

# Directional spool valves, direct operated, with mechanical or manual actuation

Type WMR, WMRZ, WMU, WMM and WMD(A)

**RE 22280**

Edition: 2013-06

Replaces: 04.10



- ▶ Size 6
- ▶ Component series 5X; 6X
- ▶ Maximum operating pressure 315 [4569 psi]
- ▶ Maximum flow 60 l/min [15.8 US gpm]

## Features

- ▶ 4/3, 4/2 or 3/2 directional design
- ▶ Porting pattern according to DIN 24340 form A (**without** locating hole)
- ▶ Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole)
- ▶ Types of actuation:
  - Roller plunger
  - Hand lever
  - Rotary knob
- ▶ Inductive position switches and proximity sensors (contactless)

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**Ordering code**

01	02	03	04	05	06	07	08	09	10	11	12	13
		6		/			/					*

01	3 main ports	3
	4 main ports	4

**Type of actuation**

02	Roller plunger (see page 12)	WMR
	Roller plunger (see page 12)	WMRZ
	Roller plunger (see page 12)	WMU
	Hand lever	WMM
	Rotary knob	WMD
	Lockable rotary knob <sup>1)</sup>	WMDA
03	Size 6	6
04	Symbols e.g. C, E, EA, EB, etc; possible version see pages 4 and 5	
05	Component series 50 to 59 (50 to 59: Unchanged installation and connection dimensions)	5X
	Component series 60 to 69 (60 to 69: Unchanged installation and connection dimensions) (only version "WMRZ")	6X
06	<b>With</b> spring return (version "WMR", "WMRZ", "WMU", "WMM")	no code
	<b>Without</b> spring return with detent (version "WMM", "WMD", "WMDA")	F


**Corrosion protection**

07	Standard corrosion protection	no code
	Improved corrosion protection <sup>2)</sup>	J

**Spool position monitoring <sup>3)</sup>**

08	<b>Without</b> position switch	no code
	<b>- Inductive position switch type QM</b>	
	Monitored spool position "a"	QMAG24
	Monitored spool position "b"	QMBG24
	Monitored rest position	QM0G24
	For more information see data sheet 24830	

- 1) Key with material no. **R900006980** for series 50 to 52 and **R900008158** from series 53 is included in the scope of delivery.
- 2) The external parts made of metal are galvanized, treated with an anti-corrosion agent or made of stainless steel. This design is also suitable for on-wall applications.
- 3) Only for valves with 2 spool positions such as versions "WMR", "WMU" and "WMM"; not for version "J"
- 4) Use if volume flow > performance limit of the valve, effective in channel P.
- 5) Locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order

 **Notice!** Preferred types and standard units are contained in the EPS (standard price list).

**Ordering code**

01	02	03	04	05	06	07	08	09	10	11	12	13
		<b>6</b>			/			/				*

09	<b>Without</b> throttle insert	<b>no code</b>
	Throttle Ø 0.8 mm [0.0315 inch]	<b>B08</b> <sup>4)</sup>
	Throttle Ø 1.0 mm [0.0394 inch]	<b>B10</b> <sup>4)</sup>
	Throttle Ø 1.2 mm [0.0472 inch]	<b>B12</b> <sup>4)</sup>

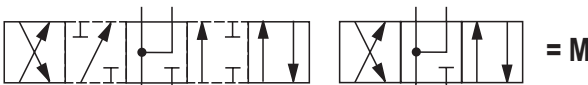
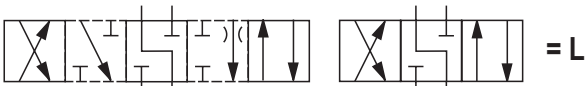
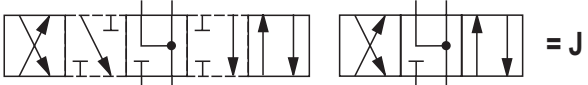
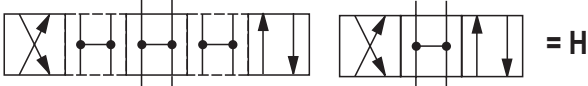
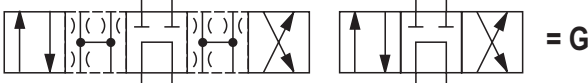
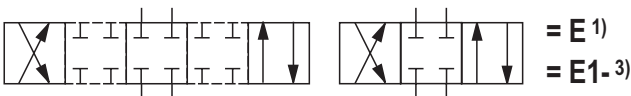
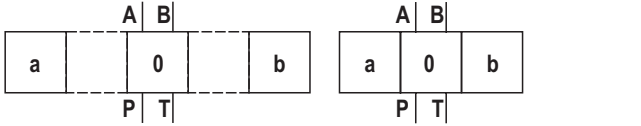
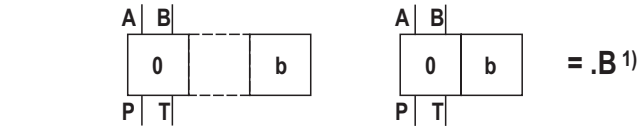
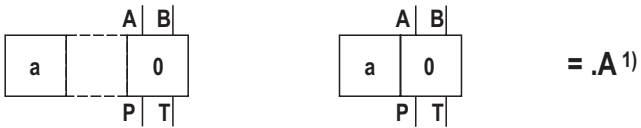
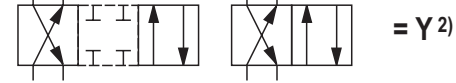
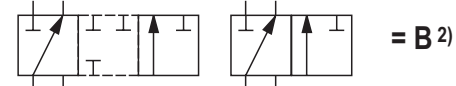
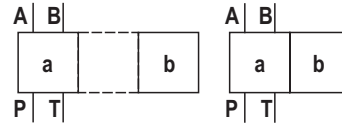
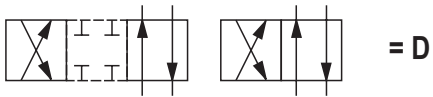
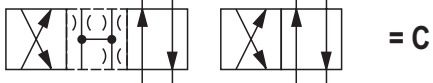
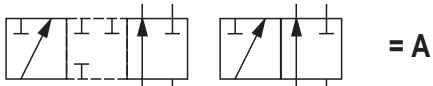
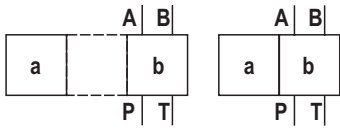
**Clamping length**

10	42 mm [1.65 inch] (standard)	<b>no code</b>
	22 mm [0.87 inch] (only version "WMRZ")	<b>Z</b>

**Seal material**

11	NBR seals	<b>no code</b>
	FKM seals	<b>V</b>
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	
12	<b>Without</b> locating hole	<b>no code</b>
	<b>With</b> locating hole	<b>/60</b> <sup>5)</sup>
	<b>With</b> locating hole and locking pin ISO 8752-3x8-St	<b>/62</b>
13	Further details in the plain text	

Symbols



1) Example:

Symbol E with spool position "a" → ordering code **.EA..**

Symbol E with spool position "a" → ordering code **.EB..**

2) Only version "WMR", "WMU" and "WMM"

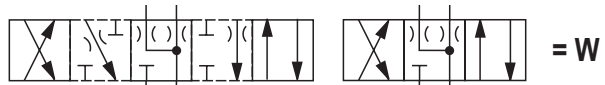
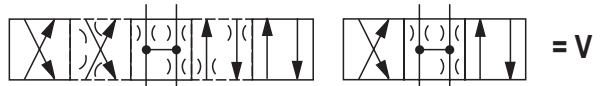
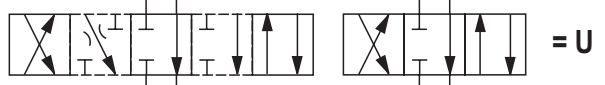
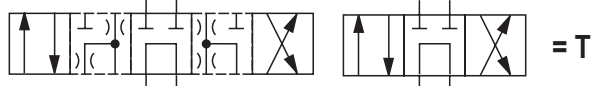
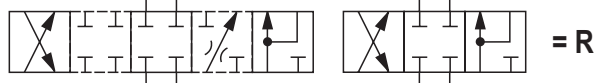
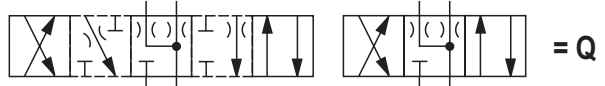
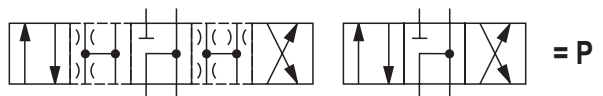
3) Symbol E1: P → A/B pre-opening

**Caution in conjunction with differential cylinders due to pressure intensification!**

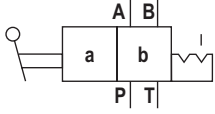
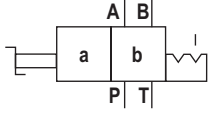
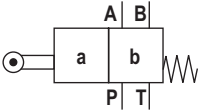
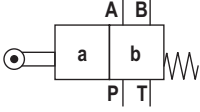
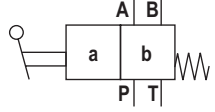
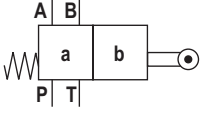
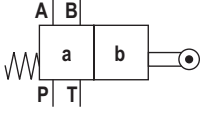
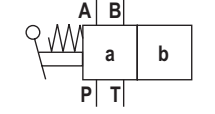
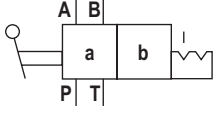
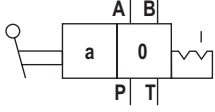
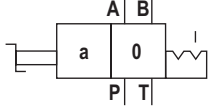
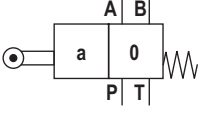
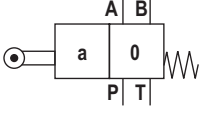
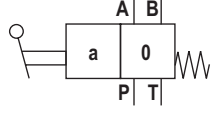
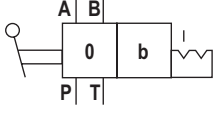
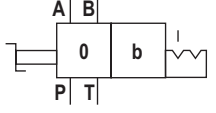
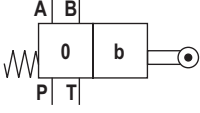
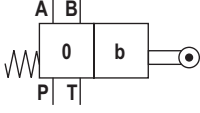
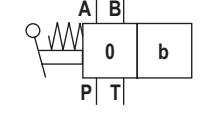
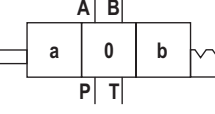
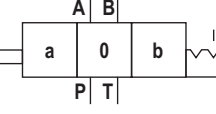

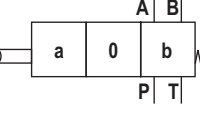
Notice!

Representation according to DIN ISO 1219-1.

Hydraulic interim positions are shown by dashes.



## Types of actuation

Symbol	Ordering code		Type of actuation			
	Actuating side	Detent	Roller plunger "WMRZ" <sup>2)</sup>	Roller plunger "WMR", "WMU"	Hand lever "WMM"	Rotary knob "WMD", "WMDA"
A, C, D		../F..				
						
B, Y						
		../F..				
E1-, E, F, G, H, J, L M, P, Q, R, T, U, V, W	"a" <sup>1)</sup> = .A	../F..				
						
	"b" <sup>1)</sup> = .B	../F..				
						
	../F..					
						
						

<sup>1)</sup> See symbols on page 4

<sup>2)</sup> Only for valves with 2 spool positions

## Function, section

Type WM.. valves are mechanical, manually actuated directional spool valves. They control the start, stop and direction of a flow.

Directional valves basically consist of housing (1), one type of actuation (2) (roller plunger, hand lever, rotary knob), control spool (3), and one or two return springs (4).

In de-energized state, the return springs (4) maintain the control spool (3) in central or starting position - if the rotary knob is actuated with a detent.

The control spool (3) is moved to the desired spool position by means of the type of actuation (2).

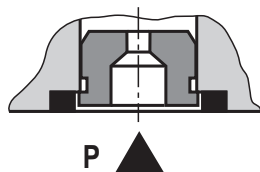
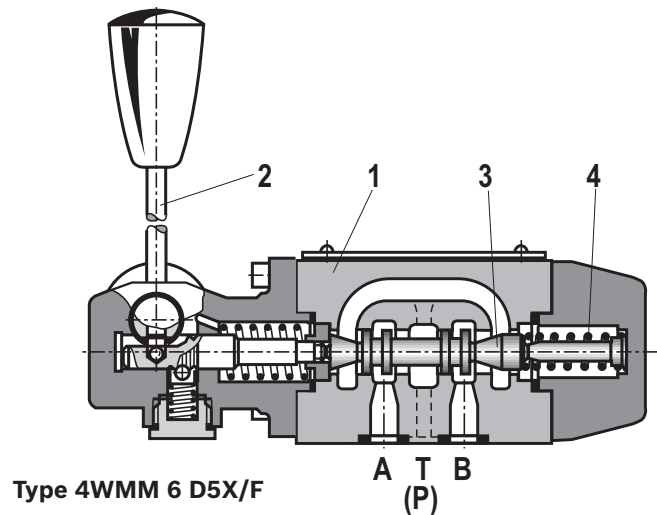
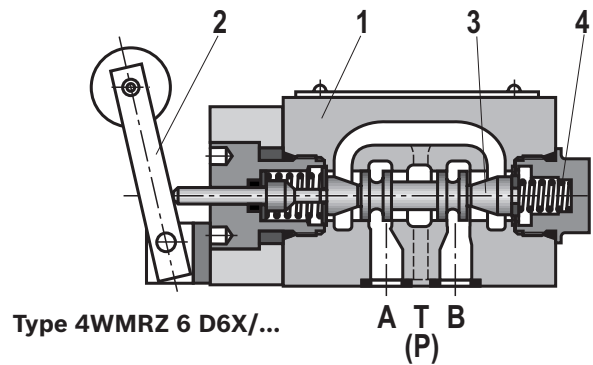
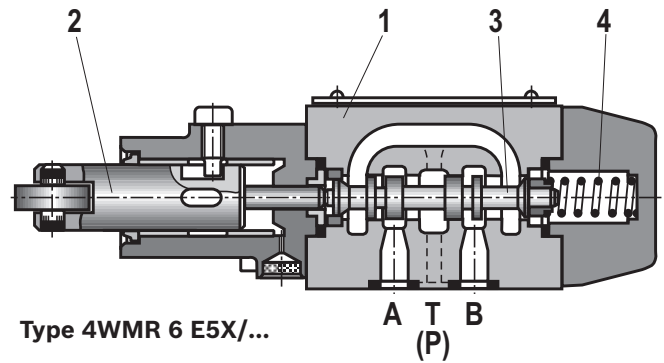
### Detent

Directional valves with rotary knob are generally designed with detent. Directional valves with hand lever are optionally available as 2 or 3 position valves with detent. Directional valves with roller plunger are generally designed without detent. If types of actuation with detent are used, each spool position can be locked, depending on the valve type.

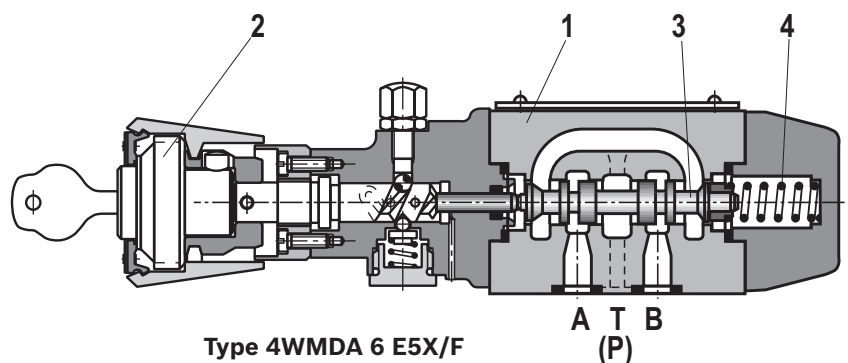
### Throttle insert

The use of a throttle insert is required when due to prevailing operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.

It is inserted in channel P of the directional valve.



Type 4WM. 6 ..5X/..B..



**Technical data**

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

general		
Weight	kg [lbs]	Approx. 1.4 [3.1]
Installation position		Any
Ambient temperature range	°C [°F]	-20 ... +80 [-4... +176] (NBR seals) -20 ... +80 [-4... +176] (FKM seals)

hydraulic			
Maximum operating pressure	- Port A, B, P	bar [psi]	315 [4569]
	- Port T:		With symbols A or B, port T must be used as leakage oil connection if the operating pressure exceeds the permissible tank pressure.
	"WMM", "WMD", "WMDA"	bar [psi]	
	"WMR", "WMRZ", "WMU"	bar [psi]	60 [900]
Maximum flow		l/min [US gpm]	60 [15.8]
Flow cross-section (spool position 0)	- Symbol Q	mm <sup>2</sup>	Approx. 6% of nominal cross-section
	- Symbol W	mm <sup>2</sup>	Approx. 3% of nominal cross-section
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C [°F]	-30 ... +80 [-22... +176] (NBR seals)
			-20 ... +80 [-4... +176] (FKM seals)
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
Mineral oils	HL, HLP, HLPD, HVLP, HVLDP	NBR, FKM	DIN 51524
Bio-degradable	- insoluble in water	HETG	NBR, FKM
		HEES	FKM
	- soluble in water	HEPG	FKM
	- water-free	HFDU, HFDR	FKM
Flame-resistant	- containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR, HNBR
			ISO 12922

**Important information on hydraulic fluids!**

- ▶ For more information and data on the use of other hydraulic fluids 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 solenoid surface temperature.

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

- Maximum pressure difference 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%

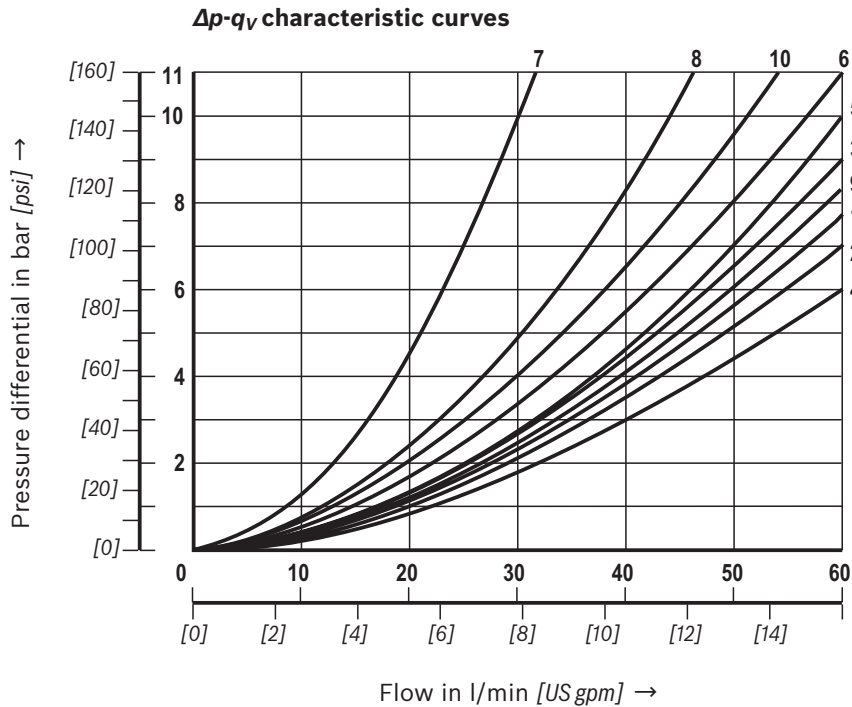
### Actuating force/torque

			Design					
			"WMR", "WMU"			"WMM"	"WMD"	"WMRZ"
Operating pressure	- Port A, B, P	bar [psi]	100 [1450]	200 [2900]	315 [4600]			315 [4600]
Actuating force at the roller plunger	- Without tank pressure	N [lbs]	100 [22.5]	112 [25.2]	121 [27.2]			30 [6.7]
	- With tank pressure	N [lbs]	184 [41.4]	196 [44.1]	205 [46.1]			160 [36]
	(Tank pressure $p_T$ max)	bar [psi]	60 bar [900 psi] - corresponds to 1.4 N [0.022 lbs] per bar [psi] of tank pressure					210 [47.2]
Maximum actuating torque		Ncm [lb-in]				-	150 [13.3]	
Actuating force	- Without tank pressure, with/without detent	N [lbs]				20 [4.5]	-	
	- At a tank pressure of 150 bar [2175 psi]	N [lbs]				30 [6.7]	-	

Calculation formula for the actuating force ( $F_R$ ) at the roller plunger in case of tank pressure:  $F_R = F_{\text{without tank pressure}} + p_T \times 1.4 \text{ N/bar}$

### Characteristic curves

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



Symbols	Direction of flow			
	P-A	P-B	A-T	B-T
A	3	3	-	-
B	3	3	-	-
C	1	1	3	1
D	5	5	3	3
E	3	3	1	1
F	1	3	1	1
G	6	6	9	9
H	2	4	2	2
J	1	1	2	1
L	3	3	4	9
M	2	4	3	3
P	3	1	1	1
Q	1	1	2	1
R	5	5	4	-
T	10	10	9	9
U	3	3	9	4
V	1	2	1	1
W	1	1	2	2
Y	5	5	3	3

7 Symbol "R" in spool position "b" (A → B)

8 Symbols "G" and "T" in central position (P → T)



**Performance limits**

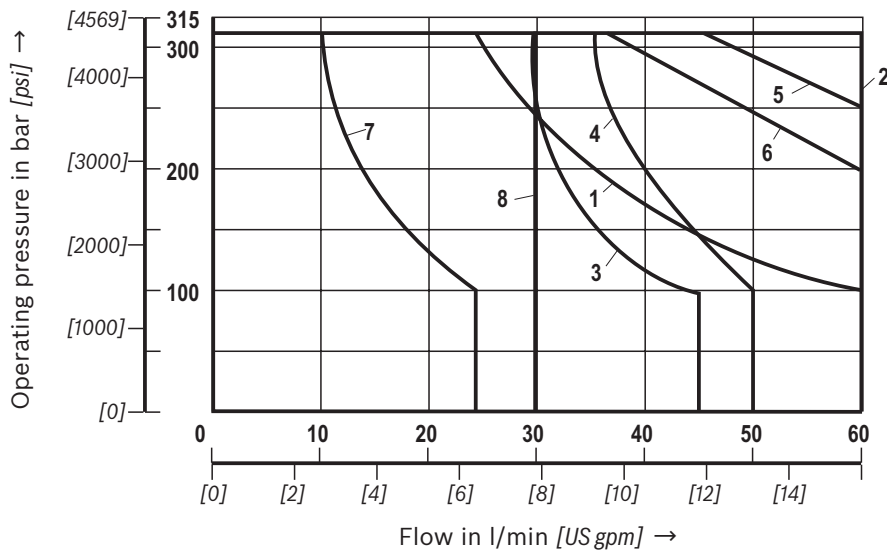
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$  [ $104 \pm 9 \text{ }^\circ\text{F}$ ])

**Notice!**

The specified switching power limits are valid for operation with two directions of flow (e.g. from P to A and simultaneous return flow from B to T).

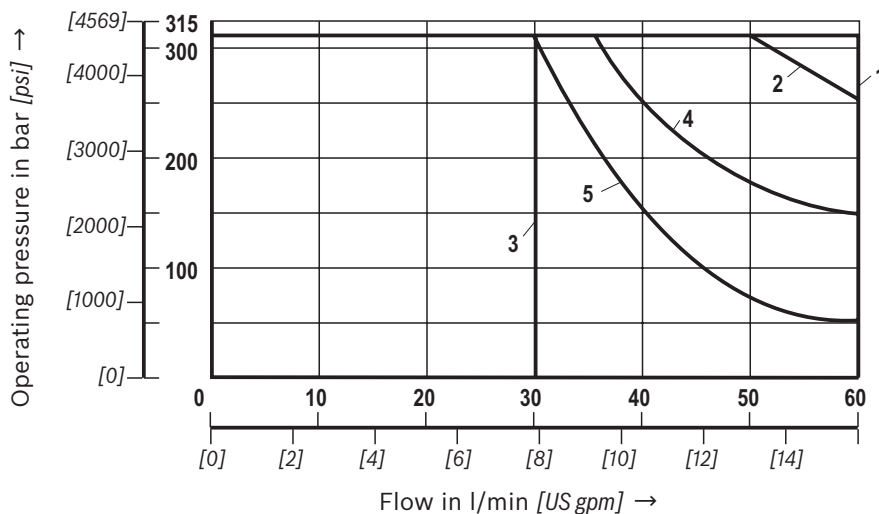
Due to the flow forces acting within the valves, the permissible switching power limit may be considerably lower with only one direction of flow (e.g. from P to A while port B is blocked)!  
In such cases, please consult us!

**Version "WMR", "WMRZ", "WMU"**



Characteristic curve	Symbol
1	A, B
2	C, D, Y, E, E1-, H, M, Q, U, W
3	F, P
4	G
5	J, L
6	R
8	V
7	T

**Version "WMM" - spring return**

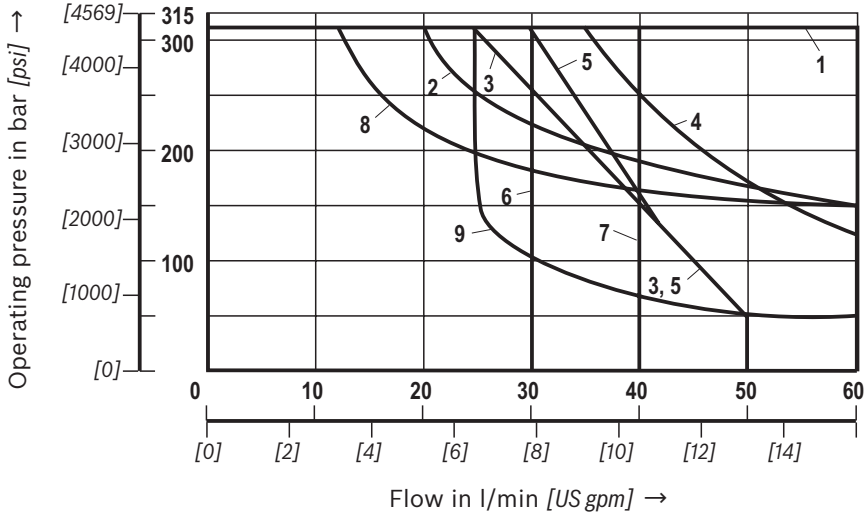


Characteristic curve	Symbol
1	E, E1-, M, J, L, Q, U, W, C, D, Y, G, H, R
2	A, B
3	V
4	F, P
5	T

**Performance limits**

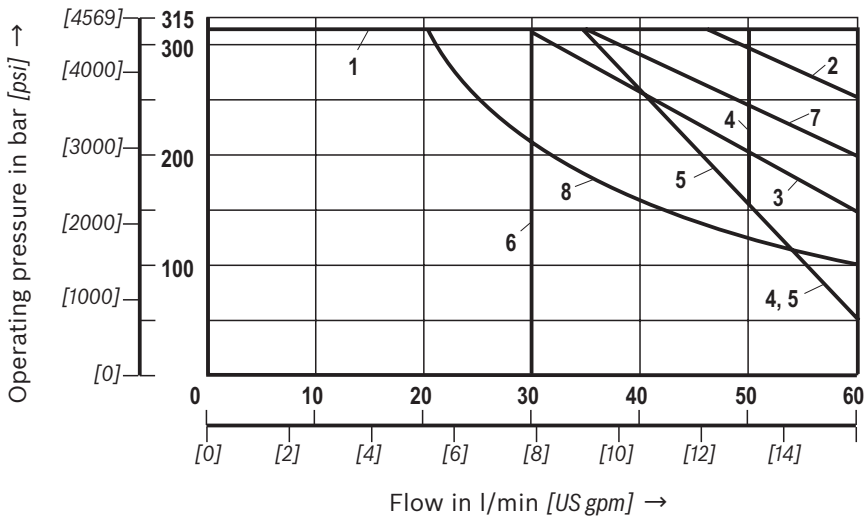
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$  [104 ± 9 °F])

**Version "WMM" - with detent**



Characteristic curve	Symbol
1	E1-, M, H, C, D, Y
2	E, J, Q, L, U, W
3	A, B
4	G, T
5	F
6	V
7	P
8	R
9	T

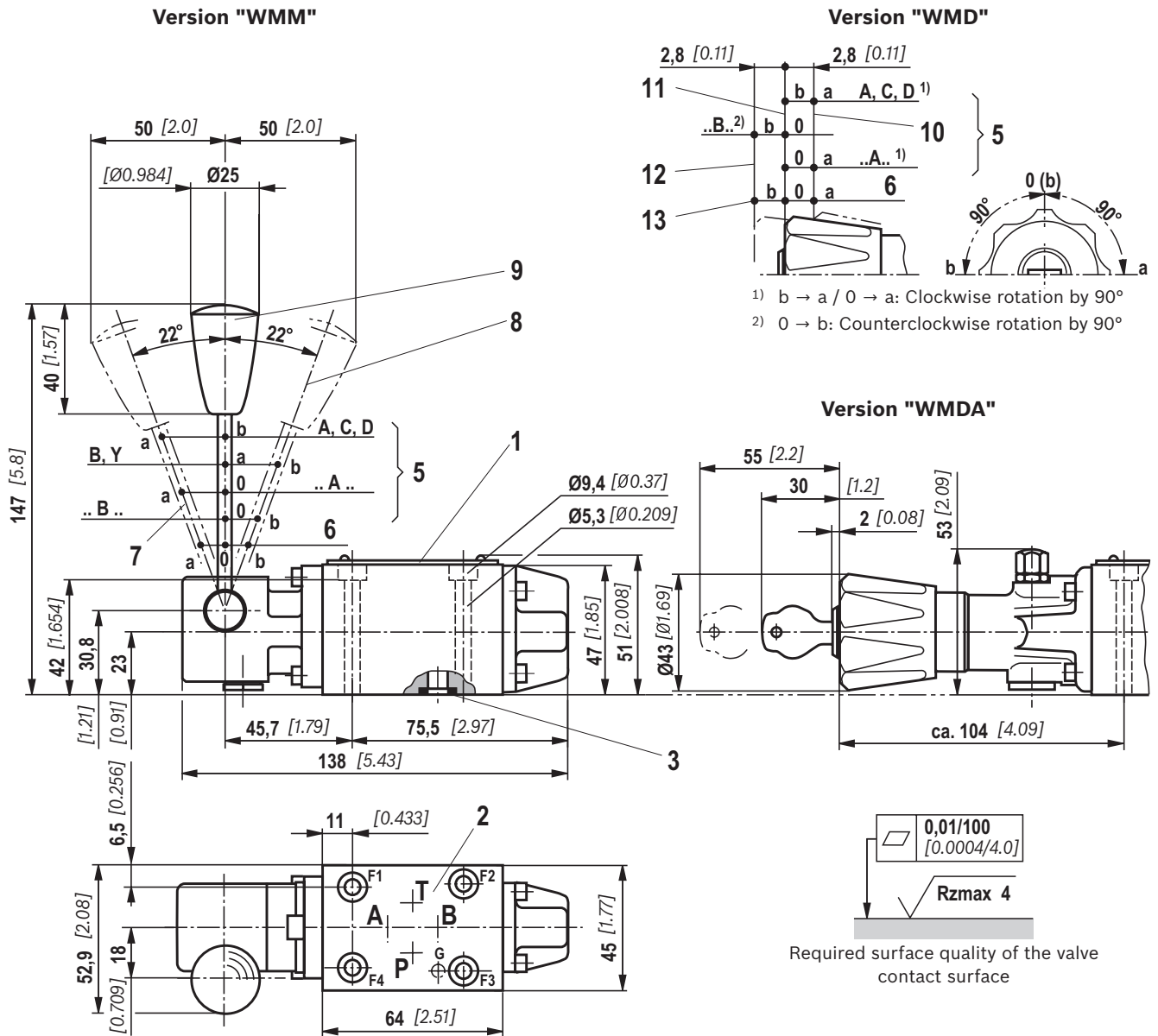
**Version "WMD", "WMDA"**



Characteristic curve	Symbol
1	E, E1-, M, H, C, D, Y, Q, U, W
2	J, L
3	A, B
4	G, P
5	F
6	V
7	R
8	T

## Dimensions

(dimensions in mm [inch])



- 1 Name plate
- 2 Porting pattern according to DIN 24340 form A (**without** locating hole), ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order)
- 3 Identical seal rings for ports A, B, P and T
- 5 Valve with 2 spool positions
- 6 Valve with 3 spool positions

### Version "WMM"

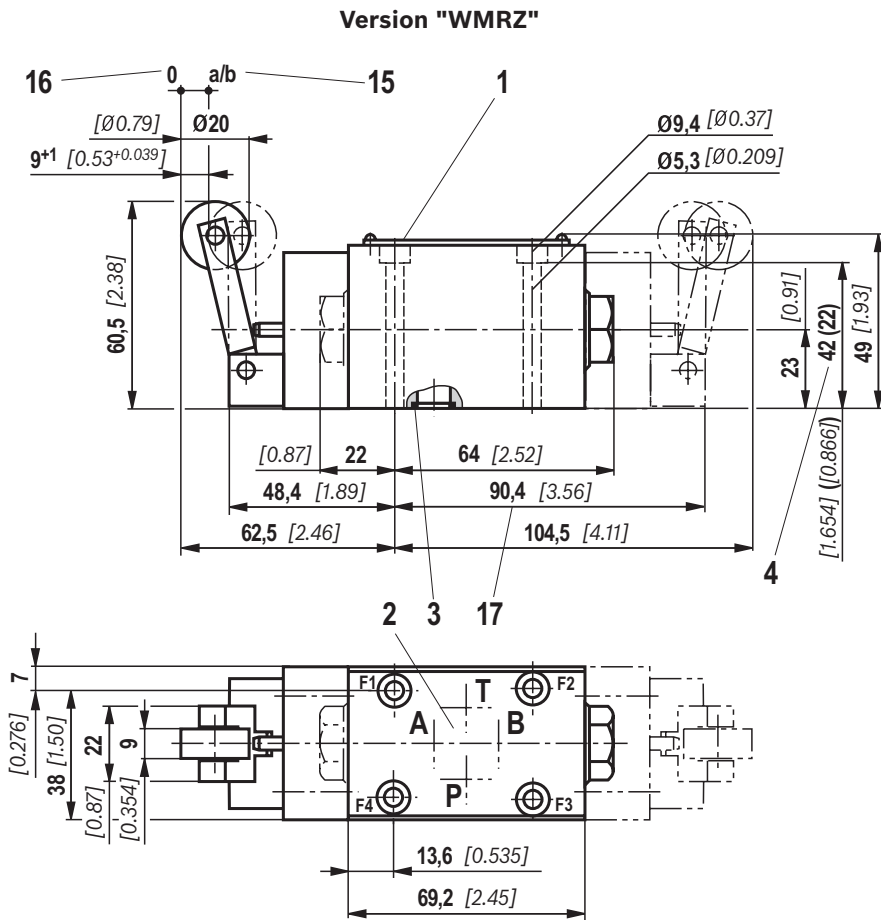
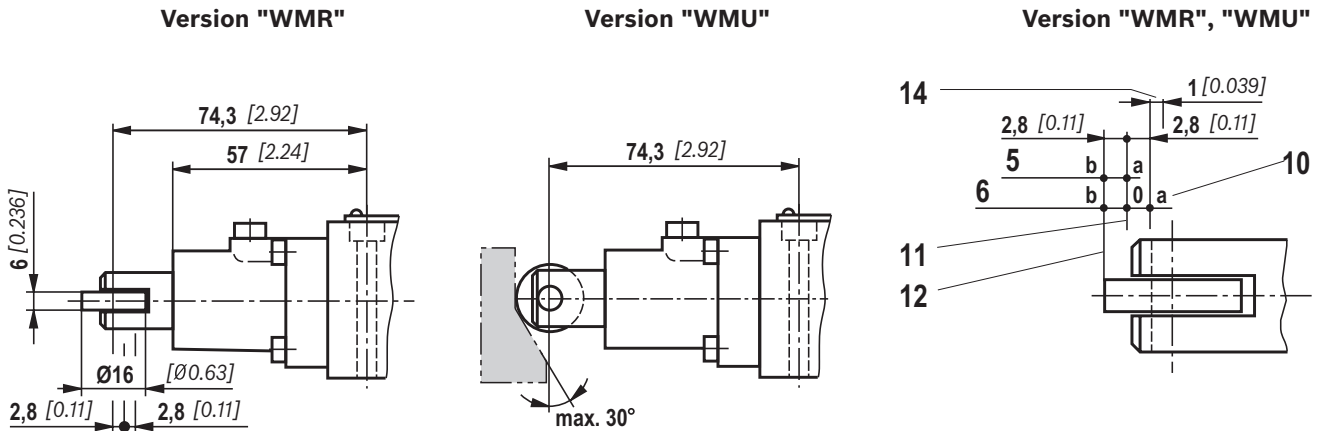
- 7 Spool position "a"
- 8 Spool position "b"
- 9 Spool position "0", "a" and "b" (a and b for valves with 2 spool positions)

### Version "WMD", "WMDA"

- 10 Spool position "a"
- 11 Spool position "0" and "b" (b for valves with 2 spool positions)
- 12 Spool position "b"
- 13 Switching angle 90° right and 90° left (for valves with 3 spool positions)

**Dimensions**

(dimensions in mm [inch])



- 1 Name plate
- 2 Porting pattern according to DIN 24340 form A (**without** locating hole), ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order)
- 3 Identical seal rings for ports A, B, P and T
- 4 Alternative clamping length ( ): 22 mm (only version "WMRZ")

**Version "WMR", "WMRZ", "WMU"**

- 5 Valve with 2 spool positions
- 6 Valve with 3 spool positions
- 10 Spool position "a"
- 11 Spool position "0" and "b" (b for valves with 2 spool positions)
- 12 Spool position "b"
- 14 Excessive stroke, cannot be used as working stroke
- 15 Spool position "a" or "b"
- 16 Spool position "0"
- 17 Actuation on side B (depending on the piston)

**Subplates and valve mounting screws**

see page 13.

## Dimensions

**Subplates** according to data sheet 45052 (separate order)  
(without locating hole)

G 341/01 (G1/4)  
G 342/01 (G3/8)  
G 502/01 (G1/2)

(with locating hole)

G 341/60 (G1/4)  
G 342/60 (G3/8)  
G 502/60 (G1/2)  
G 341/12 (SAE-6)<sup>1)</sup>  
G 342/12 (SAE-8)<sup>1)</sup>  
G 502/12 (SAE-10)<sup>1)</sup>

<sup>1)</sup> Upon request

**Valve mounting screws** (separate order)

► Clamping length 42 mm:

**4 metric hexagon socket head cap screws**

**ISO 4762 - M5 x 50 - 10.9-flZn-240h-L**

(friction coefficient  $\mu_{ges} = 0.09$  to  $0.14$ );  
tightening torque  $M_A = 7 \text{ Nm}$  [ $5.2 \text{ ft-lbs}$ ]  $\pm 10\%$ ,  
material no. **R913000064**

or

**4 hexagon socket head cap screws**

**ISO 4762 - M5 x 50 - 10.9** (not part of Rexroth delivery range)

(friction coefficient  $\mu_{total} = 0.12$  to  $0.17$ );  
tightening torque  $M_A = 8.1 \text{ Nm}$  [ $6 \text{ ft-lbs}$ ]  $\pm 10\%$

**4 hexagon socket head cap screws UNC**

**10-24 UNC x 2" ASTM-A574**

(friction coefficient  $\mu_{total} = 0.19$  to  $0.24$ );  
tightening torque  $M_A = 11 \text{ Nm}$  [ $8.2 \text{ ft-lbs}$ ]  $\pm 15\%$ ,  
(friction coefficient  $\mu_{total} = 0.12$  to  $0.17$ );  
tightening torque  $M_A = 8 \text{ Nm}$  [ $5.9 \text{ ft-lbs}$ ]  $\pm 10\%$ ,  
material no. **R978800693**

► Clamping length 22 mm:

**4 metric hexagon socket head cap screws**

**ISO 4762 - M5 x 30 - 10.9-flZn-240h-L**

(friction coefficient  $\mu_{total} = 0.09$  to  $0.14$ );  
tightening torque  $M_A = 7 \text{ Nm}$  [ $5.2 \text{ ft-lbs}$ ]  $\pm 10\%$ ,  
material no. **R913000316**

or

**4 hexagon socket head cap screws**

**ISO 4762 - M5 x 30 - 10.9** (not part of Rexroth delivery range)

(friction coefficient  $\mu_{total} = 0.12$  to  $0.17$ );  
tightening torque  $M_A = 8.1 \text{ Nm}$  [ $6 \text{ ft-lbs}$ ]  $\pm 10\%$

**4 hexagon socket head cap screws UNC**

**10-24 UNC x 1 1/4"**

(friction coefficient  $\mu_{total} = 0.19$  to  $0.24$ );  
tightening torque  $M_A = 11 \text{ Nm}$  [ $8.2 \text{ ft-lbs}$ ]  $\pm 15\%$ ,  
(friction coefficient  $\mu_{total} = 0.12$  to  $0.17$ );  
tightening torque  $M_A = 8 \text{ Nm}$  [ $5.9 \text{ ft-lbs}$ ]  $\pm 10\%$ ,  
material no. **R978802879**