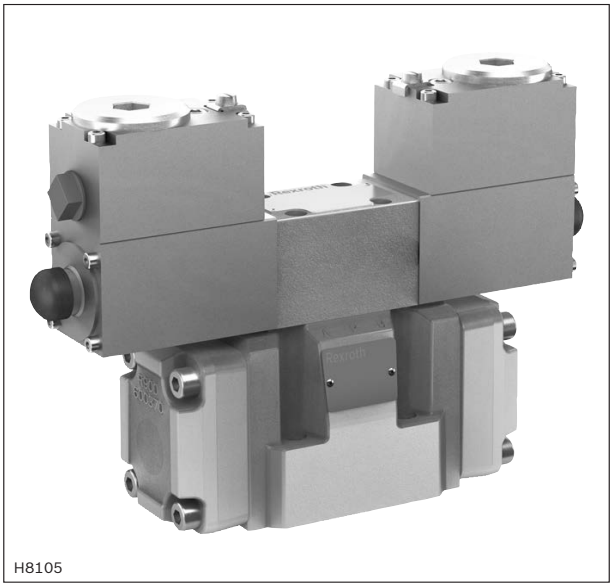
The Drive & Control Company

Rexroth
Bosch Group

Directional spool valves, pilot-operated, with electro-hydraulic actuation

WEH...VP1

RE 24751-VP1
Edition: 2016-12


H8105

- Size 10 ... 32
- Component series 4X; 6X; 7X
- Maximum operating pressure 350 bar
- Maximum flow 1100 l/min

FM C US APPROVED

Devices
For potentially explosive areas

Information on explosion protection:

- Area of application according to
  - NEC500 and CEC Appendix J:
    Class I, Division 1, Groups B, C, D T4
  - NEC502 and CEC Section 18:
    Class II/III, Division 1, Groups E, F, G T4

Features

- 4/3- or 4/2-way version
- For intended use in a potentially explosive atmosphere
- For subplate mounting
- Porting pattern according to ISO 4401
- Spring or pressure centering, spring end position or hydraulic end position
- Wet-pin DC or AC solenoids, optional
- Electrical connection with individual connection or piping connection (NPT 1/2")
- Manual override
- Optional versions:
  - Switching time adjustment
  - Preload valve in channel P of the main valve

Contents

Ordering code

01		02	03	04	05	06	07		08	09	10	11	12	13	14	15	16	17	18	19	20
H	–	**4**	**WEH**					**/**		**6B**		**N**	**VP1**			**Z2**					*****

01	Up to 350 bar	**H –**
02	4-way version	**4**

Types of actuation

03	Electro-hydraulic	**WEH**

Size

04	NG10	**10**
	NG16	**16**
	NG25	**25**
	NG32	**32**

Control spool return in the main valve

05	By means of springs	**no code**
	Hydraulic [1]	**H**
06	For symbols, see page 4 and 5	
07	Component series 40 ... 49 (40 ... 49: unchanged installation and connection dimension) – NG10	**4X**
	Component series 60 ... 69 (60 ... 69: unchanged installation and connection dimensions) – NG25 and NG32	**6X**
	Component series 70 ... 79 (70 ... 79: unchanged installation and connection dimensions) – NG16 (from series 72)	**7X**

Control spool return in the pilot control valve with 2 spool positions and 2 solenoids
(Only possible with symbols C, D, K, Z and hydraulic control spool return in the main valve)

08	**With** spring return	**no code**
	Without spring return	**O**
	Without spring return with detent	**OF**

Pilot control valve

09	High-power valve (data sheet 23178-VP1)	**6B**
10	Direct voltage 24 V	**G24**
	Alternating voltage 120 V	**W120R**
11	**With** manual override	**N**

Explosion protection

12	NEC500, NEC502, CEC Appendix J and CEC Section 18	**VP1**
	For details, see information on explosion protection, page 12	

Pilot oil flow

13	Pilot oil supply external, pilot oil return external [2]	**no code**
	Pilot oil supply internal, pilot oil return external [2; 3]	**E**
	Pilot oil supply internal, pilot oil return internal [3]	**ET**
	Pilot oil supply external, pilot oil return internal [2]	**T**

Switching time adjustment

14	**Without** switching time adjustment	**no code**
	Switching time adjustment as supply control	**S**
	Switching time adjustment as discharge control	**S2**

Ordering code

01		02	03	04	05	06	07		08	09	10	11	12	13	14	15	16	17	18	19	20
H	–	**4**	**WEH**					**/**		**6B**		**N**	**VP1**			**Z2**					*****

Electrical connection

15	**Individual connection**	
	Solenoid with terminal box and cable gland	**Z2**
	For details of electrical connections, see page 28	

Throttle insert

16	**Without** throttle insert	**no code**
	Throttle Ø 0.8 mm	**B08**
	Throttle Ø 1.0 mm	**B10**
	Throttle Ø 1.2 mm	**B12**
	Throttle Ø 1.5 mm	**B15**

Preload valve (not for NG10, see page 27)

17	**Without** preload valve	**no code**
	With preload valve (p_o = 4.5 bar)	**P4,5**

18	**Without** pressure reducing valve	**no code**
	With pressure reducing valve	**D3** [4]

Seal material

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

20	Further details in the plain text	*****

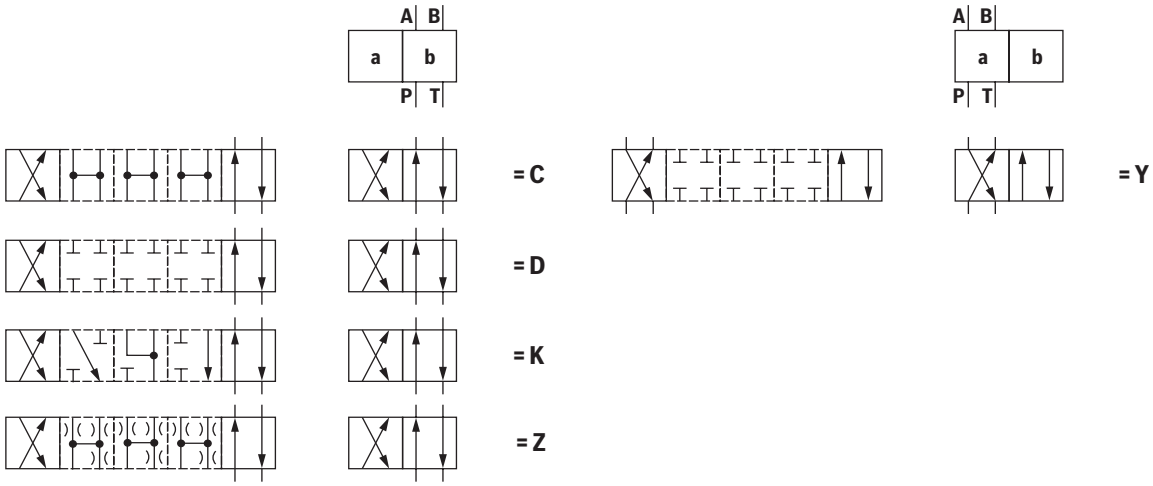
[1] 2 switching positions (hydraulic end position):
only symbols C, D, K, Z, Y

[2] Pilot oil supply X or return Y **external**:
- The maximum admissible operating parameters of the pilot control valve must be observed (see data sheet 23178-VP1)!
- Minimum pilot pressure: please observe page 10
- Maximum pilot pressure: please observe page 10

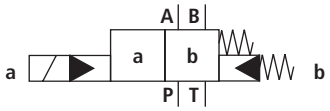
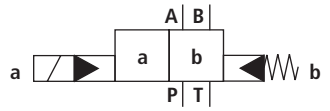
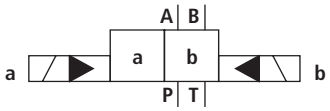
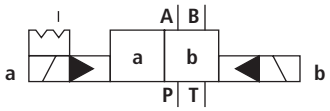
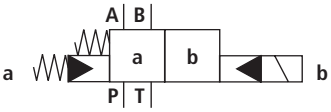
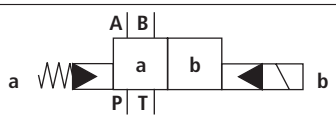
[3] Pilot oil supply **internal** (version "ET" and "E"):
- Minimum pilot pressure: please observe page 10
- Maximum pilot pressure: please observe page 10
  In order to prevent inadmissibly high pressure peaks, a **"B10" throttle insert** has to be provided in port P of the pilot control valve (see page 9).
- You must moreover provide the **pressure reducing valve "D3"**.

[4] Only in connection with the **"B10"** throttle insert

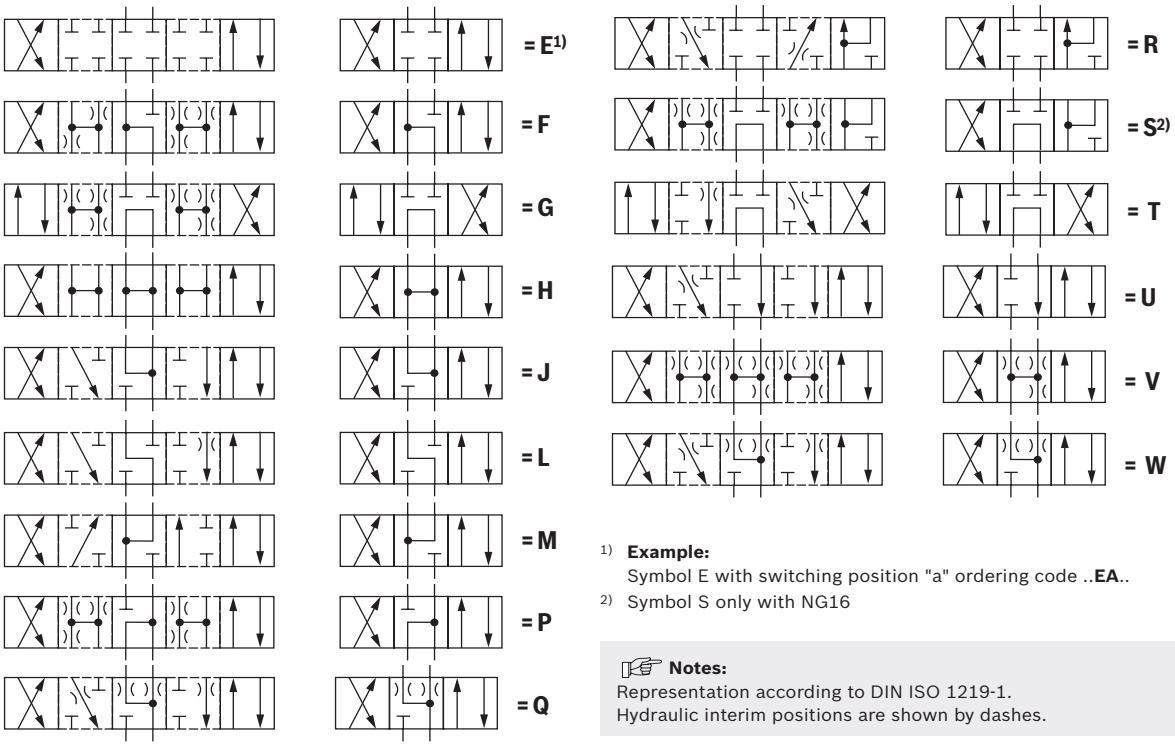
Symbols: 2 spool positions



Notes:
Representation according to DIN ISO 1219-1.
Hydraulic interim positions are shown by dashes.

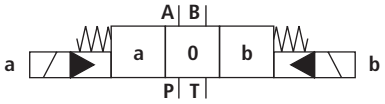
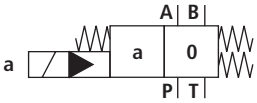
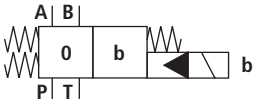
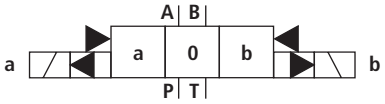
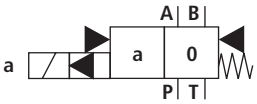
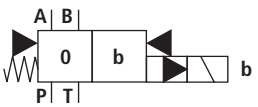
Ordering code		
Symbol	**Control spool return**	**Types of actuation**
C, D, K, Z	**../..**	
	..H../..	
	..H../O	
	..H../OF	
Y	**../..**	
	..H../..	

Symbols: 3 spool positions



1) **Example:**
Symbol E with switching position "a" ordering code ..**EA**..
2) Symbol S only with NG16

Notes:
Representation according to DIN ISO 1219-1.
Hydraulic interim positions are shown by dashes.

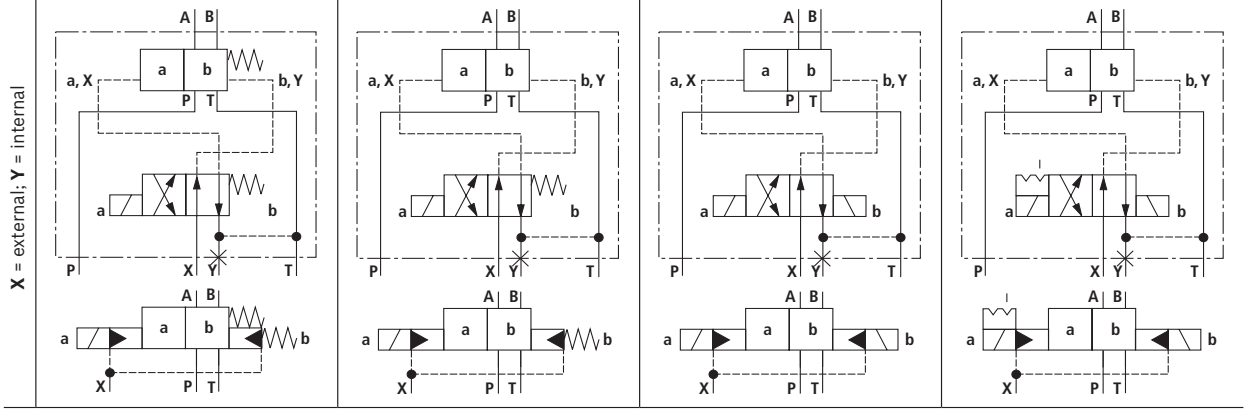
Symbol	Ordering code: Actuating side	Ordering code: Control spool return	Types of actuation
E, F, G, H, J, L, M, P, Q, R, S, T, U, V, W		../..	
	.A		
	.B		
		..H../..	
		H.A	
		H.B	

Symbols for valves with 2 spool positions

	Valve with spring end position	Valve with hydraulic end position		
X = external; Y = external	"WEH.../.."	"WEH . H../..."	"WEH . H../O..."	"WEH . H../OF..."
X = internal; Y = external	"WEH.../...E..."	" WEH . H../...E..."	"WEH . H../O...E..."	"WEH . H../OF...E..."
X = internal; Y = internal	"WEH.../...ET..."	"WEH . H../...ET..."	"WEH . H../O...ET..."	"WEH . H../OF...ET..."

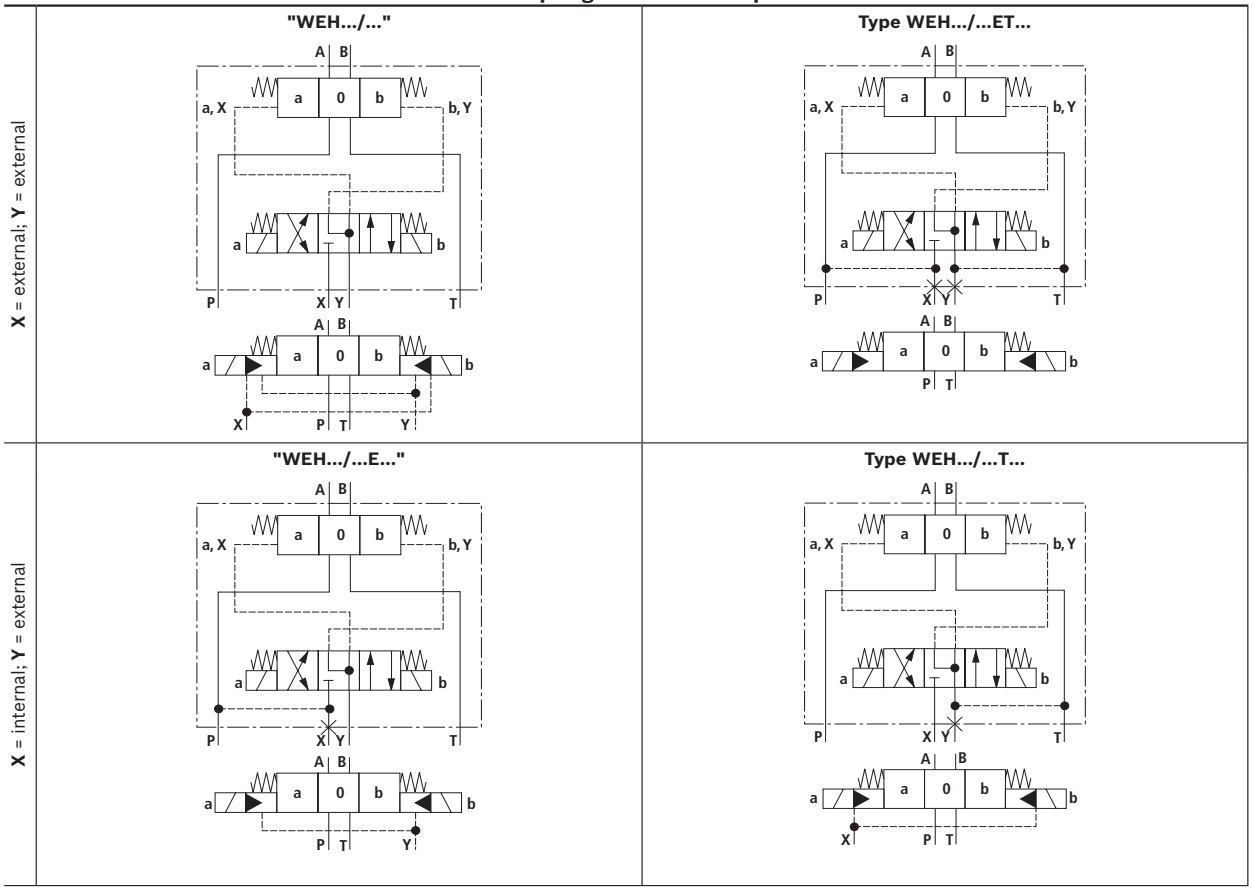
Symbols for valves with 2 spool positions

Valve with spring end position	Valve with hydraulic end position		
"WEH.../...T..."	"WEH . H../...T..."	"WEH . H../O...T..."	"WEH . H../OF...T..."



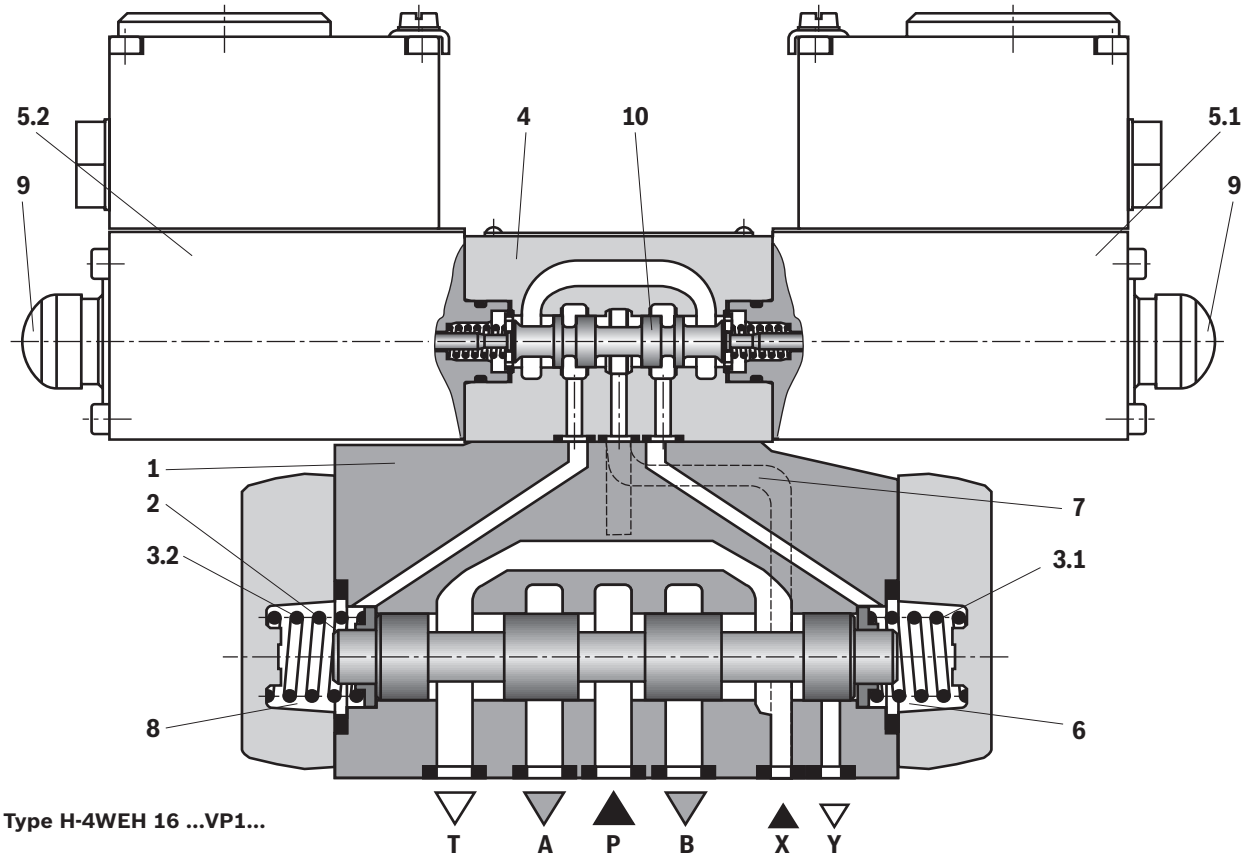
Symbols for valves with 3 spool positions

Valve with spring-centered zero position	
"WEH.../..."	Type WEH.../...ET...
"WEH.../...E..."	Type WEH.../...T...



RE 24751-VP1, edition: 2016-12, **Bosch Rexroth AG**

Function, section



Type H-4WEH 16 ...VP1...

The valve type H-WEH is a directional spool valve with electro-hydraulic actuation. It controls the start, stop and direction of a flow.
The directional valves basically consist of the main valve with housing (1), the main control spool (2), one or two return springs (3.1) and (3.2), as well as the pilot control valve (4) with one or two solenoids "a" (5.1) and/or "b" (5.2).
The main control spool (2) in the main valve is held in the zero or initial position by the springs or by means of pressurization. In the initial position, the two spring chambers (6) and (8) are connected with the tank in a depressurized form via the pilot control valve (4). Via the control line (7), the pilot control valve is supplied with pilot oil. Supply can be implemented internally or externally (externally via port X). Upon actuation of the pilot control valve, e.g. solenoid "a", the pilot control spool (10) is moved to the left and thus, the spring chamber (8) is pressurized with pilot pressure. The spring chamber (6) remains depressurized.
The pilot pressure acts on the left side of the main control spool (2) and moves it against the spring (3.1). This connects port P with B and A with T in the main valve. On switching off of solenoid, the pilot control spool (10) returns to its initial position (except impulse spool). The spring chamber (8) is unloaded to the tank.
The pilot oil return is implemented internally (via channel T) or externally (via channel Y).
An optional manual override (9) allows for moving of the pilot control spool (10) without solenoid energization.

☞ **Notes:**
The return springs (3.1) and (3.2) in the spring chambers (6) and (8) hold the main control spool (2) in central position without pilot pressure even with, for example, vertical valve positioning.
Due to the design principle, internal leakage is inherent to the valves, which may increase over the life cycle.

For pilot oil supply, see page 9.

Pilot oil supply

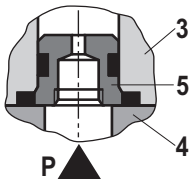
Type H-4WEH...
The pilot oil supply is implemented **externally** - via channel X - from a separate pressure supply.
The pilot oil return is implemented **externally** - via channel Y - into the tank.

Type H-4WEH...E...
The pilot oil supply is implemented **internally** from channel P of the main valve. (see page 10, footnotes [5] and [6])
The pilot oil return is implemented **externally** - via channel Y - into the tank. In the subplate, port X is closed.

Type H-4WEH...ET...
The pilot oil supply is implemented **internally** from channel P of the main valve.
The pilot oil return is implemented **internally** - via channel T - into the tank. In the subplate, ports X and Y are closed.

Type H-4WEH...T...
The pilot oil supply is implemented **externally** - via channel X - from a separate pressure supply.
The pilot oil return is implemented **internally** - via channel T - into the tank. In the subplate, port Y is closed.

Throttle insert
Use of the throttle insert (5) is necessary if the pilot oil supply in channel P of the pilot control valve is to be limited (see below).
The throttle insert (5) is inserted in channel P of the pilot control valve.



3 Pilot control valve
4 Main valve
5 Throttle insert

Technical data

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

general						
Sizes		NG	**10**	**16**	**25**	**32**
Weight, approx.	▶ Valve with one solenoid	kg	9.5	12	20	37.5
	▶ Valve with two solenoids, spring-centered	kg	12	14.5	22.5	40
	▶ Switching time adjustment "S" and "S2"	kg	0.8	0.8	0.8	0.8
	▶ "D3" pressure reducing valve	kg	0.4	0.4	0.4	0.4
Installation position			Any; horizontal with valves with hydraulic control spool return "H" and symbol C, D, K, Z, Y. With suspended installation, higher sensitivity to contamination – horizontal is recommended.			
Ambient temperature range		°C	–20 ... +60			
Storage temperature range		°C	+5 ... +40			
Maximum storage time		Years	1			
Surface protection	▶ Valve body – Pilot control valve		Galvanized			
	▶ Valve body – Main valve		Galvanized			
	▶ Solenoid		Galvanized			
$MTTF_d$ values according to EN ISO 13849		Years	75 (for further details see data sheet 08012)			

hydraulic						
Maximum operating pressure						
▶ Port P, A, B		bar	350	350	350	350
▶ Port T	Pilot oil return Y external	bar	250	250	250	250
	Pilot oil return Y internal	bar	210			
▶ Port Y	Pilot oil return external	bar	210			
Hydraulic fluid			See table on page 11			
Hydraulic fluid temperature range (at the valve working ports)		°C	–20 ... +70 (NBR seals) –15 ... +70 (FKM seals)			
Viscosity range		mm^2/s	2.8 ... 500			
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1]			
Maximum surface temperature		°C	See Information on explosion protection page 12			
Maximum pilot pressure [2]		bar	250	250	250	250
Minimum pilot pressure						
▶ Pilot oil supply X external (all symbols), pilot oil supply X internal (only symbols D, K, E, J, L, M, Q, R, U, W)						
3-spool position valve, spring-centered		bar	10	14	13	8.5
2-spool position valve with spring end position		bar	10	14	13	10
2-spool position valve with hydraulic end position		bar	7	14	8	5
▶ Pilot oil supply X internal) (with symbols C, F, G, H, P, T, V, Z, S[3])		bar	6.5 [4]	4.5 [5]	4.5 [5]	4.5 [5]
Pilot volume for switching process						
▶ 3-spool position valve, spring-centered		cm^3	2.04	5.72	14.2	29.4
▶ 2-spool position valve		cm^3	4.08	11.45	28.4	58.8
Pilot flow for shortest switching time, approx.		l/min	35	35	35	45
Free flow cross-sections in zero position with symbols Q, V and W						
▶ Symbol **Q**	A–T; B–T	mm^2	13	32	83	78
▶ Symbol **V**	P – A; P – B	mm^2	13	32	83	73
	A–T; B–T	mm^2	13	32	83	84
▶ Symbol **W**	A–T; B–T	mm^2	2.4	6	14	20

Technical data

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

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	FKM	ISO 15380	90221
		HEES	FKM		
	▶ Soluble in water	HEPG	FKM	ISO 15380	
Flame-resistant	▶ Water-free	HFDU, HFDR	FKM	ISO 12922	90222
	▶ Containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620) [6]	NBR	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.).
- Ignition temperature > 180 °C
- **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 erosion
  - Life cycle as compared to operation with mineral oil HL, HLP 30 ... 100%
- **Bio-degradable and flame-resistant:** If these hydraulic fluids are used, small amounts of dissolved zinc may get into the hydraulic system. (700 mg zinc per pole tube).

electric			
Voltage type		Direct voltage	Alternating voltage 50/60 Hz
Available voltages	V	24	120
Voltage tolerance (nominal voltage)	%	±10	
Admissible residual ripple	%	< 5	
Duty cycle/operating mode according to VDE 0580		S1 (continuous operation)	
Switching time according to ISO 6403 [7]	ms	see page 12	
Maximum switching frequency	1/h	3600	
Nominal power at ambient temperature 20°C	W	20	
Maximum power with 1.1 x nominal voltage and an ambient temperature of 20 °C	W	20.6	
Protection class according to	▶ NEMA 250	NEMA type 4X (with correctly installed electrical connection)	
	▶ DIN EN 60529	IP 65 (with correctly installed electrical connection)	

1) 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.
For the selection of the filters see www.boschrexroth.com/filter.

2) ▶ **Internal** pilot oil supply:
– You must generally provide the **pressure reducing valve "D3"**.
▶ **External** pilot oil supply:
– Compliance with the maximum pilot pressure must be ensured by appropriate measures (e. g. protection of the separate pilot oil circuit by using a pressure relief valve)!

3) Symbol S only for NG16

4) For symbols C, F, G, H, P, T, V, Z, an internal pilot oil supply is only possible if the flow from P to T in the central position (for 3-spool position valve) or while crossing the central position (for 2-spool position valve) is so large that the pressure differential of P to T reaches a value of at least 7.5 bar and the pilot oil return Y is implemented externally.

5) For symbols C, F, G, J, H, P, T, V, Z, S[3] – by means of preload valve (not NG10) or correspondingly high flow. (Determination of the required flow, see "Preload valve" characteristic curves on page 27.) For NG10, a check valve with a cracking pressure of 7.5 bar is to be provided in the return line to the tank. The pilot oil return Y must be implemented externally.

6) Maximum ambient temperature for individual operation 50 °C and 50% duty cycle, for manifold operation 40 °C and 50% duty cycle.

7) The switching times were determined at a hydraulic fluid temperature of 40 °C and a viscosity of 46 cSt. Deviating hydraulic fluid temperatures can result in different switching times! Switching times change dependent on operating time and application conditions.

Technical data
(For applications outside these values, please consult us!)

Information on explosion protection			
Area of application according to	▶ NEC500 and CEC Annex J		Class I, Division 1, Groups B, C, D T4
	▶ NEC502 and CEC Section 18		Class II/III, Division 1, Groups E, F, G T4
Maximum surface temperature [8]		°C	130
Temperature class			T4
Type of protection valve solenoid			XP (explosion-proof); DIP (dust ignition protection)
FM certificate	▶ US		3055770
	▶ Canada		3055770C
Special application conditions for a safe application			▶ The connection line requires a minimum temperature rating of 105 °C. When selecting the connection line, please observe the requirements regarding the temperature rating and avoid contact of the connection line with the solenoid surface. ▶ In case of valves with two solenoids, maximally one of the solenoids may be energized at a time. ▶ In case of bank assembly, the maximum ambient temperature may not exceed 50 °C. ▶ Ensure unobstructed heat dissipation at the solenoid. The solenoid may not be covered or exposed to direct sunlight. ▶ For use of the valve in the intended explosion protection atmosphere, a conduit seal has to be installed in the pipeline within 450 mm (downstream of the valve solenoid).
Ambient temperature range		°C	–20 ... +60

[8] Surface temperature > 50 °C, provide contact protection

Switching times

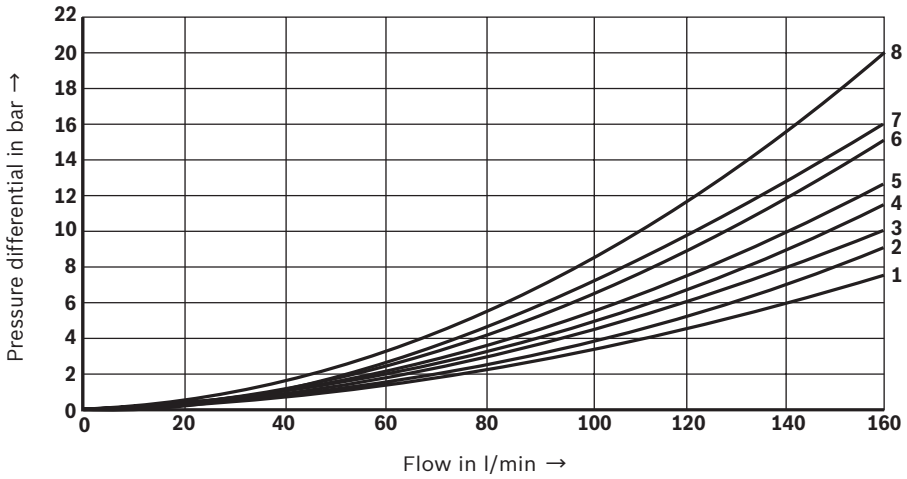
Pilot pressure		**bar**	**70**	**250**	**Spring**
			ON		**OFF**
NG10	▶ Without throttle insert	ms	40 ... 90	40 ... 90	20 ... 60
	▶ With throttle insert	ms	60 ... 120	50 ... 100	20 ... 60
NG16	▶ Without throttle insert	ms	50 ... 110	40 ... 90	50 ... 110
	▶ With throttle insert	ms	110 ... 160	80 ... 130	50 ... 110
NG25	▶ Without throttle insert	ms	70 ... 130	50 ... 100	100 ... 160
	▶ With throttle insert	ms	200 ... 280	120 ... 180	100 ... 160
NG32	▶ Without throttle insert	ms	80 ... 160	70 ... 130	140 ... 190
	▶ With throttle insert	ms	420 ... 590	230 ... 380	140 ... 190

Notes:
- Switching times = Contacting at the pilot control valve until start of opening of the control edge in the main valve and change in the control spool stroke by 95%)
- The switching times are measured according to ISO 6403 with HLP46, ϑ_{Oil} = 40 °C ±5 °C.
  With other oil temperatures, variations are possible.
- The switching times were determined using DC solenoids. They increase by approx. 25 ms if AC solenoids are used.
- The switching times increase by approx. 30 ms if the pressure reducing valve "D3" is used.
- The switching times have been determined under ideal conditions and may differ in the system, depending on the application conditions.

Bosch Rexroth AG, RE 24751-VP1, edition: 2016-12

Characteristic curves: NG10
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

Δp-q_V characteristic curves



Symbol	Spool position				Zero position		
	P – A	P – B	A – T [1]	B – T [1]	A – T	B – T	P – T
E, Y, D, Q, V, W, Z	1	1	3	5			
F	1	3	1	4	3	–	6
G, T	4	2	4	7	–	–	8
H, C	3	3	1	7	1	5	5
J, K	1	2	1	6			
L	2	2	1	4	2	–	–
M	3	3	2	5			
P	3	1	2	7	–	5	7
R	1	2	3	–			
U	2	2	3	6	–	6	–

[1] The pressure differential refers to the use of port T. If port T1 is used in addition, the pressure differential may be lower. If only port T1 is used, the relations A – T and B – T may be reversed.

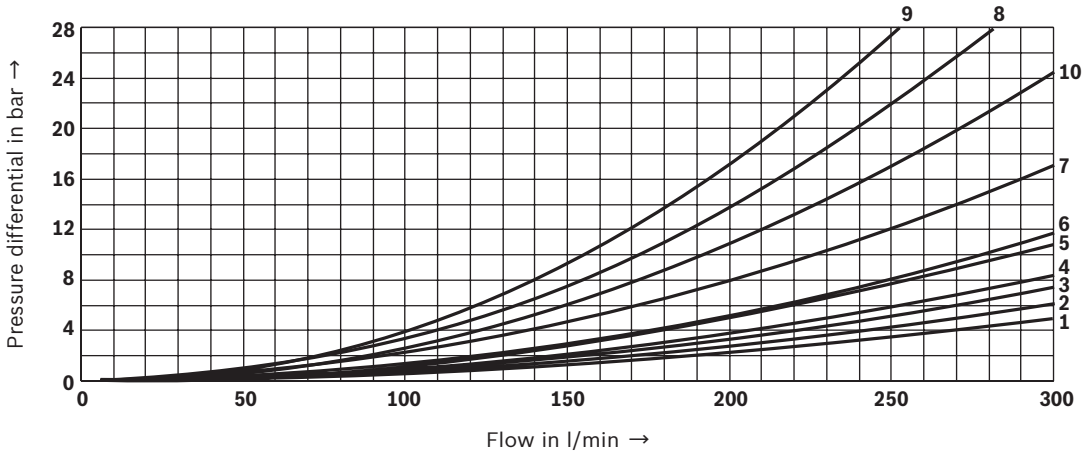
Performance limits: NG10
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

Symbol	200	250	315
C, D, K, Y, Z, E, J, L, M, Q, U, V, W, R	160	160	160
H	160	150	120
G, T	160	160	140
F, P	160	140	120

☞ **Important information see page 20.**

Characteristic curves: NG16
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

***Δp-q*V characteristic curves**



Symbol	Spool position				Zero position		
	P – A	P – B	A – T	B – T	P – T	A – T	B – T
D, E, Y	1	1	3	3			
F	1	2	5	5	4	3	–
G	4	1	5	5	7	–	–
C, H	1	1	5	6	2	4	4
K, J	2	2	6	6	–	3	–
L	2	2	5	4	–	3	–
M	1	1	3	4			
P	2	1	3	6	5	–	–

Symbol	Spool position				Zero position		
	P – A	P – B	A – T	B – T	P – T	A – T	B – T
Q	1	1	6	6			
R	2	4	7	–			
S	3	3	3	–	9	–	–
T	4	1	5	5	7	–	–
U	2	2	3	4			6
V, Z	1	1	6	6	10	8	8
W	1	1	3	4			

Performance limits: NG16
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

2-spool position valves – $q_{V\,max}$ in l/min

Symbol	Operating pressure p_{max} in bar				
	70	140	210	280	350
X external – spring end position in the main valve (with $p_{St\,min}$ = 12 bar)					
C, D, K, Y, Z	300	300	300	300	300
X external – spring end position in the main valve [1]					
C	300	300	300	300	300
D, Y	300	270	260	250	230
K	300	250	240	230	210
Z	300	260	190	180	160
X external – hydraulic end position in the main valve					
HC, HD, HK, HZ, HY	300	300	300	300	300

[1] If the specified flow values are exceeded, the function of the return spring is no longer guaranteed if the pilot pressure fails.

[2] With symbol V, the pilot control valve is not required for flows >160 l/min.

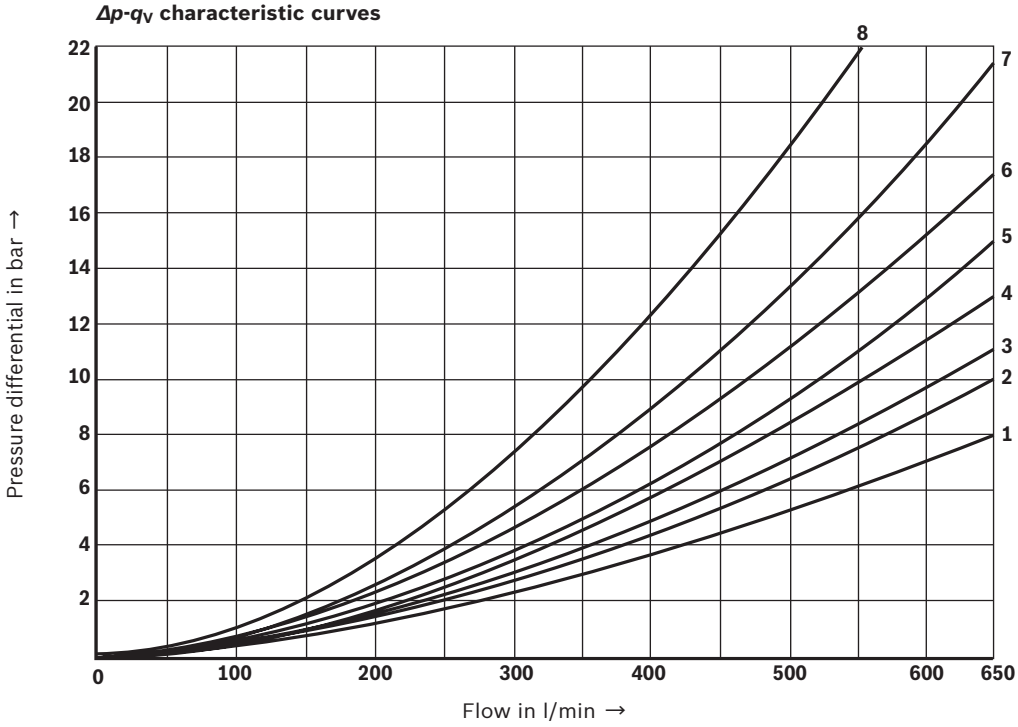
3-spool position valves – $q_{V\,max}$ in l/min

Symbol	Operating pressure p_{max} in bar				
	70	140	210	280	350
X external – spring-centered					
E, H, J, L, M, Q, U, W, R	300	300	300	300	300
F, P	300	250	180	170	150
G, T	300	300	240	210	190
S	300	300	300	250	220
V	300	250	210	200	180
X external – pressure-centered (with minimum pilot pressure 16 bar)					
all symbols [2]	300	300	300	300	300

☞ **Important information see page 20.**

Characteristic curves: NG25
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

***Δp-q*$_V$ characteristic curves**



Symbol	Spool position				Zero position		
	P – A	P – B	A – T [1)]	B – T [1)]	A – T	B – T	P – T
E, Y, D	1	1	3	4			
F	1	1	2	4	2	–	5
G, T	1	1	2	5	–	–	7
H	1	1	2	5	2	2	4
C	1	1	2	5			
J	1	1	2	5	6	5	–
K	1	1	2	5			
L	1	1	2	4	5	–	–
M	1	1	3	4			
P	1	1	3	5	–	3	5
Q	1	1	2	3			
R	1	1	3	–			
U	1	1	2	5	–	5	–
V	1	1	2	5	8	7	–
Z	1	1	2	5			
W	1	1	3	4			

8 Symbol R, spool position B – A

Performance limits: NG25
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

2-spool position valves – $q_{V\,max}$ in l/min

Symbol	Operating pressure p_{max} in bar				
	70	140	210	280	350
X external – spring end position in the main valve (with $p_{St\,min}$ = 13 bar)					
C, D, K, Y, Z	700	700	700	700	650
X external – spring end position in the main valve [1]					
C	700	700	700	700	650
D, Y	700	650	400	350	300
K	700	650	420	370	320
Z	700	700	650	480	400
X external – hydraulic end position in the main valve					
HC, HD, HK, HZ, HY	700	700	700	700	700
HC./O..., HD./O..., HK./O..., HZ./O...	700	700	700	700	700
HC./OF..., HD./OF..., HK./OF..., HZ./OF...	700	700	700	700	700

[1] If the specified flow values are exceeded, the function of the return spring is no longer guaranteed if the pilot pressure fails!

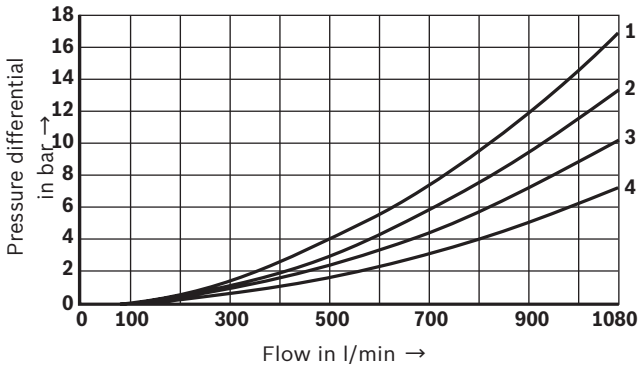
3-spool position valves – $q_{V\,max}$ in l/min

Symbol	Operating pressure p_{max} in bar				
	70	140	210	280	350
X external – spring-centered					
E, L, M, Q, U, W	700	700	700	700	650
G, T	400	400	400	400	400
F	650	550	430	330	300
H	700	650	550	400	360
J	700	700	650	600	520
P	650	550	430	330	300
V	650	550	400	350	310
R	700	700	700	650	580
X external – pressure-centered (with minimum pilot pressure 18 bar)					
E, F, H, J, L, M, P, Q, R, U, V, W	700	700	700	700	650
G, T	400	400	400	400	400
X external – pressure-centered (with pilot pressure > 30 bar)					
G, T	700	700	700	700	650

☞ **Important information see page 20.**

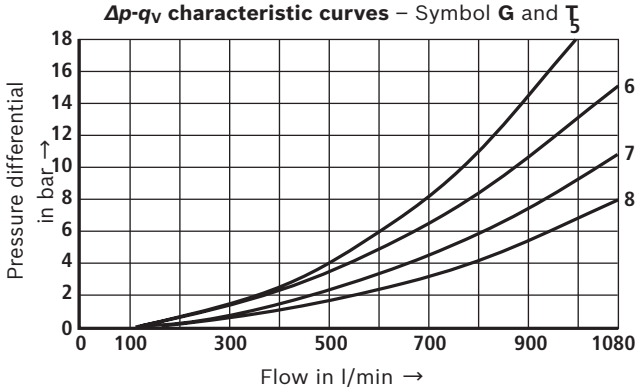
Characteristic curves: NG32
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

***Δp-q*$_V$-characteristic curves** – Symbol **E**, **R** and **W**



Symbol	Spool position				
	P – A	P – B	A – T	B – T	B – A
E	4	4	3	2	–
R	4	4	3	–	1
W	4	4	3	2	–

***Δp-q*$_V$ characteristic curves** – Symbol **G** and **T**



Symbol	Spool position				
	P – A	P – B	A – T	B – T	P – T
G	7	8	7	5	6
T	7	8	7	5	6

Performance limits: NG32
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

2-spool position valves – $q_{V\,max}$ in l/min					
Symbol	**Operating pressure p_{max} in bar**				
	70	**140**	**210**	**280**	**350**
X external – spring end position in the main valve (with $p_{St\,min}$ = 10 bar)					
C, D, K, Y, Z	1100	1040	860	750	680
X external – spring end position in the main valve [1]					
C	1100	1040	860	800	700
D, Y	1100	1040	540	480	420
K	1100	1040	860	500	450
Z	1100	1040	860	700	650
X external – hydraulic end position in the main valve					
HC, HD, HK, HZ, HY	1100	1040	860	750	680

[1] If the specified flow values are exceeded, the function of the return spring is no longer guaranteed if the pilot pressure fails!

3-spool position valves – $q_{V\,max}$ in l/min					
Symbol	**Operating pressure p_{max} in bar**				
	70	**140**	**210**	**280**	**350**
X external – spring-centered					
E, J, L, M, Q, R, U, W	1100	1040	860	750	680
G, T, H, F, P	900	900	800	650	450
V	1100	1000	680	500	450
X external – pressure-centered (at minimum pilot pressure of 8.5 bar)					
all symbols	1100	1040	860	750	680

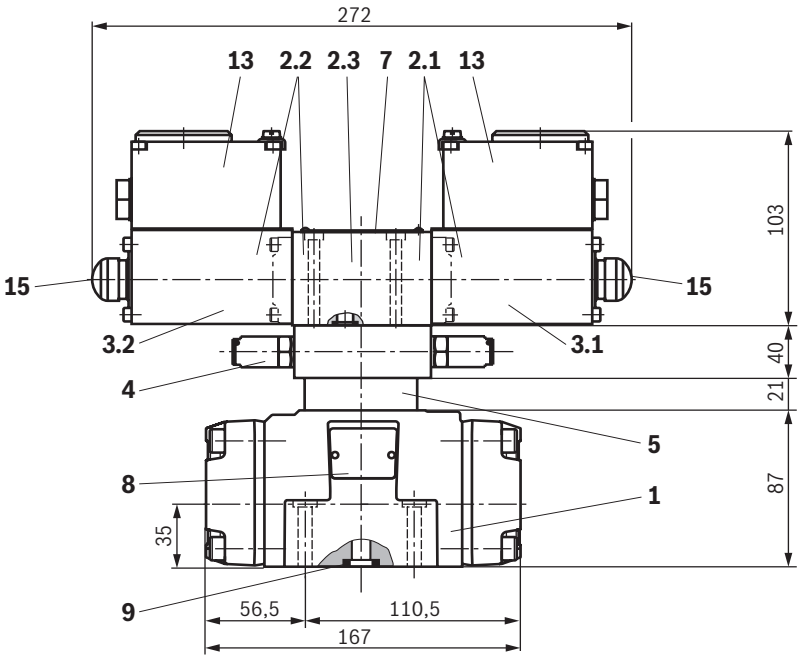
☞ **Important information see page 20.**

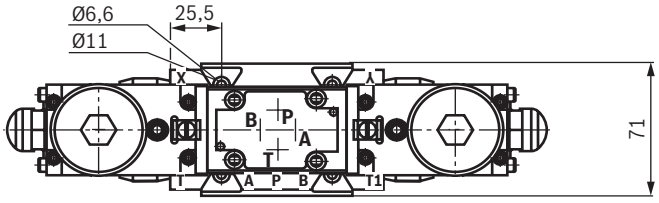
Performance limits: important information

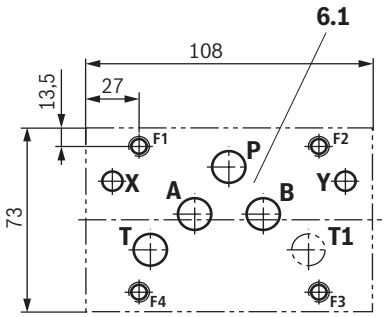
☞ **Notice** (valid for all sizes)**:**
The specified switching power limits apply to the use with two directions of flow (e. g. from P to A and simultaneous return flow from B to T at a ratio of 1:1). Due to the flow forces acting within the valves, the admissible switching power limit may be considerably lower with only one direction of flow (e. g. from P to A while port B is blocked, with flow in the same or in different directions)!
In such use cases, please consult us!
The switching power limit was established while the solenoids were at operating temperature, at 10% undervoltage, and without tank preloading.

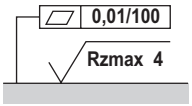
NG16	▶ With pilot oil supply **X internal**, a preload valve has to be used for flows < 160 l/min due to the negative overlap of the symbols C, Z and HC, HZ. ▶ With pilot oil supply **X internal**, sufficient flow needs to be ensured due to the negative overlap of symbols F, G, H, P, S and T (for determination of the required flow, see "Preload valve" characteristic curves (page 27). If the required flow is not reached, a preload valve has to be used (see page 11).
NG25	▶ With pilot oil supply **X internal,** a preload valve has to be used for flows < 180 l/min due to the negative overlap of symbols Z, HZ and V. ▶ Performance limits of the corresponding size. ▶ With pilot oil supply **X internal**, sufficient flow needs to be ensured due to the negative overlap of symbols C, HC, F, G, H, P and T (for determination of the required flow, see "Preload valve" characteristic curves (page 27). If the required flow is not reached, a preload valve has to be used (see page 11).
NG32	▶ With pilot oil supply **X internal,** a preload valve has to be used for flows < 180 l/min due to the negative overlap of symbols Z, HZ and V. ▶ With pilot oil supply **X internal**, sufficient flow needs to be ensured due to the negative overlap of symbols C, HC, F, G, H, P and T (for determination of the required flow, see "Preload valve" characteristic curves (page 27). If the required flow is not reached, a preload valve has to be used (see page 11).

Dimensions: NG10
(dimensions in mm)







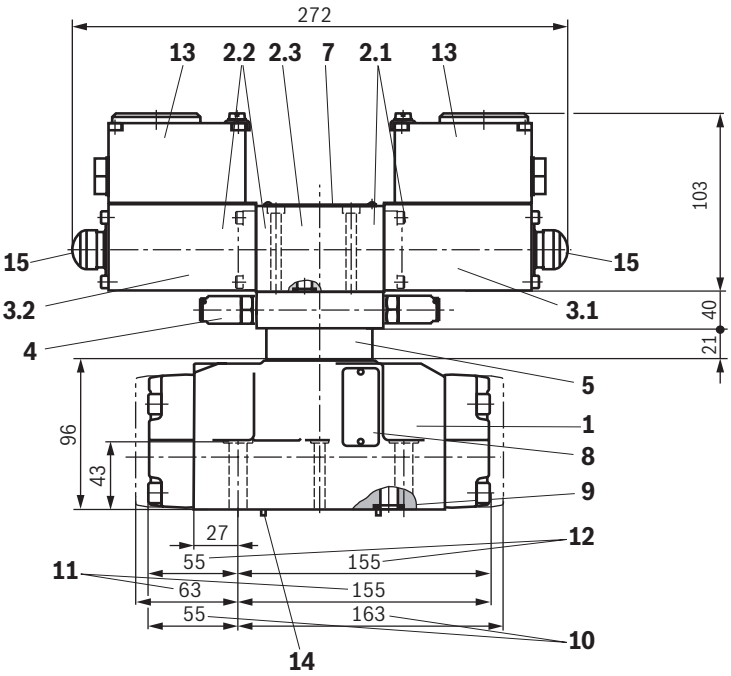


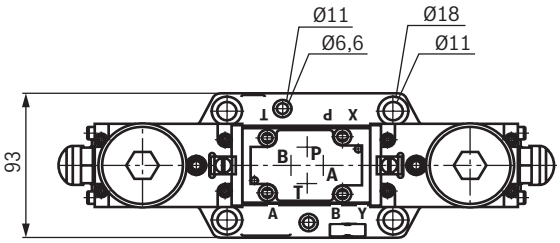
Required surface quality of the valve contact surface

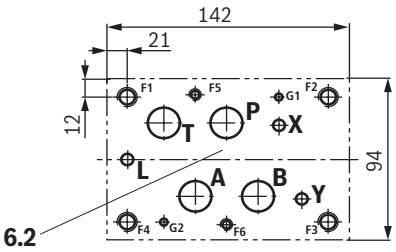
Item explanations, subplates, and valve mounting screws see page 25.

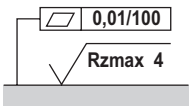
☞ **Notice:**
The dimensions are nominal dimensions which are subject to tolerances.

Dimensions: NG16
(dimensions in mm)







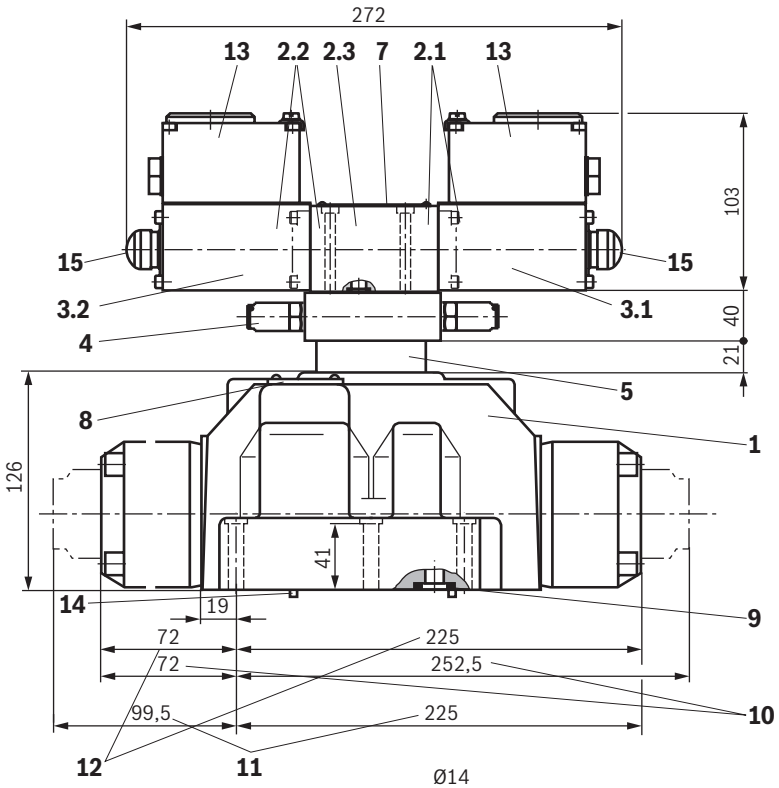


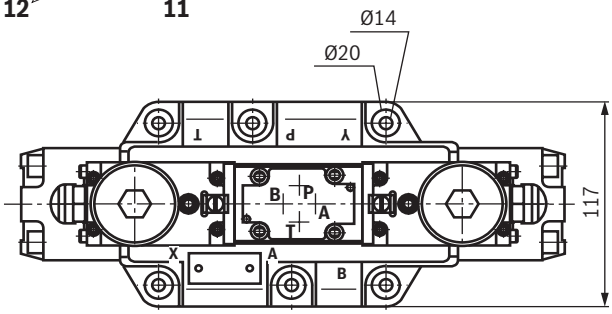
Required surface quality of the valve contact surface

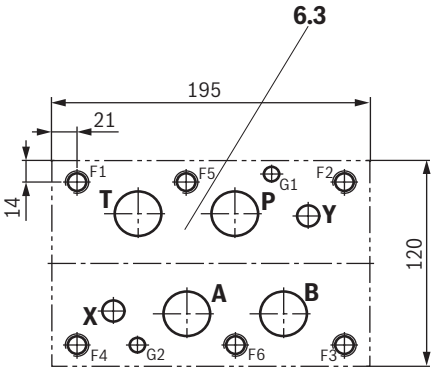
Item explanations, subplates, and valve mounting screws see page 25.

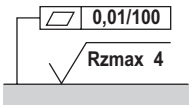
☞ **Notice:**
The dimensions are nominal dimensions which are subject to tolerances.

Dimensions: NG25
(dimensions in mm)







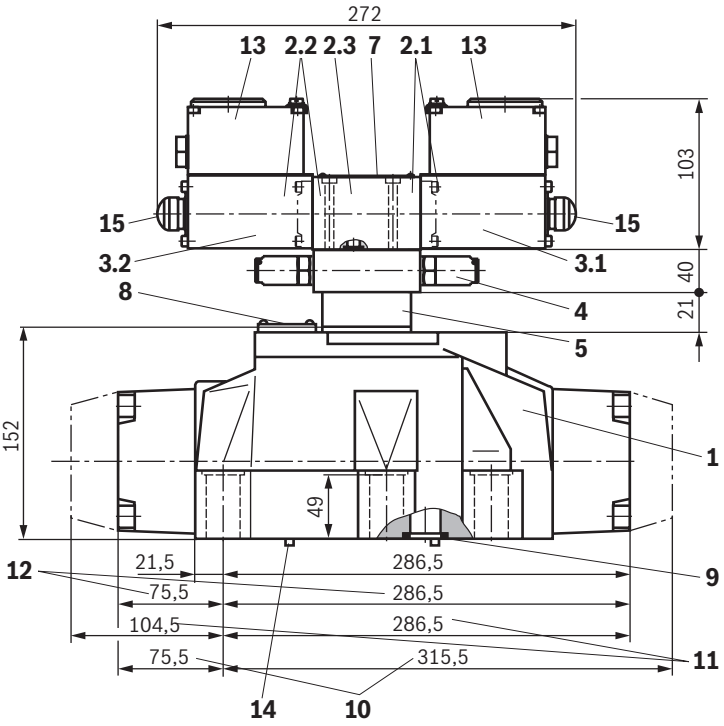


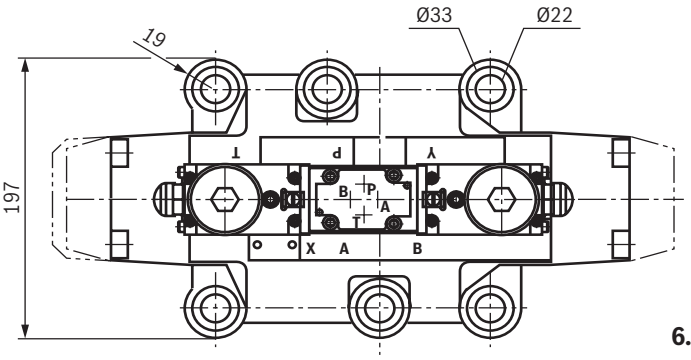
Required surface quality of the valve contact surface

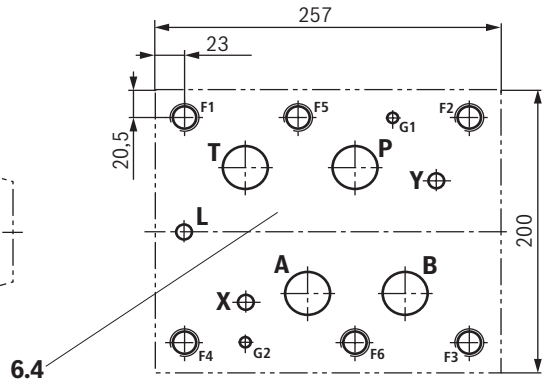
Item explanations, subplates, and valve mounting screws see page 25.

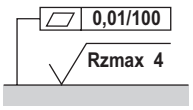
☞ **Notice:**
The dimensions are nominal dimensions which are subject to tolerances.

Dimensions: NG32
(dimensions in mm)









Required surface quality of the valve contact surface

Item explanations, subplates, and valve mounting screws see page 25.

☞ **Notice:**
The dimensions are nominal dimensions which are subject to tolerances.

Bosch Rexroth AG, RE 24751-VP1, edition: 2016-12

Dimensions

1 Main valve

2 Pilot control valve type 4WE 6 ...VP1... (data sheet 23178-VP1):

2.1
- ▶ Pilot control valve type 4WE 6 D...VP1... (1 solenoid) for main valve with symbols C, D, K, Z / symbols HC, HD, HK, HZ
- ▶ Pilot control valve type 4WE 6 JA...VP1... (1 solenoid "a") for main valves with symbols EA, FA, etc., spring return
- ▶ Pilot control valve type 4WE 6 MA...VP1... (1 solenoid "a") for main valves with symbols HEA, HFA, etc., hydraulic control spool return

2.2
- ▶ Pilot control valve type 4WE 6 Y...VP1... (1 solenoid) for main valve with symbol Y / symbol HY
- ▶ Pilot control valve type 4WE 6 JB...VP1... (1 solenoid "b") for main valves with symbols EB, FB, etc., spring return
- ▶ Pilot control valve type 4WE 6 MB...VP1... (1 solenoid "b") for main valves with symbols HEB, HFB, etc., hydraulic control spool return

2.3 ▶ Pilot control valve type 4WE 6 J...VP1... (2 solenoids) for main valve with 3 switching positions, spring-centered

3.1 Solenoid "a"

3.2 Solenoid "b"

4 Switching time adjustment (wrench size 6), optional

5 Pressure reducing valve, optional

6.1 Machined valve contact surface; porting pattern according to ISO 4401-05-05-0-05

6.2 Machined valve contact surface; porting pattern according to ISO 4401-07-07-0-05

6.3 Machined valve contact surface; porting pattern according to ISO 4401-08-08-0-05

6.4 Machined valve contact surface; porting pattern according to ISO 4401-10-09-0-05

7 Name plate pilot control valve

8 Name plate complete valve

9 Seal rings

10 2-spool position valves with spring end position in the main valve (symbols C, D, K, Z)

11 2-spool position valves with spring end position in the main valve (symbol Y)

12 3-spool position valves, spring-centered; 2-spool position valves with hydraulic end position in the main valve

13 Terminal box

14 Locking pin

15 Solenoid **with** manual override "N"

Subplates (separate order) with porting pattern according to ISO 4401 see data sheet 45100.

Valve mounting screws (separate order)
For reasons of stability, exclusively use the following valve mounting screws:

▶ NG10:
4 hexagon socket head cap screws, metric
ISO 4762 - M6 x 45 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 ... 0.14);
tightening torque M_A = 12.5 Nm ±10 %,
material no. **R913000258**

▶ NG16:
4 hexagon socket head cap screws, metric
ISO 4762 - M10 x 60 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 ... 0.14);
tightening torque M_A = 58 Nm ±10%,
material no. **R913000116**

2 hexagon socket head cap screws, metric
ISO 4762 - M6 x 60 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 ... 0.14);
tightening torque M_A = 12.5 Nm ±10%,
material no. **R913000115**

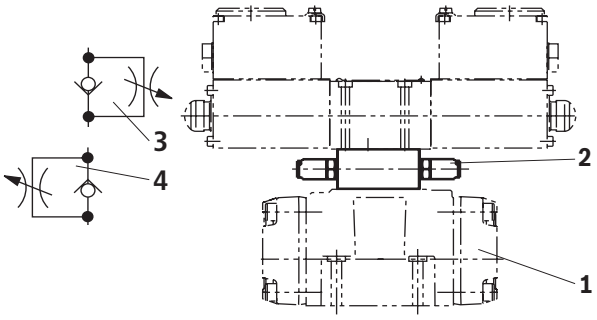
▶ NG25:
6 hexagon socket head cap screws, metric
ISO 4762 - M12 x 60 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 ... 0.14);
tightening torque M_A = 130 Nm ±10 %,
material no. **R913000121**

▶ NG32:
6 hexagon socket head cap screws, metric
ISO 4762 - M20 x 80 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 ... 0.14);
tightening torque M_A = 430 Nm ±10 %,
material no. **R901035246**

Switching time adjustment ("S" and "S2")

The switching time of the main valve (1) is influenced by using a throttle check valve (2) (type Z2FS 6; data sheet 27506).

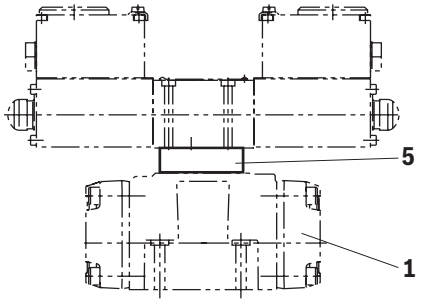
Symbol (3) shows the switching time adjustment "S" (supply control), symbol (4) shows the switching time adjustment "S2" (discharge control)



Type .WEH 10 ..4X/...S
Type .WEH 10 ..4X/...S2

Pressure reducing valve ("D3")

With the design internal pilot oil supply ("ET" or "E") or external pilot oil supply and a pilot pressure of more than 250 bar, the valve must be ordered with a direct operated pressure reducing valve (5) (type ZDR6P0) **and** a throttle insert "B10" (ordering code "B10..D3").

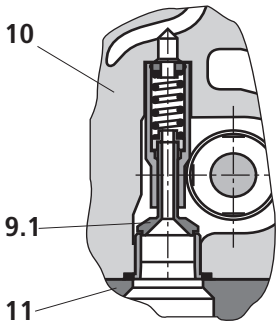


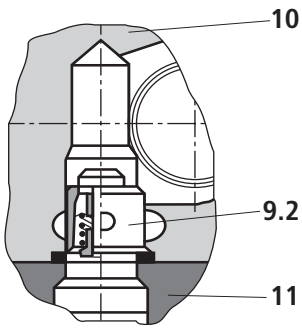
Type .WEH 10 ..4X...B10.D3

Preload valve (not for NG 10)

In case of valves with depressurized circulation and internal pilot oil supply, the installation of the preload valve (9) in channel P of the main valve is required in order to build up the minimum pilot pressure.

The pressure differential of the preload valve is to be added to the pressure differential of the main valve (see characteristic curves) to result in one total value.
The cracking pressure amounts to approx. 4.5 bar.



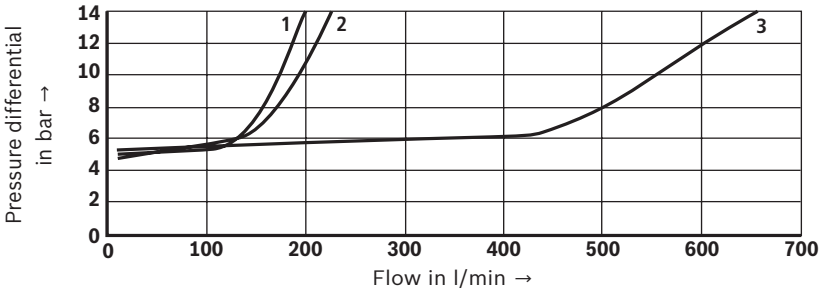


9.1 Preload valve
9.2 Preload valve
10 Main valve
11 Subplate

☞ **Notice:**
Series-production status, see ordering key on the name plate.

Size	Material number P4,5	
	Item 9.2	Item 9.1
16	R961009417 (up to component series 71)	R961009415 (from component series 72)
25	R961009416 (up to component series 67)	R961009166 (from component series 68)
32	R961009610 (up to component series 63)	–

***Δp–q*$_V$ characteristic curve** (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C)

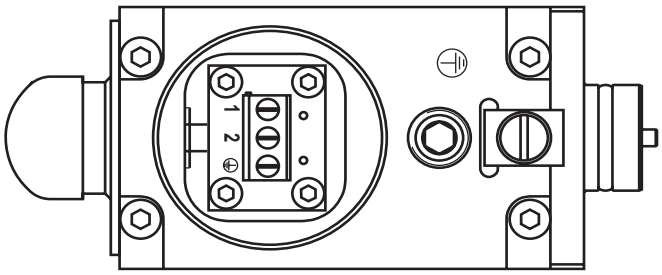


1 NG16
2 NG25
3 NG32

Electrical connection

The FM-tested valve solenoid of the valve is equipped with a connection compartment and an NPT connection thread (NPT 1/2") for pipelines.
The connection is polarity-independent.

Notice:
When establishing the electrical connection, the protective earthing conductor (PE ⏚) has to be connected properly.

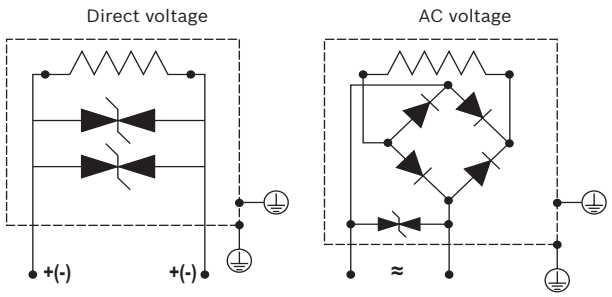


Connectable operating voltage conductors and protective earthing conductors

Function	Maximum connectable line cross-section
Terminal area, rated connection (min. 0.13 mm²)	2.5 mm²
Conductor connection cross-section AWG (min. AWG 26)	AWG 14
Single-wire, min. H05(07) V-U 0.13 mm²	2.5 mm²
Finely stranded, min. H05(07) V-K 0.13 mm²	2.5 mm²
Wire end ferrule with collar DIN 46 228/4 (min. 0.25 mm²)	1.5 mm²
Wire end ferrule according to DIN 46 228/1 (min. 0.25 mm²)	1.5 mm²

Connection line		
Line type		**Non-armored** cables and lines (outer sheath sealing)
Temperature range	°C	–20 ... > +110

Circuit diagram



Over-current fuse and switch-off voltage peaks

Voltage data in the valve type code	Nominal voltage valve solenoid	Rated current valve solenoid	Recommended pre-fuse characteristic: medium time-lag according to DIN 41571	Maximum voltage value when switching off	Rated current	Interference protection circuit
G24	24 V DC	0.899 A DC	100 mA	–36 V	1.65 A	Suppressor diode bi-directional
W120R	120 V AC	0.221 A AC	200 mA	–	0.384 A	Bridge rectifier 1000 V

☞ **Notice:**
Corresponding to the rated current, a fuse according to DIN 41571 and EN / IEC 60127 has to be connected upstream of every valve solenoid (max. 3 x I_G).
The shut-off threshold of the fuse has to match the prospective short-circuit current of the supply source.
The prospective short-circuit current of the supply source may amount to a maximum of 1500 A.

This fuse may only be installed outside the potentially explosive area or must be of an explosion-proof design.
When inductivities are switched off, voltage peaks result which may cause faults in the connected control electronics.
The voltage peak must be damped by a suitable external circuitry.
We recommend a circuitry with a suppressor diode with a limitation voltage of approx. 50 V.

Further information

▶ Directional spool valve	Data sheet 23178-VP1
▶ Subplates	Data sheet 45100
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ Environmentally compatible hydraulic fluids	Data sheet 90221
▶ Flame-resistant, water-free hydraulic fluids	Data sheet 90222
▶ Flame-resistant hydraulic fluids - containing water (HFAE, HFAS, HFB, HFC)	Data sheet 90223
▶ Directional spool valves, pilot-operated, with electro-hydraulic actuation	Operating instructions 24751-VP1-B
▶ Directional spool valves, direct operated, with solenoid actuation	Operating instructions 23178-VP1-B
▶ Use of non-electrical hydraulic components in an explosive environment (ATEX)	Data sheet 07011
▶ Selection of the filters	
▶ Information on available spare parts	