

Characteristics

The D*1*W*EE with explosion proof solenoids is based on the standard D*1*W series. The specific solenoid design allows the usage in hazardous environments. The explosion proof class is

CE Ex II 2 G

Ex e mb IIC T4 Gb

for use in zone 1 and 2 (conform to ATEX).

Additionally the solenoids have IECEx conformity.

All explosion proof solenoids are DC design. The valves for AC operate with integrated rectifier.

The pilot operated valves are available in 4 sizes:

D31DW NG10 (standard)

D31NW NG10 (high flow)

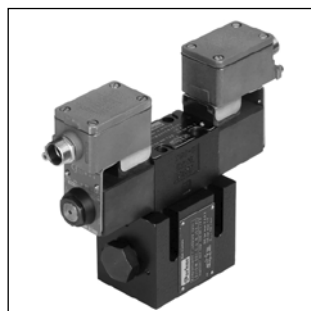
D41VW NG16

D91VW NG25 (for port diameter up to 32 mm)

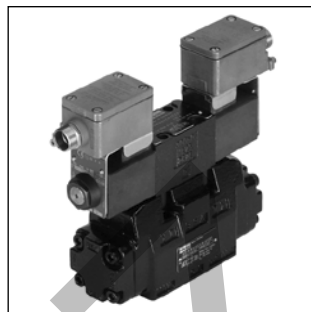
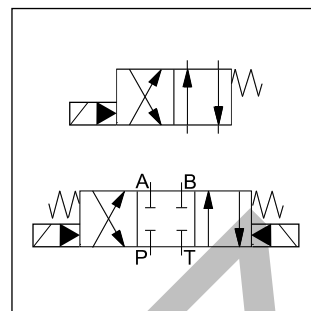
D111VW NG32

All valves are piloted by a D1VW valve. The minimum pilot pressure must be ensured for all operating conditions of the directional valve.

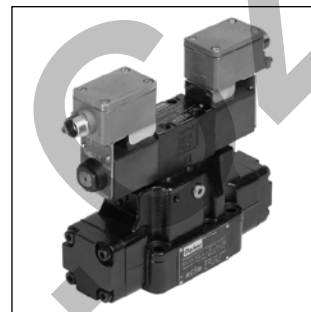
Additionally spools with a P to T connection in the de-energized position need an external pressure supply (external inlet) or an integral check valve.



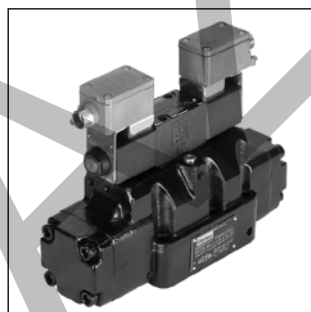
D31DW



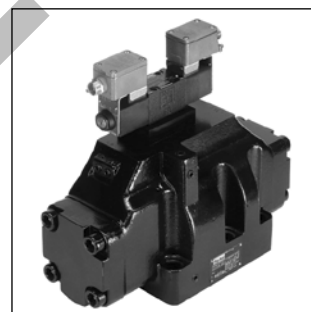
D31NW



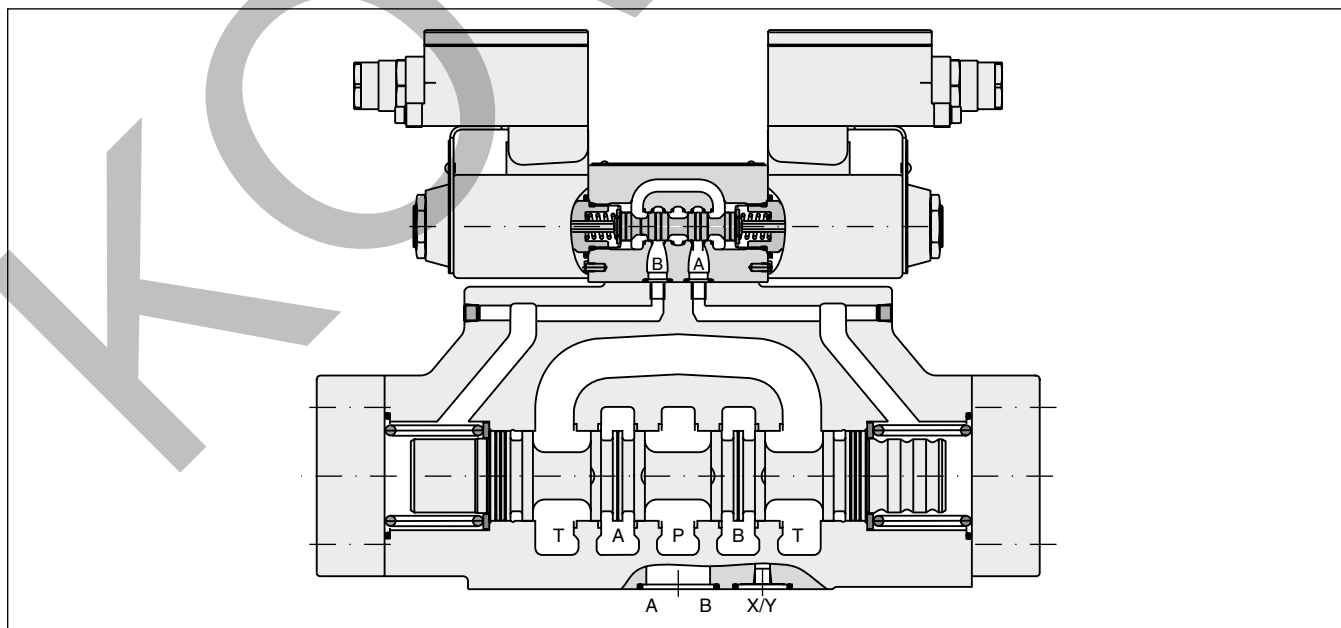
D41VW




D91VW



D111VW

D91VW

Technical Data

General							
Design		Directional spool valve					
Actuation		Solenoid					
Series		D31DW	D31NW	D41VW	D91VW	D111VW	
Size		NG10	NG10	NG16	NG25	NG32	
Weight (1/ 2 solenoids)		[kg]	6.0 / 6.6	7.6 / 8.1	9.7 / 10.3	17.9 / 18.6	67.4 / 68.0
Mounting interface		DIN 24340 A10 ISO 4401 NFFPA D05	DIN 24340 A10 ISO 4401 NFFPA D05	DIN 24340 A16 ISO 4401 NFFPA D07	DIN 24340 A25 ISO 4401 NFFPA D08	DIN 24340 A32 ISO 4401 NFFPA D10	
		CETOP RP 121-H					
Mounting position		unrestricted, preferably horizontal					
Ambient temperature		[°C]	-20...+60				
MTTF _D value		[years]	75				
Hydraulic							
Max. operating pressure		[bar]	P, A, B: 350; T: 210				
Fluid		Hydraulic oil in accordance with DIN 51524					
Fluid temperature		[°C]	-20 ... +60				
Viscosity permitted		[cSt] / [mm²/s]	2.8...400				
Viscosity recommended		[cSt] / [mm²/s]	30...80				
Filtration		ISO 4406; 18/16/13					
Flow max.		[l/min]	150	170	300	700	2000
Leakage at 350 bar (per flow path)		[ml/min]	up to 100*	up to 150*	up to 200*	up to 800*	up to 5000*
		*depending on spool					
Opening pressure integral check valve		[bar]	n.a.	n.a.	see p/Q diagram	see p/Q diagram	n.a.
Minimum pilot supply pressure		[bar]	5	7	5		
Static / Dynamic							
Step response at 95 %		[ms]	Energized / De-energized				
DC solenoids Pilot pressure		50 bar	60 / 40 (50/60)	95 / 65	150 / 170	470 / 390	
		100 bar	55 / 40 (50/60)	75 / 65	110 / 170	320 / 390	
		250 bar	55 / 40 (50/50)	60 / 65	90 / 170	210 / 390	
		350 bar	55 / 40 (50/50)	60 / 65	85 / 170	200 / 390	
AC solenoids Pilot pressure		50 bar	40 / 30 (30/50)	75 / 55	130 / 155	450 / 375	
		100 bar	35 / 30 (30/50)	65 / 55	90 / 155	300 / 375	
		250 bar	35 / 30 (30/50)	40 / 55	70 / 155	190 / 375	
		350 bar	35 / 30 (30/50)	40 / 55	65 / 155	180 / 375	
Electrical characteristics							
Duty ratio		100 % ED; CAUTION: coil temperature up to 135 °C possible					
Protection class		CE  II 2 G, Ex e mb IIC T4 Gb, IP66 (plugged and mounted correctly)					
		Code	J	N	P		
Supply voltage / ripple		[V]	24 V =	230V / 50 Hz	110V / 50 Hz		
Tolerance supply voltage		[%]	±10	±10	±10		
Current consumption		[A]	1.0	0.12	0.25		
Power consumption		[W]	24	24	24		
Solenoid connection		Box with M20x1.5 entry for cable glands. Solenoid identification as per ISO 9461.					
Wiring min.		[mm²]	3 x 1.5 recommended				
Wiring length max.		[m]	50 recommended				

With electrical connections the protective conductor (PE \perp) must be connected according to the relevant regulations.

Ordering Code

Code	Bore	Size	Feature
D31DW	Ø11 mm	NG10	
D31NW	Ø11 mm	NG10	High flow
D41VW	Ø20 mm	NG16	
D91VW	Ø32 mm	NG25	
D111VW	Ø50 mm	NG32	

3 position spool	
Code	Spool type
001 ²⁾	
002 ²⁾	
003 ³⁾	
004 ³⁾	
005 ³⁾	
006 ³⁾	
009 ¹⁾²⁾	
011 ³⁾	
015 ³⁾	
016 ³⁾	
021 ³⁾	
022 ³⁾	

2 position spool	
Code	Spool type
020 ²⁾	
030 ²⁾	

3 position spool		
Code	Spool position	
C ²⁾		3 positions. Spring offset in position "0". Operated in position "a" or "b".
	Standard	Spool type 009
E ²⁾		2 positions. Spring offset in position "0".
F ²⁾		2 positions. Operated in position "0".
K ²⁾		2 positions. Spring offset in position "0".
M ²⁾		2 positions. Operated in position "0".
R ³⁾⁴⁾		2 positions, detent. Operated in position "0" or "b".
S ³⁾⁴⁾		2 positions, detent. Operated in position "0" or "a". No center in offset position.

2 position spools		
Code	Spool position	
B ²⁾		Spring offset in position "b". Operated in position "a".
D ³⁾⁴⁾		Detent, operated in position "a" or "b". No center or offset position.
H ²⁾		Spring offset in position "a". Operated in position "b".

1) Consider specific spool position.

2) All sizes (D31, D41, D91, D111) available.

3) Only D31, D41, D91 available.

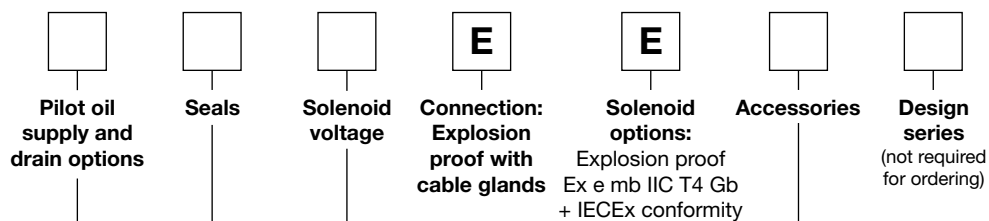
4) D31DW*D/R/S is not available with accessories 3D, 3E or 3F.

5) Not for D31DW and D111VW available.

6) Not for spools 002, 009 and 030 available.

7) Only D31, D41, D91 available.

Ordering Code



Code	Accessories
ohne	Standard valve w/o accessories
3A	Pilot choke, meter-out
3B	Pilot choke, meter-in
3C	Pilot with pressure reducing valve
3D ⁴⁾⁷⁾	Stroke adjustment side B
3E ⁴⁾⁷⁾	Stroke adjustment side A
3F ⁴⁾⁷⁾	Stroke adjustment side A and B
3R	meter-out / pressure reducing valve
1T	meter-in / pressure reducing valve

Code	Solenoid voltage
J	24 V =
N	230 V / 50 Hz
P	110 V / 50 Hz

Code	Seals
N	NBR
V	FPM

Code	Inlet	Outlet
1	Internal	External
2	External	External
3 ⁵⁾	Integral check valve	External
4 ⁶⁾	Internal	Internal
5	External	Internal
6 ⁵⁾	Integral check valve	Internal

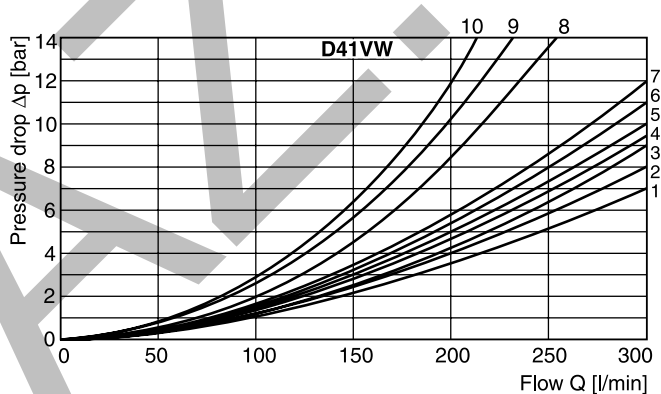
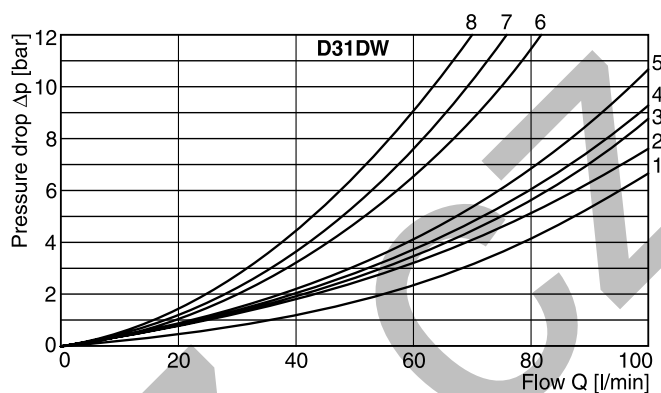
Further spool types on request.

Flow Curves

The flow curve diagram shows the flow versus pressure drop curves for all spool types. The relevant curve number for each spool type, operating position and flow direction is given in the table below.

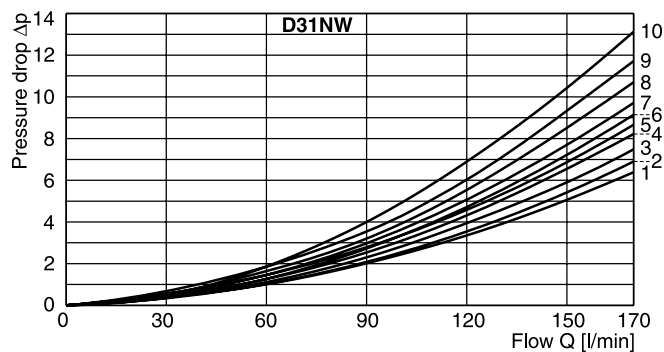
D31DW and D41VW

Spool Code	Curve number									
	P-A		P-B		P-T		A-T		B-T	
	D3	D4	D3	D4	D3	D4	D3	D4	D3	D4
001	3	1	3	1	–	–	1	4	1	5
002	3	1	3	2	4	6	1	4	1	6
003	3	1	4	2	–	–	1	5	1	6
004	3	1	3	1	–	–	1	5	1	5
005	3	2	4	2	–	–	1	3	1	5
006	3	1	3	2	–	–	1	3	1	6
009	3	2	3	9	8	8	1	7	1	10
011	3	1	3	1	–	–	1	4	1	5
015	4	1	3	2	–	–	1	4	1	6
016	4	2	3	2	–	–	1	3	1	5
020	3	3	4	5	–	–	1	3	1	5
021	4	2	3	8	–	–	1	2	–	–
022	3	8	4	2	–	–	–	–	1	3
030	3	2	1	3	–	–	1	6	1	7



D31NW

Spool Code	Curve number				
	P-A	P-B	P-T	A-T	B-T
001	3	3	–	2	5
002	3	3	7	4	3
003	2	3	–	4	4
004	2	3	–	4	4
005	2	4	–	1	4
006	8	9	–	7	9
009	4	6	6	4	10
011	3	3	–	2	4
015	2	2	–	1	4
016	4	3	–	2	4
020	6	4	–	3	6
021	–	7	–	8	–
022	4	–	–	9	–
030	5	3	–	2	5



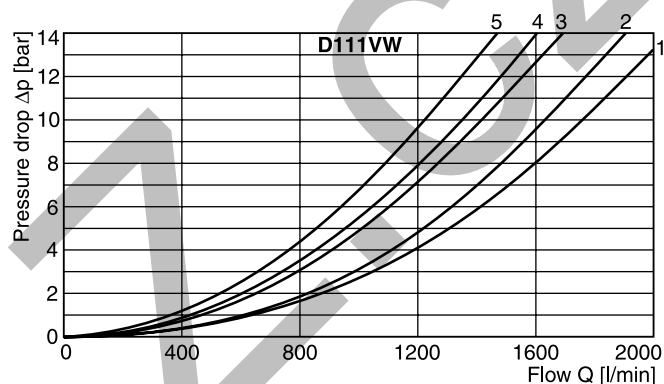
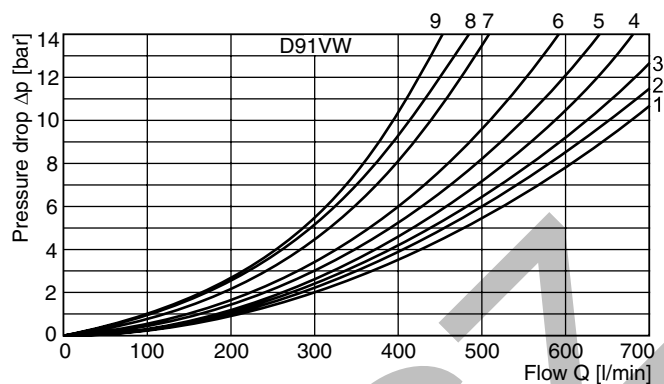
All characteristic curves measured with HLP46 at 50 °C.

Flow Curves

Pilot Operated Directional Control Valve
Series D*W*EE Explosion Proof

D91VW and D111VW

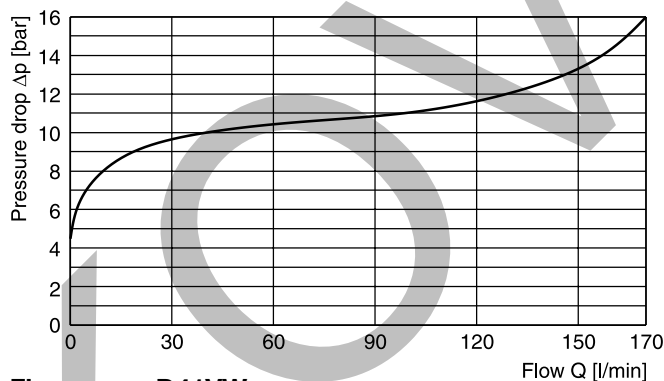
Spool Code	Curve number									
	P-A		P-B		P-T		A-T		B-T	
	D9	D11	D9	D11	D9	D11	D9	D11	D9	D11
001	3	5	2	5	-	-	3	4	5	1
002	2	5	1	5	1	5	3	4	5	1
003	4	-	2	-	-	-	3	-	6	-
004	4	-	3	-	-	-	3	-	5	-
005	1	-	2	-	-	-	4	-	5	-
006	2	-	2	-	-	-	4	-	6	-
009	4	3	7	3	8	2	4	3	9	1
011	3	-	2	-	-	-	3	-	5	-
015	3	-	3	-	-	-	4	-	5	-
016	3	-	3	-	-	-	4	-	5	-
020	6	5	5	5	-	-	6	3	7	1
021	5	-	9	-	-	-	3	-	-	-
022	9	-	5	-	-	-	-	-	5	-
030	3	5	2	5	-	-	3	4	5	1



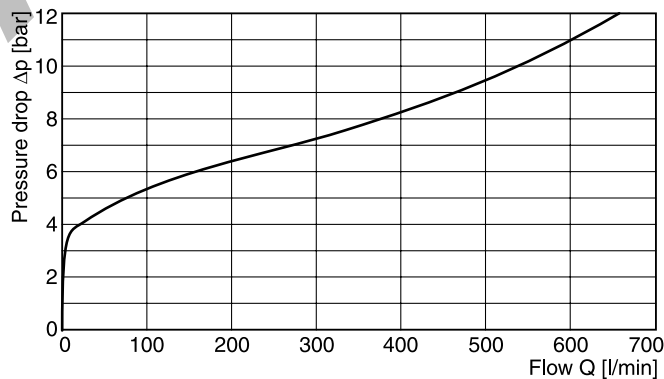
Integral check valve in the P port

Mounting an integral check valve in the P port is necessary to build up pilot pressure for valves with P to T connection and internal pilot oil supply. The pressure difference at the integral check valve (see performance curves) is to be added to all flow curves of the P port of the main valve. Directional valves with an integral check valve are available for the series D31NW and D41VW.

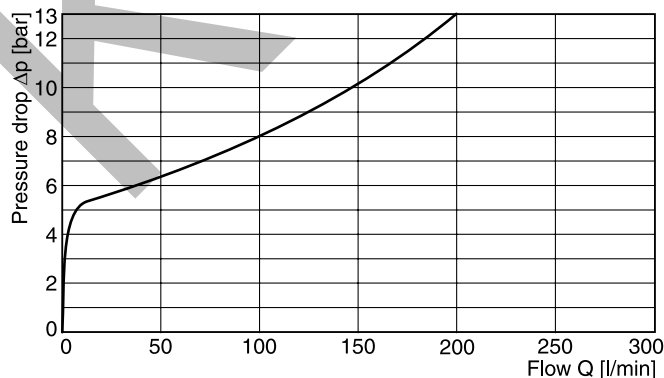
Flow curve D31NW



Flow curve D91VW



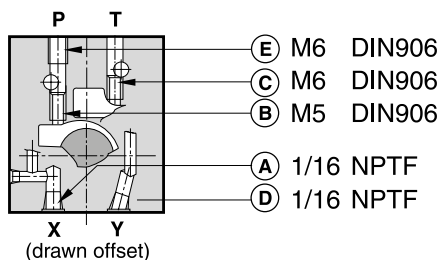
Flow curve D41VW



Pilot Oil Options

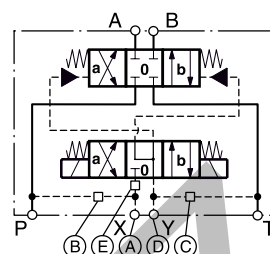
Pilot Operated Directional Control Valve Series D*W*EE Explosion Proof

D31DW

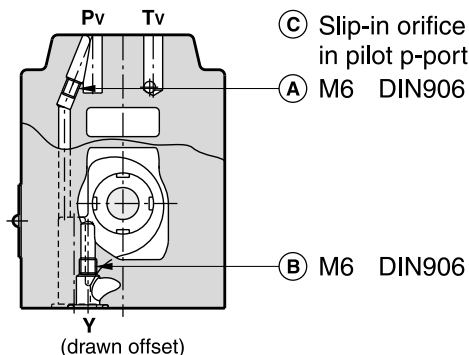


○ open, ● closed

Pilot oil		A	B	C	D	E
Inlet	Outlet					
internal	external	●	○	●	○	Orifice Ø1.2
external	external	○	●	●	○	Orifice Ø1.2
internal	internal	●	○	○	●	Orifice Ø1.2
external	internal	○	●	○	●	Orifice Ø1.2

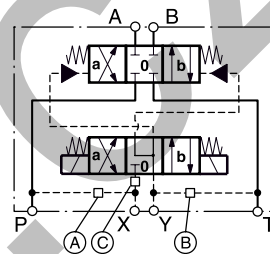


D31NW

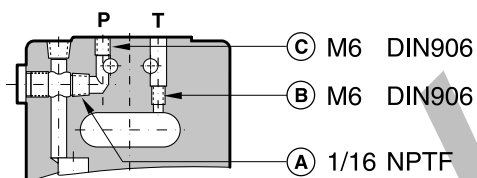


○ open, ● closed

Pilot oil		A	B	C
Inlet	Outlet			
internal	external	○	●	Orifice Ø1.0
external	external	●	●	Orifice Ø1.0
internal	internal	○	○	Orifice Ø1.0
external	internal	●	○	Orifice Ø1.0

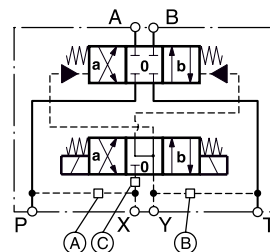


D41VW

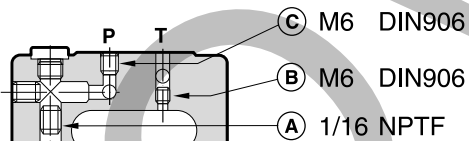


○ open, ● closed

Pilot oil		A	B	C
Inlet	Outlet			
internal	external	○	●	Orifice Ø1.5
external	external	●	●	Orifice Ø1.5
internal	internal	○	○	Orifice Ø1.5
external	internal	●	○	Orifice Ø1.5

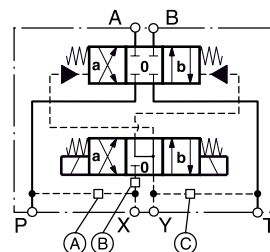


D91VW

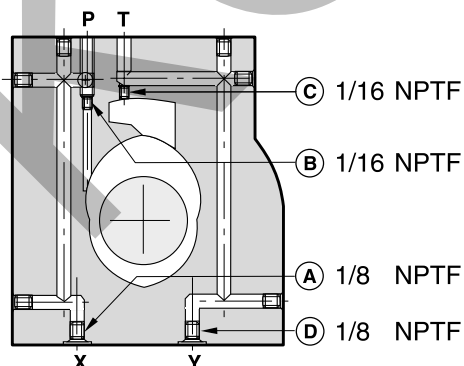


○ open, ● closed

Pilot oil		A	B	C
Inlet	Outlet			
internal	external	○	●	Orifice Ø1.5
external	external	●	●	Orifice Ø1.5
internal	internal	○	○	Orifice Ø1.5
external	internal	●	○	Orifice Ø1.5

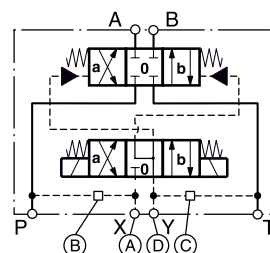


D111VW

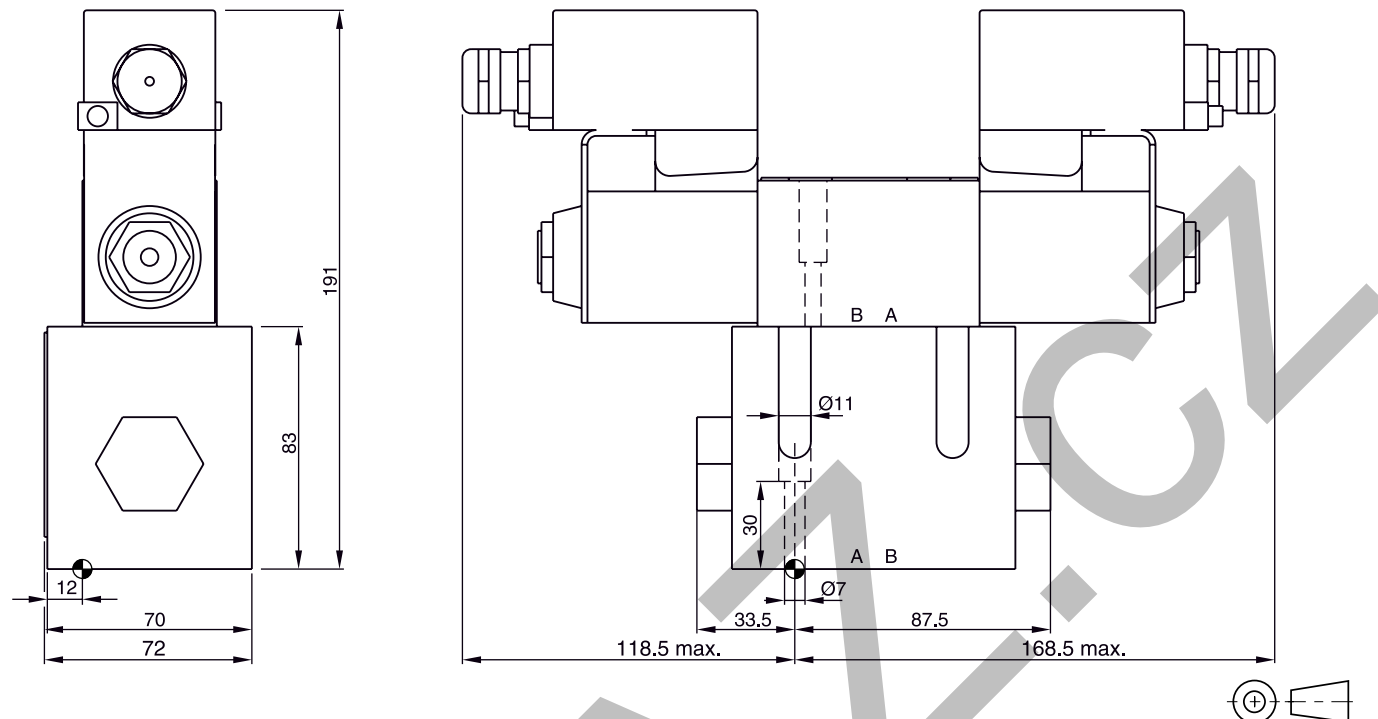







○ open, ● closed

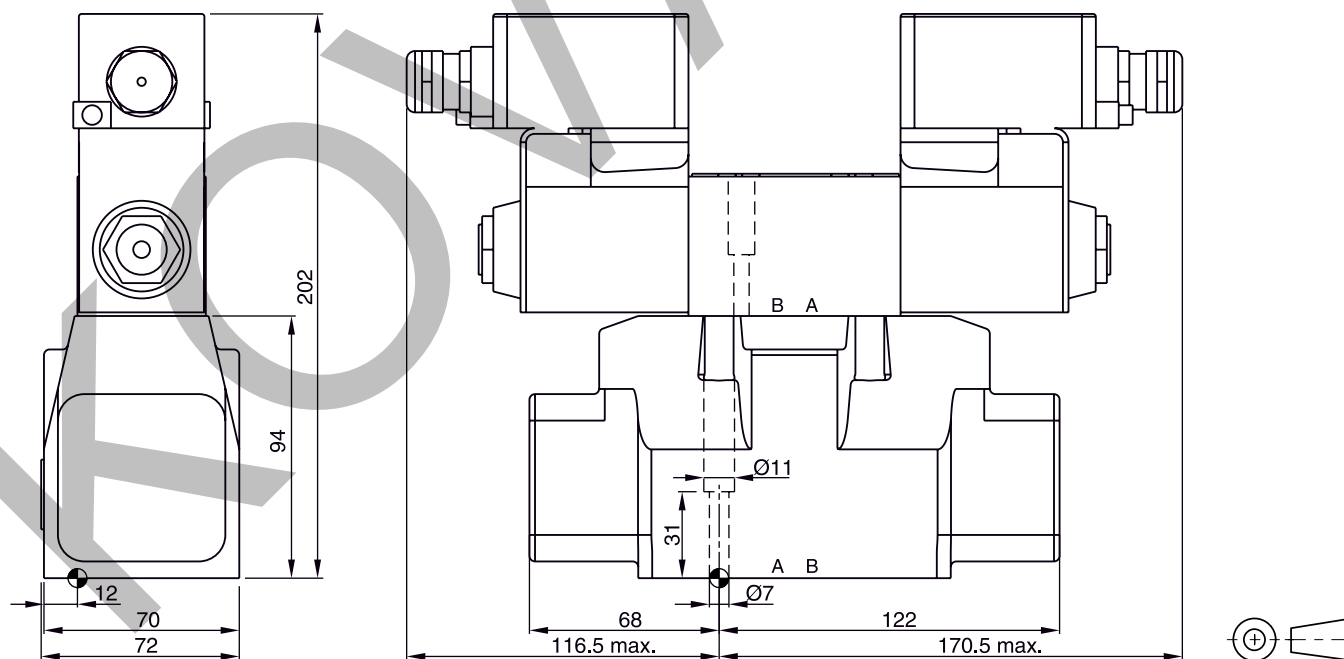
Pilot oil		A	B	C	D
Inlet	Outlet				
internal	external	○	Orifice Ø1.5	●	○
external	external	Orifice Ø1.5	●	●	○
internal	internal	○	Orifice Ø1.5	○	○
external	internal	Orifice Ø1.5	●	○	○








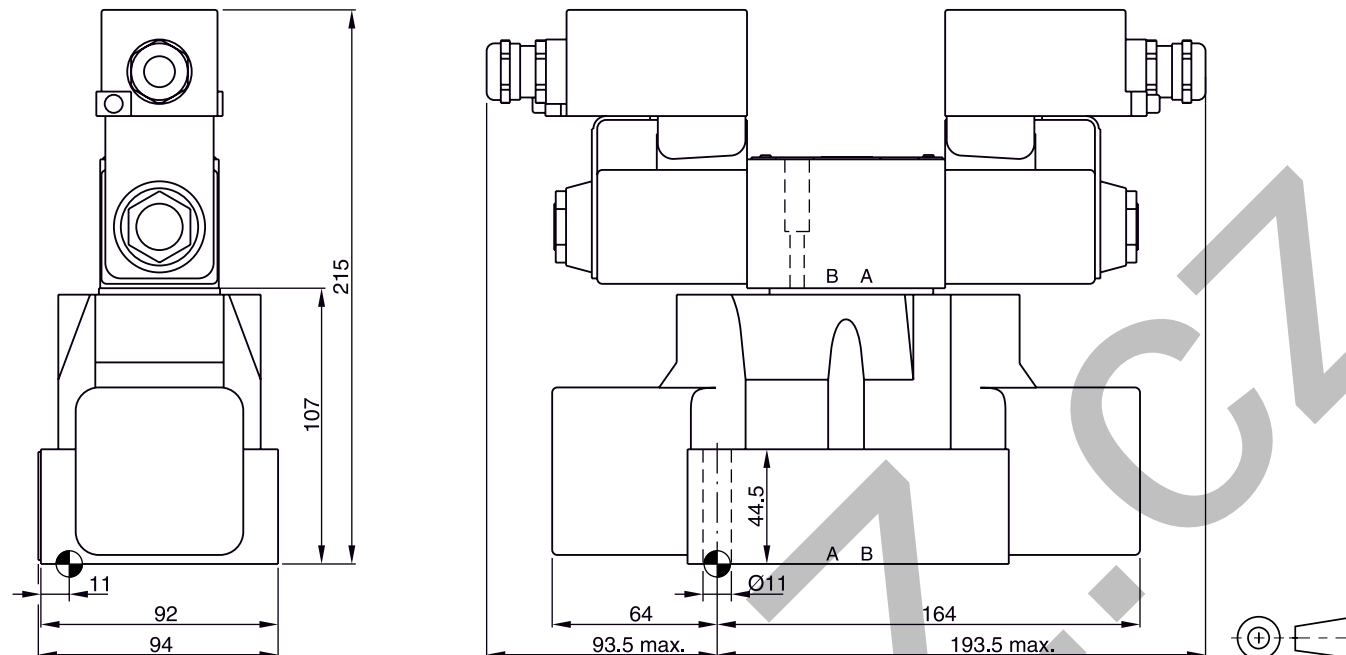
All orifice sizes for standard valves

Dimensions**D31DW**

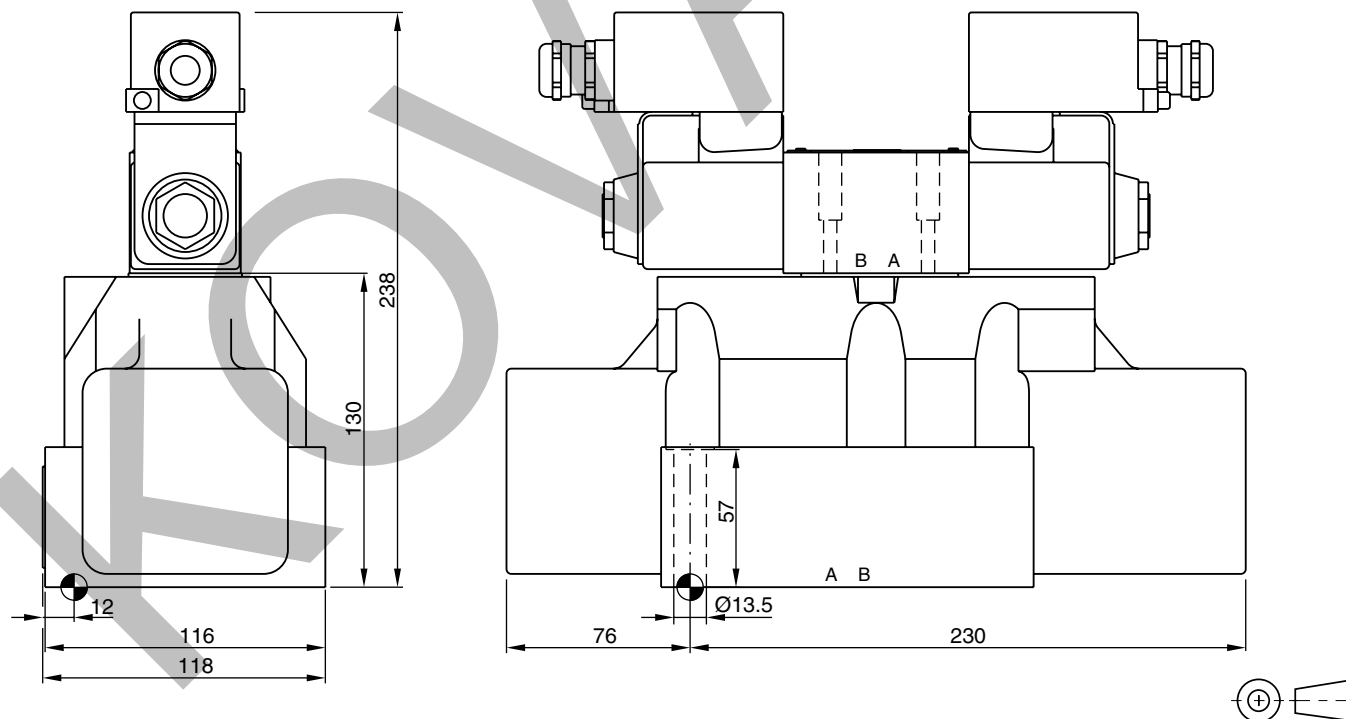
Surface finish	 Kit			 Kit
$\sqrt{R_{max} 6.3}$ 	BK385	4x M6x40 ISO 4762-12.9	13.2 Nm ±15 %	NBR: SK-D31DW-N-91 FPM: SK-D31DW-V-91

D31NW

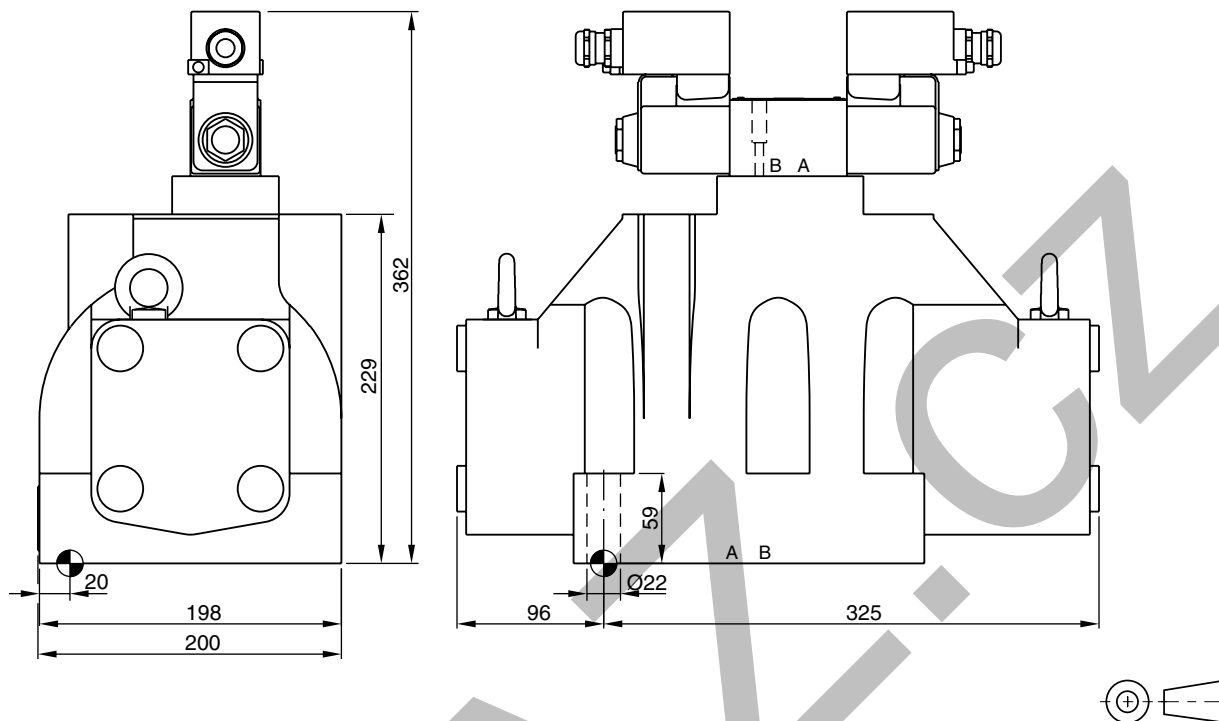
Surface finish	 Kit			 Kit
$\sqrt{R_{max} 6.3}$ 	BK385	4x M6x40 ISO 4762-12.9	13.2 Nm ±15 %	NBR: SK-4D02V-B1 FPM: SK-4D02V-B5






Dimensions**D41VW**

Surface finish	Kit	Kit	Kit	Kit
$\sqrt{R_{max} 6.3}$ $\square 0.01/100$	BK320	4x M10x60 2x M6x55 ISO 4762-12.9	63 Nm $\pm 15\%$ 13.2 Nm $\pm 15\%$	NBR: SK-D41VW-N-91 FPM: SK-D41VW-V-91

D91VW

Surface finish	Kit	Kit	Kit	Kit
$\sqrt{R_{max} 6.3}$ $\square 0.01/100$	BK385	4x M6x40 ISO 4762-12.9	13.2 Nm $\pm 15\%$	NBR: SK-D81VW-N-91 / SK-D91VW-N-91 FPM: SK-D81VW-V-91 / SK-D91VW-V-91

Dimensions**Pilot Operated Directional Control Valve
Series D*W*EE Explosion Proof****D111VW**

Surface finish	 Kit	 Kit	 Kit	 Kit
$\sqrt{R_{\max} 6.3}$ 	BK386	6x M20x90 ISO 4762-12.9	517 Nm ±15 %	NBR: SK-D111VW-N-91 FPM: SK-D111VW-V-91