

Directional spool valves, direct operated,
with solenoid actuation, fast switching

Type WES

RE 23080

Edition: 2014-08



- ▶ Size 8
- ▶ Component series 1X
- ▶ Maximum operating pressure 350 bar [5076 psi]
- ▶ Maximum pressure drop 150 bar [2175 psi]
- ▶ Maximum flow 200 l/min [52.8 US gpm]

Features

- ▶ 3/2-way version
- ▶ Cartridge valve
- ▶ Fast switching, clocked DC solenoid
- ▶ Control using analog amplifiers

Contents

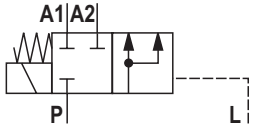
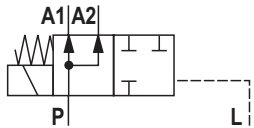
Features	1
Contents	1
Ordering code	2
Function, section	3
Technical data	4, 5
Voltage and current profile	6
Characteristic curves	7
Performance limits	8
Dimensions	9, 11
Installation bore	10
Project planning information	11
More information	12

Ordering code

01	02	03	04	05	06	07	08	09	10	11		
3	WES	8		1X	K	/	A	G24	CK50	/	V	*

01	3 main ports (P, A, (A1+A2))	3
02	Directional spool valve, direct operated, fast switching	WES
03	Size 8	8

Symbols

04	Normally closed		N
	Normally open		P

05	Component series 10 ... 19 (10 ... 19: unchanged installation and connection dimensions)	1X
06	Cartridge valve	K
07	Fast switching solenoid coil	A
08	Direct voltage, clocked 24 V	G24

Electrical connection

09	Connection line 5 m [196.85 in] with litz wire 2 x 1.5 mm ² [0.00233 in ²]	CK50
10	FKM seals	V
11	Further details in the plain text	*

Notice:

Symbol representation according to DIN ISO 1219-1.

Function, section

Directional valves of type WES are solenoid operated directional spool valves with fast switching design. Electrical and hydraulic components are combined in a compact design. They control the start and stop of a flow. The directional valve basically consists of the housing (1), integrated solenoids (2), control spool (3), thread ring (4), mounting plate (5), and a stop bushing (6) with return spring (7).

The fast switching solenoid (2) is controlled via a booster amplifier, which supplies a pulse-width modulated voltage and current signal. To achieve the specified values for switching time and flow, the operation must be carried out with a defined current profile (see page 6).

Version "N" (normally closed)

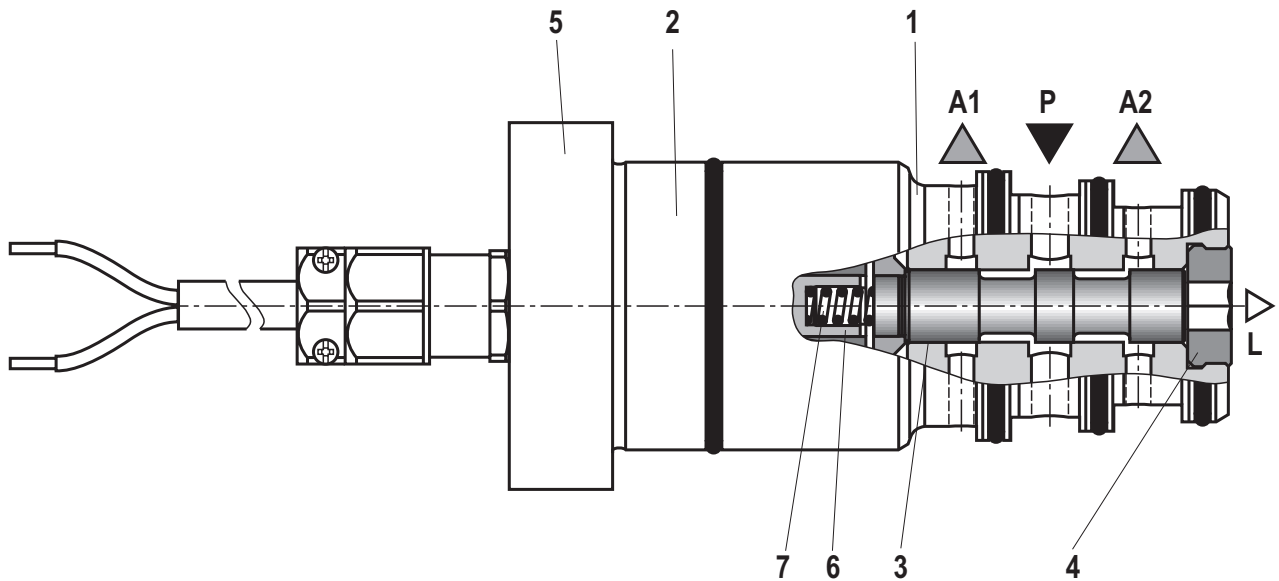
The force of the solenoid (2) acts on the control spool (3) and pulls it from the rest position to the opened spool position. This enables the direction of flow from P to A1 and A2.

After switching off the solenoid (2), the return spring (7) pushes the control spool (3) back to its rest position.

Version "P" (normally open)

The force of the solenoid (2) acts on the control spool (3) and pulls it from the initial position to the blocked spool position. This blocks the direction of flow from P to A1 and A2.

After switching off the solenoid (2), the return spring (7) pushes the control spool (3) back to its initial position.



Type 3WES . N...

Technical data

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

General			
Weight	- Valve	kg [lbs]	1.2 [2.6]
	- valve with 5 m cable	kg [lbs]	1.9 [4.2]
Installation position			any
Ambient temperature range		°C [°F]	+20 ... +85 [+68 ... +185]
Transport temperature range		°C [°F]	-40 ... +85 [-40 ... +185]
Storage temperature range		°C [°F]	-20 ... +50 [-4 ... +122]
Maximum surface temperature of the valve ^{1;2)}		°C [°F]	+85 [+185] (when installed)
Service life characteristic value B_{10} -value ³⁾	switching cycles		675 million

Hydraulic		
Maximum operating pressure	bar [psi]	350 [5076]
Maximum pressure drop	bar [psi]	150 [2175]
Maximum flow	l/min [US gpm]	200 [52.8]
Hydraulic fluid		see table below
Hydraulic fluid temperature range	°C [°F]	+40 ... +70 [+104 ... +158] (HL, HLP)
		+60 ... +70 [+140 ... +158] (SAE 40)
Viscosity range	mm ² /s [SUS]	15 ... 46 [69 ... 213] (HL, HLP)
		35 ... 55 [162 ... 255] (SAE 40)
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)		Class 21/19/15 ⁴⁾

Hydraulic fluid	Classification	Suitable sealing materials	Standards
Mineral oils	HL, HLP	FKM	DIN 51524
Motor oils	Exxon Mobil Mobilgard M440 (SAE 40), Shell Rimula R3+ (SAE 40)	FKM	

 **Important information on hydraulic fluids!**

- ▶ For more information and data on the use of other hydraulic fluids, please refer to data sheet 90220 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 valve surface temperature.

¹⁾ Surface temperature > +50°C [+122°F] possible, provide contact protection!

²⁾ Operating conditions: integrated in the control block +70°C [+158°F], hydraulic fluid temperature +70°C [+158°F]

³⁾ Observe the seal replacement intervals (see page 11)!

⁴⁾ The cleanliness classes stated for the components need to be maintained in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.

For the selection of the filters see www.boschrexroth.com/filter.

Technical data

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

Electric		
Voltage type		Direct voltage
Limiting performance according to VDE 0580 ²⁾	W	25
Duty cycle (ED)	%	≤ 50 (S1 according to VDE 0580)
Switching time according to ISO 6403	– ON	ms ≤ 5
	– OFF	ms ≤ 5
Maximum switching frequency ²⁾	Hz	10
Protection class according to DIN EN 60529		IP 66 (for professional assembly of the connection line)
Thermal class of insulation according to VDE 0580		B
Thermal class of enameled copper wire according to VDE 0580		200
Protection class according to VDE 0580		III (protective extra-low voltage)
Overvoltage category according to VDE 0580		III
Upper limiting temperature of the wire wound coil.	°C [°F]	< +125 [+185]
Ohmic resistance (incl. 5 m [196.85 in] connection line)	Ω	0.78 (at +20°C [+68°F] coil temperature)
		1.06 (at the maximum admissible coil temperature)

Control electronics

To achieve the technical data of the valve, the fast switching valve solenoid needs to operate with the following voltage and current profiles 14/12/3 A (boost/pick-up/hold) (see also page 6):

Boost voltage (U_1)	V	60 – 6
Current	– Boost (I_1 ; peak)	A 14 ± 1
	– Pick up (I_2 ; average)	A 12 ± 0.5
	– Hold (I_3 ; average)	A 3 ± 0.5
	– Hysteresis pick up (I_4 ; peak-peak)	A ≤ 1
	– Hysteresis hold (I_5 ; peak-peak)	A ≤ 1
Time pick up (t_3)	ms	5 + 0.5
Time decay	– Hold (t_4)	ms ≤ 0.2
	– Idle (t_5)	ms ≤ 0.4
PWM frequency	Hz	freely clocking
Operating voltage / pulse voltage	V	24 ± 10 %

Electrical connection

The valve solenoid is equipped with an electrical connection “CK50” according to the following information. The electrical connection of the solenoid is polarity-independent. The two-core connection line (black) is not exchangeable.

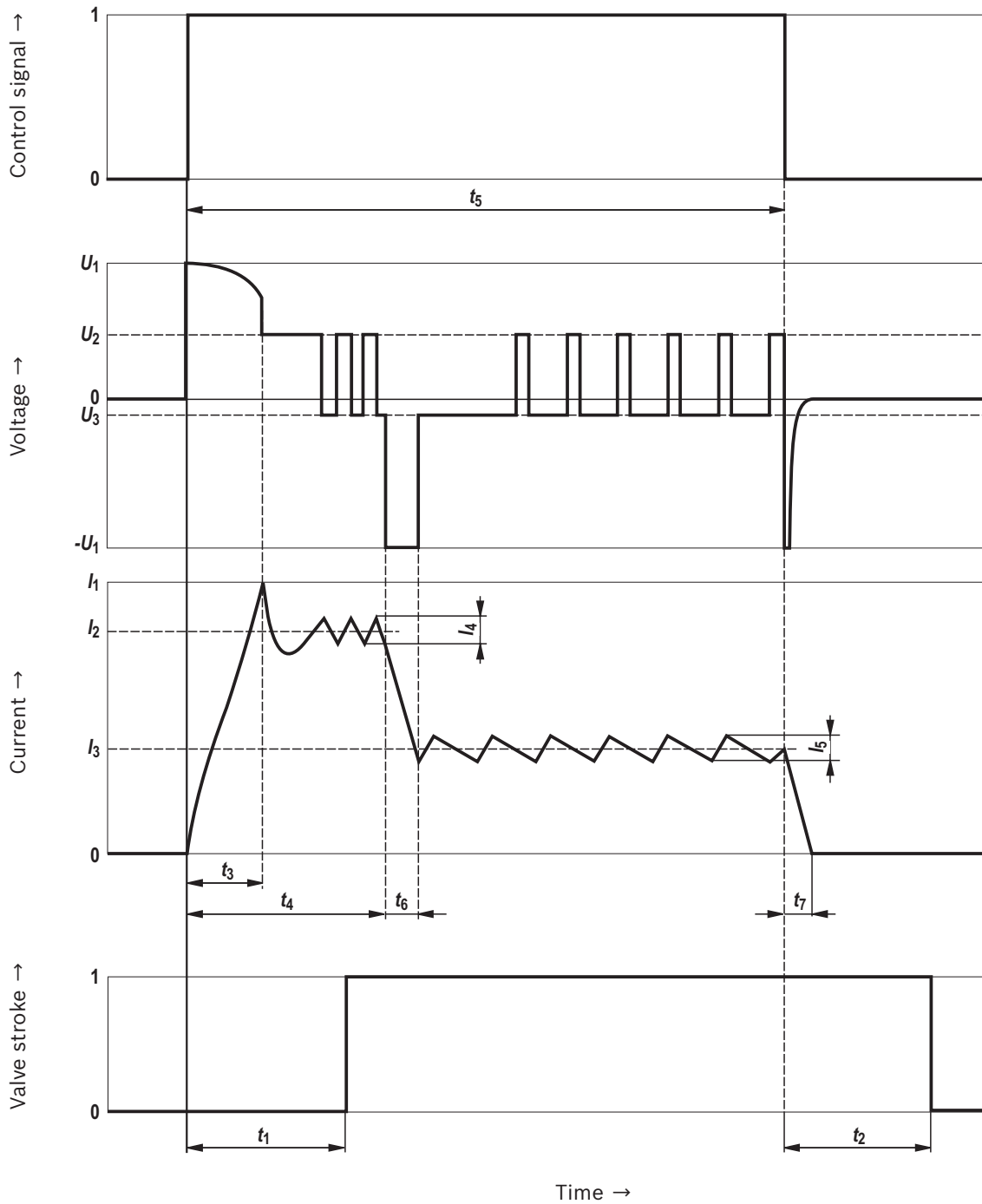
Connection line		two-core
Line cross-section	mm ² [in ²]	1.5 [0.00233]
Line diameter	mm [in]	7.3/7.9 [0.29/0.31] oval
Length	m [in]	5 [196.85]

²⁾ Operating conditions: integrated in the control block +70°C [+158°F], hydraulic fluid temperature +70°C [+158°F]

Notices:

- ▶ The solenoid coil can only be operated under current control.
- ▶ The booster amplifier is not included in the scope of delivery.

Voltage and current profile

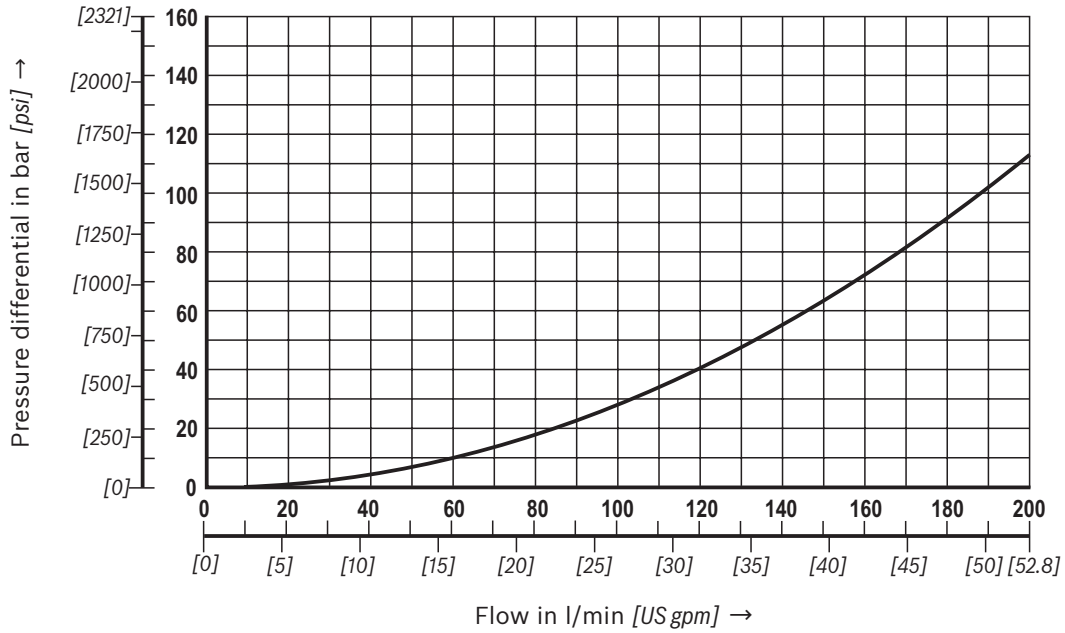


- | | |
|--------------------------------|--|
| t_1 Actuation time | I_1 Current boost (peak) |
| t_2 Dropout time | I_2 Current pick up (average) |
| t_3 Time boost (boost phase) | I_3 Current hold (average) |
| t_4 Time pick up | I_4 Current hysteresis pick up (peak-peak) |
| t_5 Time operated | I_5 Current hysteresis hold (peak-peak) |
| t_6 Time decay hold | U_1 Boost voltage |
| t_7 Time decay idle | U_2 Operating voltage |
| | U_3 Diode voltage |

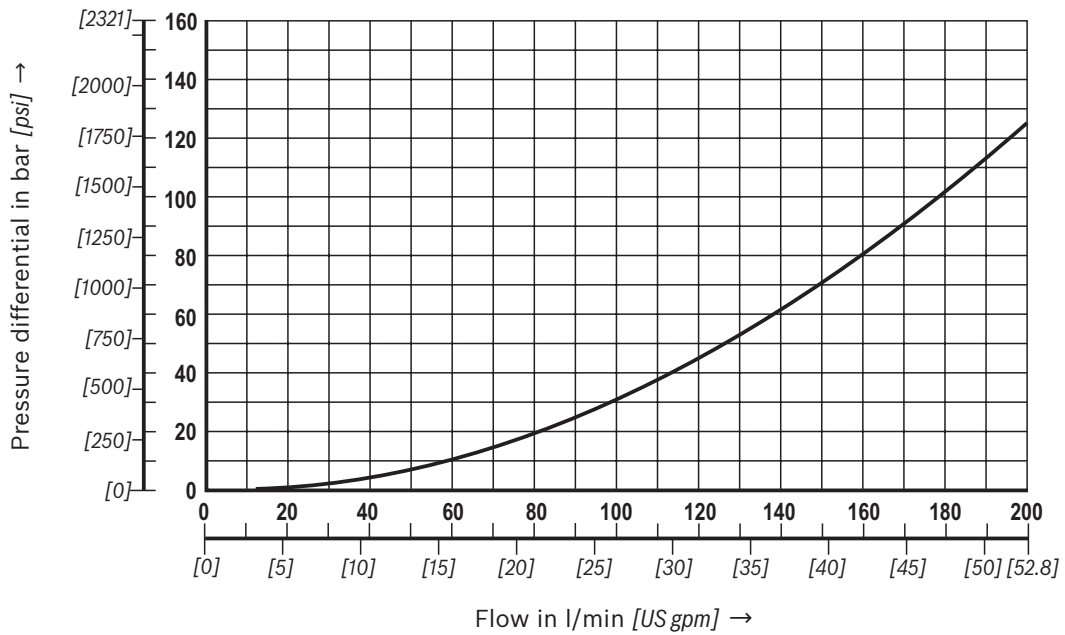
Characteristic curves

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

Δp - q_V -characteristic curves – symbol P – P → A (A1+A2)



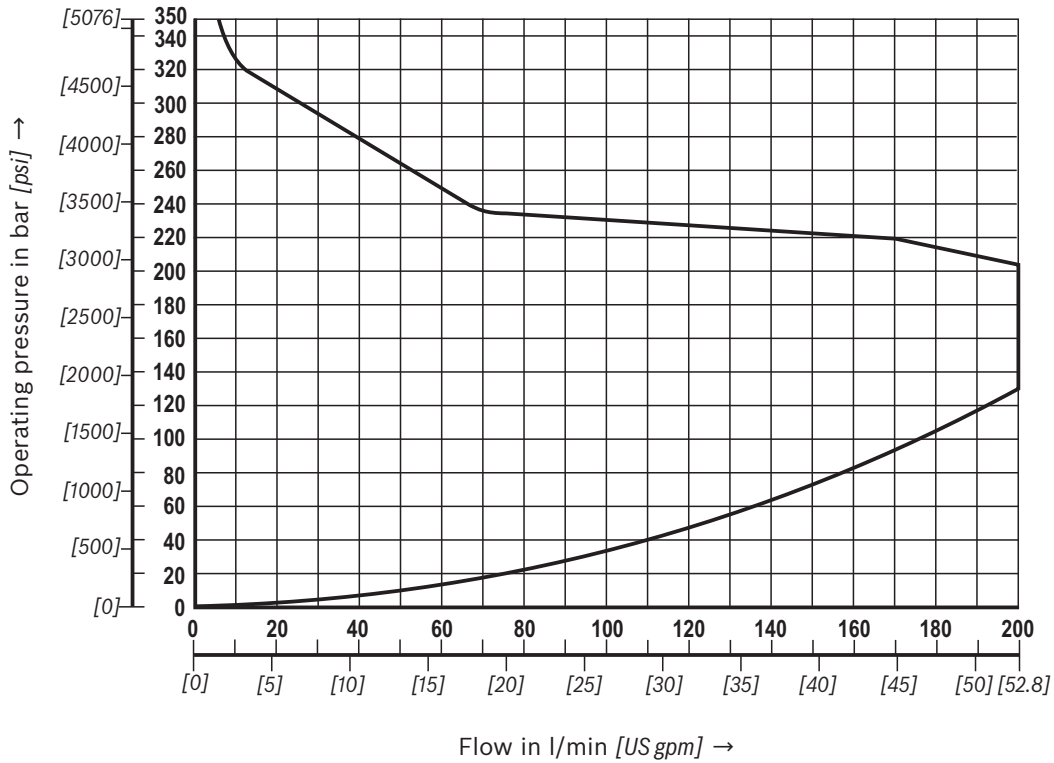
Δp - q_V -characteristic curves – symbol N – P → A (A1+A2)



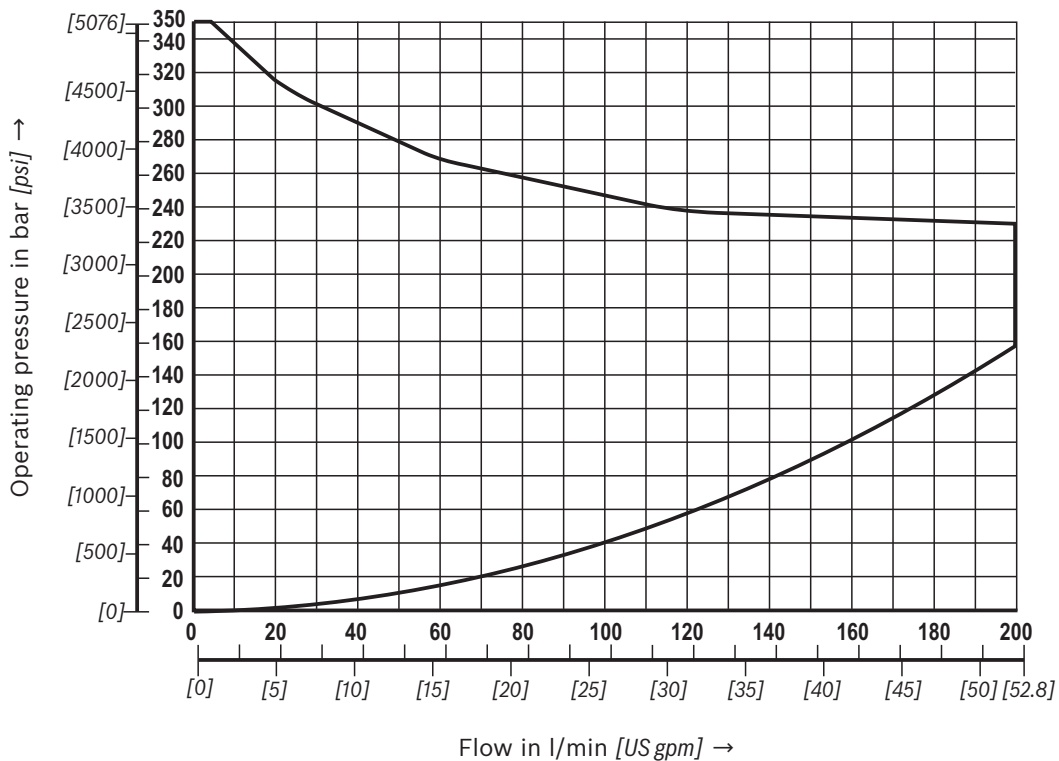
Performance limits

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

Symbol P – P → A (A1+A2)

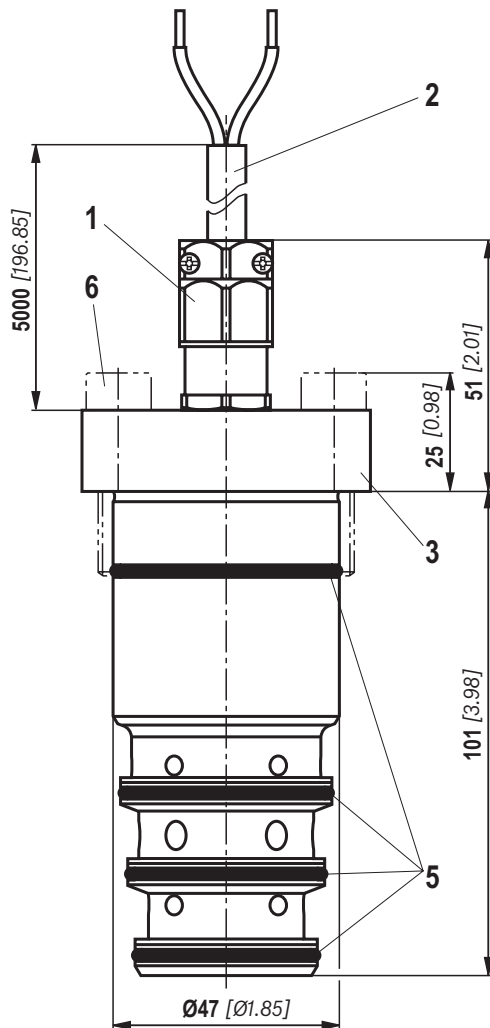
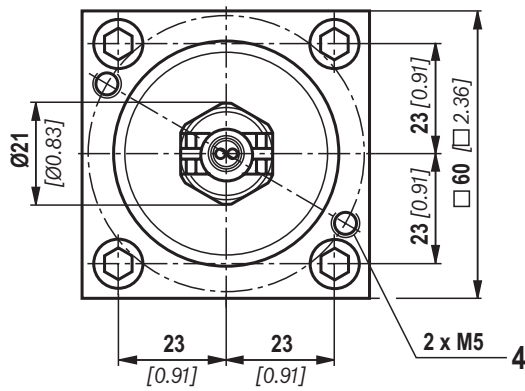


Symbol N – P → A (A1+A2)



Dimensions

(dimensions in mm [in])



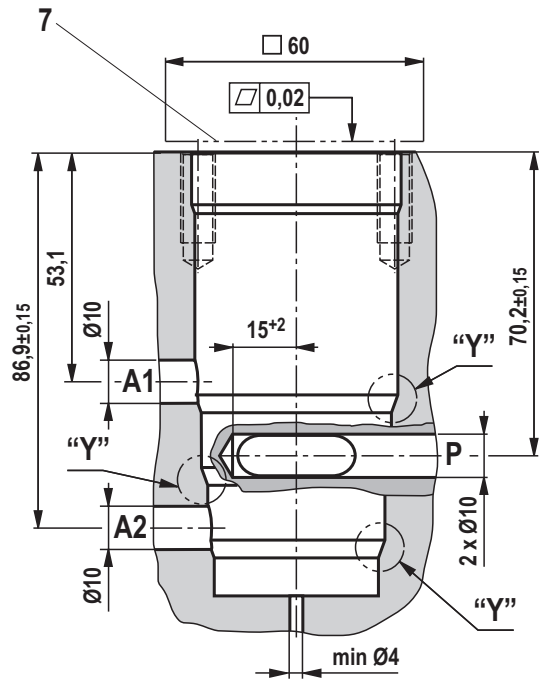
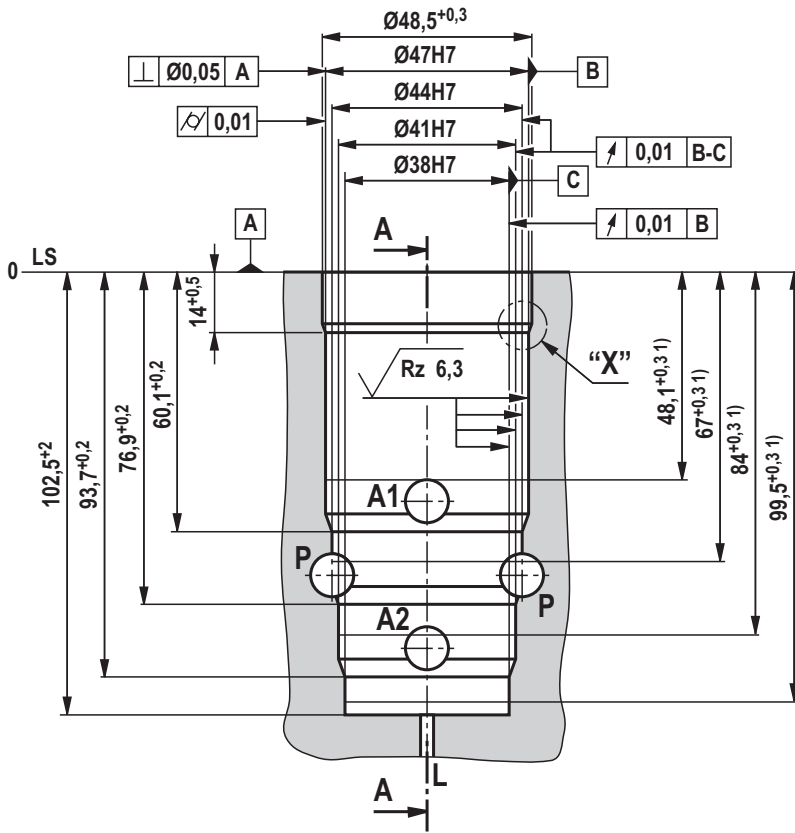
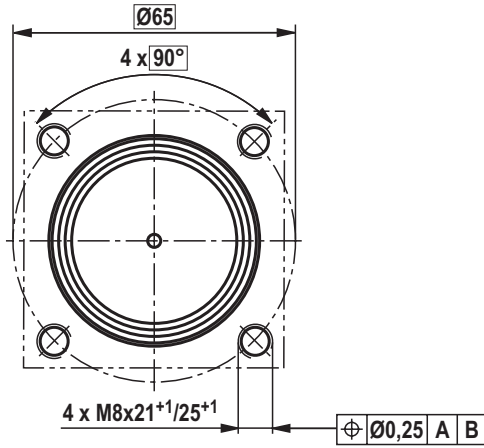
- 1 Cable bushing
 - 2 Connection line, two-core
 - 3 Mounting plate
 - 4 Disassembly bores
 - 5 Outer seal rings
 - 6 Valve mounting screws (self procurement)
- 4 hexagon socket head cap screws ISO 4762 - M8 x 35 - 10.9**

**4 hexagon socket head cap screws UNC
ASME B18.3-5/16-18UNC x 1-1/2" ASTM-A574**
(friction coefficient $\mu_{\text{total}} = 0.19$ to 0.24);
tightening torque $M_A = 41 \text{ Nm}$ [30.2 ft-lbs] $\pm 10\%$,
(friction coefficient $\mu_{\text{total}} = 0.12$ to 0.17);
tightening torque $M_A = 30 \text{ Nm}$ [22.1 ft-lbs] $\pm 10\%$
each with a washer **ASME B18.22.1-5/16-B**
(type B narrow FBN)

👉 Notice:

- ▶ The specified tightening torques are guidelines when using screws with the specified friction coefficients and when using a manual torque wrench.
- ▶ The dimensions are nominal dimensions which are subject to tolerances.

Installation bore
(dimensions in mm [inch])



1) Depth of fit

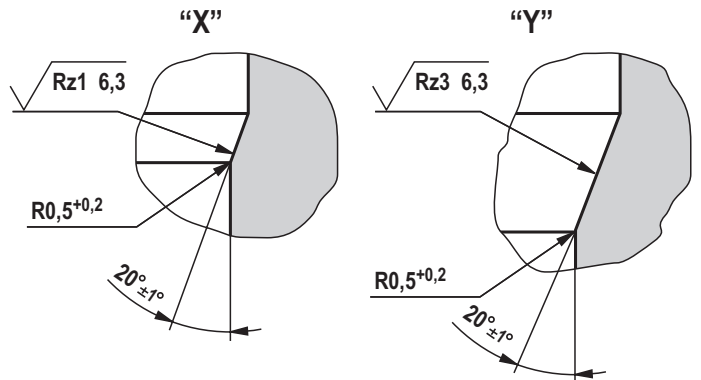
7 Contact surface mounting plate

LS = Location shoulder

Conversion table metric-USA see page 11.

Notice:

- ▶ Minimum distance between the valve axes ≥ 65 mm [2.56 in]
- ▶ Minimum distance from the valve axis to edge of installation block ≥ 49 mm [1.93 in]



Dimensions: Conversion table (dimensions in mm [in])

Metric	USA
Ø65	Ø2.559
Ø0.25	Ø0.0098
Ø0.05	Ø0.00197
Ø48.5+0.3	Ø1.910; 0/+0.0118
Ø47H7	Ø1.8504; 0/+0.0010
Ø44H7	Ø1.7323; 0/+0.0010
Ø41H7	Ø1.6142; 0/+0.0010
Ø38H7	Ø1.4961; 0/+0.0010
Ø10	Ø0.394
min Ø4	min Ø0.16
21+1	0.95+0.04
25+1	1.10+0.04

Metric	USA
0.01	0.00039
0.02	0.00079
102.5+2	4.035+0.079
93.7+0.2	3.689+0.0079
76.9+0.2	3.027+0.0079
60.1+0.2	2.366+0.0079
14+0.4	0.551+0.0157
48.1+0.3	1.894+0.0118
67+0.3	2.638+0.0118
84+0.3	3.307+0.0118
99.5+0.3	3.918+0.0118
53.1	2.091
60	2.362
70.2±0.15	2.764±0.0059
RZ1, RZ3 6.3	RZ1, RZ3 0.248
R0.5+0.2	R 0.0197+ 0.0079

Project planning information

- ▶ The leakage line is to be pre-tensioned with a pressure of 3 ... 5 bar [43.5 ... 72 psi].
- ▶ Characteristic curves and technical data can only be achieved by the defined current profile of the electronic control system (see page 6).
- ▶ The hydraulic system must be completely bled, see data sheet 07600.
- ▶ The connection line is to be fixed at a distance of < 300 mm [11.81 in] from the valve to prevent twisting!
- ▶ The minimum bending radius of 5 x line diameter for the connection line must be complied with.
- ▶ Do not pull on the connection line and valve connector!
- ▶ Do not paint over the name plate!
- ▶ After 2.5 years or after reaching 340 million load cycles, replacing the outer seals is recommended (material no. **R961009419**).
- ▶ Space required to remove the valve 222 mm [8.74 in]

Assembly:

- ▶ Lubricate the outer seals on the valve before installation.
- ▶ Push the valve by hand into the installation bore (see page 10).
- ▶ Tighten the 4 hexagon socket head cap screws (item 6, page 9).
- ▶ After assembly, there must not be a gap between the mounting plate (item 3, page 9) and block!

Disassembly:

- ▶ Remove the 4 hexagon socket head cap screws (item 6, page 9).
- ▶ Alternately screw in the 2 hexagon socket head cap screws M5 in the disassembly bores (item 4, page 9) until the valve is released from the installation bore by at least 4 mm [0.16 in].
- ▶ Remove the valve by hand from the installation bore.

Notices:

- ▶ When assembling and disassembling, the data sheet 07600-B must be complied with.

More information

- ▶ Hydraulic fluids on mineral oil basis
- ▶ Hydraulic valves for industrial applications
- ▶ General product information on hydraulic products
- ▶ Assembly, commissioning and maintenance of industrial valves
- ▶ Selection of the filters

Data sheet 90220

Data sheet 07600-B

Data sheet 07008

Data sheet 07300

www.boschrexroth.com/filter

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52/ 18-0
documentation@boschrexroth.de
www.boschrexroth.de

© This document, as well as the data, specifications and other information set forth in it, are the exclusive property of Bosch Rexroth AG. It may not be reproduced or given to third parties without consent of Bosch Rexroth AG. The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.