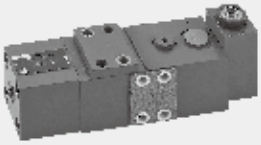
4.10

Check-Q-meter

Type FD...L2X

Sizes 12 to 32
Up to 350 bar
Up to 560 L/min



Contents

Features

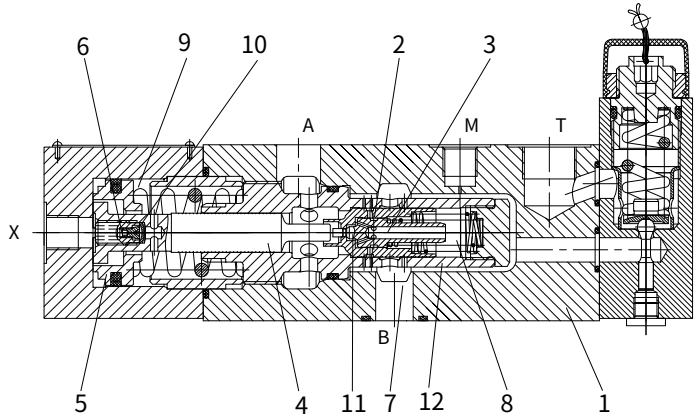
- Installation in manifolds (cartridge valve)
- With SAE flange ports
- Sub-plate connection or block, porting pattern to DIN 24340 form D, ISO 5781 and CETOP-RP121 H
- Check valve pilot operated (leakage-free)
- The check-Q-meter controls the returning flow Q_{v2} in relation to the flow Q_{v1} in the inlet port of actuator. For the application in cylinders system, the area ratio ($Q_{v2} = Q_{v1}$ Φ) has to be taken into account
- Bypass valve, free flow in opposite direction
- Safety valve, optional
  (Only for valve with flange port and special plate valve type FD12 and FD16)

Function and configuration

Check-Q-meters are used to prevent runaway of hydraulic cylinder and motor in hydraulic system. They can also prevent pipe bursting.
Check-Q-meter basically consists of the housing (1), main poppet (2), pilot part (3), steel ball (11), pilot spool (4), spring seat (5) and damping (6). When load is lifted, fluid flows from A to B, the main spool (2) is opened. If pipe is cracked caused by the system, main spool (2) closes immediately because chamber (8) is connected with load pressure.

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 main spool opens. Via the control spool (4) the pilot stage (3) and steel ball (11) are lifted off its seat and chamber (8) is de-compressed via its internal hole 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 edge of the damping spool (5).
In order to open the main poppet, the pressure in the port X is decided by the spring in the chamber (9). When the valve open, the pressure is 20bar, and fully open it is 60bar.
The opening cross-section for flow control increases progressively. It is created by the successive opening of radial hole in the sleeve (12) 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.

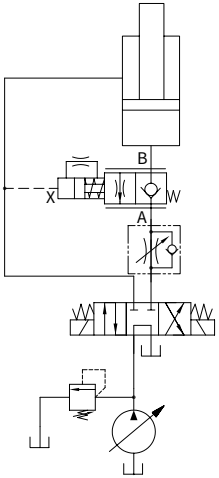
Guidelines for influencing the opening and closing times of the check-Q-meter.
- Throttling of the opening sequence is via orifice (6) in the control spool (4) and both sides of the damping spool (5). The orifice (6) is protected by sieves (10).
- The closing movement of the check-Q-meter is virtually 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 time of the directional valve are influenced.



Curcuit examples

·Cylinder with single rod

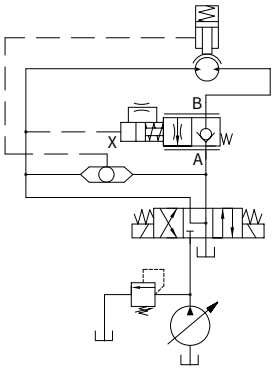
On safety grounds,
a closed in-between position directional valve should always be used!

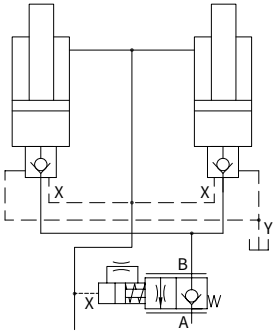


Notes:
It is not allowed to use two check-Q-meters to control two synchronized cylinders, as same synchronisation pressure cannot be guaranteed in each cylinder. Therefore, two pilot operated check valves, type SL should be equipped in cylinders. The check-Q-meter is fitted in a common line.
In this case, the load pressure must not exceed 200bar! To avoid the vibration because of too quick descent causing pressure lost at port X, a check throttle valve is commended to externally connect to Port A to limit the descent speed.

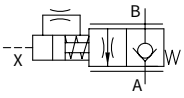
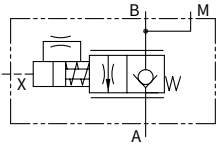
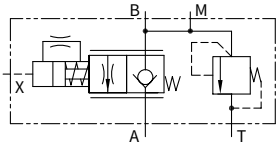
·Hydraulic motor

To make sure that brake can be operated, both of the directional valve ports have to be connected to the tank in the in-between position. If the brake is externally unloaded then it is possible to use a closed in-between position directional valve.





Symbols

Without safety valve		With safety valve
		
Type of valve: FD12KA-L2X/B03... FD16KA-L2X/B03... FD25KA-L2X/B04... FD32KA-L2X/B06...	Type of valve: FD12PA-L2X/B03... FD12FA-L2X/B03... FD16PA-L2X/B03... FD16FA-L2X/B03... FD25PA-L2X/B04... FD25FA-L2X/B04... FD32PA-L2X/B06... FD32FA-L2X/B06...	Type of valve: FD12FB-L2X/B03... FD12PB-L2X/B03... FD16FB-L2X/B03... FD16PB-L2X/B03... FD25FB-L2X/B04... FD32FB-L2X/B06...

04

Ordering code

FD | | — L2X / | / | | ★

Check-Q-meter

Nominal size 12 = 12
Nominal size 16 = 16
Nominal size 25 = 25
Nominal size 32 = 32

Cartridge valve = KA
Sub-plate mounting = PA
Flange connections without safety valve = FA
Flange connections with safety valve = FB
Sub-plate with safety valve
(only nominal size 12 and 16) =PB

Series L20 to L29 =L2X
(L20 to L29: unchanged installation and connection dimensions)

Pressure setting range of safety valve
(Only for valve with flange port and special valve type FD12 and FD16)
Pressure setting up to 200 bar =20
Pressure setting up to 300 bar =30
Pressure setting up to 400 bar =40

B00 = Without orifice
B03 = Orifice Ø 0.3 mm (sizes 12 and 16)
B04 = Orifice Ø0.4 mm (size 25)
B06 = Orifice Ø0.6 mm (size 32)
(other orifice diameters on request)

External connection
threaded connection (X, M, T)
No code = Inch thread
2 = Metric thread

No code = NBR seals
V = FKM seals

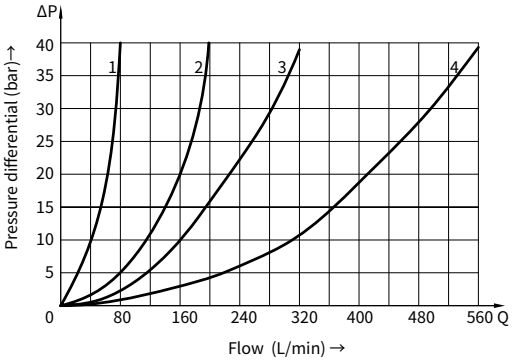
Further details in clear text

Relief setting:
At least 1.3 times the highest expected load !

Technical data

Operating pressure, ports A, X	bar	to 350
Operating pressure, port B	bar	to 420
Pilot pressure, port X (flow control range)	bar	min.20~60, max.350
Cracking pressure, A to B	bar	2
Setting pressure for secondary pressure relief valve	bar	to 400
Flow -rate	L/min	80(size 12),200(size 16),320(size 25),560(size 32)
Area ratio of the pre-opening		$\frac{\text{poppet seat area}}{\text{area of pilot spool}} = \frac{1}{20}$
Fluid		Mineral oil, phosphate ester
Fluid temperature range	℃	-20 to +80
Viscosity range	mm^2/s	10 to 800
Degree of contamination		Maximum permissible degree of fluid contamination: Class 9. NAS 1638 or 20/18/15, ISO4406

Characteristic curves (Measured at ϑ_{oil}=40℃ ±5℃ , using HLP46)

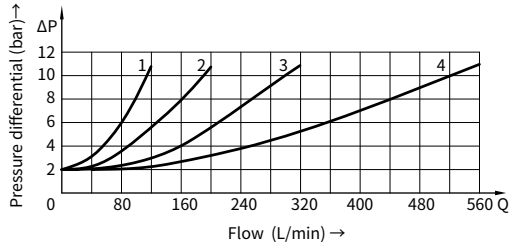


Pressure differential
Pin relation to flow Q,
measured at throttle position:

Throttle fully open (Px=60bar)

B to A

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



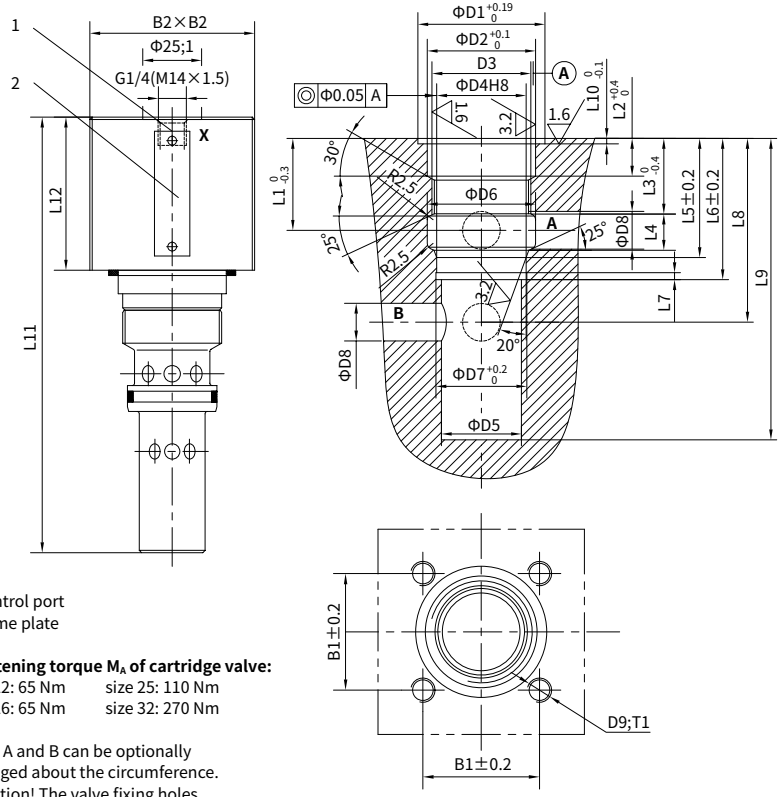
Pressure differential
Pin in relation to flow Q,
measured over the
check valve.

A to B

Unit dimensions

(Dimensions in mm)

· Installation in manifolds (cartridge valve)



1 Control port
2 Name plate

Tightening torque M_A of cartridge valve:
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.

Note: the cartridge valve is incompact structure but not integral, so when fixing, it can refer to Page 2/12.
First fix the sleeve with threaded, then fix other components, and the cover is last.

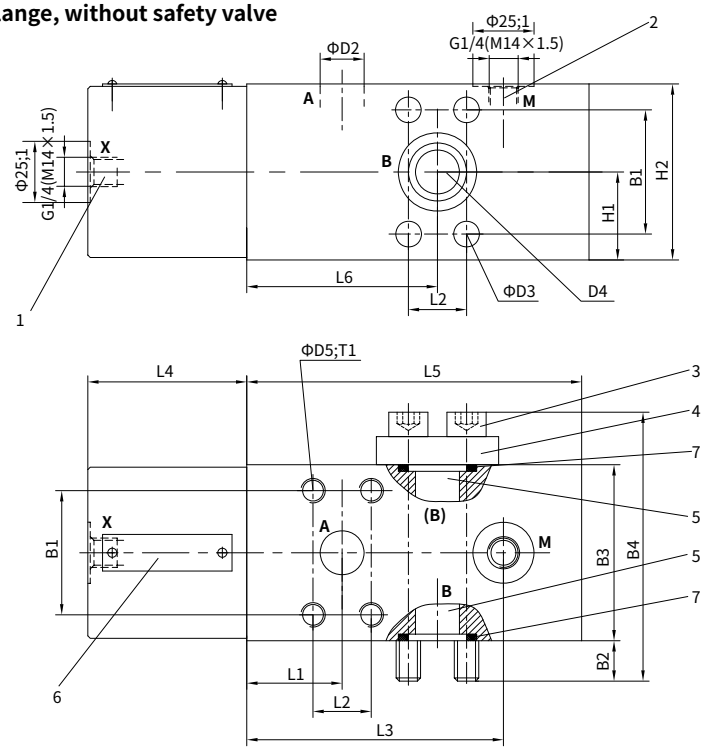
Type	B1	B2	D1	D2	D3	D4	D5	D6	D7	D8	D9	T1	L1	L2	L3	L4	L5
FD12KA	48	70	54	46	M42×2	38	34	46	38.6	16	M10	16	39	16	32	15.5	50.5
FD16KA	48	70	54	46	M42×2	38	34	46	38.6	16	M10	16	39	16	32	15.5	50.6
FD25KA	56	80	60	54	M52×2	48	40	60	48.6	25	M12	19	50	19	39	22	65
FD32KA	66	95	72	65	M64×2	58	52	74	58.6	30	M16	23	52	19	40	25	71

Type	L6	L7	L8	L9	L10	L11	L12	valve fixing screws/Tighting torque	M_A(Nm)	Weight
FD12KA	60	3	78	128	2.3	191	65	4 pcs M10×70 GB/T70.1-10.9	69	3.5kg
FD16KA	60	3	78	128	2.3	191	65	4 pcs M10×70 GB/T70.1-10.9	69	3.5kg
FD25KA	80	4	105	182	2.3	253	75	4 pcs M12×80 GB/T70.1-10.9	120	5.6kg
FD32KA	85	4	115	198	2.3	289	94	4 pcs M16×100 GB/T70.1-10.9	295	8.0kg

Unit dimensions

(Dimensions in mm)

· **SAE flange, without safety valve**



SAE flange connection:

Operating pressure 420bar

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

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

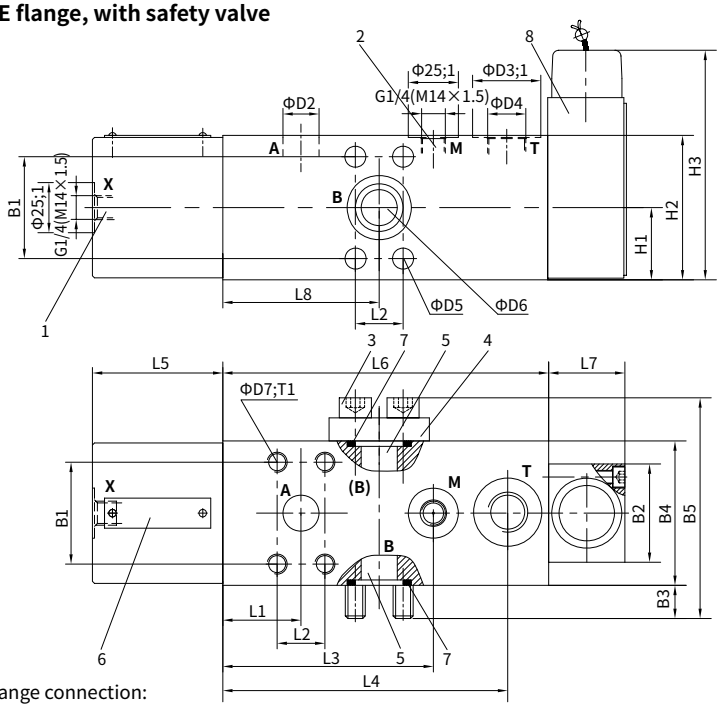
Type	B1	B2	B3	B4	D1	D2	D3	D4	D5	H1	H2	L1	L2	L3	L4
FD12FA	50.8	16.5	72	110	43	18	10.5	18	M10	36	72	39	23.8	105	65
FD16FA	50.8	16.5	72	110	43	18	10.5	18	M10	36	72	39	23.8	105	65
FD25FA	57.2	14.5	90	132	50	25	13.5	25	M12	45	90	50	27.8	148	75
FD32FA	66.7	20	105	154	56	30	15	30	M14	50	105	52	31.8	155	94

Type	L5	L6	T1	Weight	O-ring(7)	Valve fixing screws
FD12FA	140	78	15	7.2kg	25×3.5	4 pcs M10×100 GB/T70.1-10.9
FD16FA	140	78	15	7.2kg	25×3.5	4 pcs M10×100 GB/T70.1-10.9
FD25FA	200	105	18	16kg	32.92×3.53	4 pcs M12×120 GB/T70.1-10.9
FD32FA	215	115	21	23kg	37.7×3.53	4 pcs M14×140 GB/T70.1-10.9

Unit dimensions

(Dimensions in mm)

· **SAE flange, with safety valve**



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

1 Control port 2 Measuring port 3 Flange fixing screws 4 Cover
5 Optional port B 6 Name plate 7 O-ring 8 Safety valve

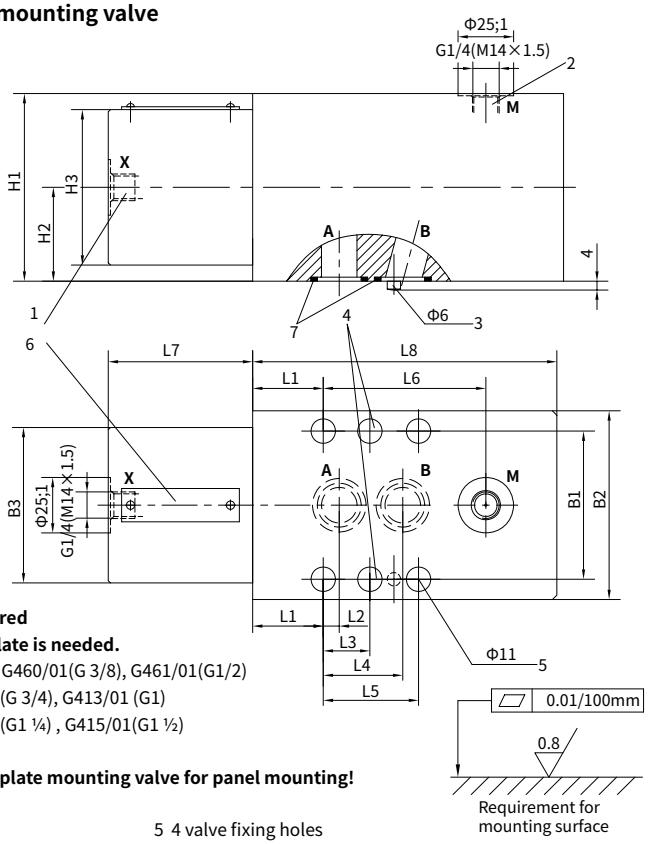
Type	B1	B2	B3	B4	B5	D1	D2	D3	D4		D5	D6	D7	H1	H2	H3	L1
									Inch	Metric							
FD12FB	50.8	49	16.5	72	110	43	18	34	G1/2	M22×1.5	10.5	18	M10	36	72	118	39
FD16FB	50.8	49	16.5	72	110	43	18	34	G1/2	M22×1.5	10.5	18	M10	36	72	118	39
FD25FB	57.2	78	14.5	90	132	50	25	42	G3/4	M27×2	13.5	25	M12	45	90	145	50
FD32FB	66.7	78	20	105	154	56	30	42	G3/4	M27×2	15	30	M14	50	105	145	52

Type	L2	L3	L4	L5	L6	L7	L8	T1	Weight	O-ring(7)	valve fixing screws
FD12FB	23.8	105	141.5	65	162	38	78	15	9kg	25×3.5	4 pcs M10×100
FD16FB	23.8	105	141.5	65	162	38	78	15	9kg	25×3.5	4 pcs M10×100
FD25FB	27.8	148	198	75	225	50	105	18	20kg	32.92×3.53	4 pcs M12×120
FD32FB	31.8	155	215	94	240	50	115	21	28kg	37.7×3.53	4 pcs M14×140

Unit dimensions

(Dimensions in mm)

· Sub-plate mounting valve



It must be ordered
if connection plate is needed.
Sizes 12 and 16: G460/01(G 3/8), G461/01(G1/2)
size 25: G412/01(G 3/4), G413/01 (G1)
size 32: G414/01(G1 ¼) , G415/01(G1 ½)
Notes:
Only use a sub-plate mounting valve for panel mounting!

1 Control port
2 Measuring port
3 Locating pin
4 Not for sizes 12, 16 and 25
5 4 valve fixing holes for sizes 12, 16 and 25
6 valve fixing holes for size 32
7 Name plate

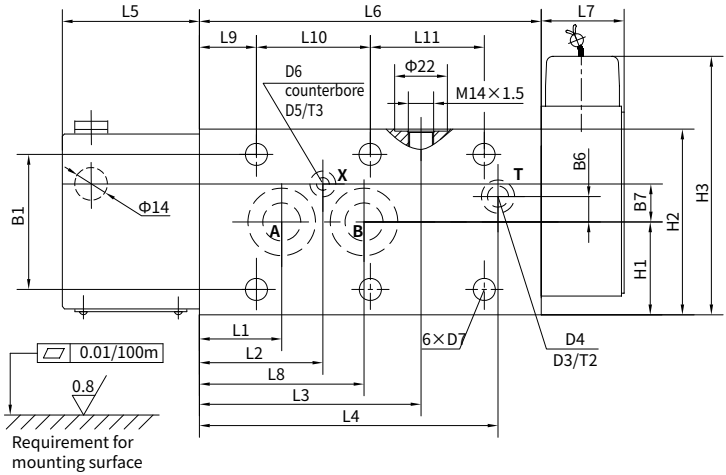
Type	B1	B2	B3	H1	H2	H3	L1	L2	L3	L4	L5	L6
FD12PA	66.7	85	70	85	42.5	70	31.8	7.2	-	35.8	42.9	73.2
FD16PA	66.7	85	70	85	42.5	70	31.8	7.2	-	35.8	42.9	73.2
FD25PA	79.4	100	80	100	50	80	38.9	11.1	-	49.2	60.3	109.1
FD32PA	96.8	120	95	120	60	95	35.3	16.7	42.1	67.5	84.2	119.7

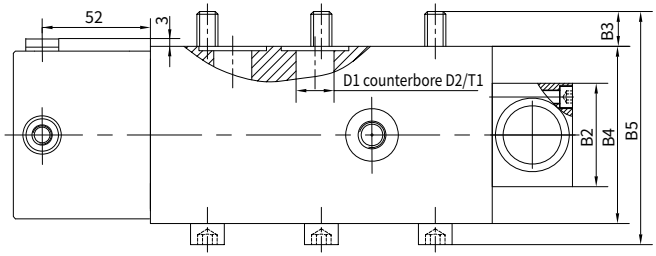
Type	L7	L8	Valve fixing screws/tighting torque	M_A(Nm)	Weight	O-ring(7)
FD12PA	65	140	4 pcs M10×100 GB/T70.1-10.9	75	9.3kg	21.3×2.4
FD16PA	65	140	4 pcs M10×100 GB/T70.1-10.9	75	9.3kg	21.3×2.4
FD25PA	75	200	4 pcs M10×120 GB/T70.1-10.9	75	18kg	29.82×2.62
FD32PA	94	215	6 pcs M10×140 GB/T70.1-10.9	75	28kg	38×3

Unit dimensions

(Dimensions in mm)

· **Special sub-plate amounting check-q-meter, with safety valve**





Dimension of Check-Q-meter type FD12PB
Dimension of Check-Q-meter type FD16PB

Type	B1	B2	B3	B4	B5	B6	B7	D1	D2	D3	D4	D5	D6	D7
FD12PB	64	49	16	84	11	12.5	18	18	32	15.7	10	12.2	6	10.5
FD16PB	64	49	16	84	11	12.5	18	18	32	15.7	10	12.2	6	10.5

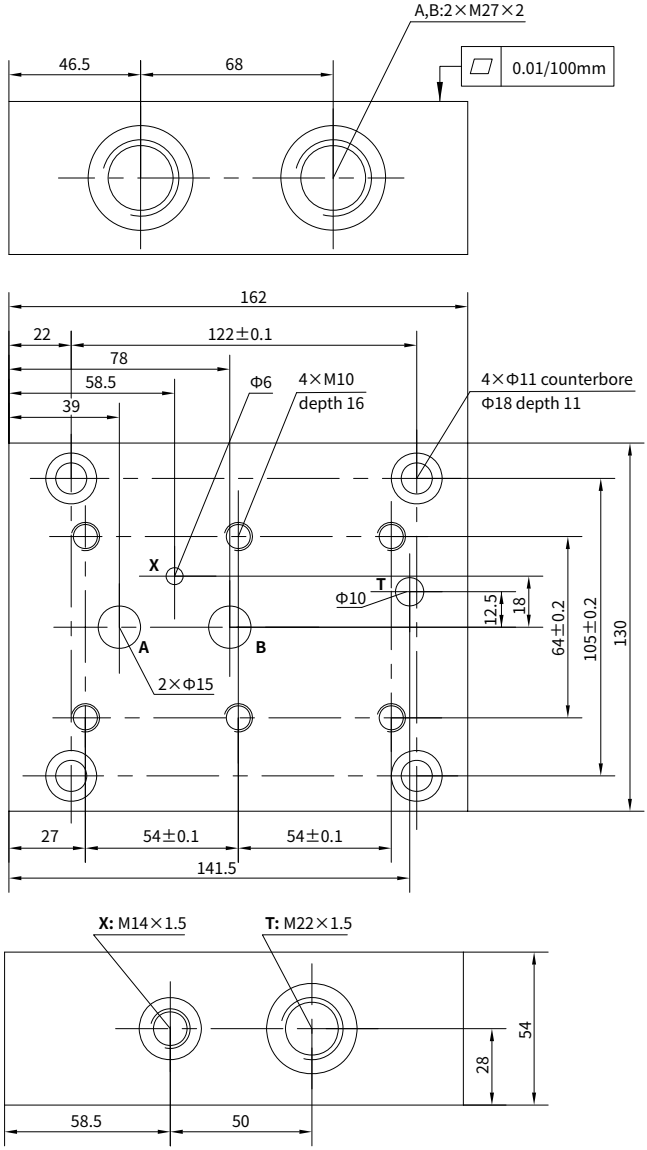
Type	H1	H2	H3	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11
FD12PB	44	88	126	39	58.5	105	141.5	65	162	38	78	27	54	54
FD16PB	44	88	126	39	58.5	105	141.5	65	162	38	78	27	54	54

Type	T1	T2	T3	Weight	Fixing screws	O-ring(7)		
FD12PB	2.7	1.9	1.4	10kg	4pcs M10×100	25×3.53	12×2	9.25×1.78
FD16PB	2.7	1.9	1.4	10kg	GB/T70.1-10.9	25×3.53	12×2	9.25×1.78

Unit dimensions

(Dimensions in mm)

· Sub-plate for special check-Q-meter with safety valve



Sub-plate dimension of Check-Q-meter type FD12PB
Sub-plate dimension of Check-Q-meter type FD16PB