

**MANNESMANN  
REXROTH****Check-Q-meter type FD, series 2X****RE  
27 551/09.97****Replaces: 03.92****Sizes 12, 16, 25, 32****Up to 560 L/min****Up to 350 bar****Features:**

- For installation in manifolds (cartridge valve),
- With SAE flanged ports,
- For sub-plate mounting, porting pattern to DIN 24 340, form D, ISO 5781 and CETOP-RP 121 H, sub-plates to catalogue sheet RE 45 062 (separate order),
- Use sub-plate version when valve panel mounting.

**Functions:**

- Pilot operated check valve, leak-free,
- The check-Q-meter controls the returning flow  $q_{V2}$  in relation to the flow being directed into the opposite side of the actuator  $q_{V1}$ . With cylinders the area ratio ( $q_{V2} = q_{V1} \cdot \varphi$ ) has to be taken into account,
- By-pass valve, free-flow in opposite direction,
- Optional built-on secondary pressure relief valve (only for valve with flange connections).

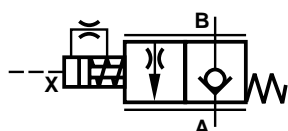


K2791/2

Type FD..F..2X/... with SAE flanged ports, with and without secondary pressure relief valve

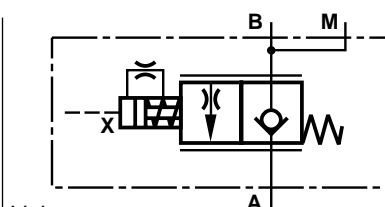
**Ordering details**

FD		2X	V	*
Nominal size 12	= 12			
Nominal size 16	= 16			
Nominal size 25	= 25			
Nominal size 32	= 32			
For manifold mounting (cartridge valve)	= KA			
For sub-plate mounting <b>without</b> secondary DBV	= PA			
For SAE flange connections <b>without</b> secondary DBV	= FA			
For SAE flange connections <b>with</b> secondary DBV	= FB			
Series 20 to 29	= 2X			
(20 to 29: unchanged installation and connection dimensions)				
				Further details in clear text
V =				FPM seals, suitable for mineral oil to DIN 51 524 (HL, HLP) and phosphate ester (HFD-R)
B00 =				<b>Without</b> orifice
B03 =				Orifice Ø 0.30 mm (sizes 12 and 16)
B04 =				Orifice Ø 0.40 mm (size 25)
B06 =				Orifice Ø 0.60 mm (size 32)
				(other orifice diameters on request)
<b>Pressure range of the secondary pressure relief valve</b>				
Valve with SAE flange connections				
(only for version "FB")				
200 =				Pressure setting up to 200 bar
300 =				Pressure setting up to 300 bar
400 =				Pressure setting up to 400 bar

**Symbols****Without secondary pressure relief valve**

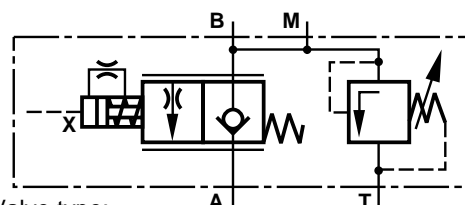
Valve type:

FD 12 KA 2X/B03..  
 FD 16 KA 2X/B03..  
 FD 25 KA 2X/B04..  
 FD 32 KA 2X/B06..



Valve type:

FD 12 PA 2X/B03..  
 FD 16 PA 2X/B03..  
 FD 25 PA 2X/B04..  
 FD 32 PA 2X/B06..  
 FD 12 FA 2X/B03..  
 FD 16 FA 2X/B03..  
 FD 25 FA 2X/B04..  
 FD 32 FA 2X/B06..

**With secondary pressure relief valve**

Valve type:

FD 12 FB 2X/B03..  
 FD 16 FB 2X/B03..  
 FD 25 FB 2X/B04..  
 FD 32 FB 2X/B06..

## Functional description, section

Check-Q-meters are used in hydraulic systems to influence the speeds of hydraulic motors and cylinders independent of the load (prevents running away). In addition there is an isolator function for pipe burst safety.

The check-Q-meter comprises basically of the housing (1), main poppet (2), pilot part (3), pilot spool (4), damping spool (5) and pilot damping (6).

### Lifting the load

With free-flow from A to B the main spool (2) is opened. If the load pressure fails (e.g. pipe break between the directional valve and port A) then the main spool (2) immediately closes. This function is achieved by the connection of the load side (7) with chamber (8).

### Lowering the load (circuit examples)

The direction of flow is from B to A. Port A is connected to tank via the directional valve. The piston rod side of the cylinder has a flow applied which corresponds to the working conditions. The relationship between the control pressure at port X and the load pressure at port B = 1 : 20.

When the control pressure is reached the pre-opening of the main spool takes place. Via the control spool (4) the pilot stage (3) is lifted off its seat and chamber (8) is de-compressed via this drilling and port A to tank. At the same time the load pressure in port B is no longer applied to chamber (8), this is due to the longitudinal movement of the pilot stage (3) within the main spool. The main poppet (2) is thereby unloaded. The reverse side of the control spool (4) at the main poppet (2), lies against the collar of the damping spool (5).

The pressure required at port X to open B to A is now only influenced by the spring in chamber (9). The pressure required to begin opening the connection B to A is 20 bar; to fully open the connection 50 bar is required.

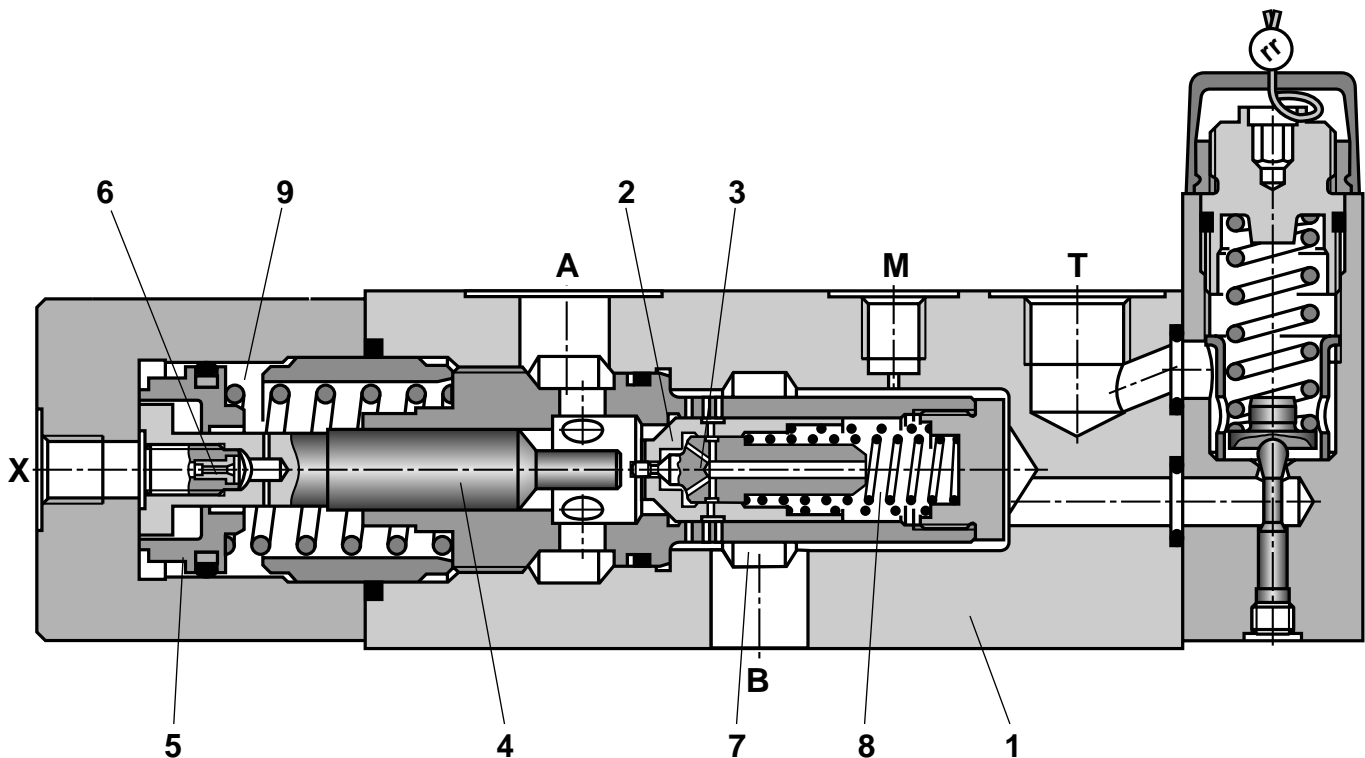
The opening cross-section for flow control increases progressively. It is created by the successive opening of radial drillings in the bush and the main poppet (2) land.

The relationship between the control pressure, cracking pressure and differential pressure determines the flow to the actuator via the connection of B to A. Thus uncontrolled running away of the actuator is prevented.

The controlled lowering procedure is not affected even if there is a pipe burst between the directional valve and port A.

### Guidelines for influencing the opening and closing times of the check-Q-meter.

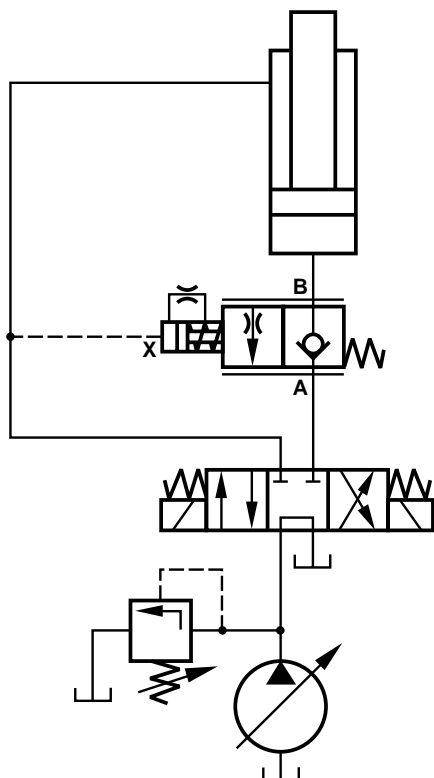
- Throttling of the opening sequence is via orifice (6) in the control spool (4) and both sides of the damping spool (5). The orifice (6) is protected by sieves.
- The closing movement of the check-Q-meter is virtually unthrottled.
- When being used in conjunction with cylinders the control line to port X can be fitted with a throttle check valve (meter-out control) to influence the closing sequence.
- When being used in conjunction with motors a throttle check valve should not be fitted in the control line to port X. In this case it is recommended that the control times of the directional valve are influenced.



## Circuit examples

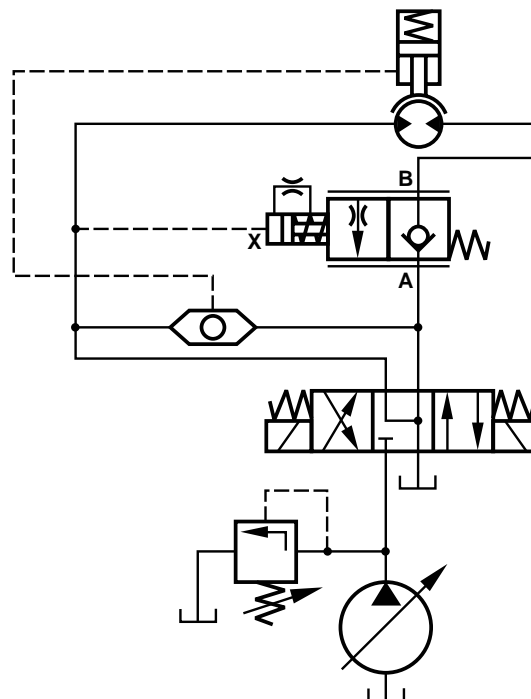
### Differential cylinder

On safety grounds, a closed centre directional valve should always be used!



### Hydraulic motor

So that the holding brake can operate both of the direction all valve ports have to be connected to port T in the de-energised position. If the brake is externally unloaded then it is possible to use a closed centre directional valve in the de-energised condition.

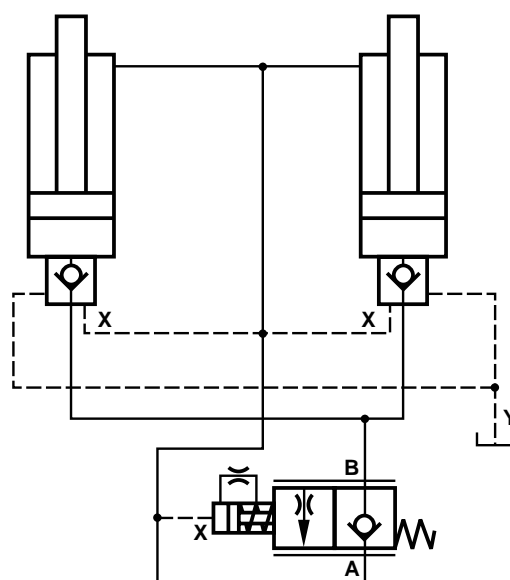


### Note:

Two check-Q-meters cannot be used to control two cylinders which are forced mechanically to move together, as synchronisation and the same pressure cannot be guaranteed in each cylinder.

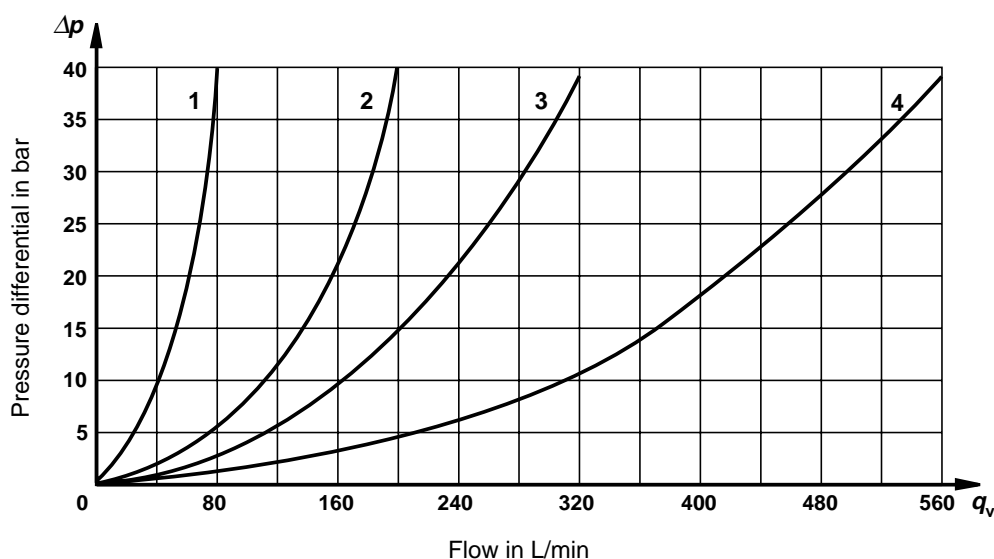
Therefore, the cylinders have to be equipped with two pilot operated check valves, type SL. The check-Q-meter is fitted in a common line.

**In this case, the load pressure must not exceed 200 bar!**

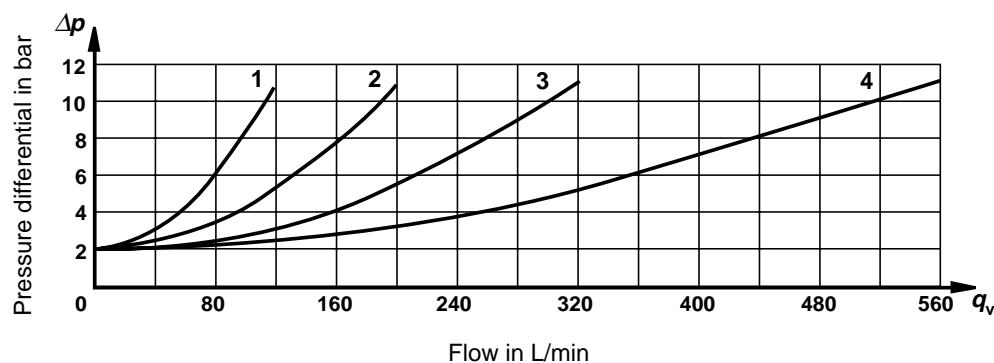


**Technical data** (for applications outside these parameters, please consult us!)

Operating pressure, ports A, X	bar	up to 350
Operating pressure, port B	bar	up to 420
Pilot pressure, port X (flow control range)		min. 20 to 50 bar, max. 350 bar
Cracking pressure, A to B	bar	2
Setting pressure for secondary pressure relief valve	bar	up to 400
Flow	L/min	80 (size 12), 200 (size 16), 320 (size 25), 560 (size 32)
Area ratio of the pre-opening		$\frac{\text{poppet seat area}}{\text{area of pilot spool}} = \frac{1}{20}$
Pressure fluid		mineral oil to DIN 51524 (HL,HLP); phosphate ester (HFD-R)
Pressure fluid temperature range	°C	– 20 to + 80
Viscosity range	mm <sup>2</sup> /s	10 to 800
Degree of contamination		maximum permissible degree of contamination of the pressure fluid is to NAS 1638 class 9. We, therefore, recommend a filter with a minimum retention rate of $\beta_{10} \geq 75$ .

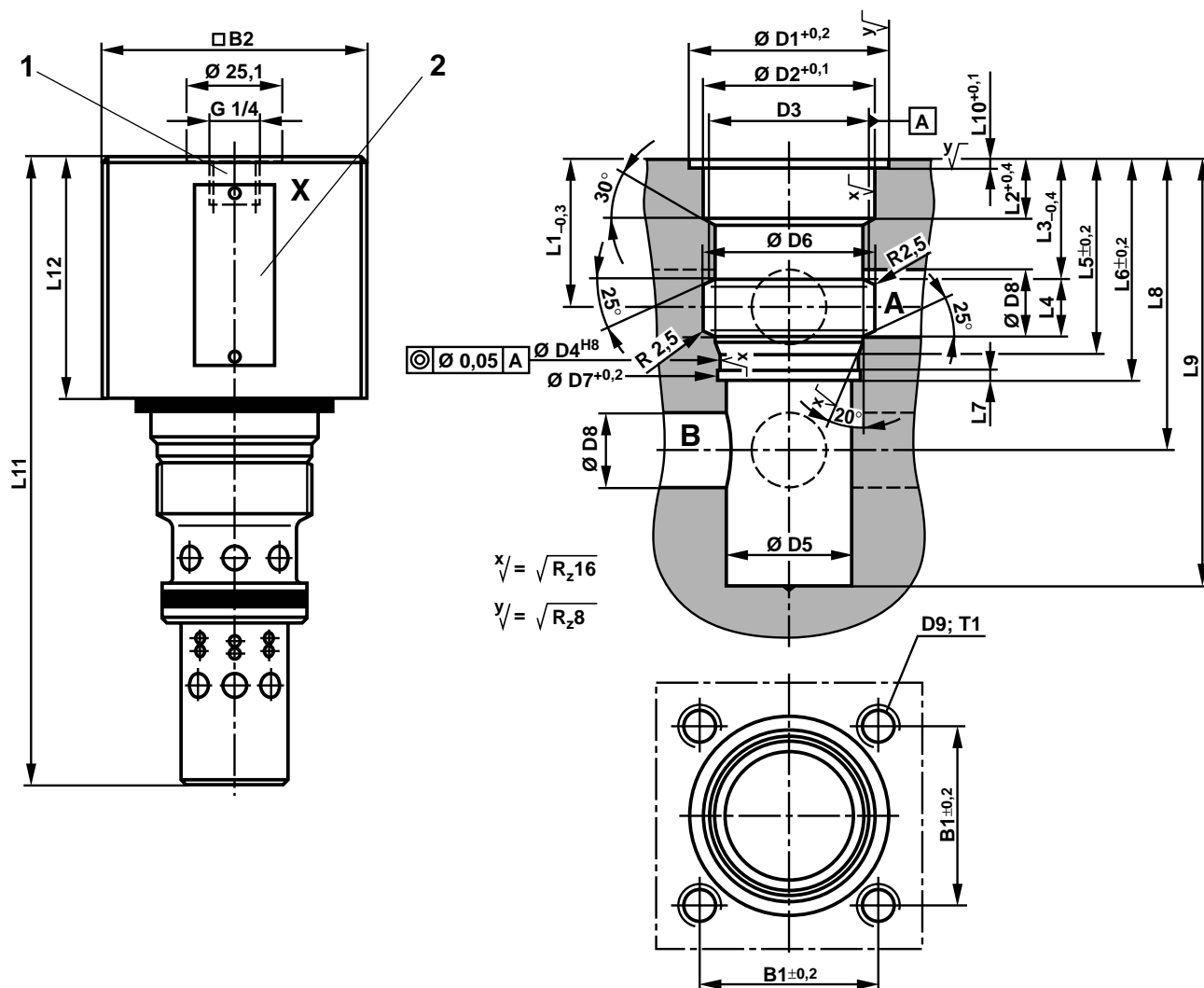
**Characteristic curves** (measured at  $v = 41 \text{ mm}^2$  and  $\vartheta = 50^\circ\text{C}$ )

- 1 = size 12  
2 = size 16  
3 = size 25  
4 = size 32



**Unit dimensions:** valve for assembly into manifolds (cartridge valve)

(Dimensions in mm)



1 Control port

2 Name plate

Tightening torque  $M_A$  of cartridge valve:

for size 12: 65 Nm      size 25: 110 Nm

size 16: 65 Nm      size 32: 270 Nm

**Ports A and B can be optionally arranged about the circumference.****Attention!****The valve fixing holes must not be damaged.**

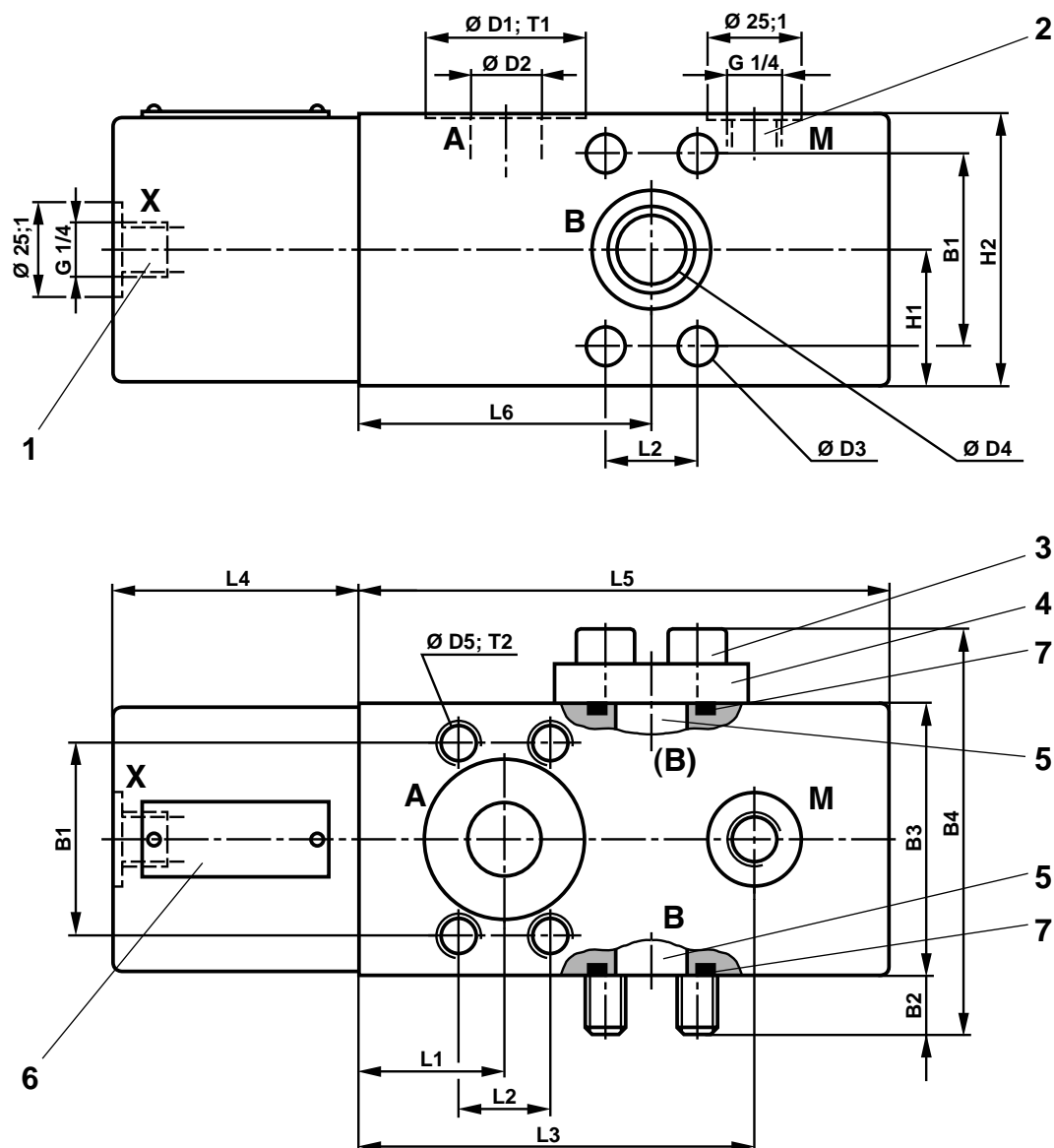
Pipe threads "G" to ISO 228/1

Type	B1	B2	D1	D2	D3	D4	D5	D6	D7	D8	D9	T1	L1	L2	L3	L4	L5	L6
FD 12 KA 2X/...	48	70	54	46	M42x2	38	34	46	38.6	16	M10	16	39	16	32	15.5	50.5	60
FD 16 KA 2X/...	48	70	54	46	M42x2	38	34	46	38.6	16	M10	16	39	16	32	15.5	50.6	60
FD 25 KA 2X/...	56	80	60	54	M52x2	48	40	60	48.6	25	M12	19	50	19	39	22	65	80
FD 32 KA 2X/...	66	95	72	65	M64x2	58	52	74	58.6	30	M16	23	52	19	40	25	71	85

Type	L7	L8	L9	L10	L11	L12	Valve fixing screws/tightening torque		$M_A$ in Nm	Weight
FD 12 KA 2X/...	3	78	128	2.3	191	65	4 off M10 x	70 DIN 912-10.9	69	2.8 kg
FD 16 KA 2X/...	3	78	128	2.3	191	65	4 off M10 x	70 DIN 912-10.9	69	2.8 kg
FD 25 KA 2X/...	4	105	182	2.3	253	75	4 off M12 x	80 DIN 912-10.9	120	5.6 kg
FD 32 KA 2X/...	4	105	198	2.3	289	94	4 off M16 x	100 DIN 912-10.9	295	7.5 kg

**Unit dimensions:** for SAE flange connections, without secondary pressure relief valve

(Dimensions in mm)



SAE flange connection:  
Operating pressure 6000 PSI (420 bar)

Flange mounting screws and blanking flange are  
included within the scope of supply.

- |                  |                        |                   |
|------------------|------------------------|-------------------|
| 1 Control port   | 3 Flange fixing screws | 5 Optional port B |
| 2 Measuring port | 4 Blanking flange      | 6 Name plate      |
|                  |                        | 7 O-ring          |

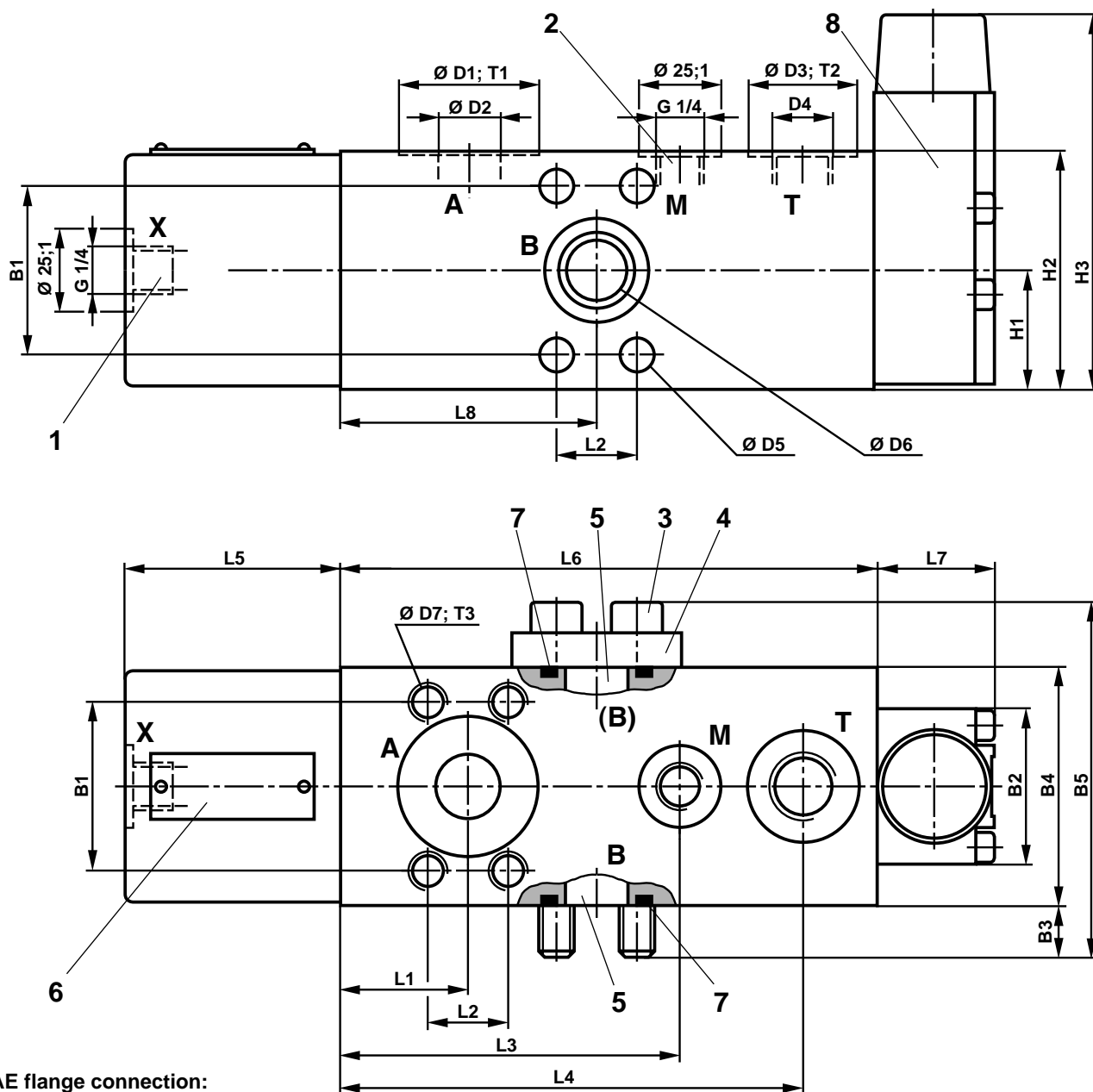
Pipe thread "G" to ISO 228/1

Type	B1	B2	B3	B4	D1	D2	D3	D4	D5	H1	H2
FD 12 FA 2X/...	50.8	16.5	72	110	43	18	10.5	18	M10	36	72
FD 16 FA 2X/...	50.8	16.5	72	110	43	18	10.5	18	M10	36	72
FD 25 FA 2X/...	57.2	14.5	90	132	50	25	13.5	25	M12	45	90
FD 32 FA 2X/...	66.7	20	105	154	56	30	15	30	M14	50	105

Type	L1	L2	L3	L4	L5	L6	T1	T2	Weight	O-ring (7)
FD 12 FA 2X/...	39	23.8	105	65	140	78	0.1	15	7 kg	25 x 3.5
FD 16 FA 2X/...	39	23.8	105	65	140	78	0.1	15	7 kg	25 x 3.5
FD 25 FA 2X/...	50	27.8	148	75	200	105	0.1	18	16 kg	32.92 x 3.53
FD 32 FA 2X/...	52	31.6	155	94	215	115	0.1	21	21 kg	37.7 x 3.53

Unit dimensions: for SAE flange connections, with secondary pressure relief valve

(Dimensions in mm)



SAE flange connection:  
 Operating pressure 6000 PSI (420 bar)  
 Flange mounting screws and blanking flange are  
 included within the scope of supply.

- |                        |                   |                                   |
|------------------------|-------------------|-----------------------------------|
| 1 Control port         | 4 Blanking flange | 7 O-ring                          |
| 2 Measuring port       | 5 Optional port B | 8 Secondary pressure relief valve |
| 3 Flange fixing screws | 6 Name plate      |                                   |

Pipe threads "G" to ISO 228/1

Type	B1	B2	B3	B4	B5	D1	D2	D3	D4	D5	D6	D7	H1	H2
FD 12 FB 2X/...	50.8	47	16.5	72	110	43	18	34	G 1/2	10.5	18	M10	36	72
FD 16 FB 2X/...	50.8	47	16.5	72	110	43	18	34	G 1/2	10.5	18	M10	36	72
FD 25 FB 2X/...	57.2	80	14.5	90	132	50	25	42	G 3/4	13.5	25	M12	45	90
FD 32 FB 2X/...	66.7	80	20	105	154	56	30	42	G 3/4	15	30	M14	50	105

Type	H3	L1	L2	L3	L4	L5	L6	L7	L8	T1	T2	T3	Weight	O-ring (7)
FD 12 FB 2X/...	118	39	23.8	105	141.5	65	162	38	78	0.1	1	15	9 kg	25 x 3.5
FD 16 FB 2X/...	118	39	23.8	105	141.5	65	162	38	78	0.1	1	15	9 kg	25 x 3.5
FD 25 FB 2X/...	145	50	27.8	148	198	75	225	50	105	0.1	1	18	18 kg	32.92 x 3.53
FD 32 FB 2X/...	145	52	31.6	155	215	94	240	50	115	0.1	1	21	24 kg	37.7 x 3.53

