

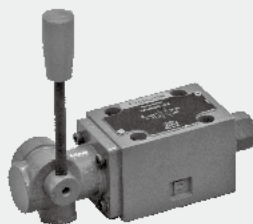


4/3, 4/2 and 3/2 directional valve with mechanical, manual operation

2.3

Type WMM6...L6X

Size 6
Up to 315 bar
Up to 60L/min



Contents

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Features

- Direct operating directional spool valves
- For sub-plates mounting
- Hand lever
- Porting pattern confirms to DIN 24 340 form A, and ISO 4401

Function and configurations

Directional Valves with Mechanical and Manual Operation type WMM6...L6X, are direct operated spool valves which switch the flow fluid by rotating the handle to move the spool axially. They have 2-position, 3-position as well as various spool symbols, optional detent or return spring. And they are sub-plate mounting.

Type WWM.../

It consists of housing (1), hand lever (2), control spool (3), one or two return springs (4) and push rod (5). In the non-operated condition the control spool (3) is held in the neutral or starting position by the return springs (4). When the hand lever (2) is pushed to right or left, the hand lever (2) acts at the push rod (5) by hinge and direct controls the spool (3), at that time, the spool (3) moves to an expected position. When the handle returns to Zero position, spool returns to normal position by return spring. The switched position is operated by the hand lever.

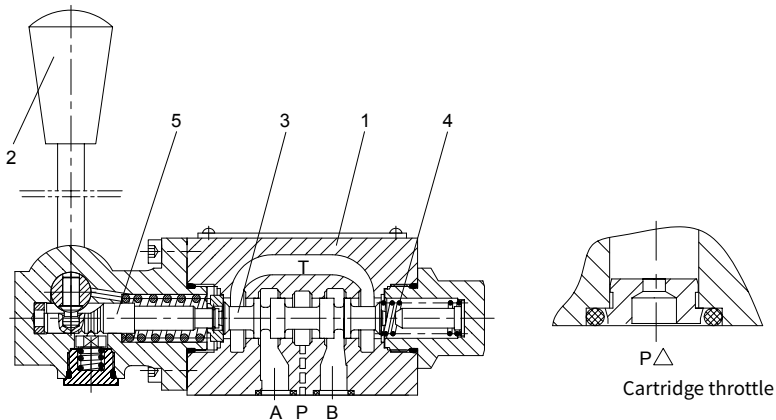
Type WWM.../F

Their operating principle is basically same as the type WWM.../, and they are fitted with 2 or 3 switched positions and a detent, so all the switched positions are fixed.

Cartridge throttle

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

These throttles are to be inserted into the P-channel of the directional valve.



Ordering code

	WMM	6	L6X	/			*
--	-----	---	-----	---	--	--	---

3 ways (version A and B) =3
 4 ways =4

Handle operation

Nominal size 6 =6

Symbols e.g. C, E, EA, EB etc. see below

Series L60 to L69 =L6X
 (L60 to L69:unchanged installation and connection dimensions)

Further details in clear text

No code = NBR seals
 V = FKM seals

No code = Without cartridge throttle
 B08 = Throttle - Φ 0.8 mm
 B10 = Throttle - Φ 1.0 mm
 B12 = Throttle - Φ 1.2 mm

No code = Return spring
 F = With detent

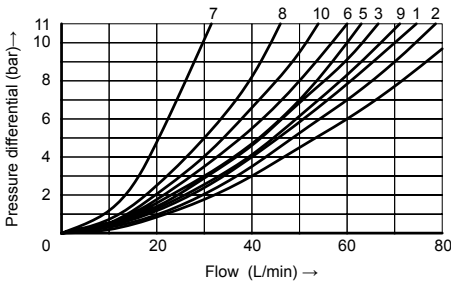
Symbols

<p>Transition position</p> <p>AB</p> <p>PT</p>	<p>Spool valve symbols</p> <p>AB</p> <p>PT</p>	<p>Transition position</p> <p>AB</p> <p>PT</p>	<p>Spool valve symbols</p> <p>AB</p> <p>PT</p>
	<p>=A (Port T as drain port)</p>		<p>=B (Port T as drain port)</p>
	<p>=C</p>		<p>=Y</p>
	<p>=D</p>		
<p>Transition position</p> <p>AB</p> <p>PT</p>	<p>Spool valve symbols</p> <p>AB</p> <p>PT</p>	<p>Transition position</p> <p>AB</p> <p>PT</p>	<p>Spool valve symbols</p> <p>AB</p> <p>PT</p>
	<p>=E</p>		<p>=EA</p>
	<p>=F</p>		<p>=FA</p>
	<p>=G</p>		<p>=GA</p>
	<p>=H</p>		<p>=HA</p>
	<p>=J</p>		<p>=JA</p>
	<p>=L</p>		<p>=LA</p>
	<p>=M</p>		<p>=MA</p>
	<p>=P</p>		<p>=PA</p>
	<p>=Q</p>		<p>=QA</p>
	<p>=R</p>		<p>=RA</p>
	<p>=T</p>		<p>=TA</p>
	<p>=U</p>		<p>=UA</p>
	<p>=V</p>		<p>=VA</p>
	<p>=W</p>		<p>=WA</p>
			<p>=EB</p>
			<p>=FB</p>
			<p>=GB</p>
			<p>=HB</p>
			<p>=JB</p>
			<p>=LB</p>
			<p>=MB</p>
			<p>=PB</p>
			<p>=QB</p>
			<p>=RB</p>
			<p>=UB</p>
			<p>=VB</p>
			<p>=WB</p>

Technical data

Fixing position		Optional	
Fluid temperature range		°C	
		-30 to +80 (NBR seal)	
Max. operating pressure		Port A,B,P	bar
		Port T	bar
Max. flow-rate		L/min	60
Flow cross section (switching neutral position)		Type Q	mm ²
		Type W	mm ²
Fluid		Mineral oil for NBR and FKM seal	
		Phosphate ester for FKM seal	
Viscosity range		mm ² /s	2.8 to 500
Degree of contamination		Maximum permissible degree of fluid contamination: Class 9. NAS 1638 or 20/18/15, ISO4406	
Weight		kg	1.6

Characteristic curves (Measured at $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$, using HLP46)



- 7 Symbol "R" in switched positions B → A
- 8 Symbol "G" and "T" in neutral position P → T
- 9 Symbol "H" in neutral position P → T

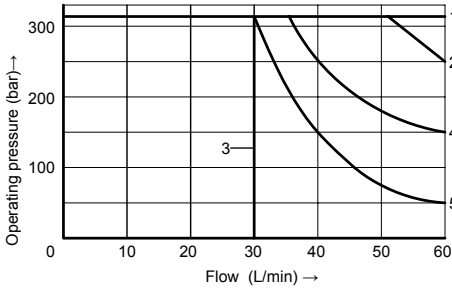
Spool symbol	Flow direction			
	P to A	P to B	A to T	B to T
AB	3	3	-	-
C	1	1	3	1
DY	5	5	3	3
E	3	3	1	1
F	1	3	1	1
T	10	10	9	9
H	2	4	2	2
JQ	1	1	2	1
L	3	3	4	9
M	2	4	3	3
P	3	1	1	1
R	5	5	4	-
V	1	2	1	1
W	1	1	2	2
U	3	3	9	4
G	6	6	9	9

Operating limitations

The switching function of the valves depends on the filtration. To achieve the specified admissible flow values, we recommend full flow filtration with 25 µm. The flow forces acting within the valves also affect the flow performance. With 4 way valves the specified flow data thus apply to normal operation with 2 volume flow directions (e.g. from P to A and at the same time return flow from B to T) (see table).

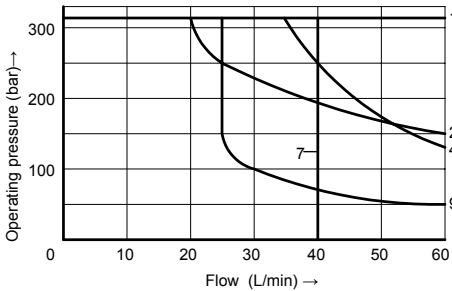
If only one flow direction is available, in certain cases, the admissible flow can be significantly smaller (e.g. when using a 4 way valve as 3 way valve, due to blocked connection A or B).

Without detent

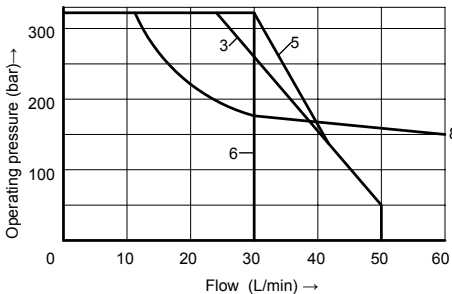


Curve		Spool symbol
Without detent	1	M E,J L,Q,U,W C,D,Y,G H,R
	2	A,B
	3	V
	4	F,P
	5	T

With detent

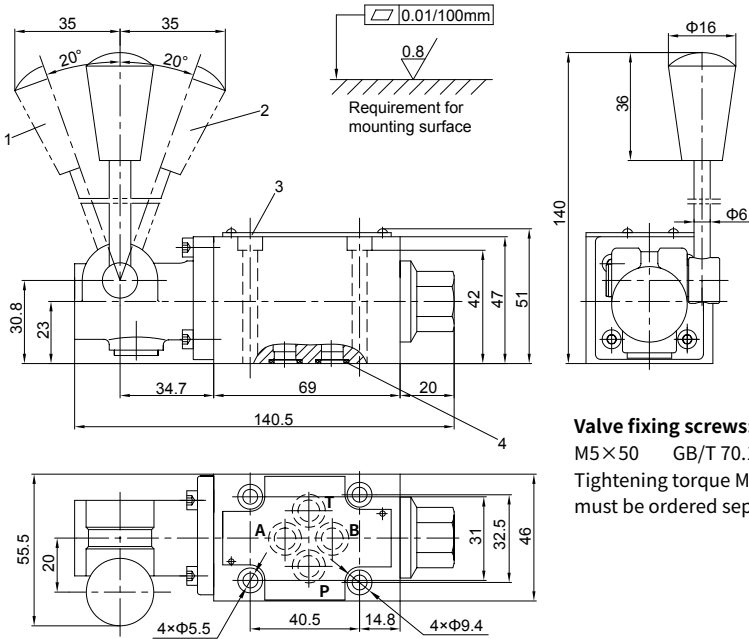


Curve		Spool symbol
With detent	1	M H,C D,Y
	2	E,J,Q,L U,W
	3	A,B
	4	G,T
	5	F
	6	V
	7	P
	8	R
	9	T



Unit dimensions

(Dimensions in mm)



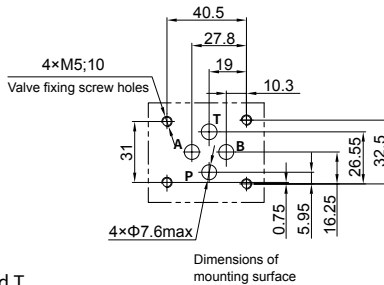
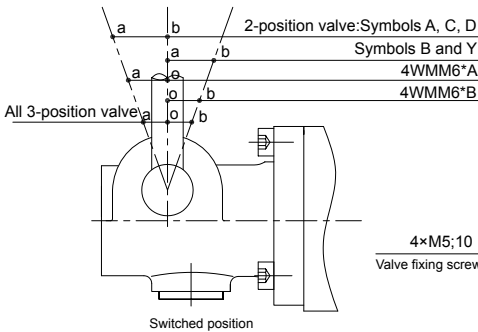
Valve fixing screws:

M5×50 GB/T 70.1-10.9,
Tightening torque $M_A=9\text{ Nm}$
must be ordered separately

It must be ordered separately if connection plate is needed.

Type :

G341/01(G1/4), G341/02 (M14×1.5)
G342/01(G3/8), G342/02 (M18×1.5)
G502/01(G1/2), G502/02 (M22×1.5)



- 1 Switched position b → a, o → a
- 2 Switched position a → b, o → b
- 3 Nameplate
- 4 O-ring 9.25×1.78 for ports A, B, P and T

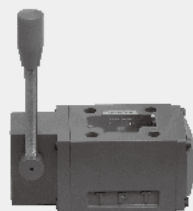


4/3, 4/2 and 3/2 directional valve with mechanical, manual operation

2.4

Type WMM10...L4X

Size 10
Up to 315 bar
Up to 120L/min



Contents

Function and configurations	02
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Operating limitations	04
Unit dimensions	05

Features

- Direct operating directional spool valves with mechanical, manual operation
- For sub-plates mounting
- Hand lever
- Porting pattern conforms to DIN 24 340 form A, and ISO 4401

Function and configurations

Directional Valves with Mechanical and Manual Operation type WMM10...L4X, are the second generation of our series 10 valves, and are direct operated spool valves which switch the flow fluid by rotating the handle to move the spool axially. They have 2-position, 3-position as well as various spool symbols, optional detent device and return spring. And they are sub-plate mounting.

Type WMM.../

These valves consist of a housing (1), hand lever (2), the control spool (3), one or two return springs (4), and a push rod (5).

In the unoperated condition the control spool (3) is held in the neutral or starting position by the return springs (4). When the hand lever (2) is pushed to right or left, the hand lever (2) acts at the push rod (5) by hinge and direct controls the spool (3), at that time, the spool (3) moves to an expected position. When the handle returns to Zero position, spool returns to normal position by return spring. The switched position is operated by the handle.

Type WMM.../F

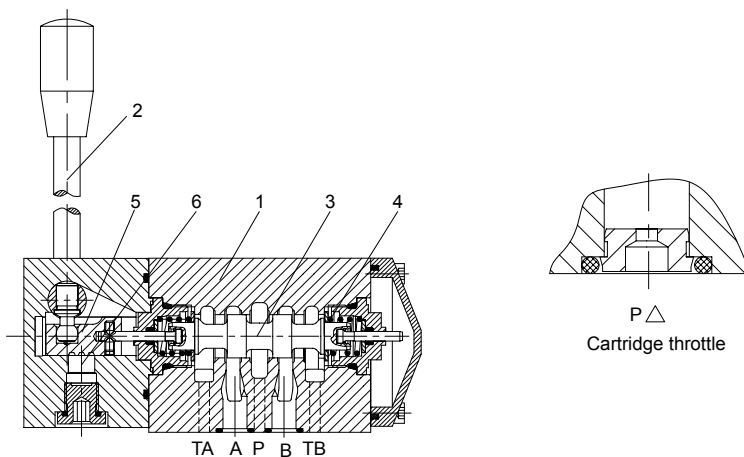
Their operating principle is the same as the type WMM.../, and they are fitted with 2 or 3 switched positions and a detent (6), so all the switched position is fixed.

Cartridge throttle

The use of a throttle insert is required, when, operating, flows can occur during the switching processes that exceed the performance limit of the valve.

These throttles are to be inserted into the P-channel of the directional valve.

Directional valves type WMM10...L4X have two handles options with different pulling direction, the detail refer to the 'Ordering code' and 'Unit dimensions'.



Ordering code

	WMM	10	/	L4X			★
--	-----	----	---	-----	--	--	---

3 ways
(version A and B) =3

4 ways =4

Handle operation =10

Nominal size 10 =10

Symbols e.g. C, E, EA, EB etc. see below

Series L40 to L49 =L4X
(L40 to L49: unchanged installation and connection dimensions)

Further details in clear text

Handle pulling direction- spool moving direction options:
No code = Pulling direction is contrary to spool (standard version, same as the series 10)
K=uniform direction (contrary to the series10)

No code = NBR seals
V = FKM seals

No code = Without cartridge throttle
B08 = Throttle - Φ0.8 mm
B10 = Throttle - Φ1.0 mm
B12 = Throttle - Φ1.2 mm

No code = Return spring
F = With detent

02

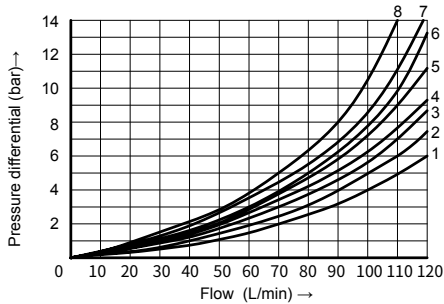
Symbols

<p>Transition position</p>	<p>Spool valve symbols</p>	<p>Transition position</p>	<p>Spool valve symbols</p>
	<p>=A (Port T as drain port)</p>		<p>=B (Port T as drain port)</p>
	<p>=C</p>		<p>=Y</p>
	<p>=D</p>		
<p>Transition position</p>	<p>Spool valve symbols</p>	<p>Transition position</p>	<p>Spool valve symbols</p>
	<p>=E</p>		<p>=EA</p>
	<p>=F</p>		<p>=FA</p>
	<p>=G</p>		<p>=GA</p>
	<p>=H</p>		<p>=HA</p>
	<p>=J</p>		<p>=JA</p>
	<p>=L</p>		<p>=LA</p>
	<p>=M</p>		<p>=MA</p>
	<p>=P</p>		<p>=PA</p>
	<p>=Q</p>		<p>=QA</p>
	<p>=R</p>		<p>=RA</p>
	<p>=T</p>		<p>=TA</p>
	<p>=U</p>		<p>=UA</p>
	<p>=V</p>		<p>=VA</p>
	<p>=W</p>		<p>=WA</p>
		<p>=EB</p>	
		<p>=FB</p>	
		<p>=GB</p>	
		<p>=HB</p>	
		<p>=JB</p>	
		<p>=LB</p>	
		<p>=MB</p>	
		<p>=PB</p>	
		<p>=QB</p>	
		<p>=RB</p>	
		<p>=TB</p>	
		<p>=UB</p>	
		<p>=VB</p>	
		<p>=WB</p>	

Technical data

Fluid temperature range		°C	-30 to +80 (NBR seal) -20 to +80 (FKM seal)
Max. operating pressure	Port A,B,P	bar	315
	Port T	bar	160
Max. flow-rate		L/min	120
Flow cross section (switching neutral position)	Type V	mm ²	For symbol V 11(A/B to T) 10.3(P to A/B)
	Type W	mm ²	For symbol W 2.5(A/B to T)
	Type Q	mm ²	For symbol Q 5.5(A/B to T)
Fluid			Mineral oil suitable for NBR and FKM seal Phosphate ester for FKM seal
Viscosity range		mm ² /s	2.8 to 500
Degree of contamination			Maximum permissible degree of fluid contamination: Class 9. NAS 1638 or 20/18/15, ISO4406
Weight		kg	4.4

Characteristic curves (Measured at $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$, using HLP46)



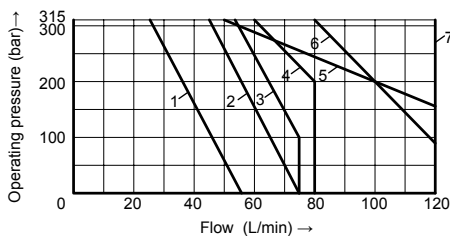
Spool symbol	Flow direction				Spool symbol	Flow direction			
	P to A	P to B	A to T	B to T		P to A	P to B	A to T	B to T
A	4	3	-	-	L	3	3	2	4
B	3	4	-	-	M	1	1	4	4
C	3	3	4	4	P	3	1	5	5
D	3	3	5	5	Q	2	2	2	2
E	2	2	4	4	R	3	4	3	-
F	1	2	3	4	U	3	3	5	2
G,T	4	4	7	7	V	2	2	3	3
H	1	1	5	5	W	3	3	3	3
J	2	2	3	3	Y	4	4	6	6

8 Symbols "G" and "T" in neutral position (P → T)
8 Symbol "R" in position (A → B)

Operating limitations

The switching performance of the valves depends on the filtration. To achieve the specified flow values, we recommend full flow filtration with 25 μm. The flow forces acting within the valves also affect the flow performance. With 4 way valves the specified flow data thus apply to normal operation with 2 volume flow directions (e.g. from P to A and at the same time return flow from B to T) (see table).

If only one flow direction is available, in certain cases, the admissible flow can be significantly smaller (e.g. when using a 4 way valve as 3 way valve, due to blocked connection A or B).

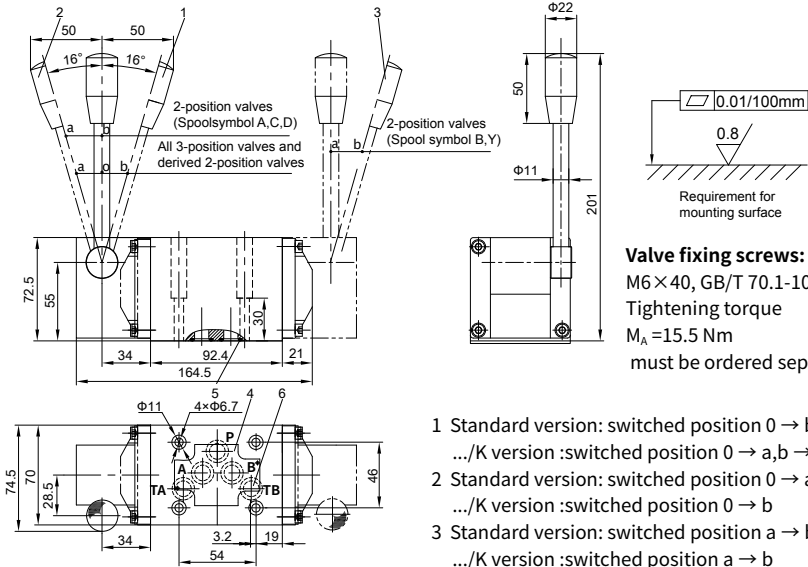


Curve	Spool symbol
1	A,B
2	A/O
3	H
4	F,G,P,R,T
5	J,L,Q,U,W
6	C,D,E,M,V,Y
7	C/O,C/OF,D/O,D/OF

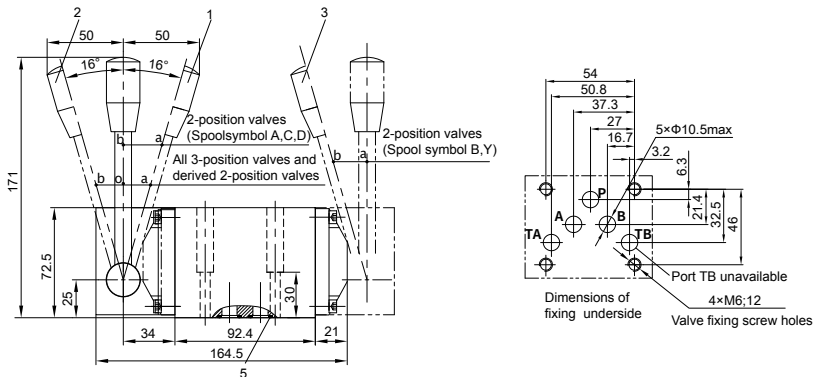
Unit dimensions

(Dimensions in mm)

WMM10...-L4X...(Standard version)



WMM10...-L4X... K (K version)



It must be ordered separately,if connection plate is needed.

- Type:** G 66/01 (G 3/8), G 66/02(M18×1.5)
G 67/01 (G 1/2), G 67/02(M22×1.5)
G 534/01(G 3/4), G 534/02(M27×2)

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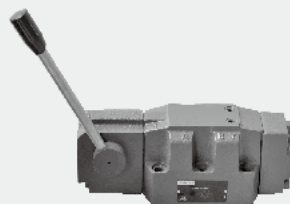


4/3, 4/2 and 3/2 directional valve with mechanical, manual operation

2.5

Type WMM16, 25 and 32

Size 16, 25 and 32
Up to 315bar
Up to 1100L/min



Contents

Function and configurations	02
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Symbols	03
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Unit dimensions	06-08

Features

- Direct operating directional spool valves with mechanical, manual operation
- For sub-plates mounting
- Hand lever
- Porting pattern conforms to DIN 24 340 form A, and ISO 4401

Function and configurations

The type WMM valves are hand lever operation directional spool valves. They control the start, stop and direction of a flow.

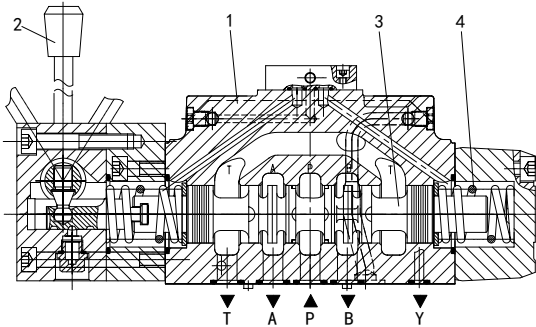
The directional valves basically comprise of a housing (1), hand lever (2), control spool (3), as well as one or two return springs (4).

In the unoperated condition the control spool (3) is held in the neutral or its initial position by the return springs (4). The control spool (3) is actuated by the hand lever (2) via a joint and a pin. The spool is thereby moved out of its initial position into switched position.

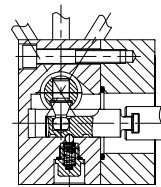
After the hand lever(2) has been returned to the zero switched position , the spool (3) is returned to the neutral position via the return springs (4).

4WMM.../F... (With the detent)

The directional valves with one detect , 2 or 3 switched position , can be orientated at any switched position.

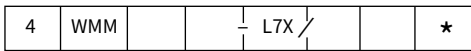


Type 4WMM...L7X



Type 4WMM...L7X/F
(with detent)

Ordering code



4 ways

= 4

Nominal size 16

=16

Nominal size 25

=25

Nominal size 32

=32

Symbols e.g. C, E etc.
see below

Further details in clear text

No code = NBR seals
V = FKM seals

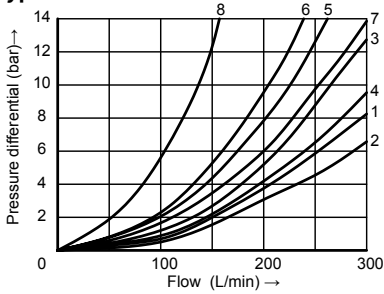
No code = Return spring
F = With detent

L7X = Series L70 to L79
(L70 to L79: unchanged installation and connection dimensions)

Characteristic curves

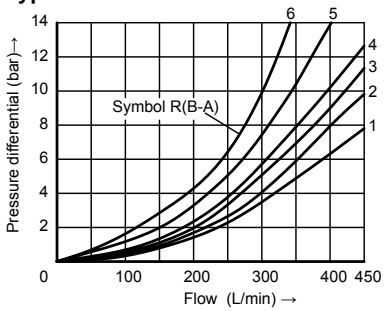
(Measured at $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$, using HLP46)

Type 4MM16...



Spool symbol	Flow direction				
	P to A	P to B	A to T	B to T	P to T
E, Y, D	1	1	1	3	-
F	2	2	3	3	-
G, F	5	1	3	7	6
H, C, Q	2	2	3	3	-
J, K, L	1	1	3	3	-
M, W	2	2	4	3	-
R	2	2	4	-	-
U	1	1	4	7	-
S	4	4	4	-	8

Type 4MM25...

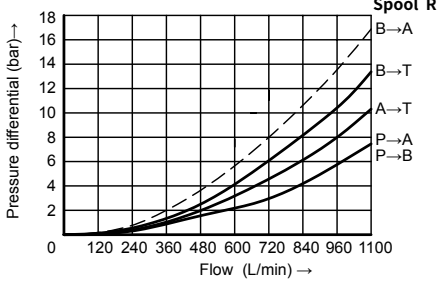


Spool symbol	Flow direction				
	P to A	P to B	A to T	B to T	P to T
E	2	2	1	4	-
F	1	2	1	2	4
G	2	2	2	4	6
H	2	2	1	3	2
J	2	2	1	3	-
L	2	2	1	2	-
M	2	2	1	4	-
P	2	2	1	4	6
Q	2	2	1	4	-
R	1	2	1	-	-
T	2	2	2	4	5
U	2	2	1	4	-
V	2	2	1	4	-
W	2	2	1	3	-

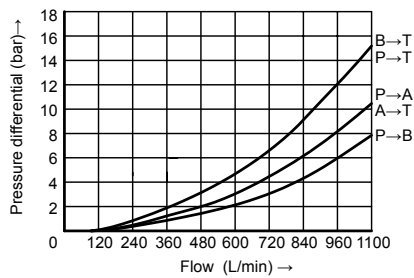
4 spools L neutral position A - T
6 spools U neutral position B - T

Type 4MM32...

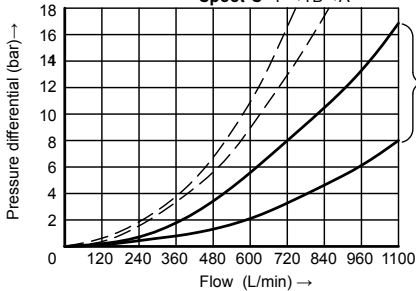
ΔP-Q characteristic curves suitable for symbol E, W and R



ΔP-Q characteristic curves suitable for symbol G and T



Spool S P→TB→A



Others symbols' characteristic curve

Characteristic curves (Measured at $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$, using HLP46)

The switching performance of the valves depends on the filtration. To achieve the specified admissible flow values, we recommend full flow filtration with 25 μm . The flow forces acting within the valves also affect the flow performance. With 4 way valves the specified flow data thus apply to normal operation with 2 volume flow directions (e.g. from P to A and at the same time return flow from B to T) (see table). If only one flow direction is available, in certain cases, the admissible flow can be significantly smaller (e.g. when using a 4 way valve as 3 way valve, due to blocked connection A or B).

Nominal size 16

Allowing flow q_v L/min, 2-position valve						Allowing flow q_v L/min, 3-position valve					
Symbol	Operating pressure P bar					Symbol	Operating pressure P bar				
	70	140	210	280	315		70	140	210	280	315
Return spring						Return spring					
C	300	300	300	260	220	E,H,J,L,M,Q,R,U,W	300	300	300	300	300
D	300	300	210	190	160	F,P	300	300	210	190	170
K	300	300	200	150	130	G,S,T	300	300	220	210	180
Z	300	240	190	170	150	V	300	260	200	180	170
With detent						With detent					
C,D,K,Z	300	300	300	300	300	E,H,J,L,M,Q,R,U,W	300	300	300	300	300
						F,P	300	300	280	230	230
						G,S,T	300	300	230	230	230
						V	300	300	250	230	230

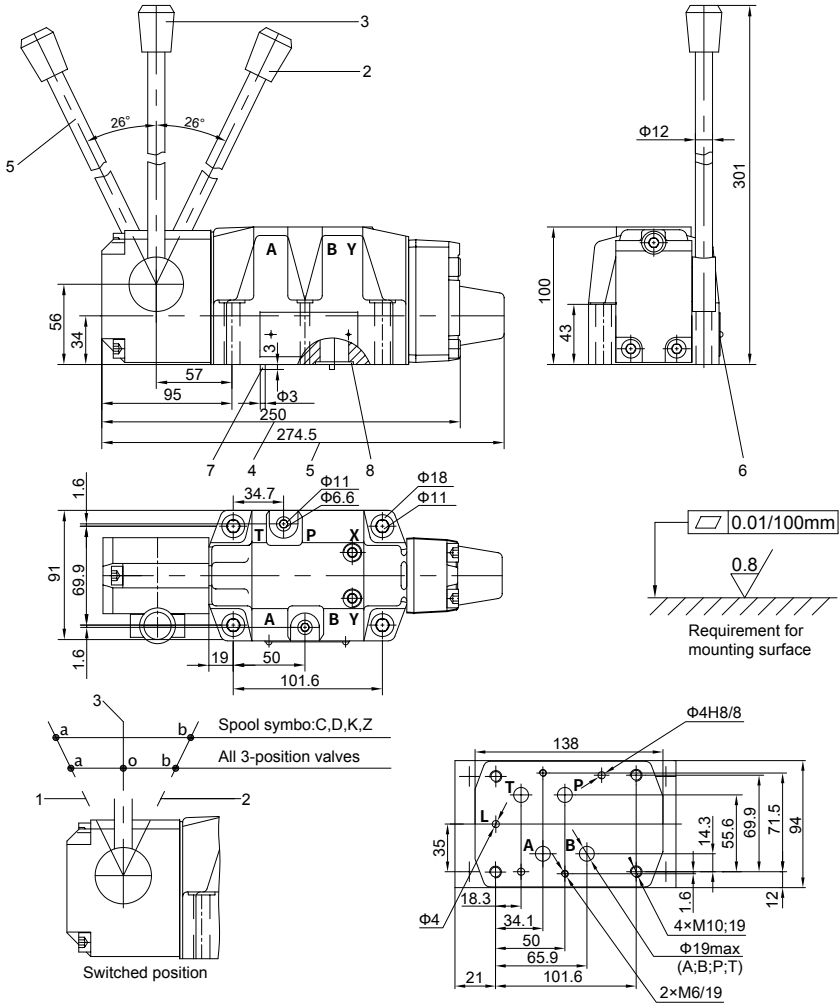
Nominal size 25

Allowing flow q_v L/min, 2-position valve						Allowing flow q_v L/min, 3-position valve					
Symbol	Operating pressure P bar					Symbol	Operating pressure P bar				
	70	140	210	280	315		70	140	210	280	315
Return spring						Return spring					
C	450	300	250	200	180	E,J,L,M,Q,R,U,W	450	450	450	450	450
D	350	300	275	250	200	F	450	250	200	135	110
K	200	150	140	130	120	G,T	450	330	290	230	180
Z	300	270	240	220	200	H	450	450	400	400	350
						P	450	310	240	215	150
						V	450	310	280	270	200
With detent						With detent					
C, D, K, Z	450	450	450	450	450	E, F, G, H, J, L, M, P, Q, R, T, U, W	450	450	450	450	450
						V	450	450	400	350	300

Nominal size 32

2-position and 3-position valves with spring return					
Flow L/min	When...(bar)				
Spool symbol	70	140	210	280	315
E,J,L,M,Q, R,V,U,W	1100	1050	860	750	680
F,G,H,S,T C,D,K,Z	650	450	370	320	280
2-position and 3-position valves with detent					
All symbols	1100	1050	860	750	680

Unit dimensions: nominal size 16



- 1 Switched position a
- 2 Switched position b
- 3 Switched position 0 (a and b for 2-position valve)
- 4 2-position and 3-position valves with detent, 3-position valve with spring centered
- 5 2-position valve with return spring
- 6 Nameplate
- 7 2 locating pins 3x8 (ports A, B, P and T)
- 8 O-ring 22x2.5 O-ring 10x2 (port L)

It must be ordered separately, if connection plate is needed.

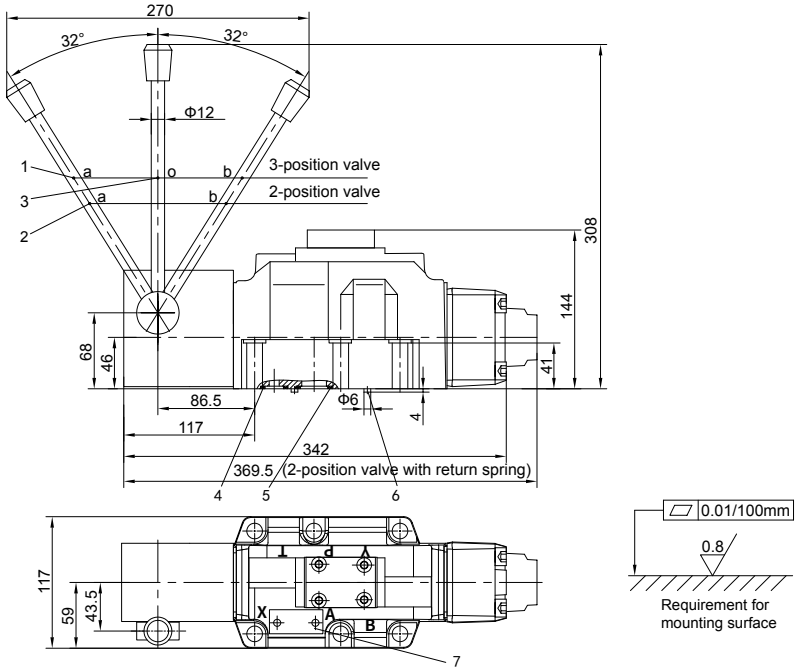
Type :

G172/01, G172/02, G174/01 G174/02, G174/08 (Port X and Y unavailable, returning directly by port L)

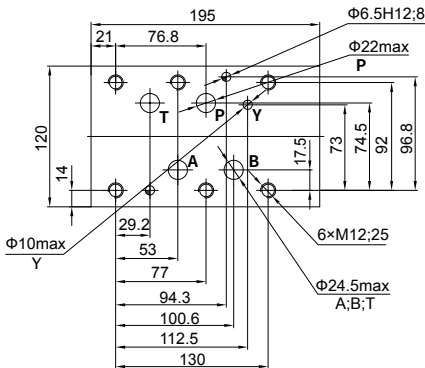
Valve fixing screws:

Internal hexagon screw, GB/T 70.1-10.9,
 4-M10x60 Tightening torque $M_A = 75$ Nm
 2-M6x55 Tightening torque $M_A = 15.5$ Nm
 must be ordered separately

Unit dimensions: nominal size 25



Port X and L unavailable, port Y is used as drain port



- 1 Switched position a
- 2 Switched position b
- 3 Switched position 0
- 4 O-ring 19×3 (ports X and Y)
- 5 O-ring 27×3 (ports A, B, P and T)
- 6 2 locating pins 6×12
- 7 Nameplate

Valve fixing screws:

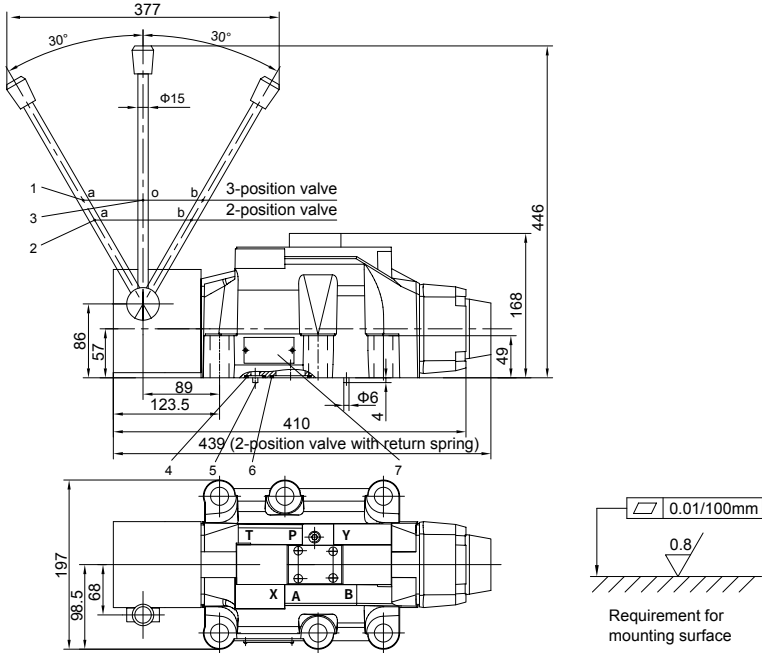
Internal hexagon screw
 GB/T 70.1-10.9, 6-M12×60
 Tightening torque $M_A=130\text{N}\cdot\text{m}$
 must be ordered separately

It must be ordered separately if connection plate is needed.

Type: G151/01(G1), G151/02 (M33×2)
 G154/01(G1 ¼), G154/02 (M42×2)

G156/01(G1½), G156/02(M48×2)
 G154/08(Flange connection)

Unit dimensions: nominal size 32



Port X and L unavailable, port Y is used as drain port

- 1 Switched position a
- 2 Switched position b
- 3 Switched position 0
- 4 O-ring 19×3 (ports X and Y)
- 5 2 locating pins 6×12
- 6 O-ring 42×3 ports A, B, P and T)
- 7 Nameplate

It must be ordered separately if connection plate is needed.

Type:

- G157/01(G1 1/2), G157/02 (M48×2)
- G158/10 (Flange connection)

Valve fixing screws:

- Internal hexagon screw
- GB/T 70.1-10.9,
- 6-M20×80 Tightening torque $M_A = 430$ Nm
- must be order separately

