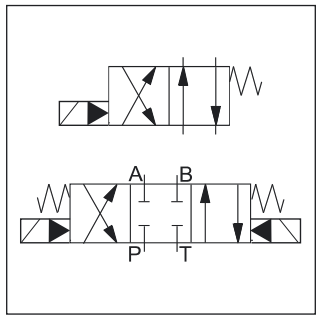
The D31, D41, D81, D91 and D111 are electrically controlled 4/3 or 4/2 way directional control valves. The valves are pilot operated by an NG6 valve.

Pressure and flow of the pilot oil have a significant influence on the response time of the spool in the main stage.

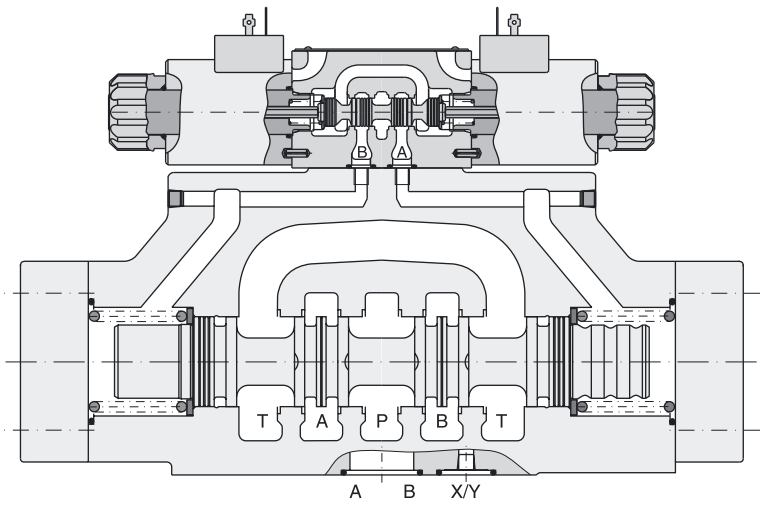
In order to guarantee a save switching of the spool please choose the appropriate pilot oil supply and drain option. (Spools with a connection P to T need an external pressure supply or an integral check valve. For spools with negative cross-over position the same options are recommended.)

The minimum pilot pressure must be ensured for all operating conditions of the directional valve.

D41VW



D81VW



2

D		1		W		
Directional control valve	Series	Pilot NG 06	Style	Electrically operated	Spool type	Spool position

Code	Bore	Size
3	**Ø11mm**	**NG10**
4	**Ø20mm**	**NG16**
8	**Ø26mm**	**NG25**
9	Ø32mm	NG25
11	Ø50mm	NG32

Code	Style
D	**D3**
V	**D4, D8/9, D111**

3 position spools

Code	Spool type a 0 b
1 [2]	
2 [2]	
3 [3]	
4 [3]	
5 [3]	
6 [3]	
7 [3]	
9 [1] [2]	
11 [3]	
14 [3]	
15 [3]	
16 [3]	
21 [3]	
22 [3]	
31 [5]	
32 [5]	
54 [4]	
81 [2]	
82 [2]	

2 position spools

Code	Spool type a b
20 [2]	
26 [3]	
30 [2]	

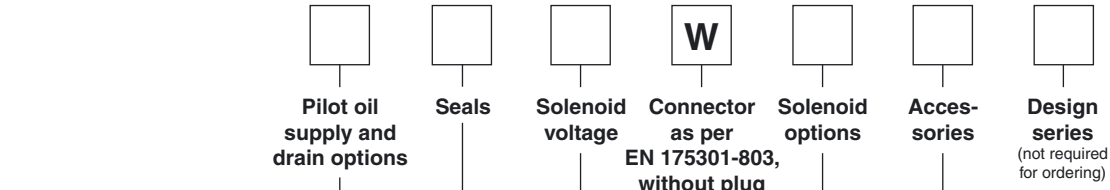
3 position spools			
Code	all 3 position spools		
C [2]			**3 positions.** **Spring offset in position “0“.** **Operated in position “a“ or “b“.**
	Standard	Spool type 9	
E [2]	Operated in position “a“.	Operated in position “b“.	2 positions. Spring offset in position “0“.
F [2]	Spring offset in position “b“.	Spring offset in position “a“.	2 positions. Operated in position “0“.
K [2]	Operated in position “b“.	Operated in position “a“.	2 positions. Spring offset in position “0“.
M [2]	Spring offset in position “a“.	Spring offset in position “b“.	2 positions. Operated in position “0“.
R [3]	No centre in offset position.	No centre in offset position.	2 positions, detent. Operated in position “0“ or “b“.
S [3]	No centre in offset position.	No centre in offset position.	2 positions, detent. Operated in position “0“ or “a“. No centre in offset position.

2 position spools		
Code	Spool position	
B [2]		**Spring offset in position “b“.** **Operated in position “a“.**
D [3]		Detent, operated in position “a“ or “b“. No centre or offset position.
H [2]		Spring offset in position “a“. Operated in position “b“.

[1] Consider specific spool position.
[2] All sizes (D31, D41, D81, D 91, D111) available
[3] Only D31, D41, D81, D91 available
[4] Only D41, D81, D91, D111 available
[5] Only D31, D81, D91 available

D3-D11_UK.INDD CM

Parker Hannifin GmbH & Co. KG
Hydraulic Controls Division
Kaarst, Germany



Code	Inlet	Outlet
1	**Internal**	**External**
2	External	External
3 [6]	Integral check valve	External
4 [7]	**Internal**	**Internal**
5 [6]	External	Internal
6	Integral check valve	Internal

[6] Only D41, D81 available.
[7] Not for spools 2, 7, 9, 14, 30, 31, 32, 54 available.

Code	Seals
N	**NBR**
V	FPM

Code	Voltage
K	12V =
J	**24V =**
U [8]	98V =
G [8]	205V =
Y	110V 50Hz / 120V 60Hz
T	230V 50Hz / 240V 60Hz

[8] For AC voltage use plug with rectifier.
Please order rectifier plug separately.

Code	Solenoid option
omit	**Standard solenoid without options**
T	without manual override

Code	Accessories
omit [9]	**Standard valve w/o accessories**
2 [9]	Pilot with press. reducing valve
7 [9]	Pilot choke, meter-out
8 [10]	Stroke adjustment side B
9 [10]	Stroke adjustment side A
60 [9]	Pilot choke, meter-in
89 [10]	Stroke adjustment side A and B

[9] All sizes (D31, D41, D81, D91, D111) available.
[10] Only D31, D41, D81, D91 available.

Bold letters =
Short-term availability

Further spool types and solenoid voltages on request.
Explosion proof solenoids EEx me II on request.

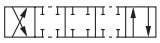
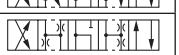
2

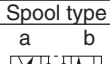
With inductive position control

D		1		W		
Directional control valve	Series	Pilot NG 06	Style	Electrically operated	Spool type	Spool position

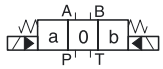
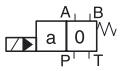
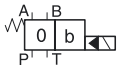
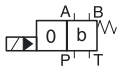
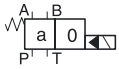
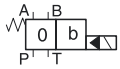
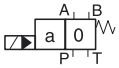
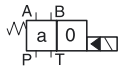
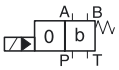
Code	Bore	Size
3	Ø11mm	NG10
4	Ø20mm	NG16
8	Ø26mm	NG25
9	Ø32mm	NG25
11	Ø50mm	NG32

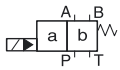
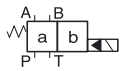
Code	Style
D	D3
V	D4, D8/9, D111

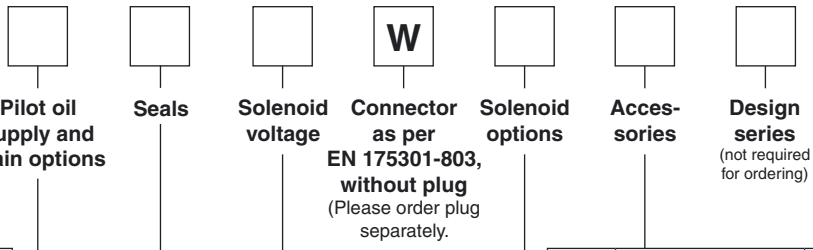
3 position spools	
Code	Spool type a 0 b
1 [2]	
2 [5]	
3 [3]	
4 [3]	
7 [5]	
9 [1] [4]	
11 [5]	
14 [5]	
15 [3]	

2 position spools	
Code	Spool type a b
20 [2]	
30 [5]	

[1] Consider specific spool position.
[2] All sizes (D31, D41, D81, D91, D111) available
[3] Only D31, D41, D81, D91 available
[4] Only D41, D81, D91, D111 available
[5] Only D41, D81, D91 available

3 position spools			
Code	all 3 position spools		
C			3 positions. Spring offset in position “0“. Operated in position “a“ or “b“.
	Standard	Spool type 9	
E	 Operated in position “a“.	 Operated in position “b“.	2 positions. Spring offset in position “0“.
F	 Spring offset in position “b“.	 Spring offset in position “a“.	2 positions. Operated in position “0“.
K	 Operated in position “b“.	 Operated in position “a“.	2 positions. Spring offset in position “0“.
M	 Spring offset in position “a“.	 Spring offset in position “b“.	2 positions. Operated in position “0“.

2 position spools	
Code	Spool position
B	 Spring offset in position “b“. Operated in position “a“.
H	 Spring offset in position “a“. Operated in position “b“.



Code	Inlet	Outlet
1	Internal	External
2	External	External
3 [6]	Integral check valve	External
4 [7]	Internal	Internal
5	External	Internal
6 [6]	Integral check valve	Internal

[6] Only D41, D81 available.
[7] Not for spools 2, 7, 9, 14, 30 available.

Code	Seals
N	NBR
V	FPM

Code	Voltage
K	12V =
J	24V =
U [8]	98V =
G [8]	205V =

[8] For AC voltage use plug with rectifier.
Please order rectifier plug separately.

Code	Solenoid option
omit	Standard solenoid without options
T [9]	without manual override

[9] For hydraulic presses according to the safety regulations EN 693, solenoid option “T“ (without manual override) and accessories “66“, “80“ or “88“ (start position monitored) are required.

Code	Spool position	Position control
55	C	End position monitored, side A and B
88 [9]		Start position monitored, side A and B
11	C, B, E, F (all spools) C, K, M (spool 9)	End position monitored, side B
80 [9]		Start position monitored, side B
10	C, H, K, M (all spools) C, E, F (spool 9)	End position monitored, side A
66 [9]		Start position monitored, side A

The plug M12 x 1 for the position control is included. The monitor switch has to be located on the side to which the spool moves from the spring offset position.

Attention

The adjustment of the position control is factory set and sealed. Replacement and repairs can only be undertaken by the manufacturer.

2

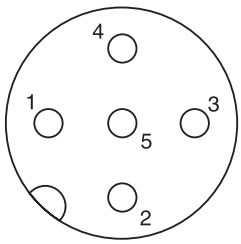
General							
Design		Directional spool valve					
Actuation		Solenoid					
Series		**D31**	**D41**	**D81/91**	**D111**		
Size		NG10	NG16	NG25	NG32		
Weight (1/ 2 solenoids)	[kg]	6.0 / 6.6	9.7 / 10.3	17.9 / 18.6	67.4 / 68.0		
Mounting interface		DIN 24340 A10	DIN 24340 A16	DIN 24340 A25	DIN 24340 A32		
		ISO 4401	ISO 4401	ISO 4401	ISO 4401		
		NFPA D05	NFPA D07	NFPA D08	NFPA D10		
		CETOP RP 121-H					
Mounting position		unrestricted, preferably horizontal					
Ambient temperature	[°C]	-25...+50 (without inductive position control)					
	[°C]	0...+50 (with inductive position control)					
Hydraulic							
Max. operating pressure	[bar]	Pilot drain internal: P, A B, X: 350; T, Y: 105					
		Pilot drain external: P, A B, T, X: 350; Y: 105					
Fluid		Hydraulic oil in accordance with DIN 51524 / 51525					
Fluid temperature	[°C]	-25 ... +70					
Viscosity permitted	[cSt] / [mm²/s]	2.8...400					
Viscosity recommended	[cSt] / [mm²/s]	30...80					
Filtration		ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)					
Flow max.	[l/min]	150	300	700	2000		
Leakage at 350 bar (per flow path)	[ml/min]	up to 100*	up to 200*	up to 800*	up to 5000*		
*depending on spool							
Opening pressure integral check valve	[bar]	n.a.	see p/Q diagram	see p/Q diagram	n.a.		
Minimum pilot supply pressure	[bar]	5					
Static / Dynamic							
Step response at 95%	[ms]	Energized / De-energized					
DC solenoids Pilot pressure	50 bar	60 / 40	95 / 65	150 / 170	470 / 390		
	100 bar	55 / 40	75 / 65	110 / 170	320 / 390		
	250 bar	55 / 40	60 / 65	90 / 170	210 / 390		
	350 bar	55 / 40	60 / 65	85 / 170	200 / 390		
AC solenoids Pilot pressure	50 bar	40 / 30	75 / 55	130 / 155	450 / 375		
	100 bar	35 / 30	65 / 55	90 / 155	300 / 375		
	250 bar	35 / 30	40 / 55	70 / 155	190 / 375		
	350 bar	35 / 30	40 / 55	65 / 155	180 / 375		
Electrical characteristics							
Duty ratio		100% ED; CAUTION: coil temperature up to 150 °C possible					
Protection class		IP 65 in accordance with EN 60529 (plugged and mounted)					
	Code	K	J	U	G	Y	T
Supply voltage / ripple	[V]	12 V =	24 V =	98 V =	205 V =	110V at 50Hz/ 120V at 60Hz	230V at 50Hz/ 240V at 60Hz
Tolerance supply voltage	[%]	±10	±10	±10	±10	±5	±5
Current consumption hold	[A]	2.5	1.25	0.31	0.15	0.58 / 0.49	0.31 / 0.26
Current consumption in rush	[A]	2.5	1.25	0.31	0.15	2.1 / 2.0	1.05 / 1.0
Power consumption hold	[W]	30	30	30	30	64 / 59 VA	68 / 62 VA
Power consumption in rush	[W]	30	30	30	30	231 / 240 VA	231 / 240 VA
Solenoid connection		Connector as per EN 175301-803, 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 ⏚) must be connected according to the relevant regulations.

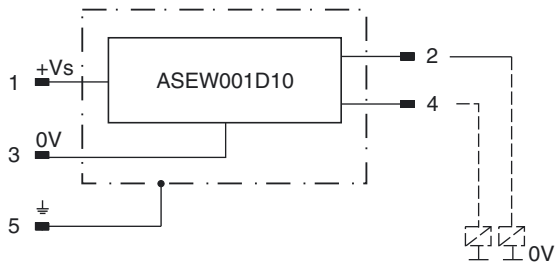
Electrical characteristics of position control M12x1

Protection class		IP 65 in accordance with EN 60529 (plugged and mounted)
Ambient temperature	[°C]	0...+50
Supply voltage / ripple	[V]	18...42 / 10%
Current consumption without load	[A]	≤ 30
Max. output current per channel, ohmic	[mA]	400
Min. output load per channel, ohmic	[kOhm]	100
Max. output drop at 0.2A	[V]	≤ 1.1
Max. output drop at 0.4A	[V]	≤ 1.6
EMC		EN50081-1 / EN50082-2
Max. tolerance ambient field strength	[A/m]	<1200
Min. distance to next AC solenoid	[m]	>0.1
Interface		M12x1
Wiring min.	[mm²]	5 x 0.25 brad shield recommended
Wiring length max.	[m]	50 recommended

M12 pin assignment



1 + Supply 18...42V
2 Normally open
3 0V
4 Normally closed
5 Earth ground



Definitions

Start position monitored:

The valve is de-energized. The inductive switch gives a signal at the moment (below 15% spool stroke) when the spool leaves the spring offset position.

End position monitored:

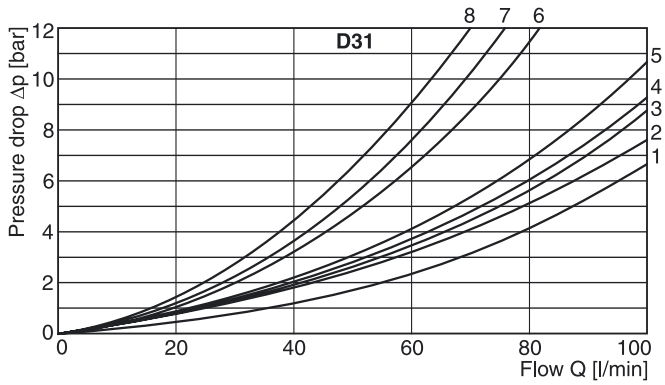
The inductive switch gives a signal before the end position is reached. (above 85% spool stroke).

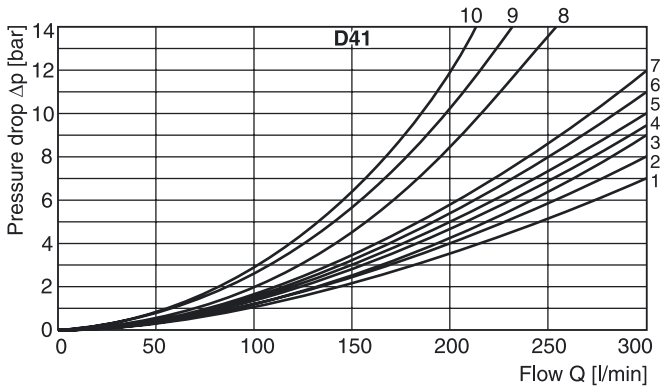
The flow curve diagram shows the flow versus pressure drop curves for all spool types. The relevant curve number for each spool type, operating position and flow direction is given in the table below.

2

D31DW and D41VW

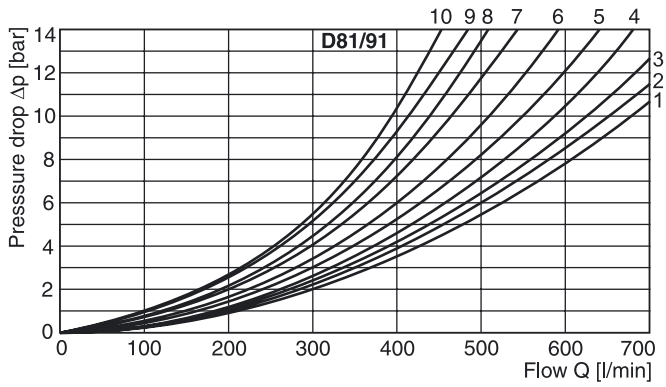
Spool Code	Curve number									
	P-A		P-B		P-T		A-T		B-T	
	D3	D4	D3	D4	D3	D4	D3	D4	D3	D4
1	3	1	3	1	–	–	1	4	1	5
2	3	1	3	2	4	6	1	4	1	6
3	3	1	4	2	–	–	1	5	1	6
4	3	1	3	1	–	–	1	5	1	5
5	3	2	4	2	–	–	1	3	1	5
6	3	1	3	2	–	–	1	3	1	6
7	4	1	3	1	–	6	1	4	1	5
9	3	2	3	9	8	8	1	7	1	10
11	3	1	3	1	–	–	1	4	1	5
14	3	1	4	1	–	6	1	4	1	5
15	4	1	3	2	–	–	1	4	1	6
16	4	2	3	2	–	–	1	3	1	5
20	3	3	4	5	–	–	1	3	1	5
21	4	2	3	8	–	–	1	2	–	–
22	3	8	4	2	–	–	–	–	1	3
26	3	3	3	5	–	–	–	–	–	–
30	3	2	1	3	–	–	1	6	1	7
54	–	2	–	3	–	–	–	6	–	7

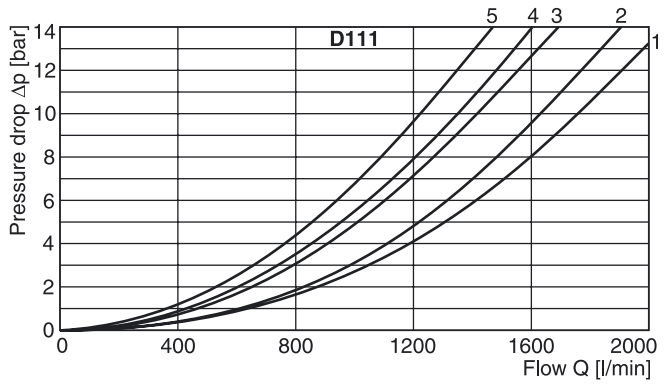




D81/D91VW and D111VW

Spool Code	Curve number									
	P-A		P-B		P-T		A-T		B-T	
	D8/9	D11	D8/9	D11	D8/9	D11	D8/9	D11	D8/9	D11
1	3	5	2	5	–	–	3	4	5	1
2	2	5	1	5	1	5	3	4	5	1
3	4	–	2	–	–	–	3	–	6	–
4	4	–	3	–	–	–	3	–	5	–
5	1	–	2	–	–	–	4	–	5	–
6	2	–	2	–	–	–	4	–	6	–
7	3	–	1	–	7	–	3	–	5	–
9	4	3	8	3	9	2	4	3	10	1
11	3	–	2	–	–	–	3	–	5	–
14	1	–	2	–	8	–	3	–	5	–
15	3	–	3	–	–	–	4	–	5	–
16	3	–	3	–	–	–	4	–	5	–
20	6	5	5	5	–	–	6	3	8	1
21	5	–	10	–	–	–	3	–	–	–
22	10	–	5	–	–	–	–	–	5	–
26	6	–	5	–	–	–	–	–	–	–
30	3	5	2	5	–	–	3	4	5	1
54	4	5	3	5	–	–	3	4	5	1





D3-D11_UK.INDD CM

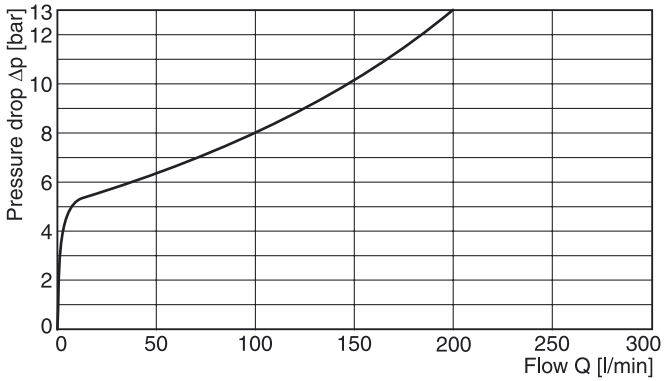
Parker Hannifin GmbH & Co. KG
Hydraulic Controls Division
Kaarst, Germany

2

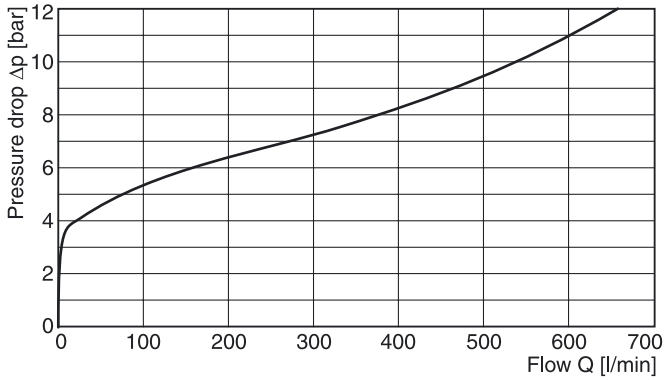
Integral check valve in the P port

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 D41 and D81.

Flow curve D41VW

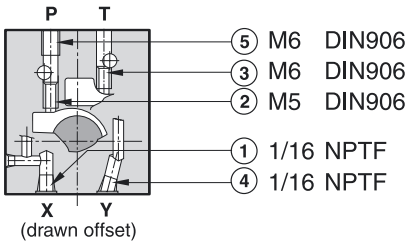


Flow curve D81VW



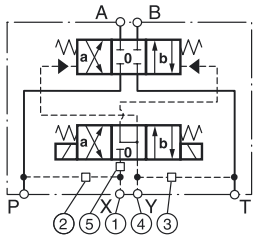
Pilot oil inlet (supply) and outlet (drain)

Series D31DW

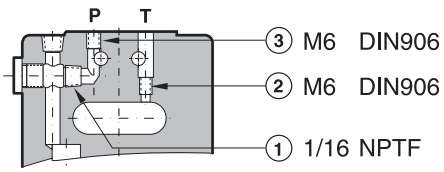


○ open, ● closed

Pilot oil Inlet	Outlet	1	2	3	4	5
internal	external	●	○	●	○	Orifice Ø1.2
external	external	○	●	●	○	Orifice Ø1.2
internal	internal	●	○	○	●	Orifice Ø1.2
external	internal	○	●	○	●	Orifice Ø1.2

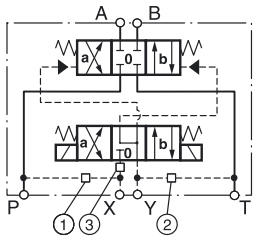


Series D41VW

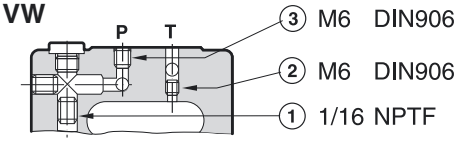


○ open, ● closed

Pilot oil Inlet	Outlet	1	2	3
internal	external	○	●	Orifice Ø1.5
external	external	●	●	Orifice Ø1.5
internal	internal	○	○	Orifice Ø1.5
external	internal	●	○	Orifice Ø1.5

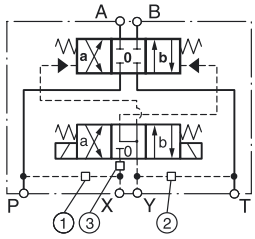


Series D81/91VW

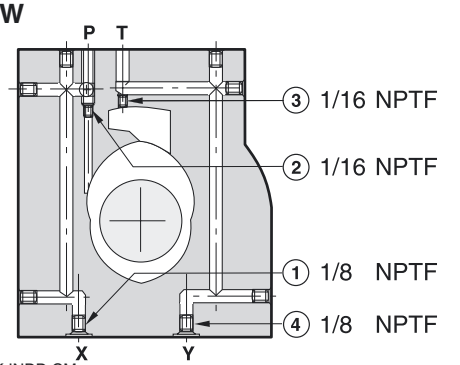


○ open, ● closed

Pilot oil Inlet	Outlet	1	2	3
internal	external	○	●	Orifice Ø1.5
external	external	●	●	Orifice Ø1.5
internal	internal	○	○	Orifice Ø1.5
external	internal	●	○	Orifice Ø1.5

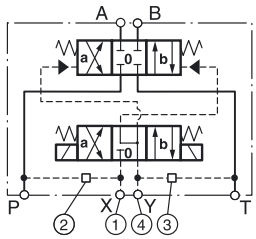


Series D111VW



○ open, ● closed

Pilot oil Inlet	Outlet	1	2	3	4
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

D3-D11_UK.INDD CM

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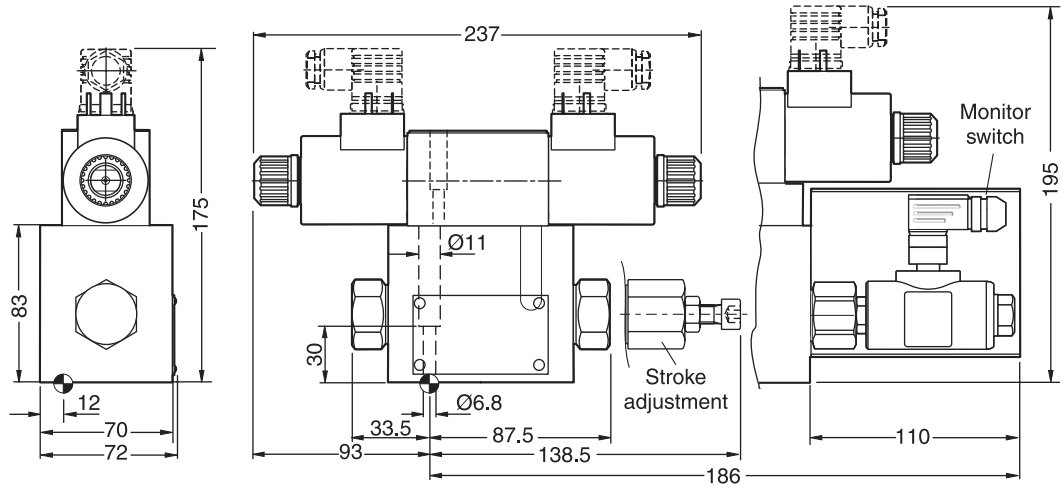
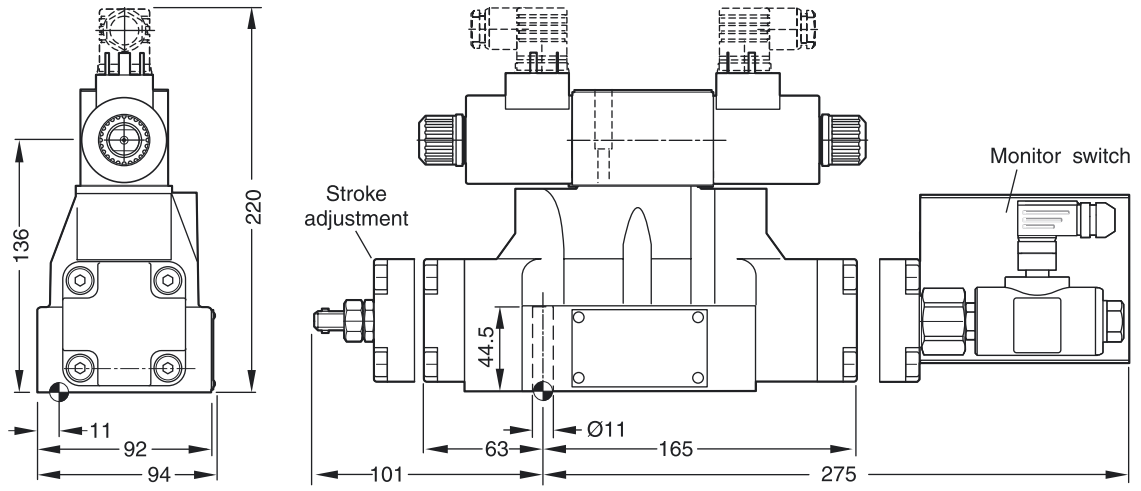
D31DW



Surface finish	Kit			Kit
R_{max}6.3 ⏥ 0.01/100	BK385	4x M6x40 DIN 912 12.9	13.2 Nm ±15%	**NBR: SK-D31DW-75** FPM: SK-D41DW-V75

D41VW



Surface finish	Kit			Kit
R_{max}6.3 ⏥ 0.01/100	BK320	4x M10x60 2x M6x55 DIN 912 12.9	63 Nm ±15% 13.2 Nm ±15%	**NBR: SK-D41DW-70** FPM: SK-D41DW-V70

The space necessary to remove the plug per EN 175301-803, design type AF is at least 15 mm.
The torque for the screw M3 of the plug has to be 0.5 to 0.6 Nm.

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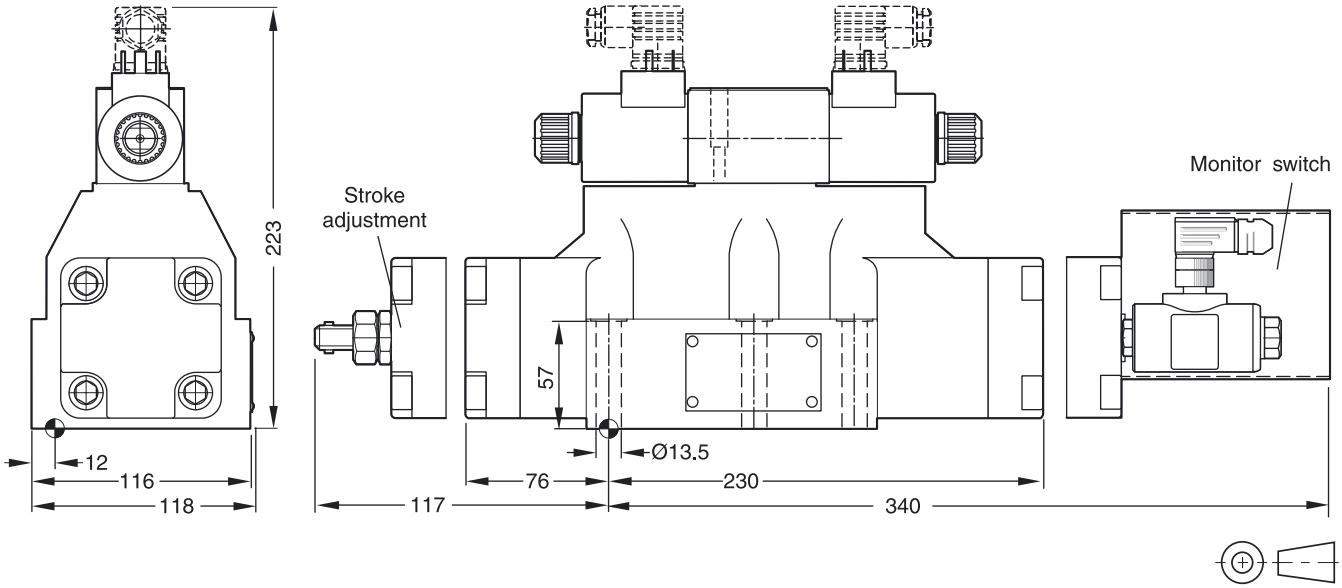
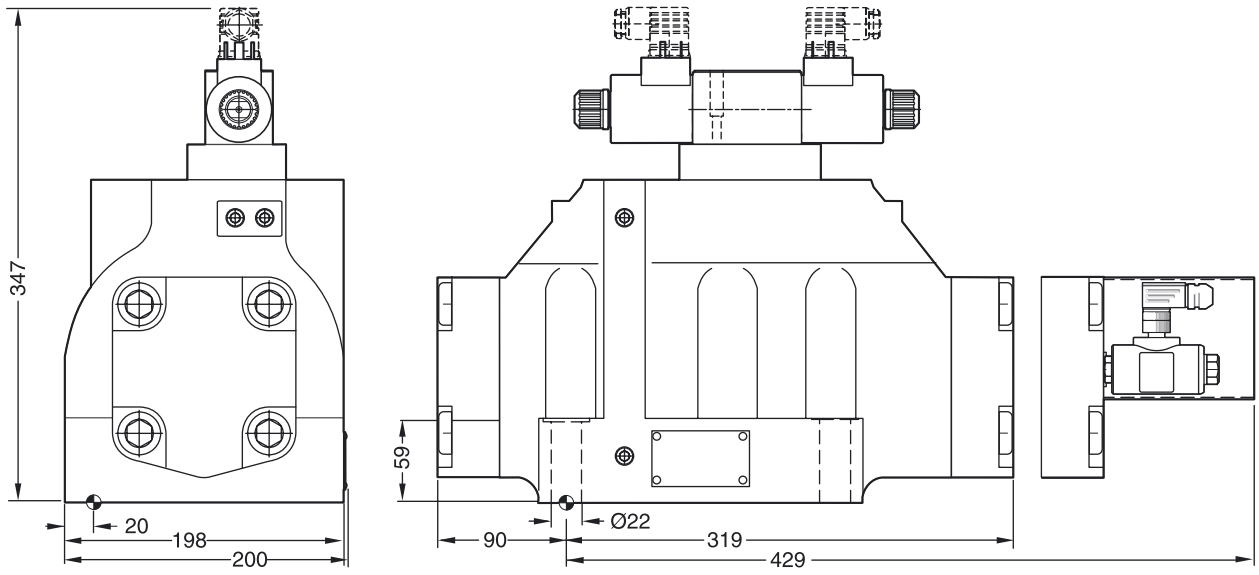
D81/91VW



Surface finish	Kit			Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK360	6x M12x75 DIN 912 12.9	108 Nm ±15%	**NBR: SK-D81VW-70 / SK-D91VW-70** FPM: SK-D81VW-V70 / SK-D91VW-V70

D111VW



Surface finish	Kit			Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK386	6x M20x90 DIN 912 12.9	517 Nm ±15%	**NBR: SK-D111VW-70** FPM: SK-D111VW-V70

The space necessary to remove the plug as per EN 175301-803, design type AF is at least 15 mm.
The torque for the screw M3 of the plug has to be 0.5 to 0.6 Nm.

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Notes