

The Drive & Control Company

Rexroth
Bosch Group

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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RE 22280, edition: 2013-06, **Bosch Rexroth AG**

Knowledge is POWER – Motion Force Control is our Business

HYQUIP Limited New Brunswick Street Horwich Bolton Lancashire BL6 7JB UK

2/14 **WMR, WMRZ, WMU, WMM, WMD(A)** | Directional spool valve

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 ¹⁾	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	With spring return (version "WMR", "WMRZ", "WMU", "WMM")	no code
	Without spring return with detent (version "WMM", "WMD", "WMDA")	F


Corrosion protection

07	Standard corrosion protection	no code
	Improved corrosion protection ²⁾	J

Spool position monitoring ³⁾

08	Without position switch	no code
	– Inductive position switch type QM	
	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
		6			/			/				*

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

Clamping length

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

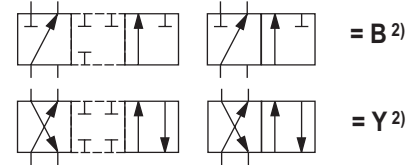
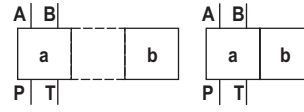
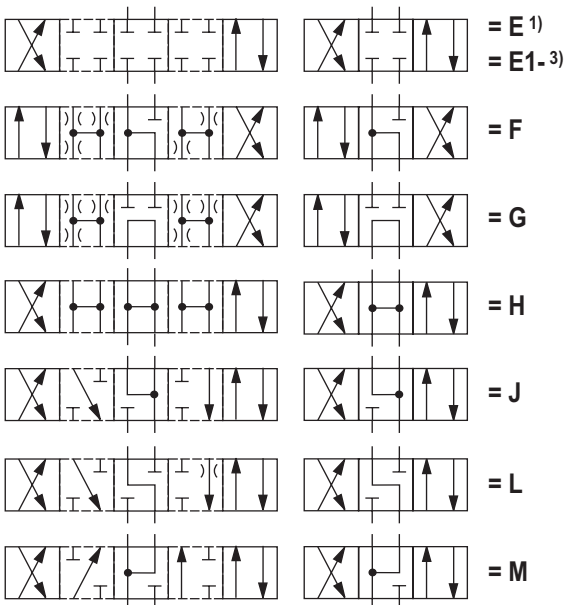
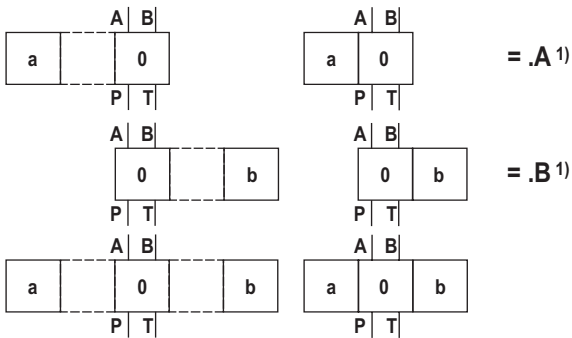
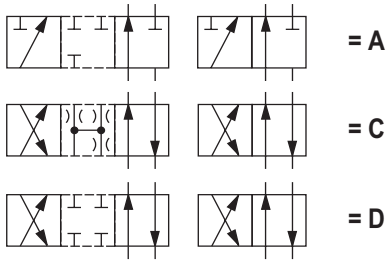
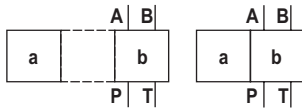
Seal material

11	NBR seals	no code
	FKM seals	V
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	

12	Without locating hole	no code
	With locating hole	/60 ⁵⁾
	With locating hole and locking pin ISO 8752-3x8-St	/62

13	Further details in the plain text	
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Symbols



1) Example:

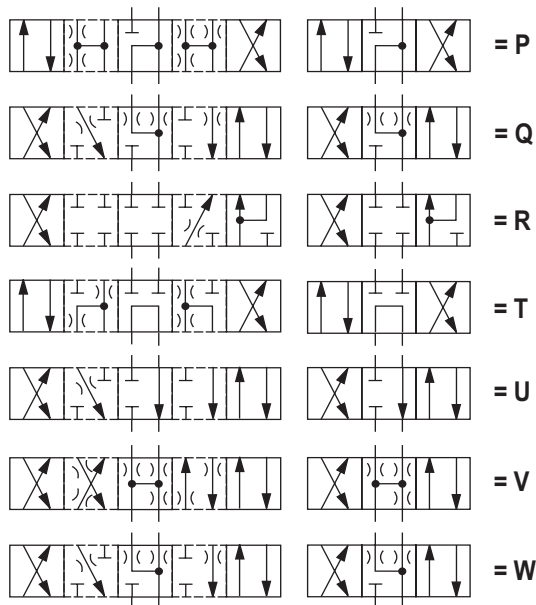
Symbol E with spool position "a" → ordering code ..EA..
Symbol E with spool position "a" → ordering code ..EB..

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

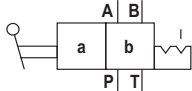

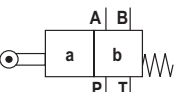
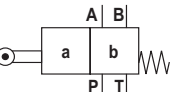
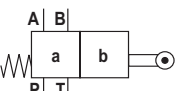
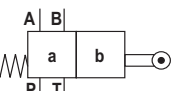
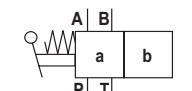
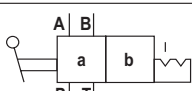
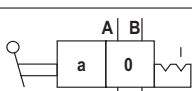
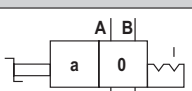
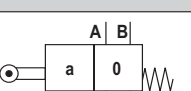
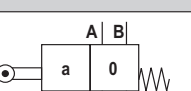
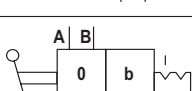
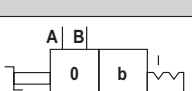
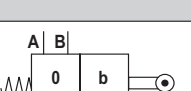
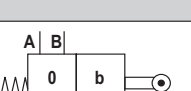
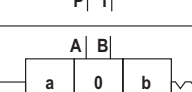
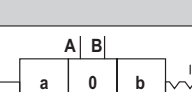
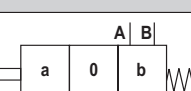
3) **Symbol E1:** P → A/B pre-opening
Caution in conjunction with differential cylinders due to pressure intensification!

Notice!

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



Types of actuation

Ordering code			Type of actuation			
Symbol	Actuating side	Detent	Roller plunger "WMRZ" 2)	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" 1) = .A	../F..				
						
	"b" 1) = .B	../F..				
						
		../F..				
						

1) See symbols on page 4

2) Only for valves with 2 spool positions

6/14 WMR, WMRZ, WMU, WMM, WMD(A) | Directional spool valve

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).

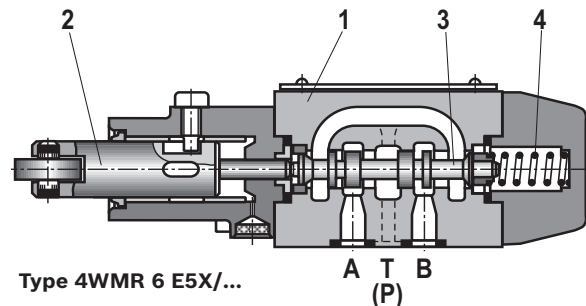
Detent

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.

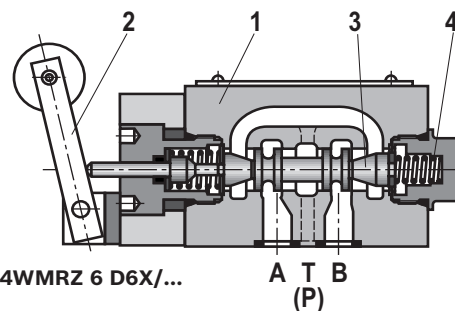
Throttle insert

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.

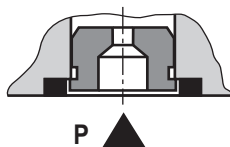
It is inserted in channel P of the directional valve.



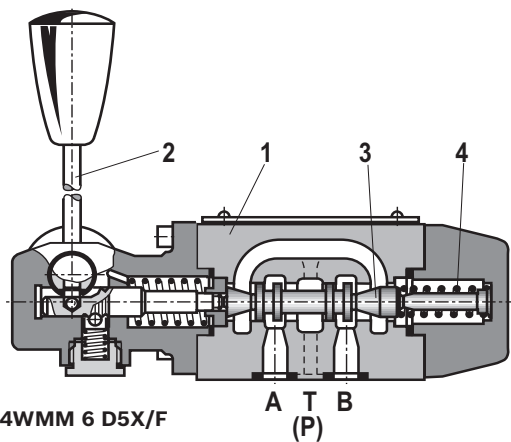
Type 4WMR 6 E5X/...



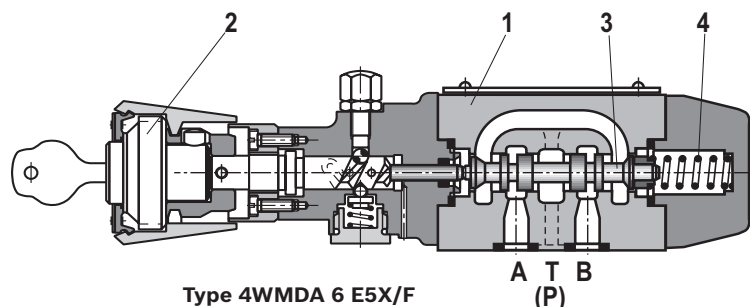
Type 4WMRZ 6 D6X/...



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



Type 4WMM 6 D5X/F



Type 4WMDA 6 E5X/F

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]
	– Port T:	
	"WMM", "WMD", "WMDA"	bar [psi]
	"WMR", "WMRZ", "WMU"	bar [psi]
Maximum flow	l/min [US gpm]	60 [15.8]
Flow cross-section (spool position O)	– Symbol Q	mm ²
	– Symbol W	mm ²
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 ² /s [cSt]	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 ¹⁾

Hydraulic fluid	Classification	Suitable sealing materials	Standards
Mineral oils	HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM
	– soluble in water	HEES	FKM
	– water-free	HEPG	FKM
Flame-resistant	– containing water	HFDU, HFDR	FKM
		HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR, HNBR



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%

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.

8/14 WMR, WMRZ, WMU, WMM, WMD(A) | Directional spool valve

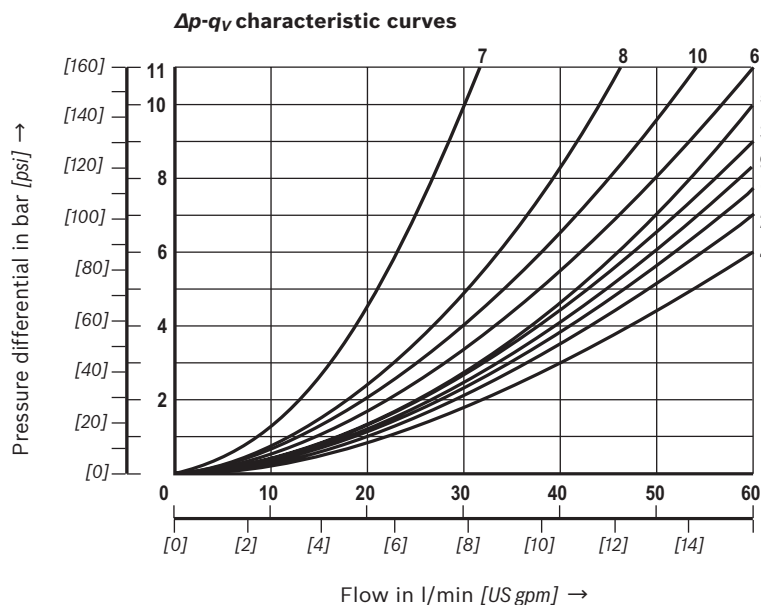
Actuating force/torque

			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, $\vartheta_{\text{oil}} = 40 \pm 5 \text{ °C}$ [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)

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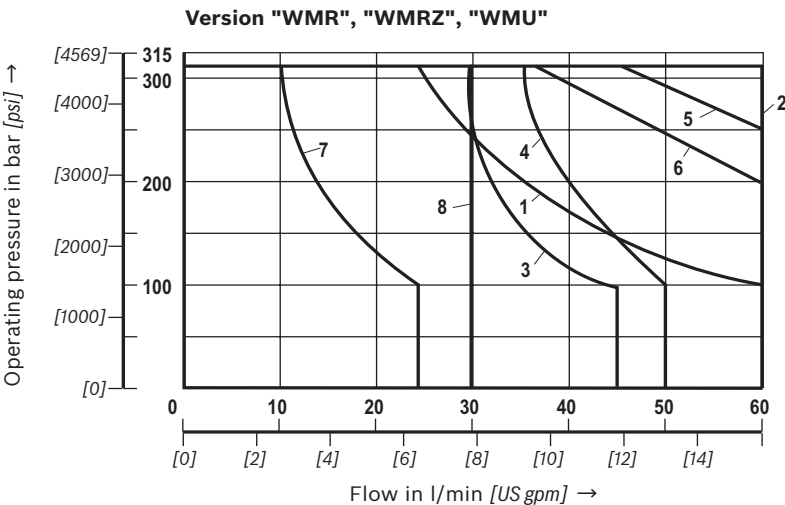
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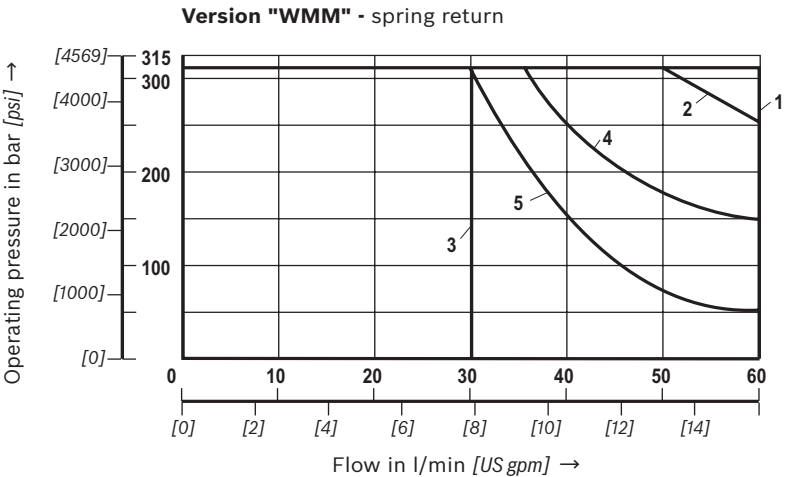
Performance limits
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$ [$104 \pm 9 \text{ }^{\circ}\text{F}$])

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!



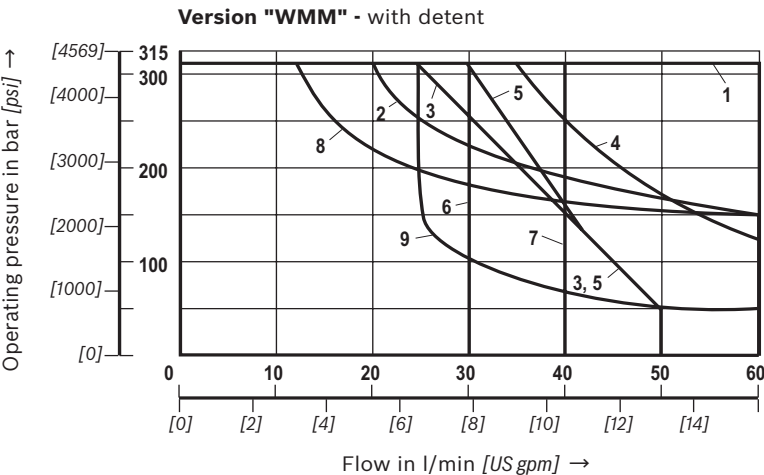
Characteristic curve	Symbol
1	A, B
2	C, D, Y, E, E1-, H, M, Q, U, W
3	F, P
4	G
5	J, L
6	R
8	V
7	T



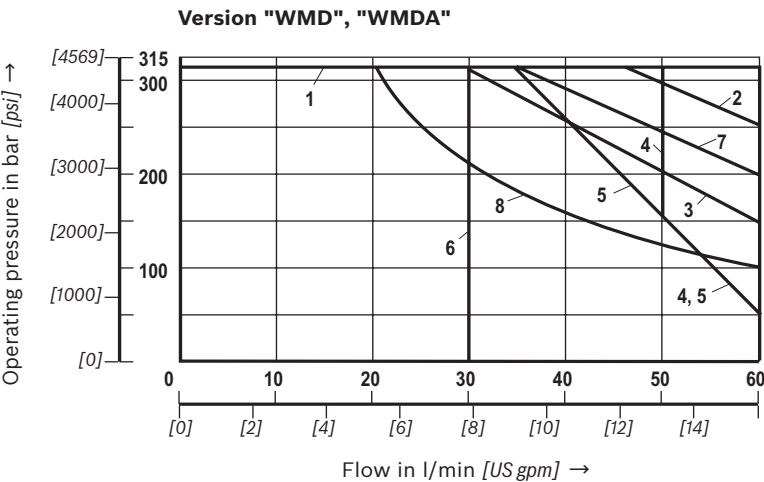
Characteristic curve	Symbol
1	E, E1-, M, J, L, Q, U, W, C, D, Y, G, H, R
2	A, B
3	V
4	F, P
5	T

10/14 WMR, WMRZ, WMU, WMM, WMD(A) | Directional spool valve

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



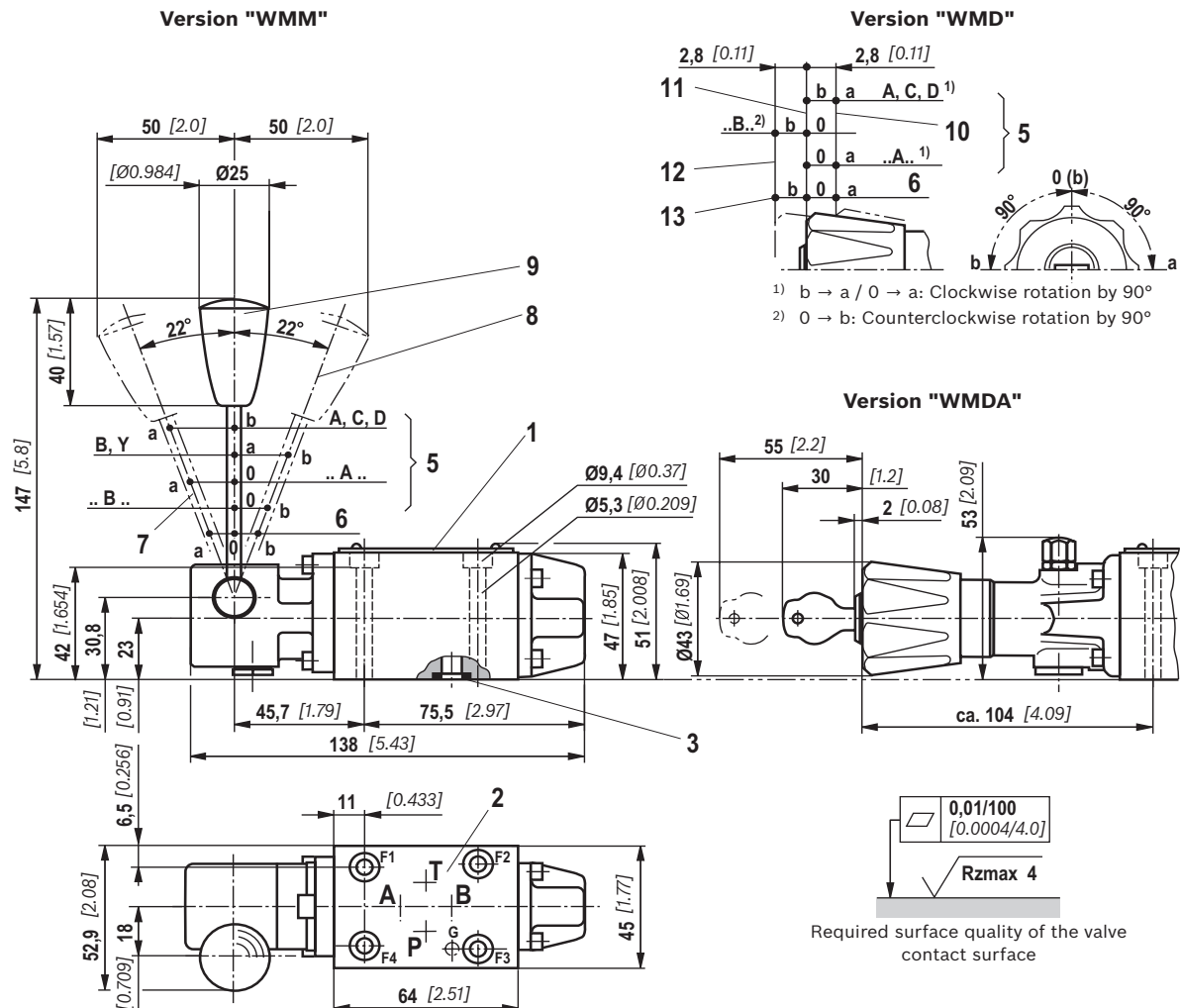
Characteristic curve	Symbol
1	E1-, M, H, C, D, Y
2	E, J, Q, L, U, W
3	A, B
4	G, T
5	F
6	V
7	P
8	R
9	T



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

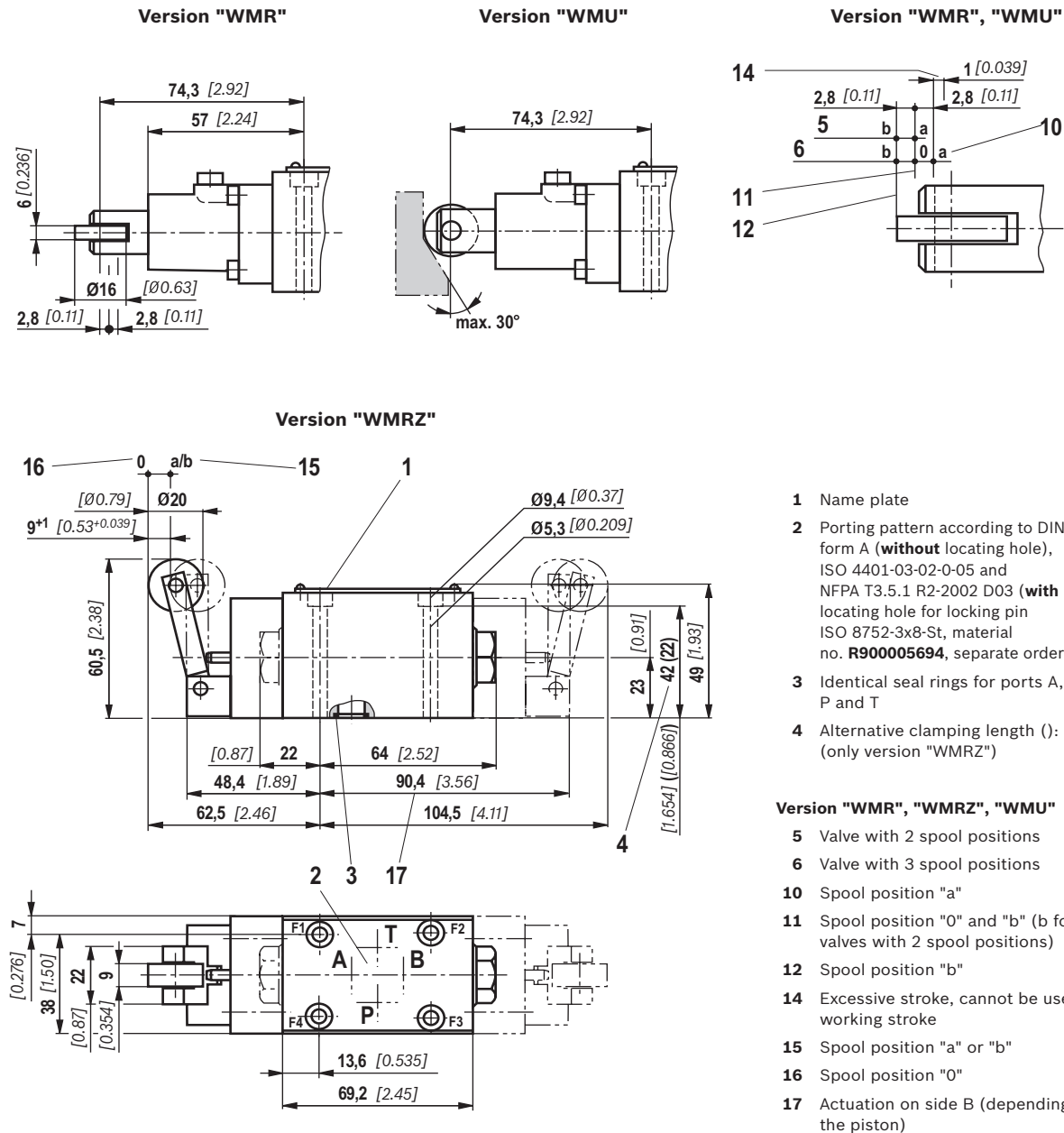
(dimensions in mm [inch])



12/14 **WMR, WMRZ, WMU, WMM, WMD(A)** | Directional spool valve

Dimensions

(dimensions in mm [inch])



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) ¹⁾
	G 342/12 (SAE-8) ¹⁾
	G 502/12 (SAE-10) ¹⁾

¹⁾ 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-fIZn-240h-L

(friction coefficient $\mu_{ges} = 0.09$ to 0.14);
tightening torque $M_A = 7 \text{ Nm}$ [5.2 ft-lbs] $\pm 10\%$,
material no. **R91300064**

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 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 ft-lbs] $\pm 15\%$,
(friction coefficient $\mu_{total} = 0.12$ to 0.17);
tightening torque $M_A = 8 \text{ Nm}$ [5.9 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-fIZn-240h-L

(friction coefficient $\mu_{total} = 0.09$ to 0.14);
tightening torque $M_A = 7 \text{ Nm}$ [5.2 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 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 ft-lbs] $\pm 15\%$,
(friction coefficient $\mu_{total} = 0.12$ to 0.17);
tightening torque $M_A = 8 \text{ Nm}$ [5.9 ft-lbs] $\pm 10\%$,
material no. **R978802879**

14/14

More information

- ▶ Subplates
- ▶ Mineral oil-based hydraulic fluids
- ▶ General product information on hydraulic products
- ▶ Installation, commissioning and maintenance of industrial valves
- ▶ Hydraulic valves for industrial applications
- ▶ Selection of the filters

Data sheet 45052
Data sheet 90220
Data sheet 07008
Data sheet 07300

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