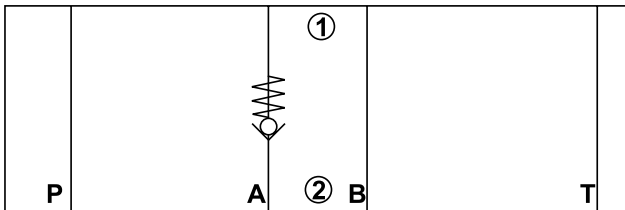
✳ Standard type

## SYMBOLS

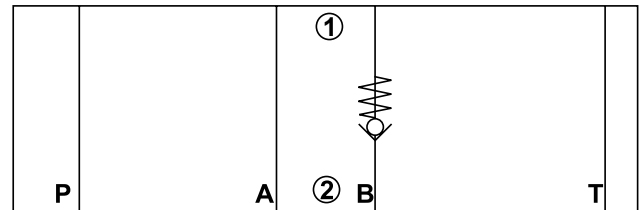
Straight-through valve

① = component side, ② = plate side

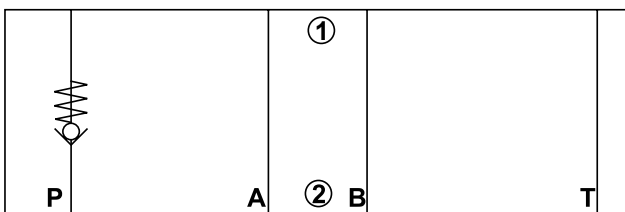
Type Z1S 6 A...



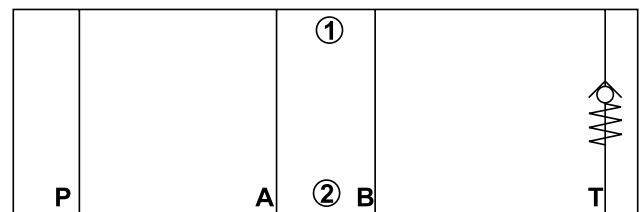
Type Z1S 6 B...



Type Z1S 6 P...



Type Z1S 6 T...



## FUNCTION, SECTIONS

The valve type Z1S is a direct operated check valve in sandwich plate design.

It is used for the leakage-free blocking in one direction and allows for free flow in the opposite direction.

The stroke of the poppet (1) is limited by the plastic socket (2). The installed spring (3) supports the closing movement. When no fluid flows through the valve, the spring (3) keeps the poppet (1) in closed position.

In contrast to the straight-through valve (section 1), the angle valve (section 2) links or closes off up to three internal channels. Stop and sealing function are taken over by the plug screw (4).

TECHNICAL DATA

(for applications outside these parameters, please consult us!)

general		
Weight	kg [lbs]	Approx. 0.8 [1.76]
Installation position		Any
Ambient temperature range	°C [°F]	-20 ... +80 [-4 ... +176]
hydraulic		
Maximum operating pressure	bar [psi]	350 [5076]
Cracking pressure	bar [psi]	0.5; 1.5; 3; 5 [7.25; 21.76; 43.51; 72.52]
Maximum flow	l/min [US gpm]	35 [9.25]
Hydraulic fluid		See table below
Hydraulic fluid temperature range	°C [°F]	-20 ... +80 [-4 ... +176]
Viscosity range	mm <sup>2</sup> /s [SUS]	2.8 ... 500 [35 ... 2320]
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)		Class 20/18/15 <sup>1)</sup>

Hydraulic fluid	Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils	HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	• insoluble in water	HETG	ISO 15380	90221
		HEES		
	• soluble in water	HEPG	ISO 15380	
Flame-resistant	• water-free	HFDU, HFDR	ISO 12922	90222
	• containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	ISO 12922	90223

**Important information on hydraulic fluids:**

- For more information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.

**Flame-resistant – containing water:**

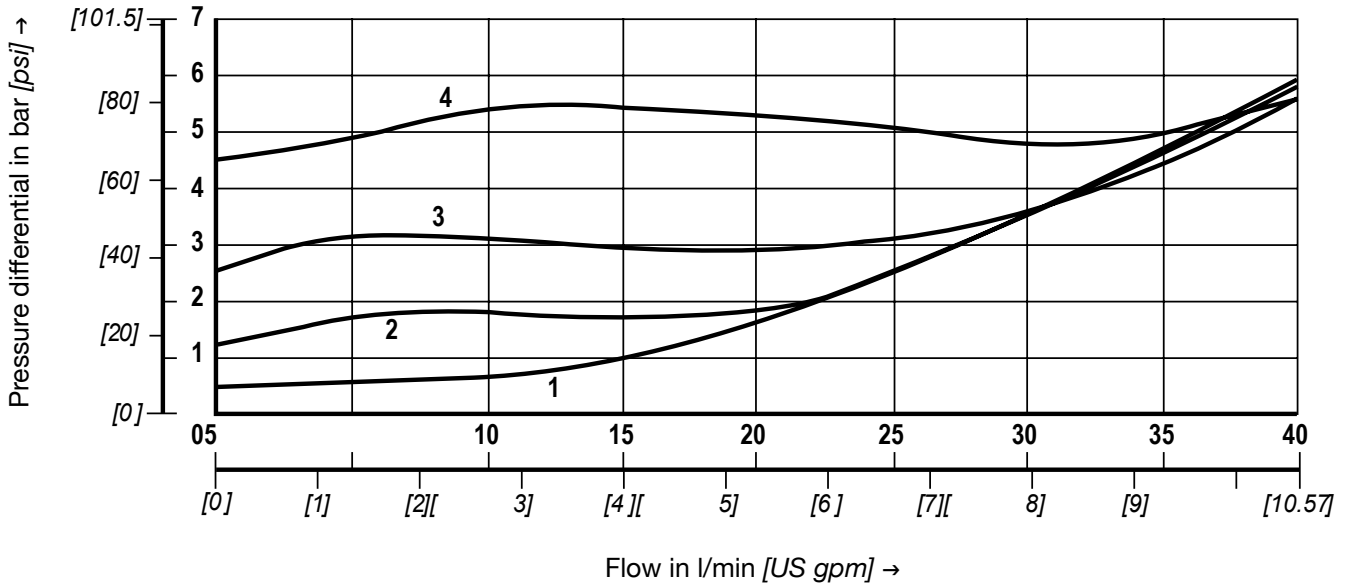
- Maximum pressure differential per control edge 50 bar
- Pressure pre-loading at the tank port > 20 % of the pressure differential, otherwise increased cavitation
- Life cycle as compared to operation with mineral oil HL, HLP 50 to 100 %

## CHARACTERISTIC CURVES

Straight-through valve

(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$  [ $104 \pm 9 \text{ }^\circ\text{F}$ ])

$\Delta p$ - $q_v$ -characteristic curves (A2 → A1)



1. Cracking pressure 0.5 bar
2. Cracking pressure 1.5 bar
3. Cracking pressure 3 bar
4. Cracking pressure 5 bar



# TYPE Z1S10

## CHECK VALVE



NG 10

Component series 4X

Maximum operating pressure 350 bar

Maximum flow 70 l/min

### FEATURES

- Sandwich plate valve for use in vertical stackings
- Porting pattern according to ISO 4401-05-04-0-05, ISO 4401-05-05-0-05 and NFPA T3.5.1 R2-2002 D05



ORDERING CODE

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
Z1S	10			-							4X	/	F	/				*

01	Check valve, sandwich plate	Z1S
----	-----------------------------	-----

02	Size 10	10
----	---------	----

Check valve 1 <sup>1)</sup> – in channel ...

03	Channel A	A
	Channel B	B
	Channel P	P
	Channel TA	TA
	Channel TB	TB

Check valve 1 <sup>1)</sup> – cracking pressure

04	without spring	00
	0.5 bar [7.25 psi]	05
	3.0 bar [43.51 psi]	30
	5.0 bar [72.52 psi]	50

Check valve 1 <sup>1)</sup> – installation direction

05	Component side ⊙ (direction of flow ⊙ → ⊙)	1
	Plate side ⊙ (direction of flow ⊙ → ⊙)	2

Check valve 1 <sup>1)</sup> – nozzle diameter (when used as a throttle check valve)

06	without throttle	no code
	Ø0.5 mm [0.0197 inch]	D05
	Ø1.0 mm [0.0394 inch]	D10
	Ø1.5 mm [0.0591 inch]	D15

Check valve 2 (optional) <sup>1)</sup> – in channel ...

07	Without check valve 2	no code
	Channel B	B
	Channel P	P
	Channel TA	TA
	Channel TB	TB

Check valve 2 (optional) <sup>1)</sup> – cracking pressure

08	Without check valve 2	no code
	Without spring	00
	0.5 bar [7.25 psi]	05
	3.0 bar [43.51 psi]	30
	5.0 bar [72.52 psi]	50

Check valve 2 (optional) <sup>1)</sup> – installation direction

09	Without check valve 2	no code
	Component side ⊙ (direction of flow ⊙ → ⊙)	1
	Plate side ⊙ (direction of flow ⊙ → ⊙)	2

Check valve 2 (optional) <sup>1)</sup> – nozzle diameter (when used as a throttle check valve)

10	without throttle	no code
	Ø0.5 mm [0.0197 inch]	D05
	Ø1.0 mm [0.0394 inch]	D10
	Ø1.5 mm [0.0591 inch]	D15

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	
Z1S	10			-							-	4X	/	F	/			-	*

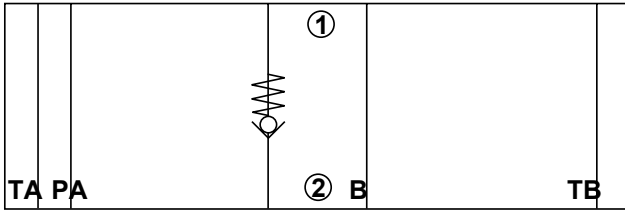
11	Channels TA and TB free-flowing	no code
	Channel TA closed	TA9
	Channel TB closed	TB9
12	Component series 40 ... 49 (40 ... 49: unchanged installation and connection dimensions)	4X
<b>Seal material</b>		
13	FKM seals	F
	Observe compatibility of seals with hydraulic fluid used. (Other seals upon request)	
<b>Additional pilot oil ports X and Y</b>		
14	Without X and Y	no code
	With X and Y	XY
<b>Measuring port G1/4</b>		
15	Without measuring port	no code
	Channel B	MA
	Channel P	MB
	Channel TA	MP
	Channel TB	MTA
16	Without measuring port	no code
	Measuring port input	A
	Measuring port output	B
<b>Corrosion resistance</b> (external; thick film passivated (DIN 50979 Fe//Zn8//Cn//T0))		
17	None (valve housing primed)	no code
	Improved corrosion protection (240 h salt spray test according to EN ISO 9227)	J3
18	Further details in the plain text	✱

✱ Standard type

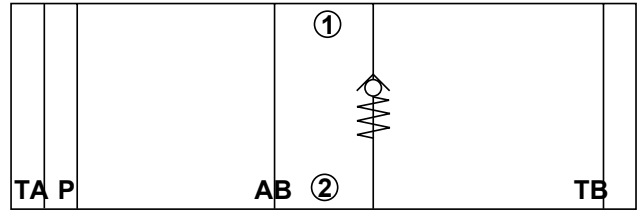
SYMBOLS

① = component side, ② = plate side

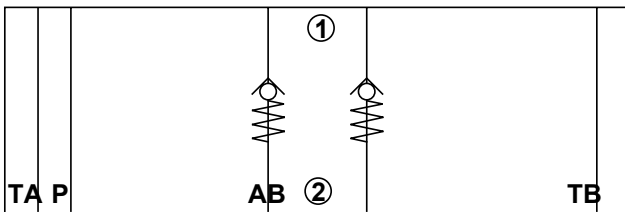
Type Z1S 10 **A**.-1-4X/...  
(check valve in channel A)



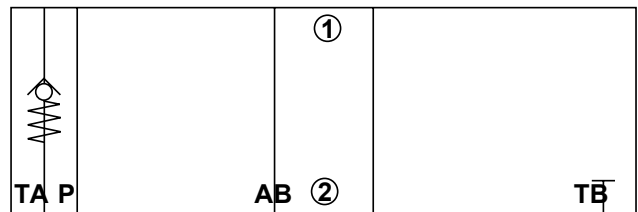
Type Z1S 10 **B**.-2-4X/...  
(check valve in channel B)



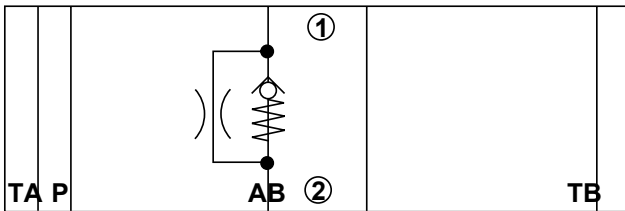
Type Z1S 10 **A**.-2B.-2-4X/...  
(check valve in channel A and B)



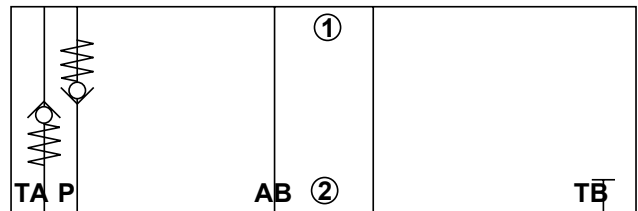
Type Z1S 10 **TA**.-2-**TB9**-4X/...  
(check valve in channel TA, TB locked)



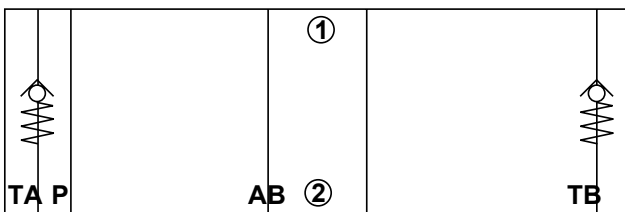
Type Z1S 10 **A**.-2D10-4X/...  
(check valve in channel A with nozzle Ø1.0 mm)



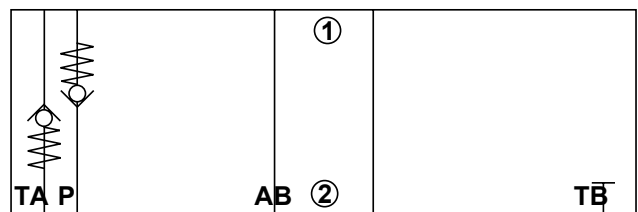
Type Z1S 10 **P**.-1**TA**-2**TB9**-4X/...  
(check valve in channel TA and P, TB locked)



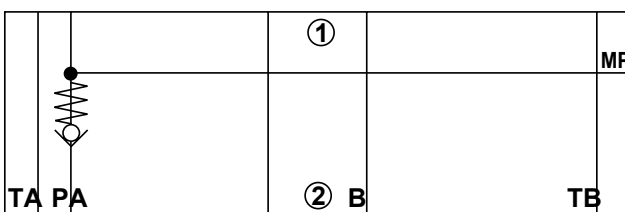
Type Z1S 10 **TA**.-2**TB**-2-4X/...  
(check valve in channel TA and TB)



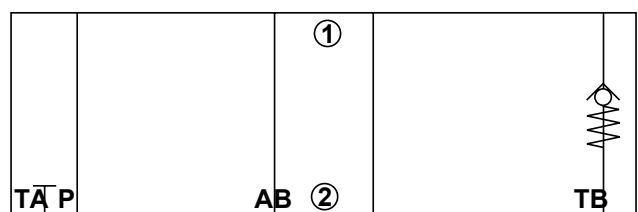
Type Z1S 10 **P**.-1-4X/F/**XY**...  
(check valve in channel P, additionally channel X and Y)



Type Z1S 10 **P**.-1-4X/F/.**MPB**...  
(check valve in channel P, measuring port P Out G1/4)



Type Z1S 10 **TA**.-2-**TB9**-4X/...  
(check valve in channel TA, TB locked)



CHECK VALVES

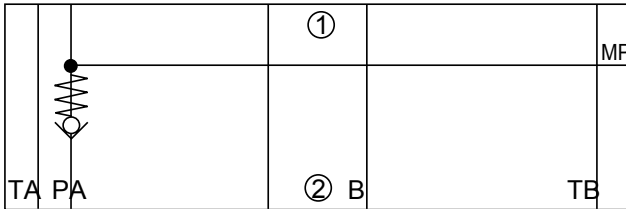
## SYMBOLS

Special versions

① = component side, ② = plate side

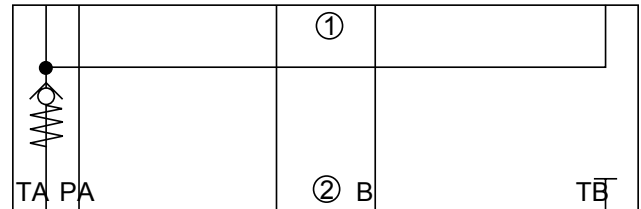
## Type Z1S 10 P.-1-4X/...-068

(check valve in channel P, measuring port in P (G1/2))



## Type Z1S 10 TA.-2-TB9-4X/...-120

(check valve in channel TA, with tank bracket)



## FUNCTION, SECTIONS

The type Z1S valve is a direct-operated sandwich plate check valve.

It blocks flow in one direction without leakage, while allowing free flow in the opposite direction.

The stroke of the plastic poppet (1) is limited by the plastic socket (2). The installed spring (3) supports the closing movement.

If the valve is not flown through, the spring (3) holds the plastic poppet (1) in closed position.

Perfect leak-tightness is already achieved with low pressures ( $0.1 \times p_{max}$ ).

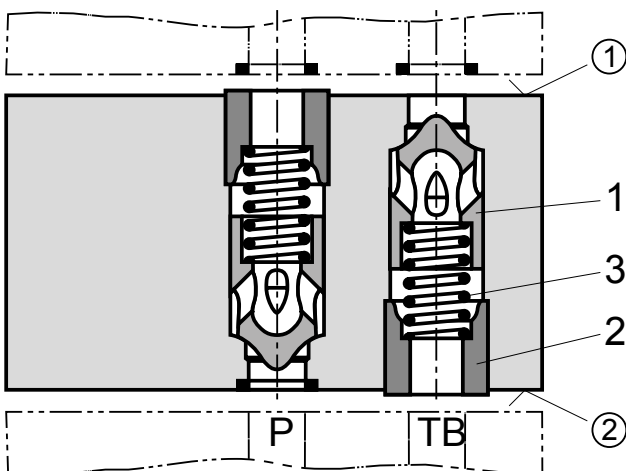
**Note:**

In all installation positions, in which the plastic socket (2) is mounted on the plate side ②, no additional seal ring must be used in this position! On the component side ①, sealing is (as usual) ensured by the seal ring of the subsequently mounted assembly.

The installed plastic socket (2) has a sealing function and must therefore not be removed or damaged.

The protrusion of the plastic socket (2) is necessary for design reasons (preload).

Depending on the included hydraulic fluid volume and its temperature variations, static pressure changes may result that are not attributable to leakage at the seat area.

**Example:**

Type Z1S 10 P.-1.TB.-2-4X/...

TECHNICAL DATA

(for applications outside these parameters, please consult us!)

general		
Weight	kg [lbs]	about 2.3 [5.1]
Installation position		Any
Ambient temperature range	°C [°F]	-20 ... +80 [-4 ... +176]
hydraulic		
Maximum operating pressure	bar [psi]	350 [5076]
Cracking pressure	bar [psi]	0.5; 3; 5 [7.25; 43.51; 72.52]
Maximum flow	l/min [US gpm]	70 [18.49]
Hydraulic fluid		See table below
Hydraulic fluid temperature range (at the valve working ports)	°C [°F]	-20 ... +80 [-4 ... +176]
Viscosity range	mm <sup>2</sup> /s [SUS]	2.8 ... 500 [35 ... 2320]
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)		Class 20/18/15 <sup>1)</sup>

Hydraulic fluid	Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils	HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	• insoluble in water	HETG	ISO 15380	90221
		HEES		
	• soluble in water	HEPG	ISO 15380	
Flame-resistant	• water-free	HFDU, HFDR	ISO 12922	90222
	• containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	ISO 12922	90223

**Important information on hydraulic fluids:**

- For more information and data about the use of other hydraulic fluids, refer to data sheets above or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.

**Flame-resistant – containing water:**

- Maximum pressure differential per control edge 50 bar
- Pressure pre-loading at the tank port > 20 % of the pressure differential, otherwise increased cavitation
- Life cycle as compared to operation with mineral oil HL, HLP 50 to 100 %

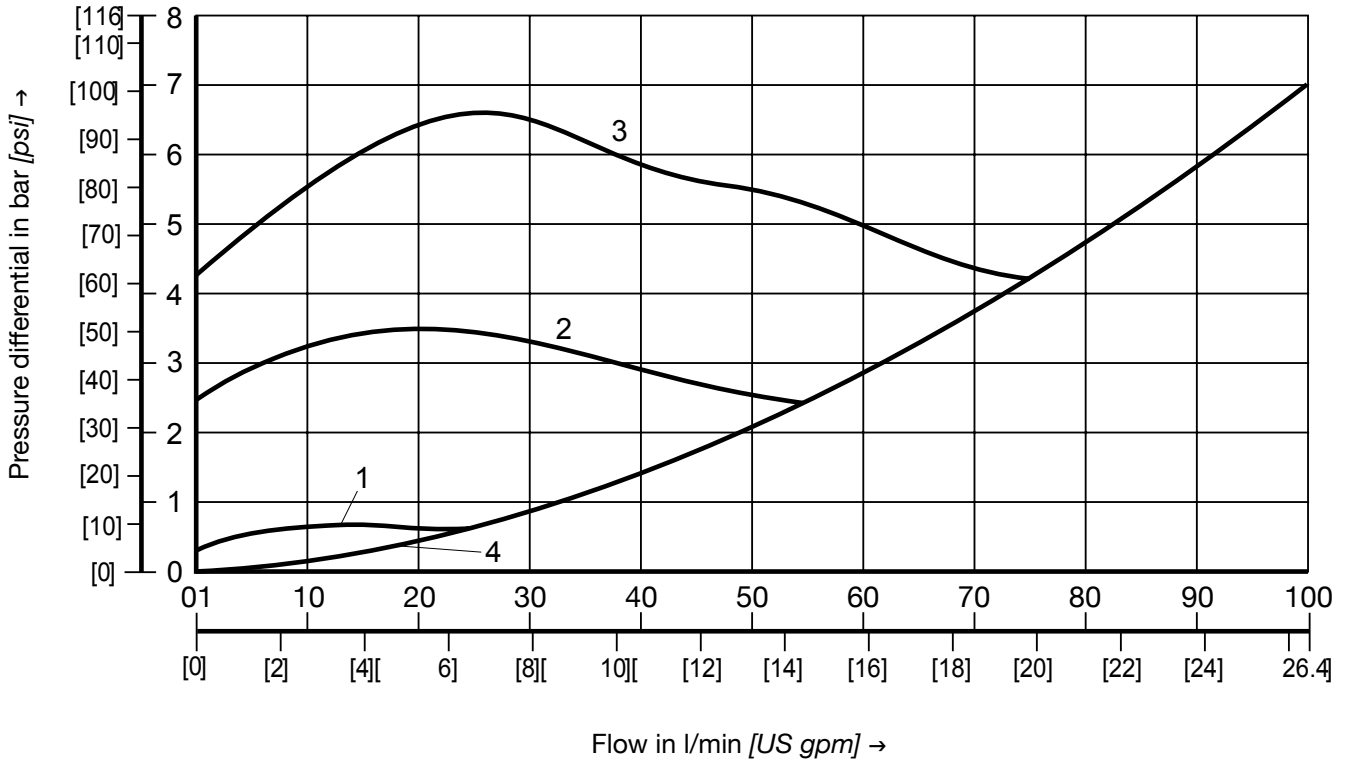
<sup>1)</sup> The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.

## CHARACTERISTIC CURVES

Straight-through valve

(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$  [ $104 \pm 9 \text{ }^\circ\text{F}$ ])

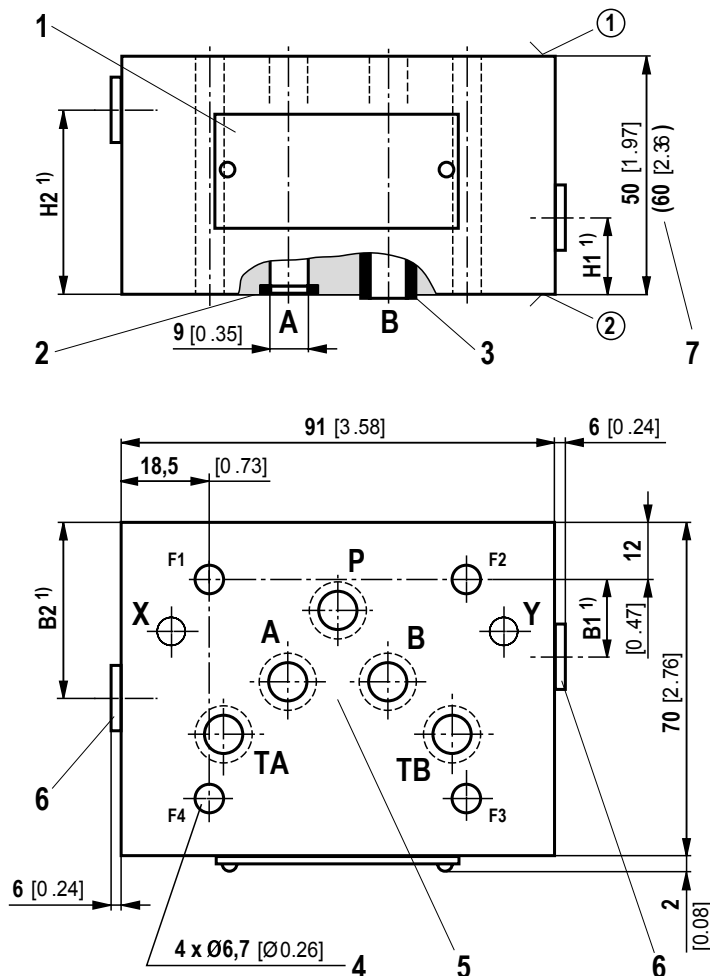
$\Delta p$ - $q_v$ -characteristic curves



1. Cracking pressure 0.5 bar [7.25 psi]
2. Cracking pressure 3.0 bar [43.51 psi]
3. Cracking pressure 5.0 bar [72.52 psi]
4. Without check valve

DIMENSIONS

In mm [inch]



1. Name plate
2. Identical seal rings for ports A, B, P, TA, and TB; identical seal rings for ports X and Y (plate side)
3. Plastic socket (position and quantity depend on order option)
4. Valve mounting bores
5. Porting pattern according to ISO 4401-05-04-0-05, ISO 4401-05-05-0-05 and NFPA T3.5.1 R2-2002 D05
6. Plug screw for measuring port (position and quantity depend on order option)
  - Connection G1/4:  
Tightening torque MA = 30 Nm [22.1 ft-lbs] +10%
  - Port G1/2 ("068" version):  
Tightening torque MA = 80 Nm [59 ft-lbs] +10%
7. Dimension with model "120"

**Valve mounting screws** (separate order)

**4 hexagon socket head cap screws ISO 4762 - M6 - 10.9**

**4 hexagon socket head cap screws 10-24 UNC**

**Note:**

The length of the valve mounting screws of the sandwich plate valve must be selected according to the components mounted under and over the isolator valve.

Depending on the application, screw type and tightening torque must be adjusted to the circumstances.

## TYPE ZDR6D

PRESSURE REDUCING VALVE,  
DIRECT OPERATED



NG 6

Component series 4X

Maximum operating pressure 350 bar

Maximum flow 35 l/min

### FEATURES

- Sandwich plate valve
- Porting pattern according to ISO 4401-03-02-0-05 (with or without locating hole)
- 4 pressure ratings
- 4 adjustment types, optionally:
  - Rotary knob
  - Bushing with hexagon and protective cap
  - Lockable rotary knob with scale
  - Rotary knob with scale
- Pressure reduction in channel A, B or channel P
- Check valve, optional (version "A" only)



ORDERING CODE

01	02	03	04	05	06	07	08	09	10	11	12	13	14
Z	DR	6	D			-	4X	/		Y			*

01	Sandwich plate valve	Z
02	Pressure reducing valve	DR
03	Size 6	6
04	Direct operated	D
05	Pressure reduction in channel A⊙	A
	Pressure reduction in channel B⊙	B
	Pressure reduction in channel P⊙	P
<b>Adjustment type</b>		
06	Rotary knob	1
07	Component series 40 ... 49 (40 ... 49: unchanged installation and mounting dimensions)	4X
08	Secondary pressure up to 25 bar	25
	Secondary pressure up to 75 bar	75
	Secondary pressure up to 150 bar	150
	Secondary pressure up to 210 bar	210
	Secondary pressure up to 315 bar (only version "B", "P", and "2")	315
09	Pilot oil supply internal, pilot oil return external	Y
10	<b>With</b> check valve (only version "A")	no code
	<b>Without</b> check valve	M
<b>Corrosion resistance</b>		
11	None	no code
<b>Seal material</b>		
12	NBR seals	no code
	FKM seals	V
	Observe compatibility of seals with hydraulic fluid used	
13	<b>Without</b> locating hole	no code
14	Further details in the plain text	

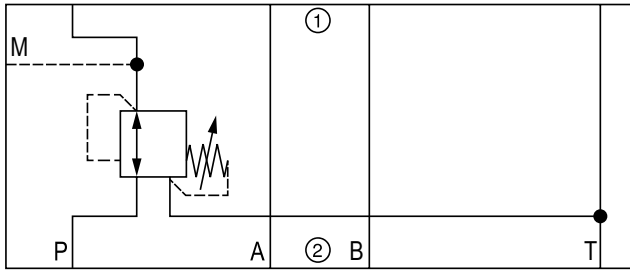


✱ Standard type

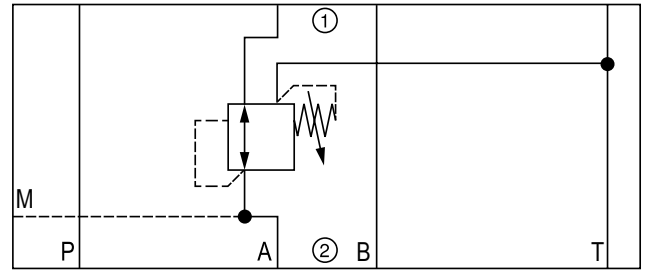
**SYMBOLS**

① = component side, ② = plate side

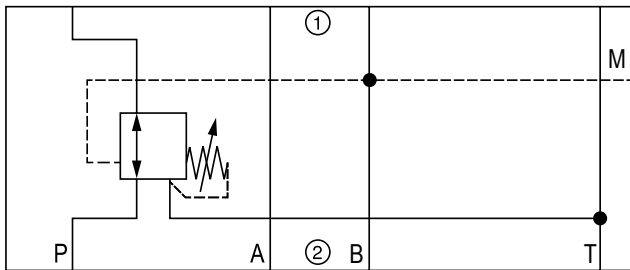
Version "P...YM"



Version "A...YM"



Version "B...YM"



FUNCTION, SECTIONS

The valve type ZDR is a direct operated pressure reducing valve in sandwich plate design with pressure limitation of the secondary circuit. It is used to reduce the system pressure.

The pressure reducing valve basically comprises housing (1), control spool (2), compression spring (3), adjustment type (4) and an optional check valve. The secondary pressure is set via the adjustment type (4).

**Version "A"**

The valve is open in initial position. Hydraulic fluid can flow from channel A⊙ to channel A⊗ without restrictions.

The pressure in channel A⊗ is simultaneously applied via the control line (5) at the piston area opposite the compression spring (3). If the pressure in channel A⊗ exceeds the value set at the compression spring (3), the control spool (2) is pushed against the compression spring (3) to control position and keeps the set pressure in channel A⊗ at a constant level.

Control signal and pilot oil are supplied internally via the control line (5) from channel A⊗.

If the pressure in channel A⊗ increases further due to an external force effect at the actuator, it pushes the control spool (2) even further against the compression spring (3).

In this way, channel A⊗ is connected to the tank via the control edge (9) at the control spool (2) and the housing (1). So much hydraulic fluid is discharged into the tank that the pressure does not increase any further.

The leakage oil drain from the spring chamber (7) is always effected externally via the bore (6) and channel T (Y).

A pressure gauge connection (8) allows for the control of the secondary pressure at the valve.

A check valve can be used for free flow back from channel A⊗ to A⊙ with version "A".

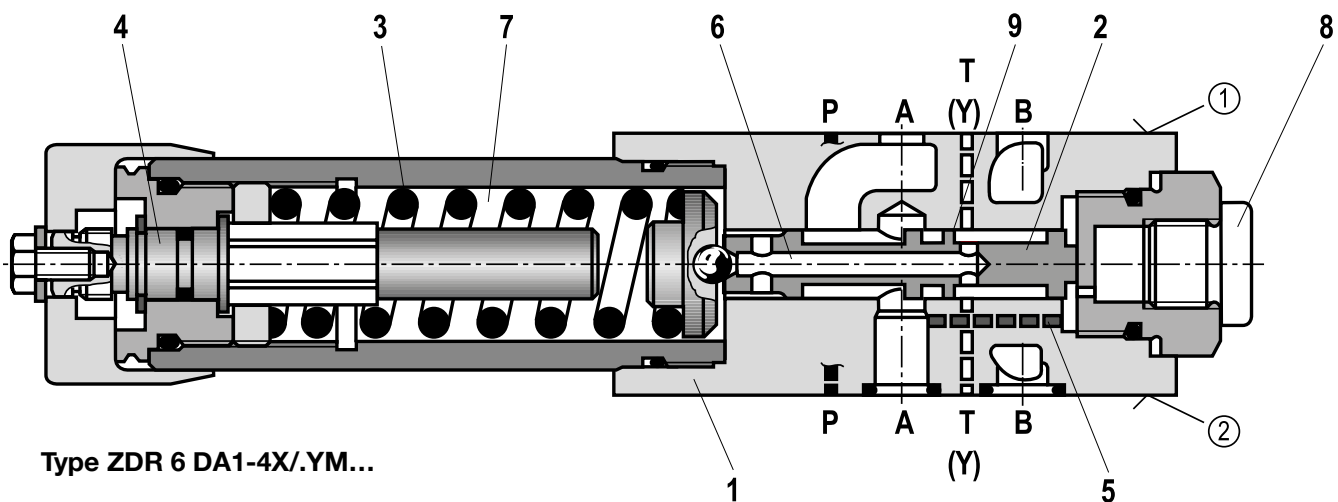
**Versions "P" and "B"**

With version "P", the pressure reduction is effected in channel P⊙. Control signal and pilot oil are supplied internally from channel P⊙.

With version "B", the pressure is reduced in channel P⊙; but the pilot oil is extracted from channel B.

**Notice:**

If the directional valve is in spool position P to A, the pressure in channel B may not exceed the set secondary pressure. Otherwise, there is pressure reduction in channel A.



Type ZDR 6 DA1-4X/.YM...

① = component side  
② = plate side

## TECHNICAL DATA

(for applications outside these parameters, please consult us!)

General	
Weight	kg ca. 1.2
Installation position	Any
Ambient temperature range	°C –30 ... +80 (NBR seals) –20 ... +80 (FKM seals)
MTTF <sub>D</sub> values according to EN ISO 13849	years 150 ... 1200 (for more information see data sheet 08012)
Hydraulic	
Maximum operating pressure	• Input
	- Versions „B“, „P“ bar 350
	- Versions „A“ bar 315
Maximum secondary pressure	• Output bar 25; 75; 150; 210; 315 <sup>1)</sup>
Maximum counter pressure	• Port T(Y) bar 160
Maximum flow	l/min 35
Hydraulic fluid	see table below
Hydraulic fluid temperature range	°C –30 ... +80 (NBR seals) –20 ... +80 (FKM seals)
Viscosity range	mm <sup>2</sup> /s [SUS] 10 ... 800
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)	Class 20/18/15 <sup>2)</sup>

Hydraulic fluid	Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils	HL, HLP, HLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	• insoluble in water	HETG	ISO 15380	90221
		HEES		
	• soluble in water	HEPG	ISO 15380	
Flame-resistant	• water-free	HFDU (glycol base)	ISO 12922	90222
		HFDU (ester base)		
		HFDR		
	• containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	ISO 12922	90223

### Important information on hydraulic fluids:

- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.

### Flame-resistant – containing water:

- Maximum pressure differential 210 bar, otherwise, increased cavitation erosion
- Life cycle as compared to operation with mineral oil HL, HLP 30 ... 100%
- Maximum hydraulic fluid temperature 60 °C

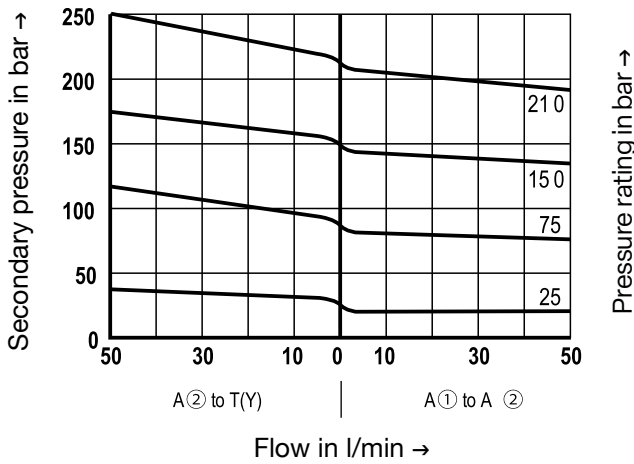
<sup>1)</sup> Only with version „B“ and „P“

<sup>2)</sup> The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and simultaneously increases the life cycle of the components.

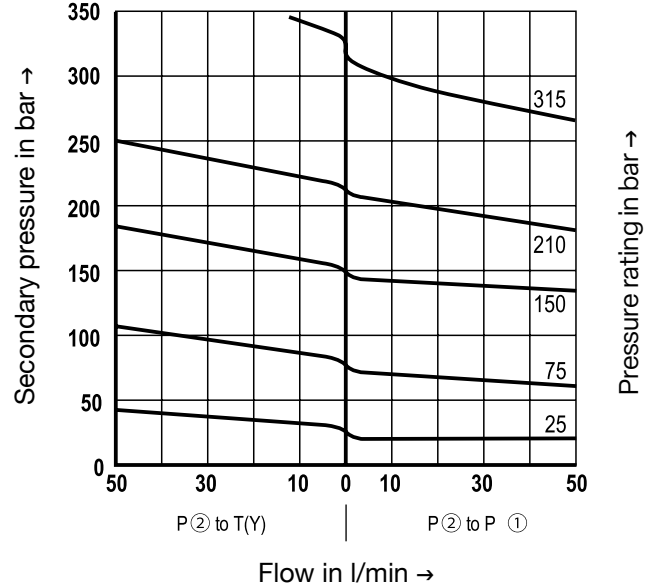
CHARACTERISTIC CURVES

(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

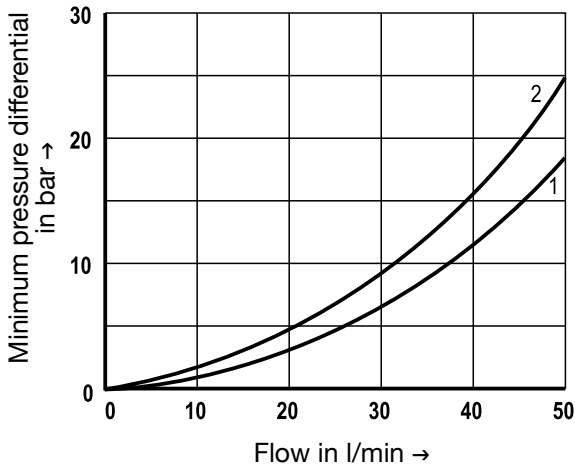
$p_A$ - $q_V$  characteristic curves – Version “A”



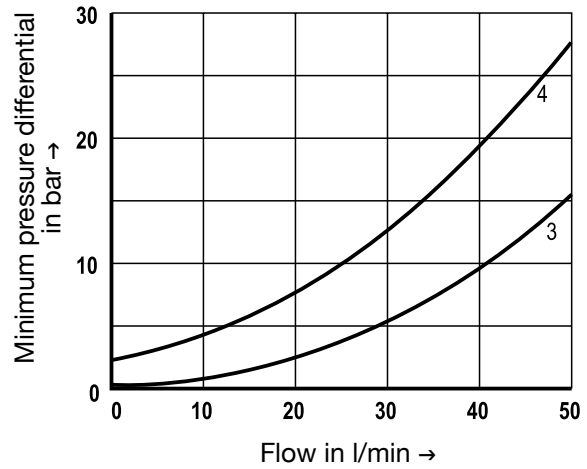
$p_A$ - $q_V$  characteristic curves – Version “B” and “P”



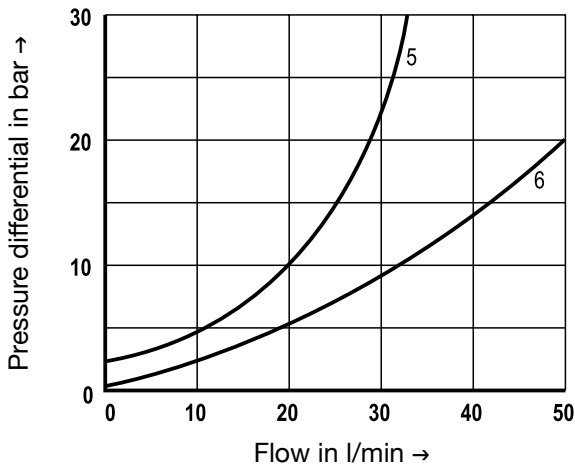
$\Delta p_{min}$ - $q_V$  characteristic curves



$\Delta p_{min}$ - $q_V$  characteristic curves



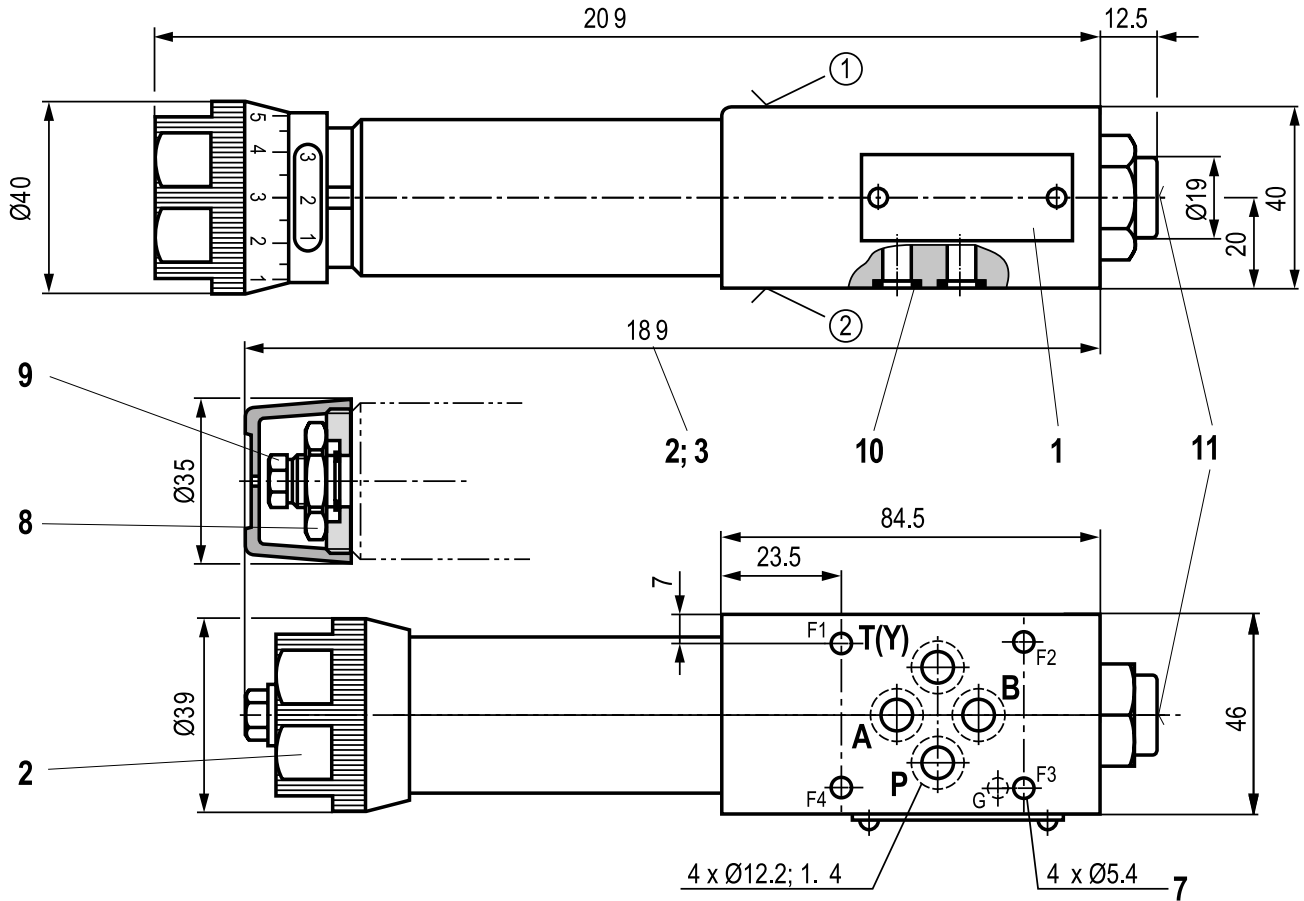
$\Delta p_{min}$ - $q_V$  characteristic curves



1. A⊙ to A⊙
2. A⊙ to T(Y) (3rd path)
3. P⊙ to P⊙
4. P⊙ to T(Y) (3rd path)
5. A⊙ to A⊙; flow only via check valve
6. A⊙ to A⊙; flow via check valve and fully opened control cross-section

## DIMENSIONS

Version "B" and "P"  
(dimensions in mm)

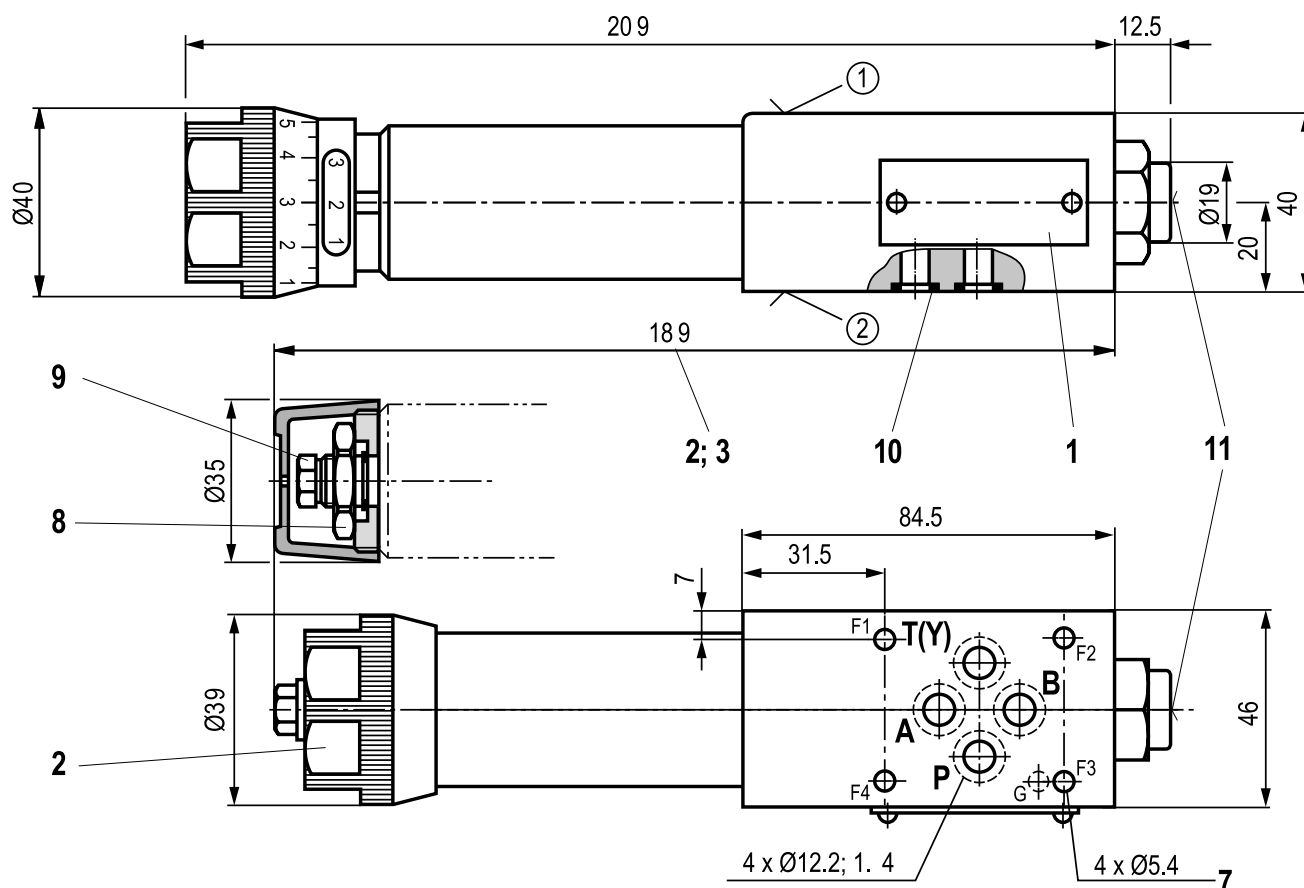


- ① component side – Porting pattern according to ISO 4401-03-02-0-05 (with or without locating hole); (**with** locating hole  $\varnothing 3 \times 5$  mm deep)
- ② plate side – Porting pattern according to ISO 4401-03-02-0-05 (with or without locating hole); (**with** locating hole for locking pin ISO 8752-3x8-St; version “/60”)
- 1. Name plate
- 2. Adjustment type “1”
- 7. Valve mounting bores
- 8. Lock nut SW24
- 9. Hexagon, wrench size 10
- 10. Identical seal rings for ports A, B, P, T(Y)
- 11. Pressure gauge connection G1/4; 12 deep; internal hexagon SW6

**Valve mounting screws** (separate order)  
**4 hexagon socket head cap screws ISO 4762 - M5 - 10.9**

**DIMENSIONS**

Version “B” and “P”  
(dimensions in mm)



- ① component side – Porting pattern according to ISO 4401-03-02-0-05 (with or without locating hole); (**with** locating hole  $\varnothing 3 \times 5$  mm deep)
- ② plate side – Porting pattern according to ISO 4401-03-02-0-05 (with or without locating hole); (**with** locating hole for locking pin ISO 8752-3x8-St; version “/60”)
- 1. Name plate
- 2. Adjustment type “1”
- 7. Valve mounting bores
- 8 Lock nut SW24
- 9 Hexagon, wrench size 10
- 10 Identical seal rings for ports A, B, P, T(Y)
- 11 Pressure gauge connection G1/4; 12 deep; internal hexagon SW6

**Valve mounting screws** (separate order)  
**4 hexagon socket head cap screws ISO 4762 - M5 - 10.9**

## TYPE ZDR 10D

PRESSURE REDUCING VALVE,  
DIRECT OPERATED



NG 10

Component series 5X

Maximum operating pressure 210 bar

Maximum flow 70 l/min

### FEATURES

- Sandwich plate valve
- Porting pattern according to ISO 4401-05-04-0-05
- 4 pressure ratings
- adjustment types, optionally:
  - Rotary knob
- Pressure reduction in channel A, B or channel P



PRODUCT DESCRIPTION

The valve type ZDR is a direct operated pressure reducing valve in sandwich plate design with pressure limitation of the secondary circuit. It is used to reduce the system pressure.

The pressure reducing valve basically comprises housing (1), control spool (2), compression spring (3), adjustment type (4) and an optional check valve. The secondary pressure is set via the adjustment type (4).

**Version "A"**

The valve is open in initial position. Hydraulic fluid can flow from channel A⊙ to channel A⊙ without restrictions. The pressure in channel A⊙ is simultaneously applied via the control line (5) at the piston area opposite the compression spring (3). If the pressure in channel A⊙ exceeds the value set at the compression spring (3), the control spool (2) is pushed against the compression spring (3) to control position and keeps the set pressure in channel A⊙ at a constant level.

Control signal and pilot oil are supplied internally via the control line (5) from channel A⊙.

If the pressure in channel A⊙ increases further due to an external force effect at the actuator, it pushes the control spool (2) even further against the compression spring (3).

In this way, channel A⊙ is connected to the tank via the control edge (6) at the control spool (2) and the housing (1). So much hydraulic fluid is discharged into the tank that the pressure does not increase any further.

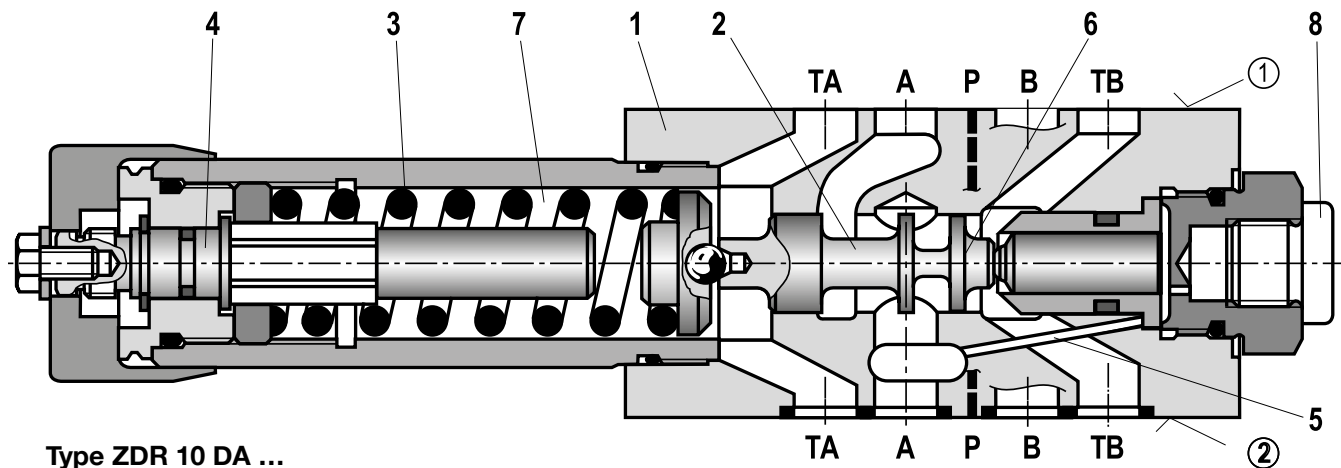
**Versions "P" and "B"**

With version "P", the pressure reduction is effected in channel P⊙. Control signal and pilot oil are supplied internally from channel P⊙.

With version "B", the pressure is reduced in channel P⊙; but the pilot oil is extracted from channel B.

If the directional valve is in spool position P to A, the pressure in channel B may not exceed the set secondary pressure.

Otherwise, there is pressure reduction in channel A.



Type ZDR 10 DA ...

- ① = component side
- ② = plate side

## ORDERING CODE

01	02	03	04	05	06	07	08	09	10	11	12	13
Z	DR	10	D			-	5X	/		Y		*

01	Sandwich plate valve	Z
----	----------------------	---

02	Pressure reducing valve	DR
----	-------------------------	----

03	Size 10	10
----	---------	----

04	Direct operated	D
----	-----------------	---

05	Pressure reduction in channel A⊗	A
	Pressure reduction in channel P⊗ (pilot oil supply from channel B)	B
	Pressure reduction in channel P⊗	P

**Adjustment type**

06	Rotary knob	1
----	-------------	---

07	Component series 50 ... 59 (50 ... 59: unchanged installation and connection dimensions)	5X
----	--	----

08	Secondary pressure up to 25 bar	25
	Secondary pressure up to 75 bar	75
	Secondary pressure up to 150 bar	150
	Secondary pressure up to 210 bar	210

09	Internal pilot oil supply, external pilot oil return	Y
----	--	---

10	<b>Without</b> check valve	M
----	----------------------------	---

**Corrosion resistance**

11	None	no code
----	------	---------

**Seal material**

12	NBR seals	no code
	FKM seals	V

13	Further details in the plain text	
----	-----------------------------------	--

✱ Standard type

TECHNICAL DATA

(for applications outside these parameters, please consult us!)

General	
Size	10
Weight	kg ca. 2.8
Installation position	Any
Ambient temperature range	°C -30 ... +80 (NBR seals) -20 ... +80 (FKM seals)
Hydraulic	
Size	10
Maximum operating pressure	• Input bar 210
Maximum secondary pressure	• Output bar 25; 75; 150; 210
Maximum counter pressure	• Port T bar 160
Maximum flow	l/min 70
Hydraulic fluid	see table "Hydraulic fluid"
Hydraulic fluid temperature range	°C -30 ... +80 (NBR seals) -20 ... +80 (FKM seals)
Viscosity range	mm <sup>2</sup> /s [SUS] 10 ... 800
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)	Class 20/18/15

Hydraulic fluid	Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils	HL, HLP	NBR, FKM	DIN 51524	90220
Bio-degradable	• insoluble in water	HETG	ISO 15380	90221
		HEES		
	• soluble in water	HEPG	ISO 15380	
Flame-resistant	• water-free	HFDU (glycol base)	ISO 12922	90222
		HFDU (ester base)		
		HFDR		
	• containing water	HFC (Fuchs: Hydrotherm 46M, Fuchs Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	ISO 12922	90223

**Important information on hydraulic fluids:**

- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.

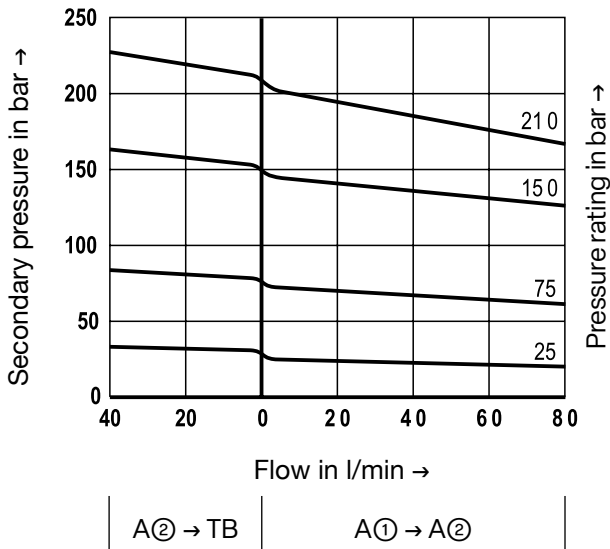
**Flame-resistant – containing water:**

Due to increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended - if possible specific to the installation - to back up the return flow pressure in ports T to approx. 20% of the pressure differential at the component.

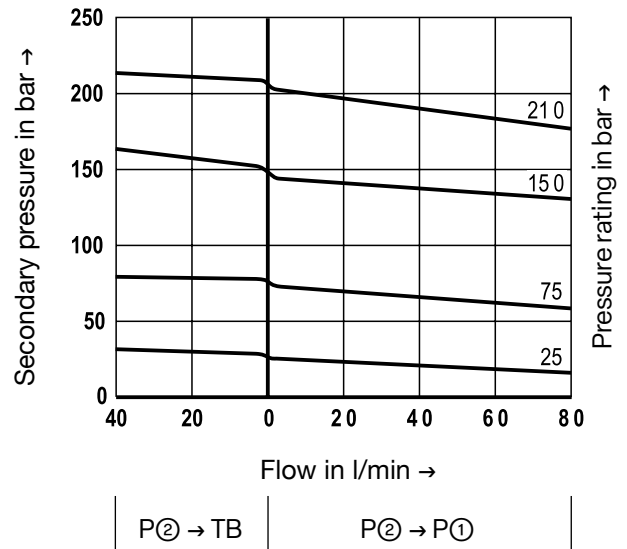
## CHARACTERISTIC CURVES

(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ } ^\circ\text{C}$ )

$p_A$ - $q_V$  characteristic curves – Version “A”



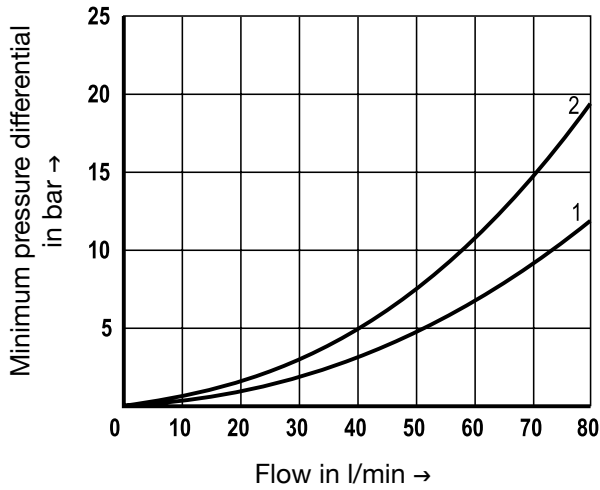
$p_A$ - $q_V$  characteristic curves – Versions “B” and “P”



**Notice:**

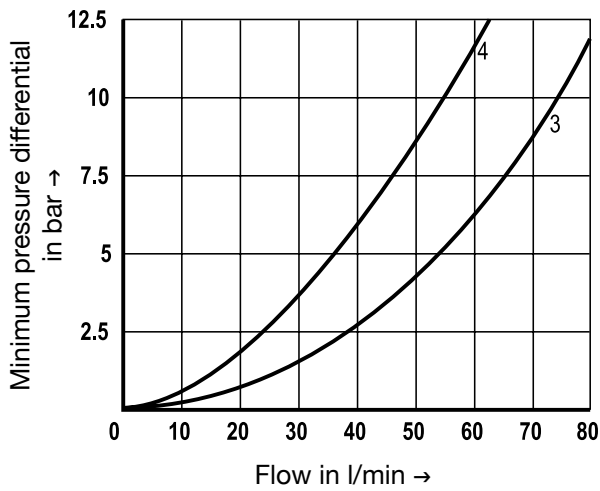
The curve development is maintained if the pressure is set lower according to the pressure rating.

$\Delta p_{min} - q_v$  characteristic curves



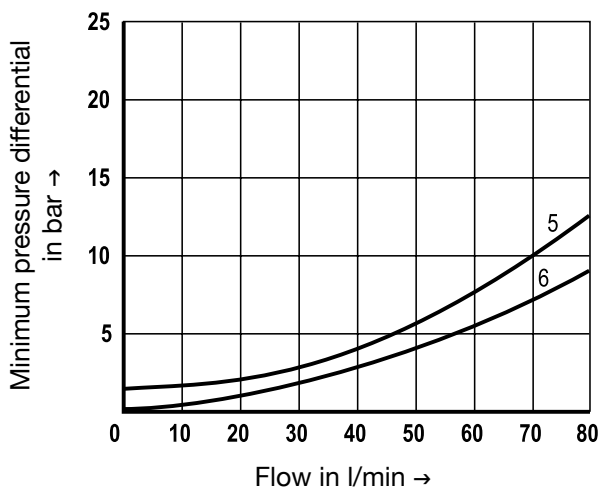
- 1 A<sup>①</sup> → A<sup>②</sup>
- 2 A<sup>②</sup> → TB (3. Weg)

$\Delta p_{min} - q_v$  characteristic curves



- 3 P<sup>①</sup> → P<sup>②</sup>
- 4 P<sup>②</sup> → TB (3. Weg)

$\Delta p_{min} - q_v$  characteristic curves



- 5 A<sup>②</sup> → A<sup>①</sup>; flow only via check valve
- 6 A<sup>②</sup> → A<sup>①</sup>; flow only via check valve and fully opened control cross-section

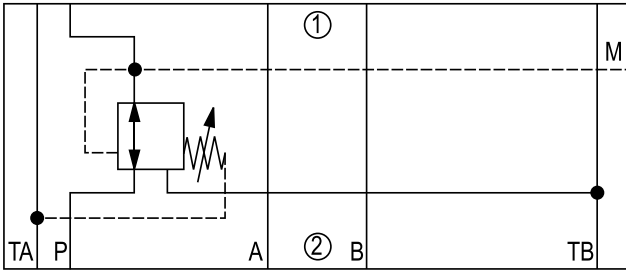
**Notice:**

The characteristic curves apply to the pressure at the valve output  $p_T = 0$  bar across the entire flow range.

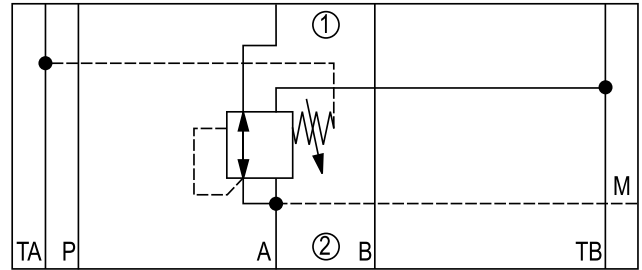
## SYMBOLS

① = component side, ② = plate side

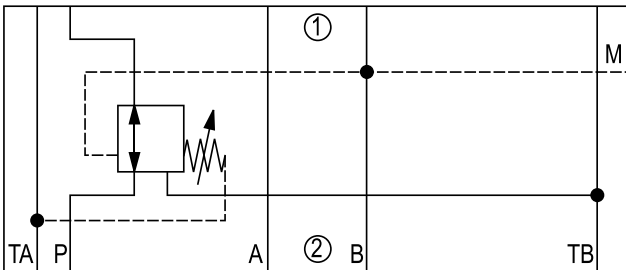
Version "P...YM"



Version "A...YM"



Version "B...YM"



**Notice:**

Deviating from ISO 4401, port T is called TA and port T1 is called TB in this data sheet.



## TYPE Z2FS6

### THROTTLE CHECK VALVE



NG 6

Component series 4X

Maximum operating pressure 350 bar

Maximum flow 80 l/min

### FEATURES

- Sandwich plate valve for use in vertical stackings
- Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** or **without** locating hole)
- For the main or pilot flow limitation of 2 actuator ports
- For supply or discharge throttling



ORDERING CODE

01	02	03	04	05	06	07	08	09	10
Z2FS	6			-	4X	/			*

01	Throttle check valve	Z2FS
----	----------------------	------

02	Size 6	6
----	--------	---

03	Throttle check valve side A and B	- <sup>1)</sup>
	Throttle check valve side A	A
	Throttle check valve side B	B

**Adjustment type**

04	Setscrew with lock nut and protective cap (versions "J3" and "J5" without protective cap)	2
----	---	---

05	Component series 40 ... 49 (40 ... 49: unchanged installation and mounting dimensions)	4X
----	--	----

06	Standard version	2Q
----	------------------	----

**Corrosion resistance (outside)**

07	None (valve housing primed)	no code
----	-----------------------------	---------

**Seal material**

08	NBR seals	no code
	FKM seals	V

09	<b>Without</b> locating hole	no code
----	------------------------------	---------

10	Further details in the plain text	
----	-----------------------------------	--

<sup>1)</sup> Identical adjustment types on sides A and B  
 ✦ Standard type

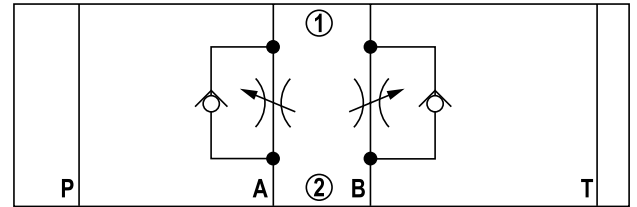
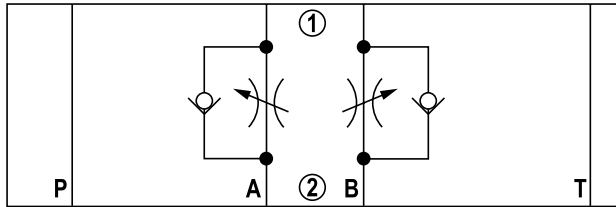
## SYMBOLS

① = component side, ② = plate side

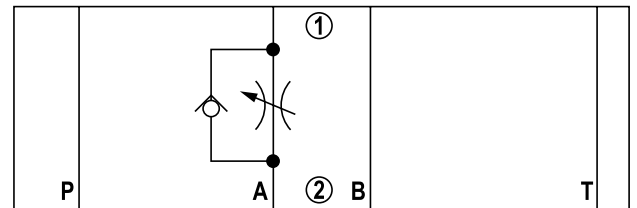
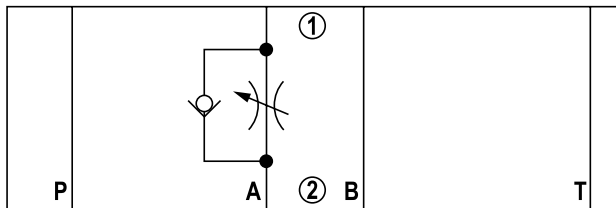
Supply throttling

Discharge throttling

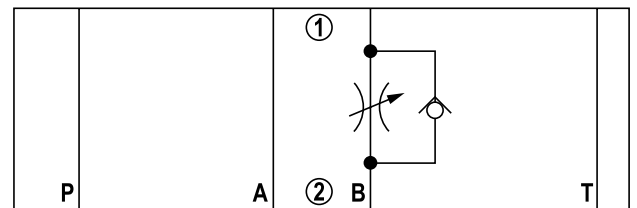
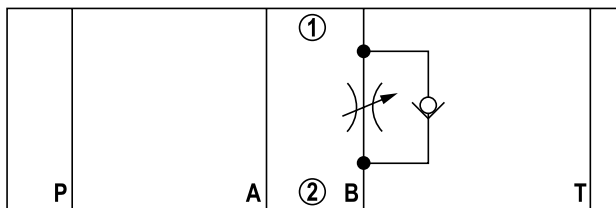
Version "L"



Version "A"



Version "B"

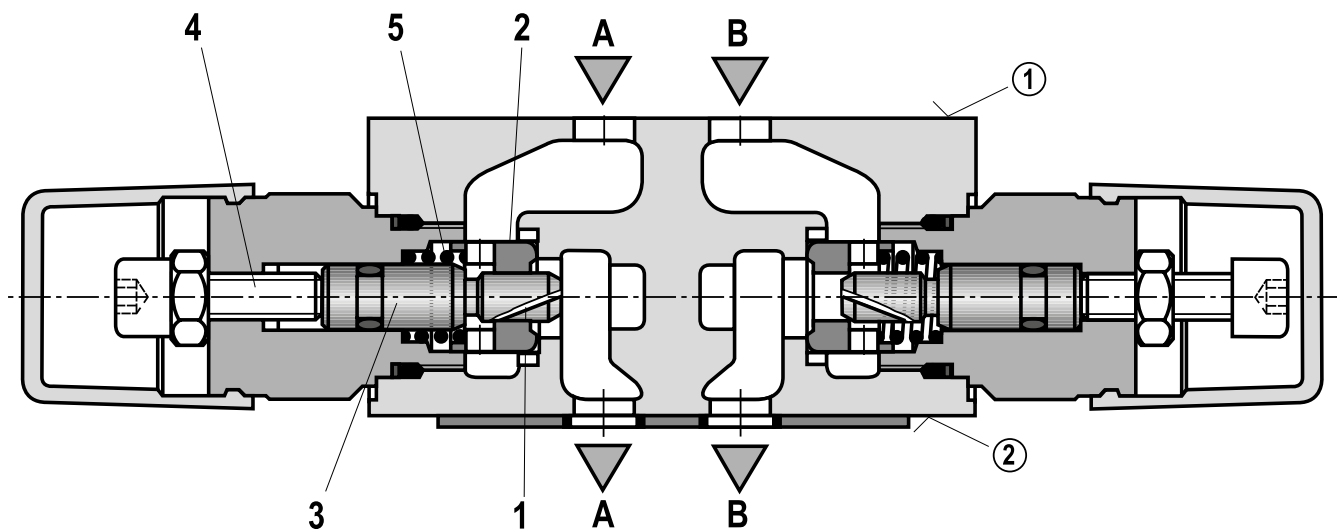


FUNCTION, SECTION

The valve type Z2FS6 is a throttle check valve in sandwich plate design. It is used for the main or pilot flow limitation of one or two actuator ports. Two throttle check valves aligned symmetrically to each other limit flows in one direction and allow free return flow in the opposite direction. In case of supply throttling, the hydraulic fluid is directed via channel A⊙ via throttling point (1) formed by the valve seat (2) and the throttle spool (3) to actuator A⊙. The throttle spool (3) can be axially adjusted via the setscrew (4) for adjustment of the throttling point (1).

The hydraulic fluid return flow from actuator A⊙ displaces the valve seat (2) against the spring (5) in the direction of the throttle spool (3) and enables the unobstructed flow as check valve. Depending on the installation position, the throttling effect may occur in supply or discharge.

**Main flow limitation** (version “2Q”)  
For actuator velocity adjustment (main flow limitation), the throttle check valve is installed between the directional valve and the subplate.



Type Z2FS 6 -2... (supply throttling)

- ① = component side
- ② = plate side

## TECHNICAL DATA

(for applications outside these parameters, please consult us!)

General			
		Z2FS6A./...Z2FS6B./...	Z2FS6.-/...
Weight Version "2"	kg	0.9	1.0
Installation position		Any	
Ambient temperature range	°C	-30 ... +80 (NBR seals) -20 ... +80 (FKM seals)	
Storage temperature range		see operating instructions 07600-B	

Hydraulic			
Maximum operating pressure	bar	350	
Maximum flow	l/min	80	
Maximum leakage (at $\Delta p$ 350 bar)	l/min	< 1	
Hydraulic fluid		see table below	
Hydraulic fluid temperature range	°C	-30 ... +80 (NBR seals) -20 ... +80 (FKM seals)	
Viscosity range	mm <sup>2</sup> /s	10 ... 800	
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)		Class 20/18/15 <sup>1)</sup>	

Hydraulic fluid	Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils	HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	• insoluble in water	HETG	ISO 15380	90221
		HEES		
	• soluble in water	HEPG	ISO 15380	
Flame-resistant	• water-free	HFDU (glycol base)	ISO 12922	90222
		HFDU (ester base)		
		HFDR		
	• containing water	HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	ISO 12922	90223

### Important information on hydraulic fluids:

- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.
- **Bio-degradable and flame-resistant – containing water:** If components with galvanic zinc coating (e.g. version "J3" or "J5") or parts containing zinc are used, small amounts of dissolved zinc may get

into the hydraulic system and cause accelerated aging of the hydraulic fluid. Zinc soap may form as a chemical reaction product, which may clog filters, nozzles and solenoid valves – particularly in connection with local heat input.

- **Flame-resistant – containing water:**

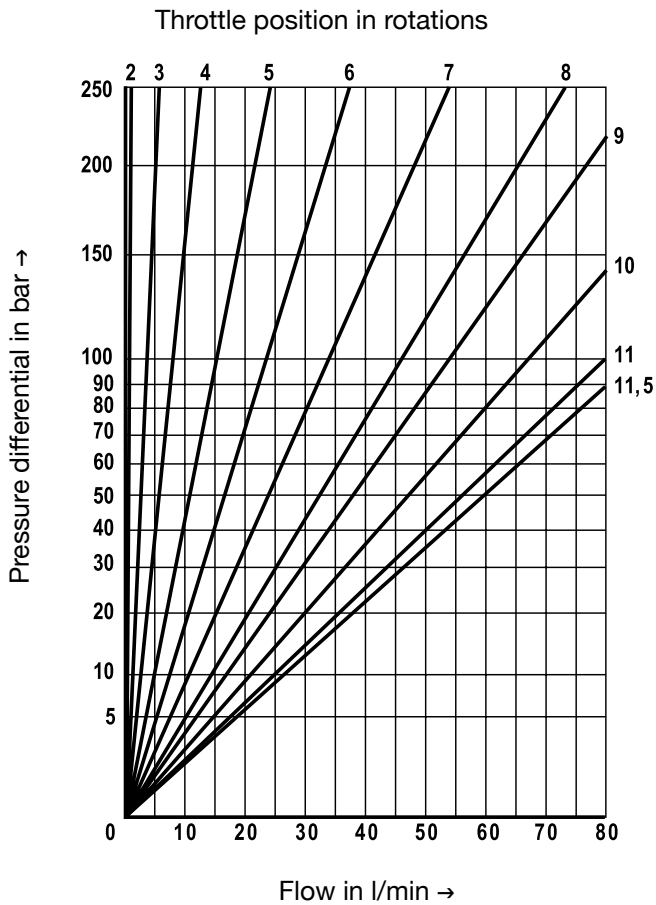
Due to increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended - if possible specific to the installation - to back up the return flow pressure in ports T to approx. 20% of the pressure differential at the component.

<sup>1)</sup> The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and simultaneously increases the life cycle of the components.

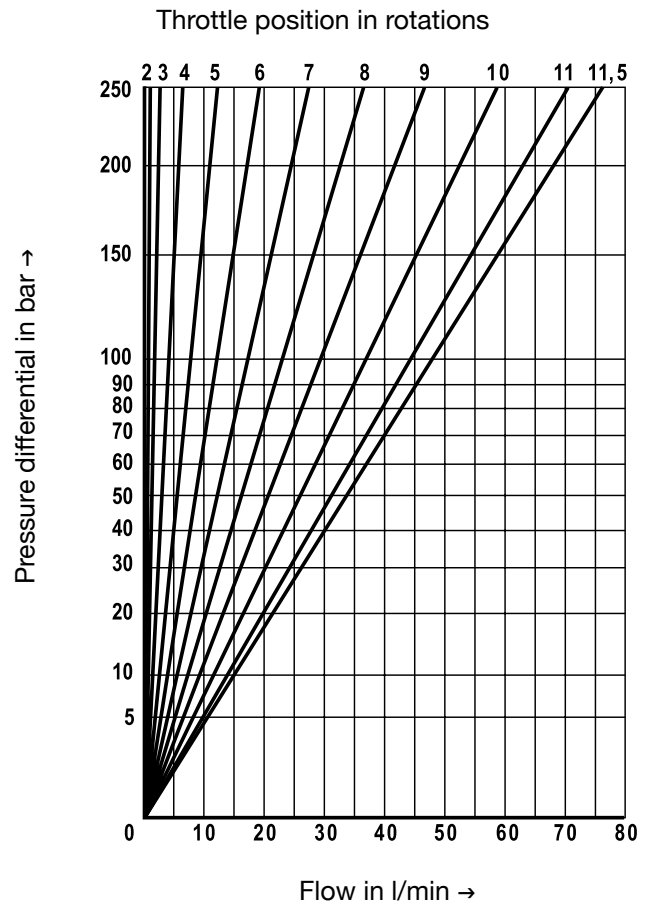
CHARACTERISTIC CURVES

(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ , averages)

$\Delta p-q_v$  characteristic curves – version “2Q”

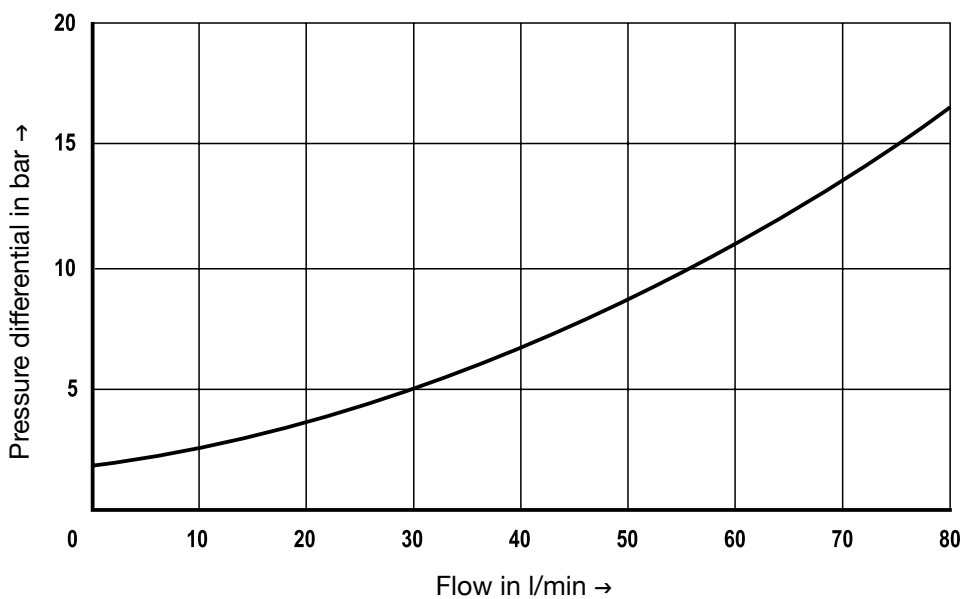


$\Delta p-q_v$  characteristic curves – version “1Q”



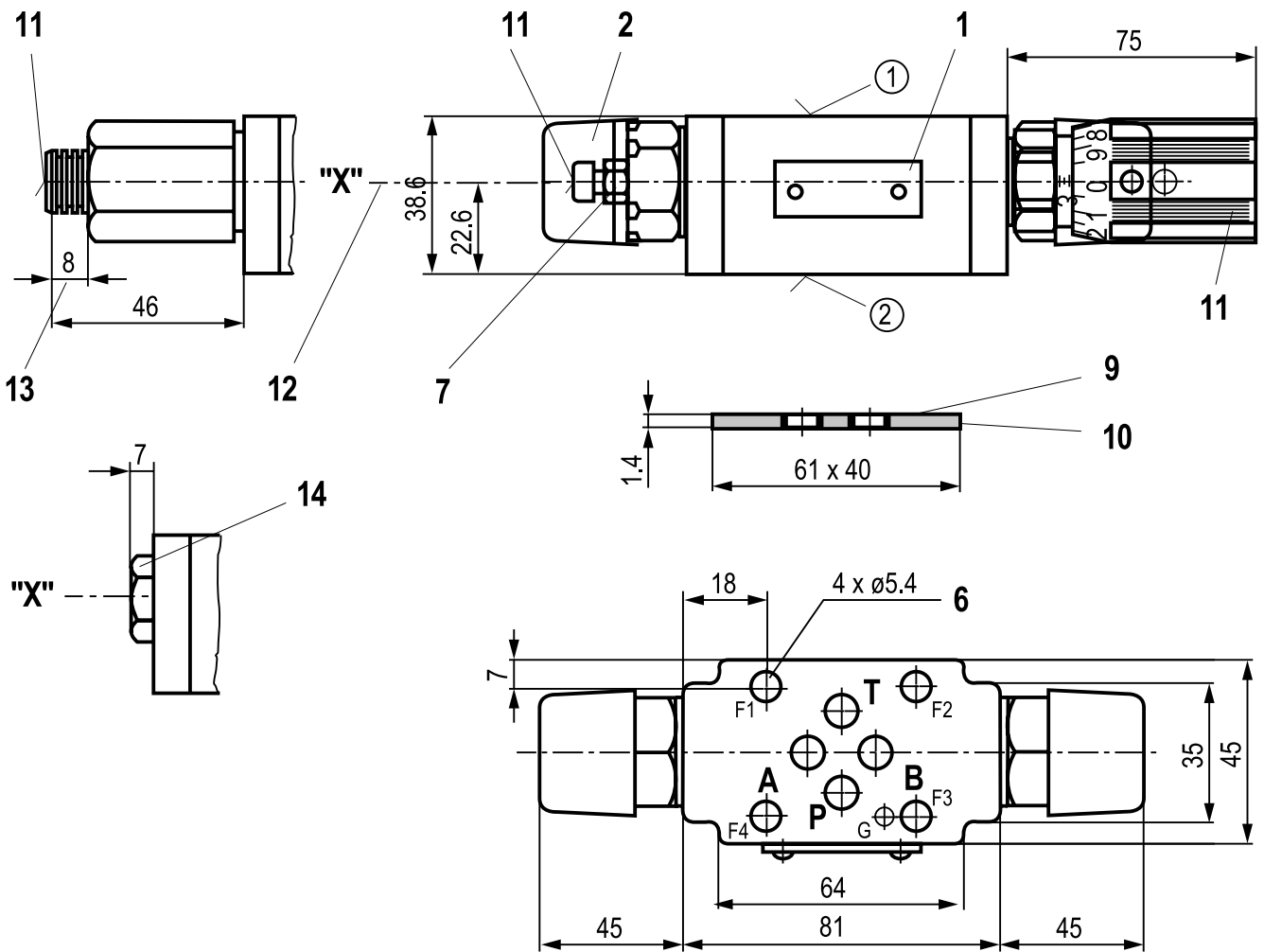
$\Delta p-q_v$  characteristic curves

(via check valve; throttle closed)



## DIMENSIONS

(dimensions in mm)



### Notice:

The dimensions are nominal dimensions which are subject to tolerances.

- ① component side – porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (with locating hole  $\varnothing 4 \times 4$  mm deep; version “/60” or without locating hole)
- ② plate side – porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (with locating hole  $\varnothing 3 \times 5$  mm deep for locking pin ISO 8752-3x8-St; version “/60” or without locating hole)
- 1. Name plate
- 2. Adjustment type “2”
- 6. Valve mounting bores
- 7. Lock nut SW10
- 9. Identical seal rings for ports A, B, P, and T
- 10. Seal ring plate
- 11. For all adjustment types:  
Left rotation = higher flow  
Right rotation = lower flow
- 12. Modification from supply to discharge throttling is realized by rotation of the device around axis “X” – “X”
- 13. Stroke
- 14. Plug screw SW22

### Valve mounting screws (separate order)

**4 hexagon socket head cap screws ISO 4762 - M5 - 10.9**

**4 hexagon socket head cap screws N10-24 UNC ASTM - A574**



# TYPE Z2FS10

## THROTTLE CHECK VALVE



NG 10

Component series 3X

Maximum operating pressure 315 bar

Maximum flow 150 l/min

### FEATURES

- Sandwich plate valve
- Porting pattern according to ISO 4401-05-04-0-05, NFPA T3.5.1 R2 and ANSI B93-7D05
- For the main or pilot flow limitation of 2 actuator ports.



ORDERING CODE

01	02	03	04	05	06	07	08	09	10
Z2FS	10			-	3X	/			*

01	Twin throttle check valve, sandwich plate design	Z2FS
----	--	------

02	Size 10	6
----	---------	---

03	Throttle check valve side A and B	- <sup>1)</sup>
	Throttle check valve side A	A
	Throttle check valve side B	B



**Adjustment type**

04	Spindle with internal hexagon and scale	5
----	---	---

05	Component series 30	3X
----	---------------------	----

06	With two throttle check valves, supply or discharge throttling (the valve can be rotated)	no code
	Supply throttling on side A (version "A...S")	S
	Supply throttling on side B (version "B...S")	S
	Discharge throttling on side A (version "A...S2")	S2
	Discharge throttling on side B (version "B...S2")	S2

**Corrosion resistance**

07	None	no code
	Improved corrosion protection (240 h salt spray test according to EN ISO 9227); (only version "5" without scale)	J3

**Seal material**

08	NBR seals	no code
	FKM seals	V
	Observe compatibility of seals with hydraulic fluid used. (Other seals upon request)	

**Pilot oil duct**

09	None	no code
	Via channel X and Y	S030

10	Further details in the plain text	
----	-----------------------------------	--



<sup>1)</sup> Identical adjustment types on sides A and B

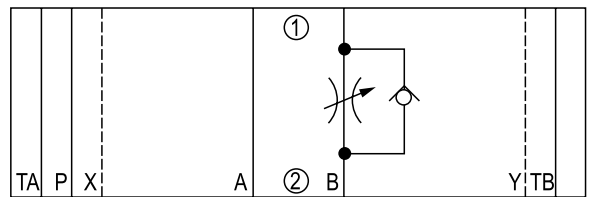
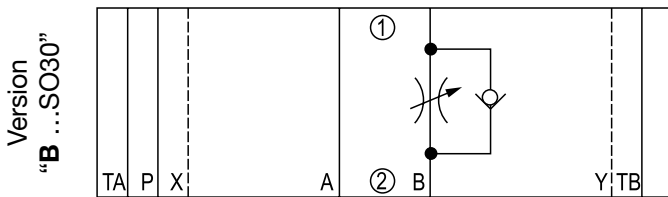
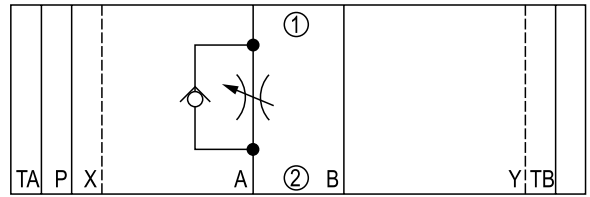
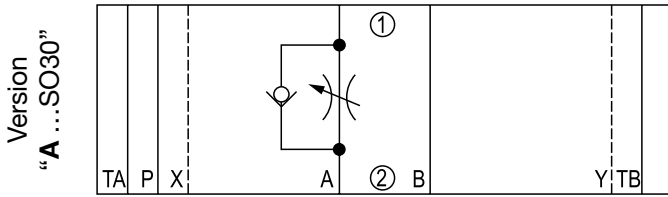
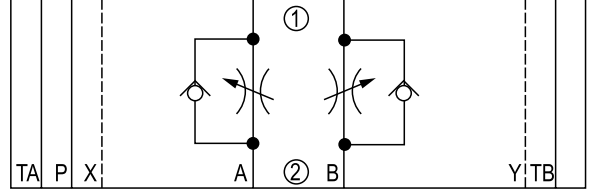
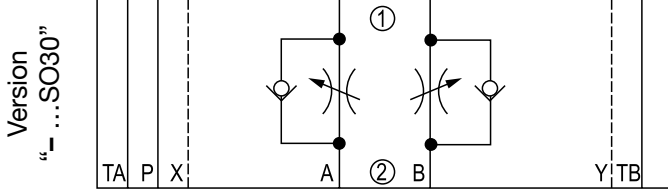
✳ Standard type

**SYMBOLS**

① = component side, ② = plate side

Supply throttling

Discharge throttling



FUNCTION, SECTION

The valve type Z2FS 10 is a throttle check valve in sandwich plate design. It is used for the main or pilot flow limitation of one or two actuator ports.

Two throttle check valves aligned symmetrically to each other limit flows in one direction and allow free return flow in the opposite direction.

In case of supply throttling, the hydraulic fluid is directed through channel A1 via throttling point (1) formed by the control edge (2) and the throttle spool (3.1) to actuator A2. The throttle spool (3.1) can be axially adjusted via the spindle (4) for adjustment of the throttling point (1).

Simultaneously, the hydraulic fluid in channel A1 is directed via the bore (5) to the piston side (6). The active pressure and the spring force retain the throttle spool (3.1) in throttle position.

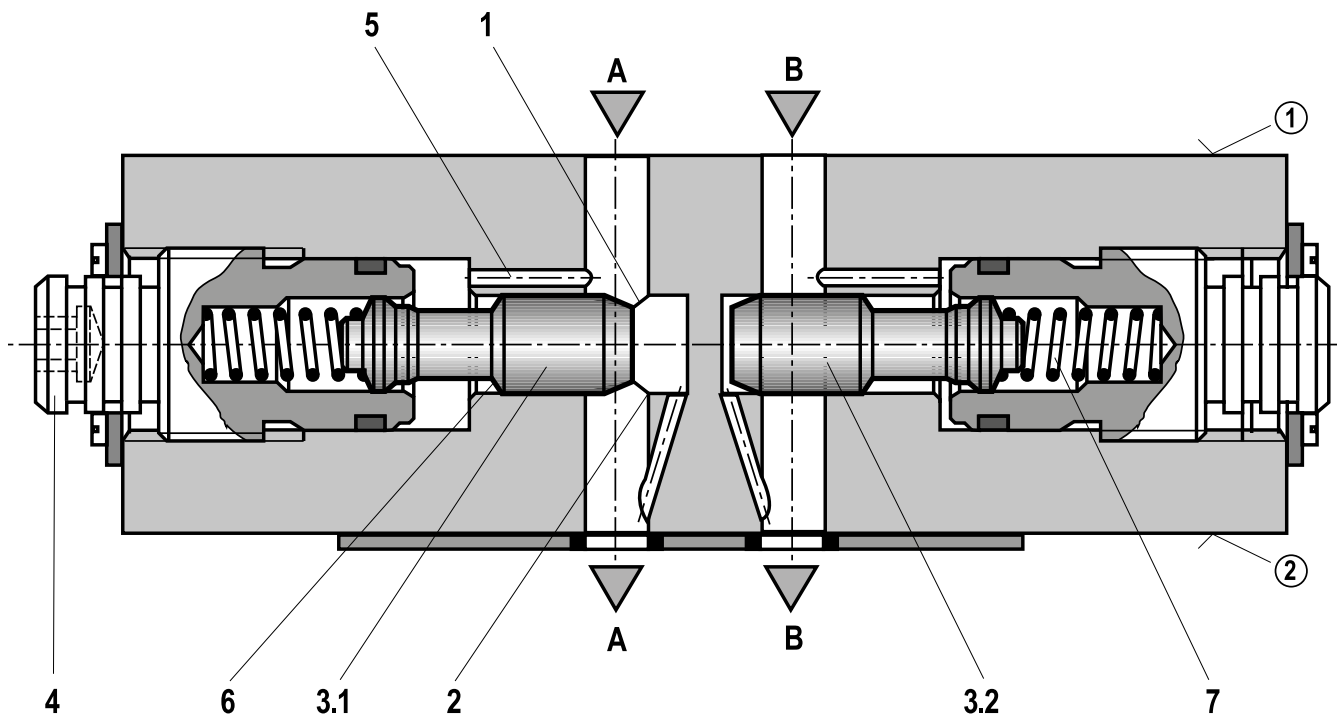
The hydraulic fluid return flow from actuator B2 displaces the throttle spool (3.2) against the spring (7) and enables the unobstructed flow as check valve. Depending on the installation position, the throttling effect may occur in supply or discharge.

**Main flow limitation**

For actuator velocity adjustment (main flow limitation), the throttle check valve is installed between the directional valve and the subplate.

**Pilot flow limitation**

With pilot-operated directional valves, the throttle check valve can be applied for switching time adjustment (pilot flow limitation). In this case, it is installed between the pilot control valve and the main valve.



**Supply throttling**

- ① = component side
- ② = plate side

THROTTLE CHECK VALVES

## TECHNICAL DATA

(for applications outside these parameters, please consult us!)

General		
Weight Version "2"	kg	0.9
Installation position		Any
Ambient temperature range	°C	-30 ... -80 (NBR seals) -20 ... +80 (FKM seals)
Hydraulic		
Maximum operating pressure	bar	315
Maximum flow	l/min	150
Hydraulic fluid		see table below
Hydraulic fluid temperature range	°C	-30 ... +80 (NBR seals) -20 ... +80 (FKM seals)
Viscosity range	mm <sup>2</sup> /s	10 ... 800
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)		Class 20/18/15 <sup>1)</sup>

Hydraulic fluid	Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils	HL, HLP	NBR, FKM	DIN 51524	90220
Bio-degradable	• insoluble in water	HETG	ISO 15380	90221
		HEES		
	• soluble in water	HEPG	ISO 15380	
Flame-resistant	• water-free	HFDU (glycol base)	ISO 12922	90222
		HFDU (ester base) <sup>2)</sup>		
	• containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	ISO 12922	90223

### Important information on hydraulic fluids:

- For more information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.

### • Flame-resistant – containing water:

- Maximum pressure differential 210 bar, otherwise, increased cavitation erosion
- Life cycle as compared to operation with mineral oil HL, HLP 30 ... 100%
- Maximum hydraulic fluid temperature 60 °C

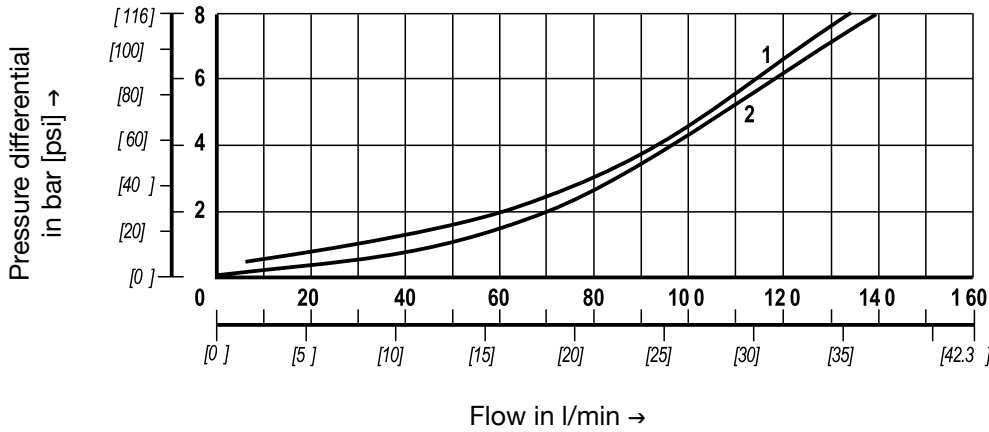
<sup>1)</sup> The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.

<sup>2)</sup> Not recommended for corrosion-protected version "J3"

CHARACTERISTIC CURVES

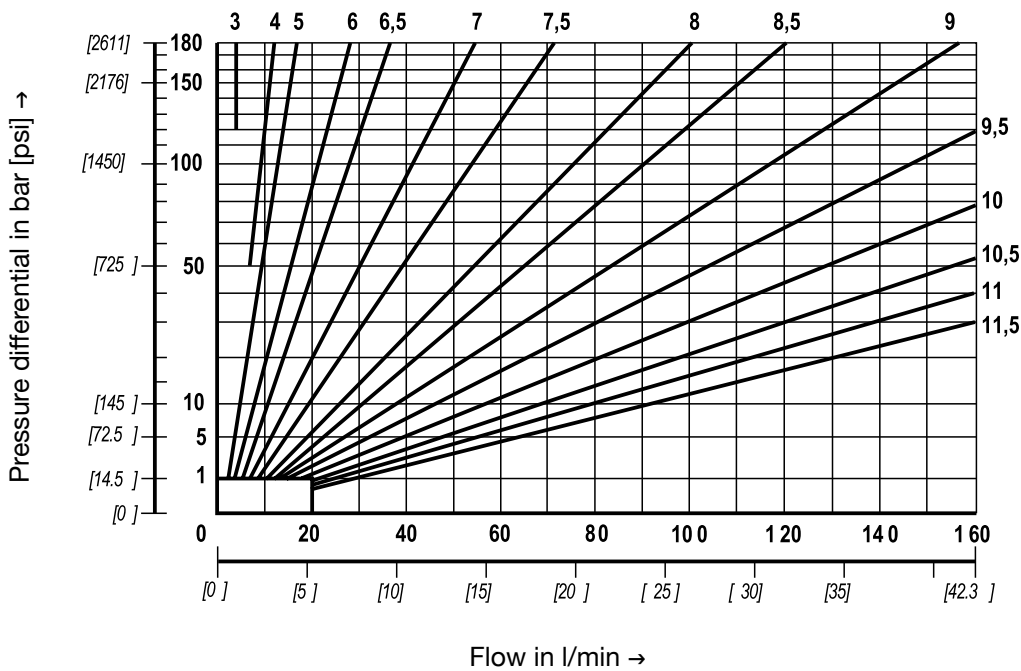
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$  [104  $\pm$  9 $^\circ\text{F}$ ])

$\Delta p$ - $q_v$  characteristic curves (via check valve)



1 Throttle closed  
2 Throttle open

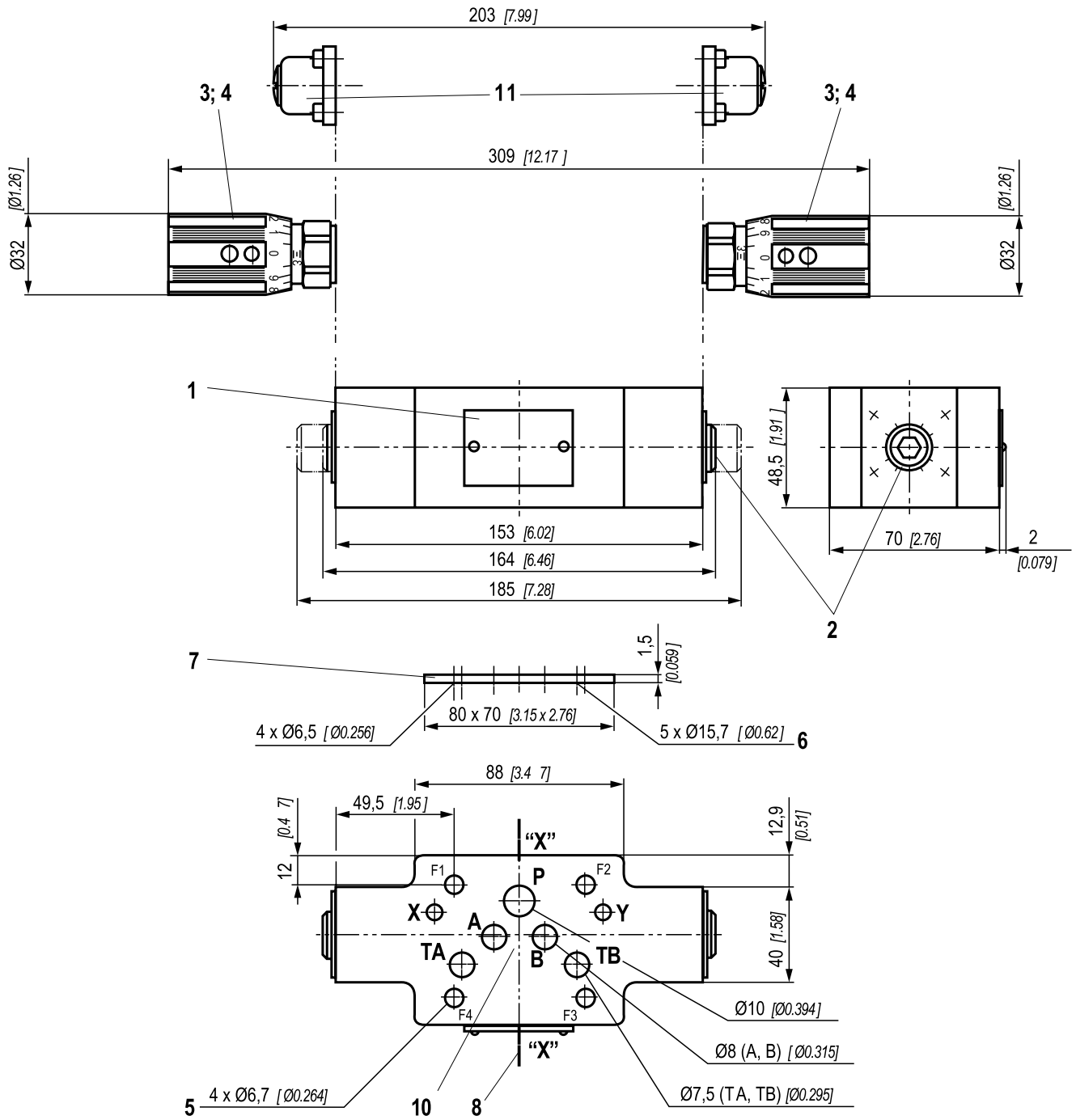
$\Delta p$ - $q_v$  characteristic curves (throttle position constant)



Throttle position in rotations

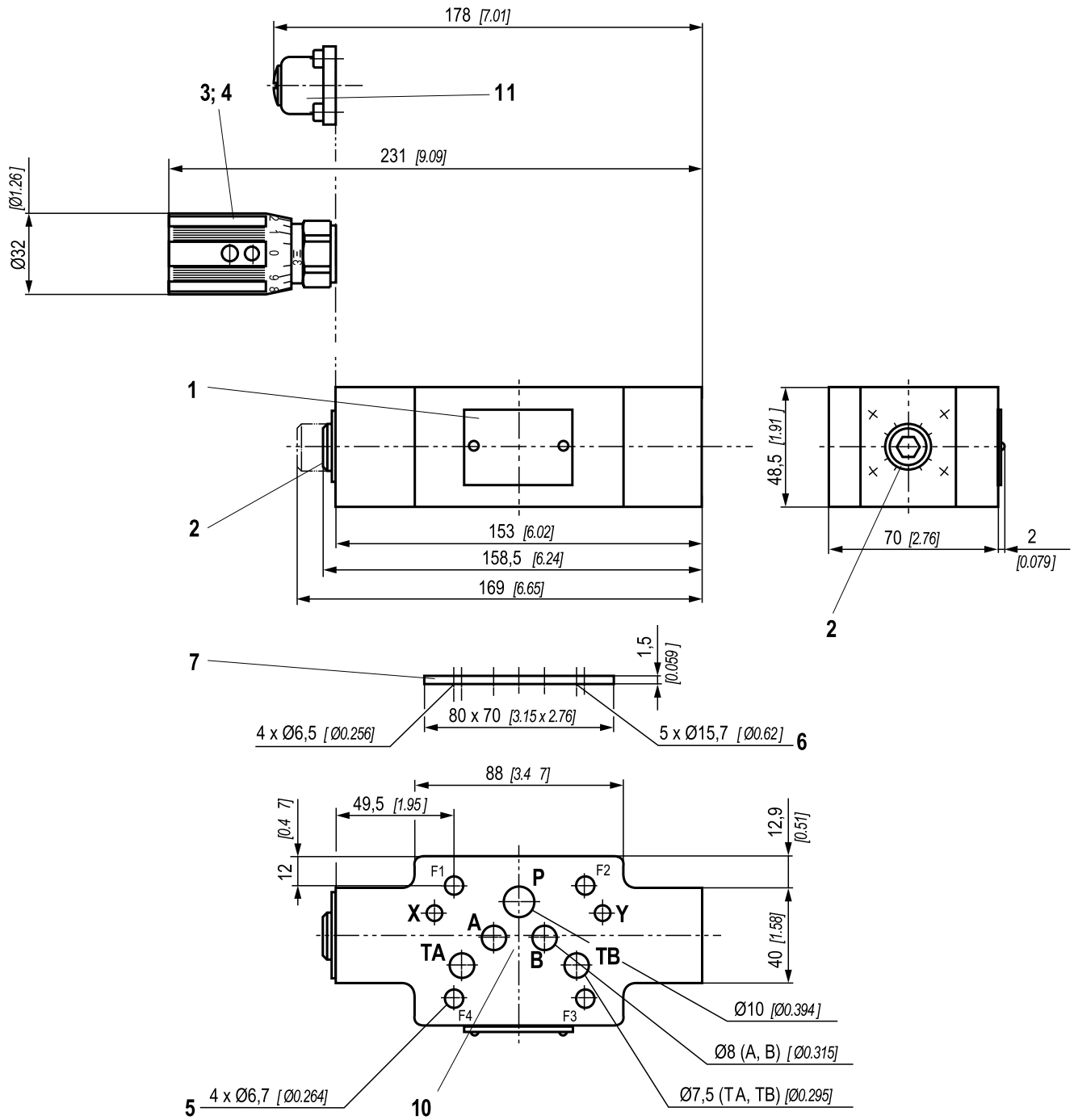
## DIMENSIONS

Version “-” (dimensions in mm)



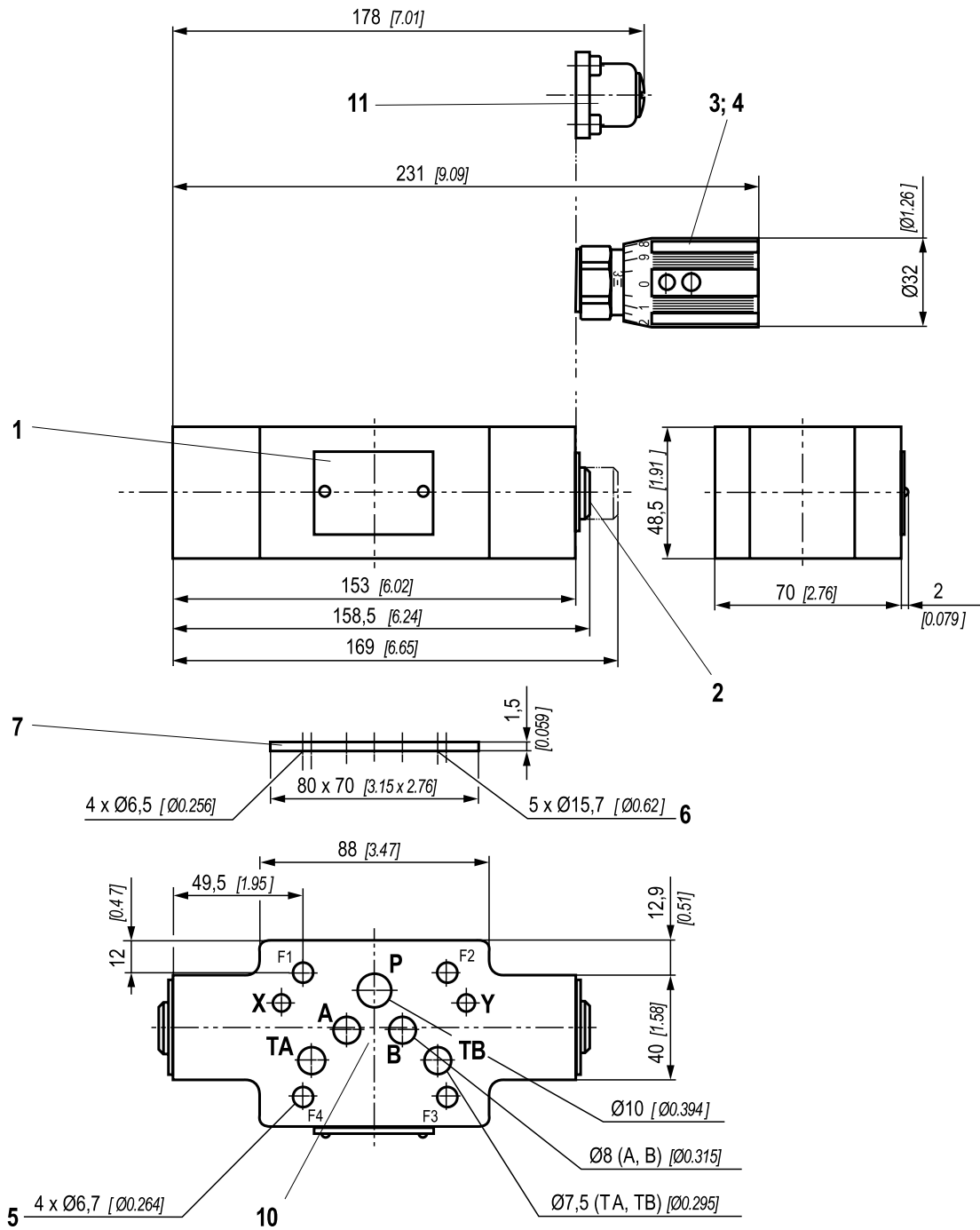
DIMENSIONS

Version "A" (dimensions in mm)



DIMENSIONS

Version “-” (dimensions in mm)





## DIMENSIONS

1. Name plate
2. Adjustment type “5” – spindle for changing the flow crosssection (internal hexagon SW8)
  - Left rotation = higher flow
  - Right rotation = lower flow
3. Adjustment type “3”
4. Adjustment type “7”
5. 4 through holes for valve mounting
6. Identical seal rings for ports A, B, P, TA, TB
7. R-ring plate
8. Modification from supply to discharge throttling is realized by rotation of the device around axis “X”-“X” (only with version “-”)
10. Porting pattern according to ISO 4401-05-04-0-05, NFPA T3.5.1 R2 and ANSI B93-7D05
11. Version “J”
  - To adjust the valve, disassemble the slotted screw. Further procedure see position 2 (adjustment type “5”). After setting of the valve, assemble the slotted screw.

**Valve mounting screws** (separate order)  
**4 hexagon socket head cap screws ISO 4762 - M6 - 10.9**  
**4 hexagon socket head cap screws 1/4-20 UNC**

### Notice:

Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

# TYPE ZDB6 AND Z2DB6

PRESSURE RELIEF VALVE,  
PILOT-OPERATED



NG 6

Component series 2X

Maximum operating pressure 315 bar

Maximum flow 35 l/min

## FEATURES

- Sandwich plate valve
- Porting pattern according to ISO 4401-03-02-0-05 (with or without locating hole)
- 4 pressure ratings
- 5 directions of action, optional
- 1 or 2 pressure valve cartridges

ORDERING CODE

01	02	03	04	05	06	07	08	09	10	11
Z		DB	6			-	4X	/		V

01	Sandwich plate	Z
----	----------------	---

02	1 pressure valve cartridge (only with version "VA", "VB" and "VP")	no code ∅
	2 pressure valve cartridges (only with version "VC" and "VD")	2 ∅

03	Pressure relief valve	DB
----	-----------------------	----

04	Size 6	6
----	--------	---

Relief function from - to:

05	A - T	DA
	P - T	DP
	B - T	DB
	A - T and B - T	DC
	A - B and B - A	DD

Adjustment type for pressure adjustment

06	Rotary knob	1
	Sleeve with hexagon and protective cap	2
	Rotary knob with scale	7

07	Component series 40 ... 49 (40 ... 49: unchanged installation and mounting dimensions)	2X
----	--	----

Pressure rating

08	Set pressure up to 50 bar	50
	Set pressure up to 100 bar	100 ∅
	Set pressure up to 200 bar	200 ∅
	Set pressure up to 315 bar	315 ∅

Seal material

10	NBR seals	no code ∅
	FKM seals	V

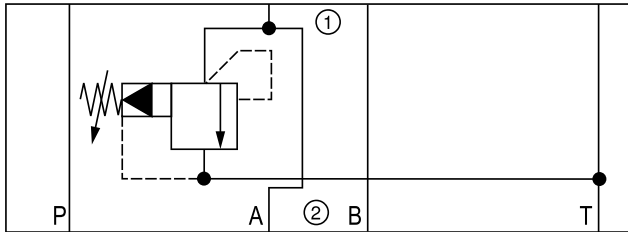


✱ Standard type

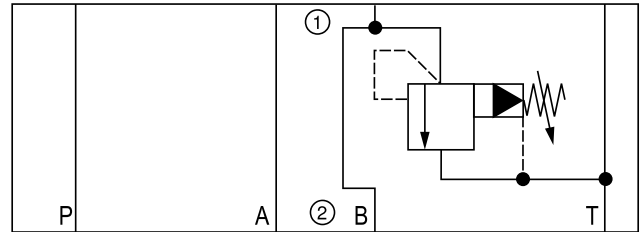
## SYMBOLS

① = component side, ② = plate side

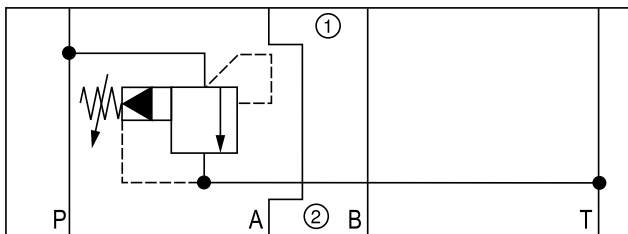
“ZDB 6 DA...”



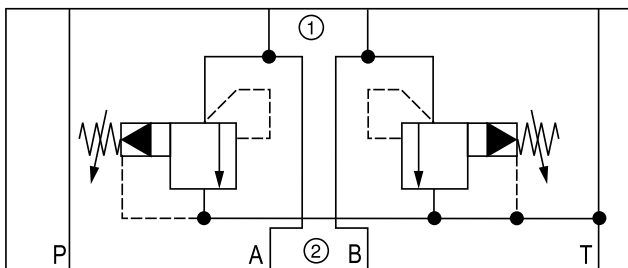
“ZDB 6 DB...”



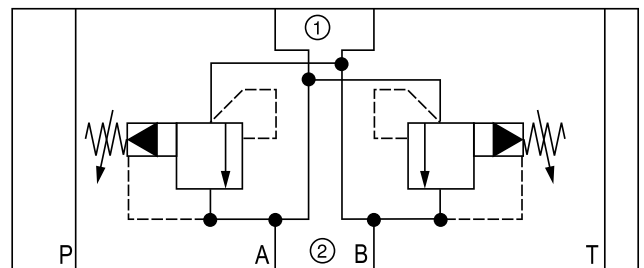
“ZDB 6 DP...”



“ZDB 6 DC...”



“ZDB 6 DD...”

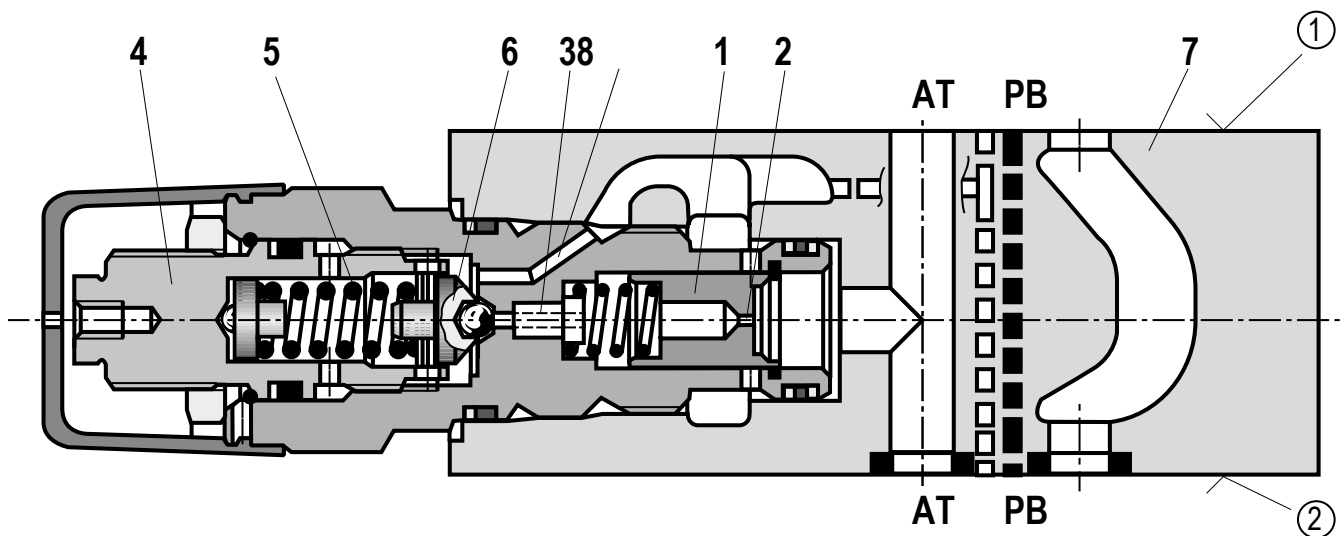


FUNCTION, SECTION

Pressure valves of type ZDB and Z2DB are pilot-operated pressure relief valves in sandwich plate design. They are used for limiting a system pressure. The valves basically consist of the housing (7) and one or two pressure valve cartridges. The system pressure can be set via the adjustment type (4).

**Example version "DA":**

In the initial position the valves are closed. The pressure in channel A acts on the spool (1). At the same time, pressure is applied to the spring-loaded side of the spool (1) via nozzle (2) and to the pilot poppet (6) via nozzle (3). If the pressure in channel A exceeds the value set at the spring (5), the pilot poppet (6) opens. Hydraulic fluid flows from the spring-loaded side of the spool (1), nozzle (3), channel (8) into channel T. The resulting pressure drop moves the spool (1) and thus opens the connection A to T while maintaining the pressure set at spring (5). The pilot oil drain from the two spring chambers is effected externally, via channel T.



Type ZDB 6 DA2-...

- ① = component side
- ② = plate side

## TECHNICAL DATA

(for applications outside these parameters, please consult us!)

General	
Type of connection	Sandwich plate valve
Porting pattern	ISO 4401-03-02-0-05
Weight	• Type ZDB <i>kg</i> Approx. 1
	• Type Z2DB <i>kg</i> Approx. 1.2
Installation position	Any
Ambient temperature range	°C -20 ... +80 (NBR seals) -15 ... +80 (FKM seals)
Hydraulic	
Maximum operating pressure	<i>bar</i> 315
Hydraulic fluid	see table below
Hydraulic fluid temperature range	°C -30 ... +80 (NBR seals) -20 ... +80 (FKM seals)
Viscosity range	<i>mm<sup>2</sup>/s</i> 10 ... 800
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)	Class 20/18/15
Maximum flow	<i>l/min</i> 35
Maximum set pressure	<i>bar</i> 50; 100; 200; 315
Maximum counter pressure	<i>bar</i> 40 (observe the maximum tank pressure of the subplate-mounted valve/directional valve)

Hydraulic fluid	Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils	HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	• insoluble in water	HETG	ISO 15380	90221
		HEES		
	• soluble in water	HEPG	ISO 15380	
Flame-resistant	• water-free	HFDU (glycol base)	ISO 12922	90222
		HFDU (ester base)		
		HFDR		
	• containing water	HFC (Fuchs: Hydrotherm 46M, Fuchs Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	ISO 12922	90223

### Important information on hydraulic fluids:

- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.

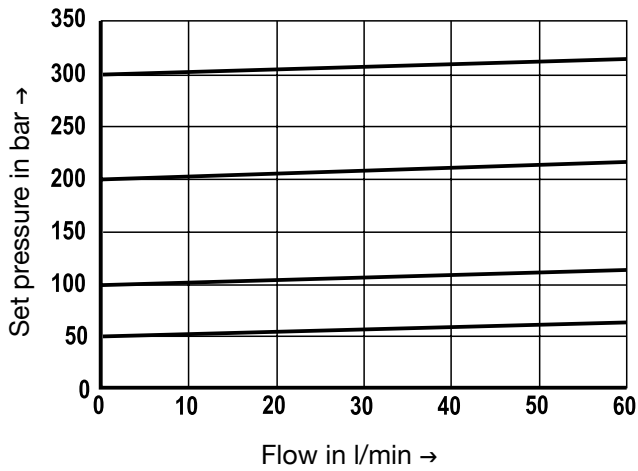
### • Flame-resistant – containing water:

Due to the increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended - if possible specific to the installation - to back up the return flow pressure in ports T to approx. 20% of the pressure differential at the component.

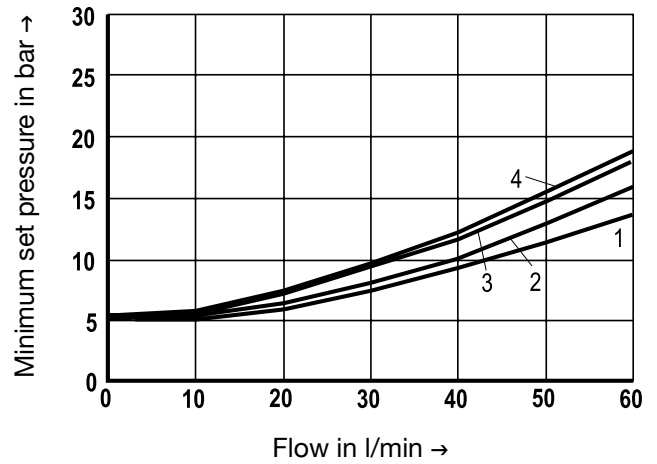
CHARACTERISTIC CURVES

(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

$p_E$ - $q_V$  characteristic curves – Version “A”



$p_{Emin}$ - $q_V$  characteristic curves – Version “A”



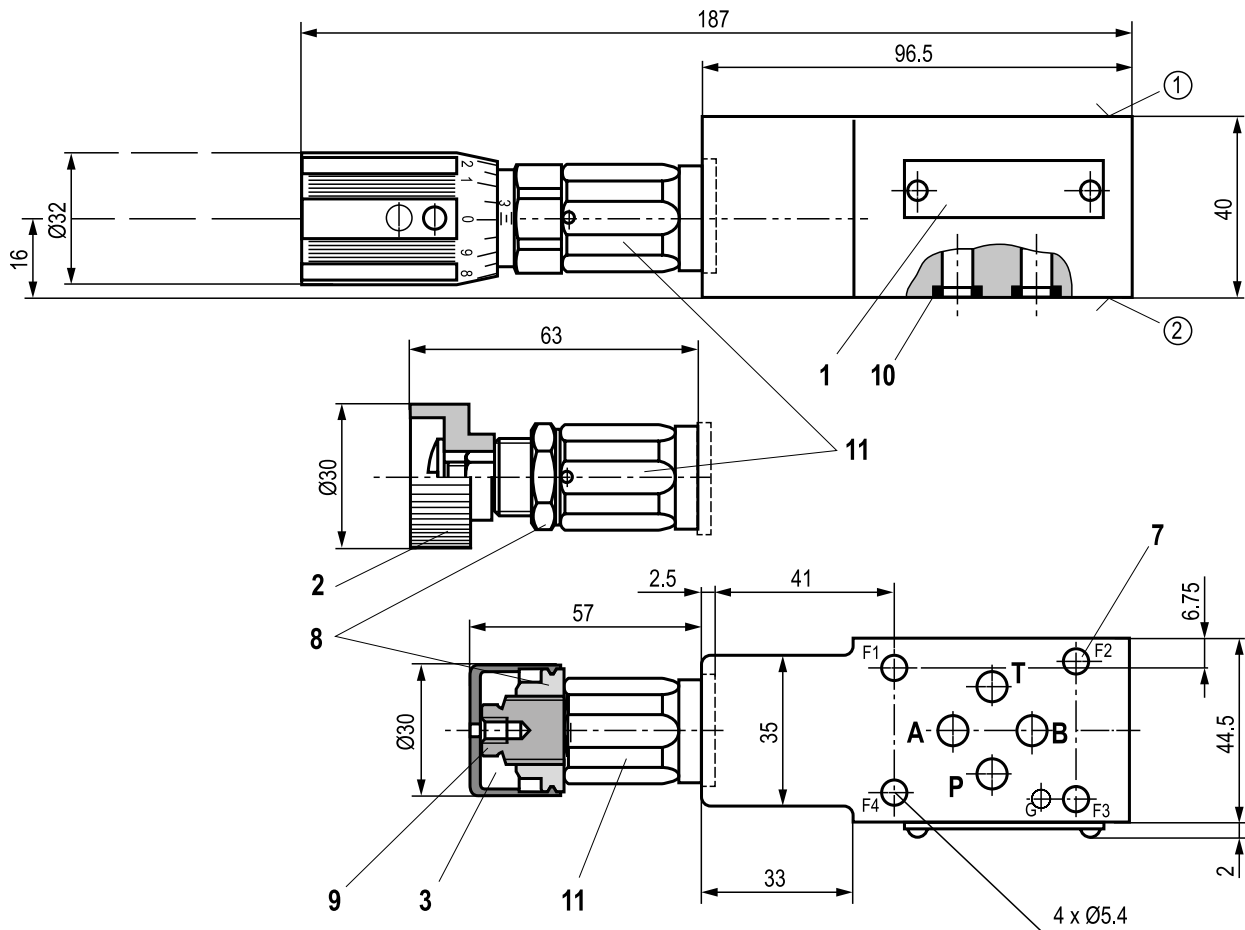
**Notice:**

The characteristic curves apply to the pressure at the valve output  $p_T = 0$  bar across the entire flow range.

- 1 DD (A → B)
- 2 DA
- 3 DB, DC
- 4 DP, DD

## DIMENSIONS

Type ZDB 6 VA... (dimensions in mm)



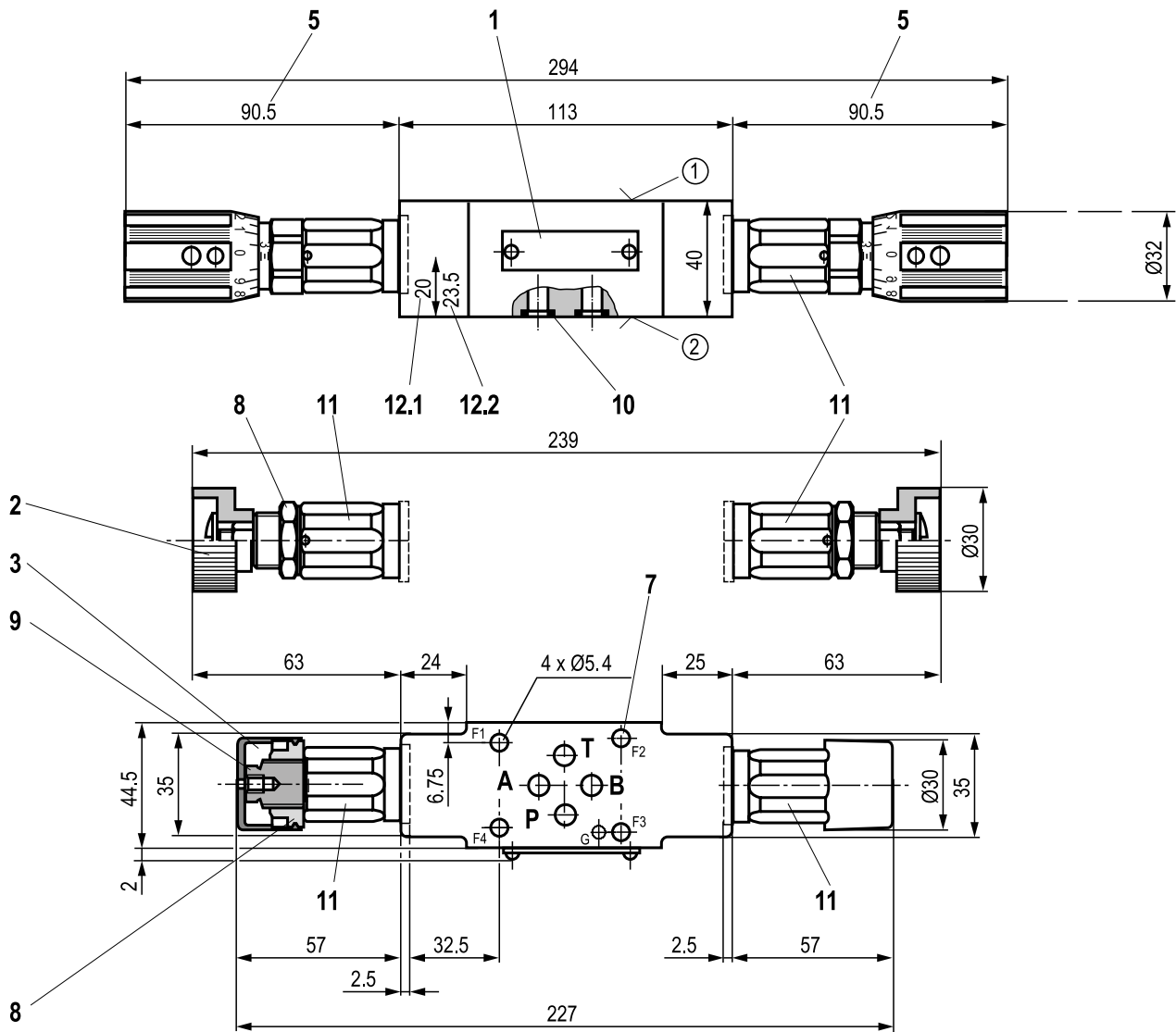
1. Name plate
2. Adjustment type "1"
3. Adjustment type "2" (with version "J3" and "J5" without protective cap)
5. Adjustment type "7"
7. Valve mounting bores
8. Lock nut SW24, tightening torque  $M_A = 10^{+5}$  Nm
9. Hexagon, wrench size 10
10. Identical seal rings for ports A, B, P, T (plate side)
11. Hexagon SW24, tightening torque  $M_A = 50$  Nm





## DIMENSIONS

Type Z2DB 6 VC... and type Z2DB 6 VD... (dimensions in mm)



1. Name plate
2. Adjustment type "1"
3. Adjustment type "2" (with version "J3" and "J5" without protective cap)
5. Adjustment type "7"
7. Valve mounting bores
8. Lock nut SW24, tightening torque  $M_A = 10^{+5}$  Nm
9. Hexagon, wrench size 10
10. Identical seal rings for ports A, B, P, T (plate side)
11. Hexagon SW24, tightening torque  $M_A = 50$  Nm
- 12.1 Version "DC"
- 12.2 Version "DD"



# TYPE ZDB10 AND Z2DB10

PRESSURE RELIEF VALVE,  
PILOT-OPERATED



NG 10

Component series 2X

Maximum operating pressure 315 bar

Maximum flow 70 l/min

## FEATURES

- Sandwich plate valve
- Porting pattern according to ISO 4401-03-02-0-05
- 4 pressure ratings
- 5 directions of action, optional
- 1 or 2 pressure valve cartridges

ORDERING CODE

01	02	03	04	05	06	07	08	09	10
Z		DB	10			-	4X	/	

01	Sandwich plate	Z
----	----------------	---

02	1 pressure valve cartridge (only with version "VA", "VB" and "VP")	no code
	2 pressure valve cartridges (only with version "VC" and "VD")	2

03	Pressure relief valve	DB
----	-----------------------	----

04	Size 10	6
----	---------	---

Relief function from - to:

05	A – TA	DA
	P – TA	DP
	B – TB	DB
	A – TA and B – TB	DC
	A – B and B – A	DD

Adjustment type for pressure adjustment

06	Rotary knob	1
	Sleeve with hexagon and protective cap	2
	Lockable rotary knob with scale	3
	Rotary knob with scale	7

07	Component series 40 ... 49 (40 ... 49: unchanged installation and mounting dimensions)	2X
----	--	----

Pressure rating

08	Set pressure up to 50 bar	50
	Set pressure up to 100 bar	100
	Set pressure up to 200 bar	200
	Set pressure up to 315 bar	315

Corrosion resistance

09	None	no code
	Improved corrosion protection (240 h salt spray test according to EN ISO 9227)	J3
	Improved corrosion protection (720 h salt spray test according to EN ISO 9227)	J5

Seal material

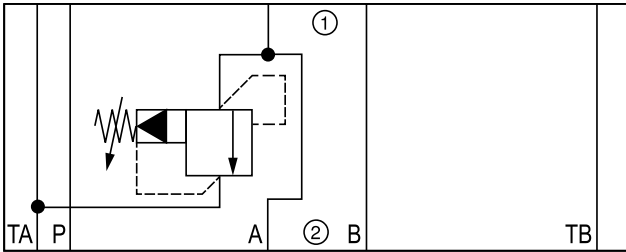
10	NBR seals	no code
	FKM seals	V

✳ Standard type

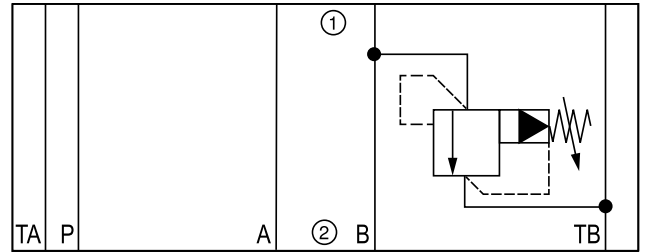
## SYMBOLS

① = component side, ② = plate side

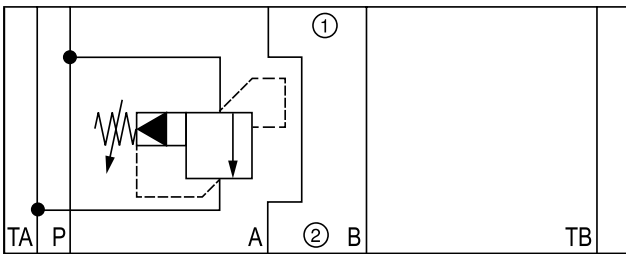
“ZDB 10 **DA**...”



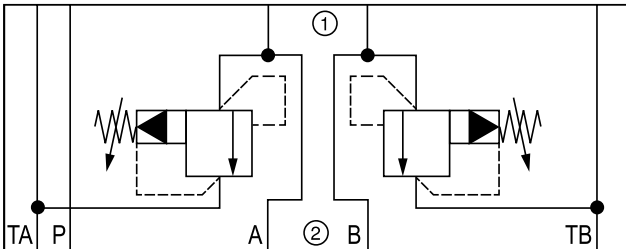
“ZDB 10 **DB**...”



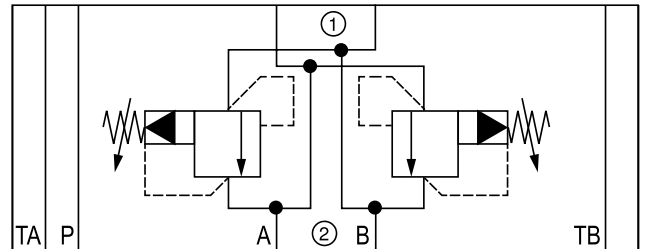
“ZDB 10 **DP**...”



“ZDB 10 **DC**...”



“ZDB 10 **DD**...”



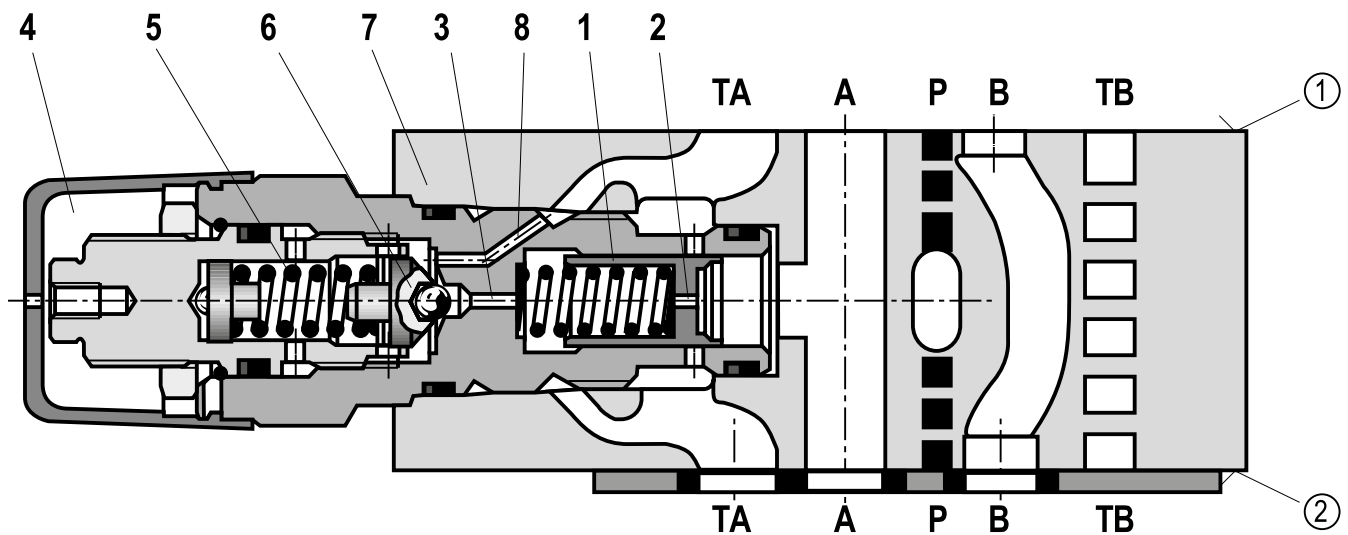
**Notice:**

Deviating from ISO 4401, port T is called TA and port T1 is called TB in this data sheet.

FUNCTION, SECTION

Pressure valves of type ZDB and Z2DB are pilot-operated pressure relief valves in sandwich plate design. They are used for limiting a system pressure. The valves basically consist of the housing (7) and one or two pressure valve cartridges. The system pressure can be set via the adjustment type (4).

In the initial position the valves are closed. The in channel A acts on the spool (1). At the same time, pressure is applied to the spring-loaded side of the spool (1) via nozzle (2) and to the pilot poppet (6) via nozzle (3). If the pressure in channel A exceeds the value set at the spring (5), the pilot poppet (6) opens. Hydraulic fluid flows from the spring-loaded side of the spool (1), nozzle (3) and channel (8) into channel T (TA). The resulting pressure drop moves the spool (1) and opens the connection from A to T (TA). Channel A is pressurized to the pressure set at the spring (5).



Type ZDB 10 DA2-4X/...V

- ① = component side
- ② = plate side

## TECHNICAL DATA

(for applications outside these parameters, please consult us!)

General			
Weight	• Type ZDB	kg	Approx. 2.4
	• Type Z2DB	kg	Approx. 2.6
Installation position			Any
Ambient temperature range		°C	-20 ... +80 (NBR seals) -15 ... +80 (FKM seals)
Hydraulic			
Maximum operating pressure		bar	315
Hydraulic fluid		see table below	
Hydraulic fluid temperature range		°C	-20 ... +80 (NBR seals) -15 ... +80 (FKM seals)
Viscosity range		mm <sup>2</sup> /s	10 ... 800
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			Class 20/18/15 <sup>1)</sup>
Maximum flow		l/min	70
Maximum set pressure		bar	50; 100; 200; 315
Maximum counter pressure		bar	40 (observe the maximum tank pressure of the subplate-mounted valve/directional valve)

Hydraulic fluid	Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils	HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	• insoluble in water	HETG	ISO 15380	90221
		HEES		
	• soluble in water	HEPG	ISO 15380	
Flame-resistant	• water-free	HFDU (glycol base)	ISO 12922	90222
		HFDU (ester base)		
		HFDR		
	• containing water	HFC (Fuchs: Hydrotherm 46M, Fuchs Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	ISO 12922	90223

### Important information on hydraulic fluids:

- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be
- 50 K higher than the maximum surface temperature.

### • Flame-resistant – containing water:

Due to the increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended - if possible considering conditions specific to the installation - to back up the return flow pressure in ports T to approx. 20% of the pressure differential at the component.

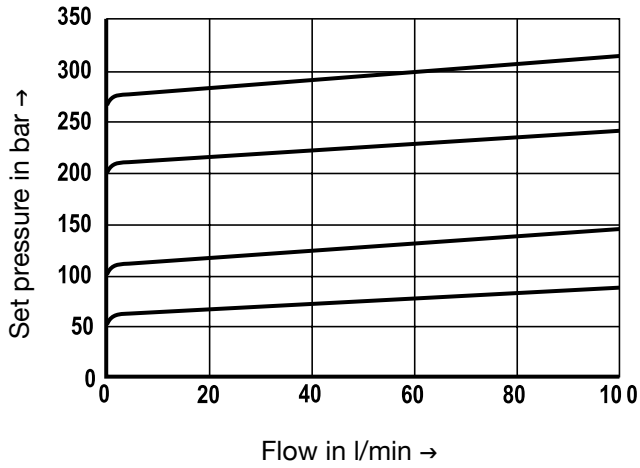
<sup>1)</sup> The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.



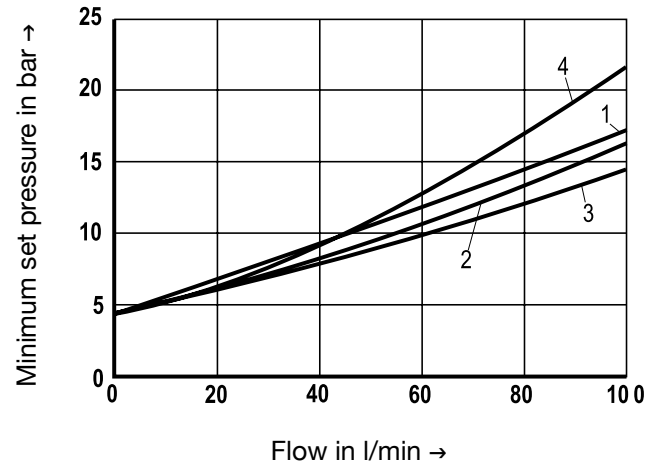
## CHARACTERISTIC CURVES

(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

$p_E - q_V$  characteristic curves



$p_{Emin} - q_V$  characteristic curves



**Notice:**

- The characteristic curves apply to the pressure at the valve output  $p_T = 0$  bar across the entire flow range.
- Typical characteristic curves which are subject to tolerance variations.

- 1 VD (A → B)
- 2 VA
- 3 VB, VC
- 4 VP, VD (B → A)







## DIMENSIONS

1. Name plate
  2. Adjustment type "1"
  3. Adjustment type "2" (with version "J3" and "J5" without protective cap)
  4. Adjustment type "3"
  5. Adjustment type "7"
  7. Valve mounting bores
  8. Lock nut SW24, tightening torque  $M_A = 10^{+5}$  Nm
  9. Hexagon, wrench size 10
  10. Identical seal rings for ports A, B, P, T (plate side)
  11. Hexagon SW24, tightening torque  $M_A = 50$  Nm
- ① component side – porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (with locating hole  $\varnothing 4$  x 4 mm deep; version "/60" or without locating hole)
  - ② plate side – porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (with locating hole  $\varnothing 3$  x 5 mm deep for locking pin ISO 8752-3x8-St; version "/60" or without locating hole)





