



# Explosion-Proof Valves

According to Directive 2014/34/EU (ATEX)  
and IECEx Requirements



ENGINEERING YOUR SUCCESS.



## **WARNING – USER RESPONSIBILITY**

**FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.**

This document and other information from Parker-Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.

The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.

To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

## **Offer of Sale**

Please contact your Parker representation for a detailed "Offer of Sale".

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**Explosion-proof valves: now available with IECEx certificates**

Parker has expanded the range of application for its explosion-proof industry hydraulic valves. All series are not only ATEX certified but also equipped with IECEx compliant solenoids.

Parker has certified the solenoids of the explosion-proof directional control valves in accordance with IECEx standard for equipment class 2 G, as well ensuring ATEX compliance. Technically-speaking the valves are practically unchanged. Both the performance characteristics and the dimensions are identical to the values of the previous versions, so that the valves can also easily be used as a replacement in existing systems.

In addition, the proportional valves series D1FB\*EE, D1FV\*EE and D\*1FB\*EE are optionally available with a coil which is approved for an ambient temperature up to 60 °C. These variants can be ordered by selecting the modification code XG371.

All valves offered in this catalogue are ATEX certified for usage in zone 1 and 2.

Among other things, the provided operating instructions contain:

- EC declaration of conformity for the valve
- Safety instructions
- Operating instructions, CE type examination certificate and declaration of conformity

Group I		Group II		
Mining-equipment		Non-mining equipment		
Category M		Category 1	Category 2	Category 3
1	2	G	G	G
		Gas: Zone 0	Gas: Zone 1	Gas: Zone 2
<p><b>Very high level of protection.</b> Equipment can be operated in presence of explosive atmospheres. Covered by means of two protective safety measures.</p>	<p><b>High level of protection.</b> Equipment to be de-energised in presence of explosive atmospheres.</p>	<p><b>Very high level of protection.</b> Used where explosive atmospheres are present continuously or for long periods of time. Covered by means of two protective safety measures.</p>	<p><b>High level of protection.</b> Used where explosive atmospheres are likely to occur in normal service.</p>	<p><b>Normal level of protection.</b> Used where explosive atmospheres are unlikely to occur and would be infrequent and for short time only.</p>

**Characteristics / Technical Data**

The D1VW with explosion proof solenoids is based on the standard D1VW series. The specific solenoid design allows the usage in hazardous environments. The explosion proof class is

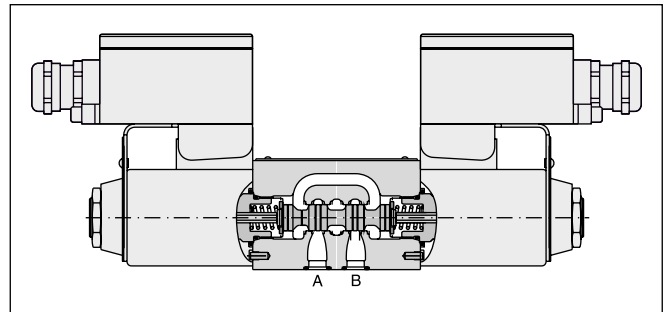
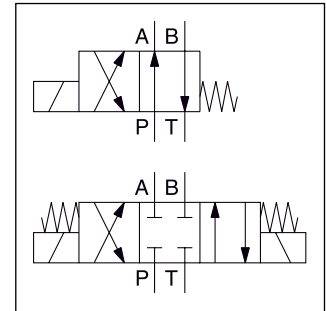
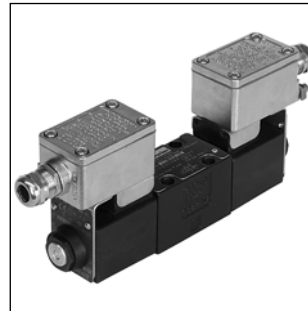
CE  $\langle \text{Ex} \rangle$  II 2 G

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.



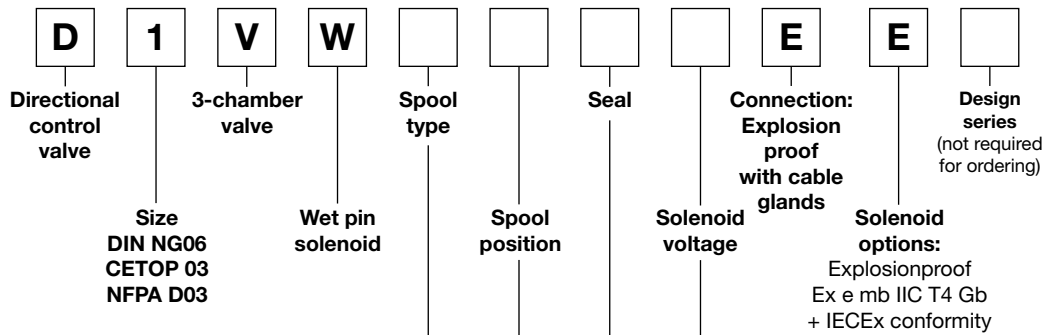
**Technical data**

General	
Design	Directional spool valve
Actuation	Solenoid
Size	DIN NG06 / CETOP 03 / NFPA D03
Mounting interface	DIN 24340 A6 / ISO 4401 / CETOP RP 121-H / NFPA D03
Mounting position	unrestricted, preferably horizontal
Ambient temperature	[°C] -20...+60
MTTF <sub>D</sub>	[years] 150
Weight	[kg] 1.8 (1 solenoid), 2.7 (2 solenoids)
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] / [mm <sup>2</sup> /s] 2.8...400
Viscosity recommended	[cSt] / [mm <sup>2</sup> /s] 30...80
Filtration	ISO 4406; 18/16/13
Flow max.	[l/min] 60
Leakage at 50 bar	[ml/min] Up to 10 per flow path, depending on spool
Static / Dynamic	
Step response at 95 %	[ms] Energized: 32 (DC), 40 (AC) / De-energized: 40 (DC), 75 (AC)
Electrical characteristics	
Duty ratio	100 % ED; CAUTION: coil temperature up to 135 °C possible
Max. switching frequency	[1/h] 15000 (DC), 7200 (AC)
Protection class	CE $\langle \text{Ex} \rangle$ II 2 G , Ex e mb IIC T4 Gb, IP66 (plugged and mounted correctly)
Code	<b>J</b> <b>N</b> <b>P</b>
Supply voltage / ripple	[V] 24 V =                      230 V / 50 Hz                      110 V / 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.	[mm <sup>2</sup> ] 3 x 1.5 recommended
Wiring length max.	[m] 50 recommended

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

# Directional Control Valve Series D1VW Explosion Proof

## Ordering Code



3 position spools	
Code	Spool type
	a   0   b
001	
002	
003	
004	
005	
006	
007	
008 1)	
009 1)	
010	
011	
014	
015	
016	
021	
022	
081	
082	
102	

2 position spools	
Code	Spool type
	a   b
020	
026	
030	
101	

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

Code	Seal
N	NBR
V	FPM

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 008, 009
E	 Operated in position "a".	 Operated in position "b".
K	 Operated in position "b".	 Operated in position "a".

2 position spools		
Code	Spool position	
B		2 positions. Spring offset in position "b". Operated in position "a".
D		2 positions. Operated in position "a" or "b". No center or offset position.
H		2 positions. Spring offset in position "a". Operated in position "b".

Further spool types, styles and combinations on request.

1) Consider specific spool position.

**Flow Curves**

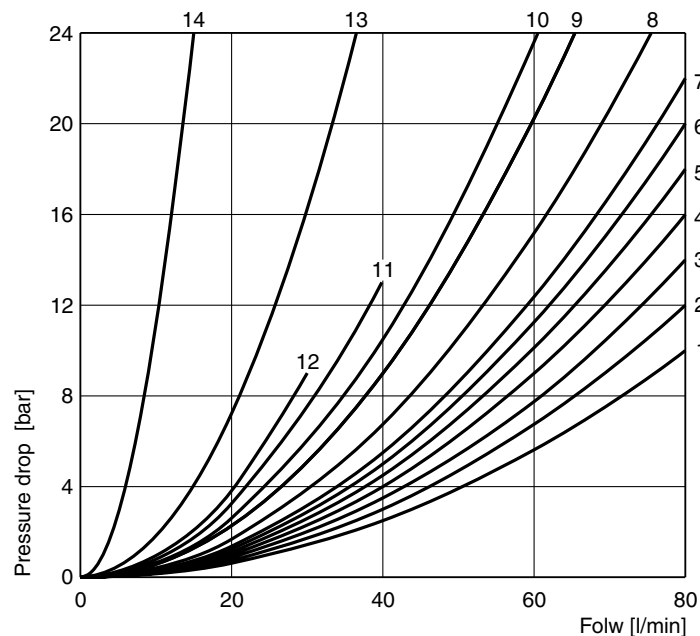
The flow curve diagram shows the flow versus pressure drop curves for all spool types. The relevant curve number for each spool type, operating position and flow direction is given in the table below.

Spool	Position "b"			Position "a"			Position "0"				
	P-A	B-T	P-B	P-B	A-T	P-A	P-A	P-B	A-T	B-T	P-T
001	2	2		2	2						
002	1	4		1	4		1	1	5	5	2
003	3	4		3	6				7		
004	2	3		2	3				7	7	
005	2	2		2	2		12				
006	1	4		1	4		7	7			
007	3	2		2	2			3		2	7
010	3			3							
011	2	2		2	2				14	14	
014	3	2		2	2		3		2		7
015	3	6		3	4					7	
016	2	2		2	2			12			
020B	4	4		2	3						
026B	4			4							
030B	2	3		1	2						
081	13	13		13	13						
082	13	13		13	13				1)	1)	
101B	11	10		10	9						
102	1	4		1	4		5	5	8	8	6
	P-B	A-T		P-A	B-T		P-A	P-B	A-T	B-T	P-T
008	4	5		4	5						9
009	5	5		6	7						7

Spool	Position "b"			Position "a"		
	P-A	P-B	A-B	P-B	A-T	
021	2	4		4	2	
	P-A	B-T		P-A	P-B	A-B
022	6	2		5	2	

1) Only for pressure compensation, no high flow possible.

**Flow curve**

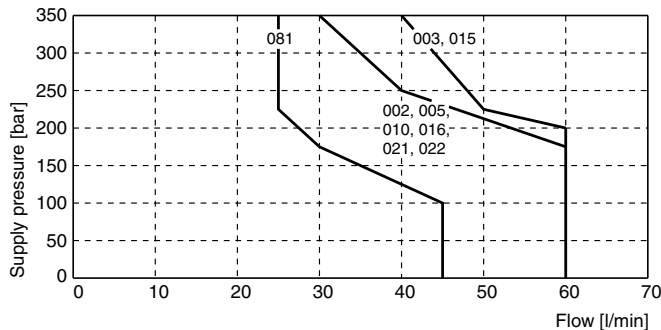
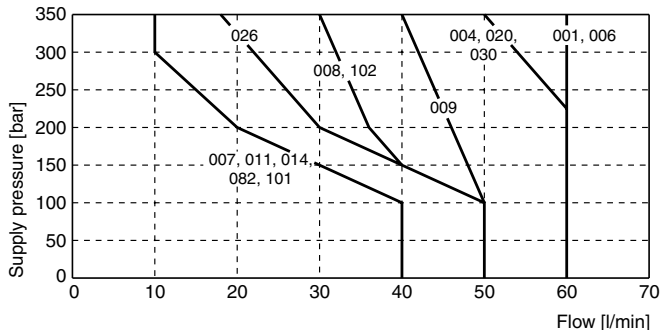


All characteristic curves measured with HLP46 at 50 °C.

**Shift Limits**

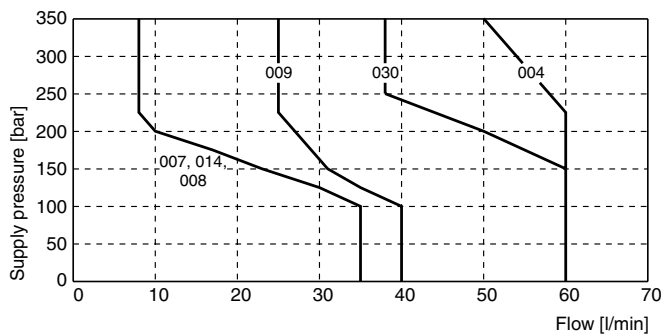
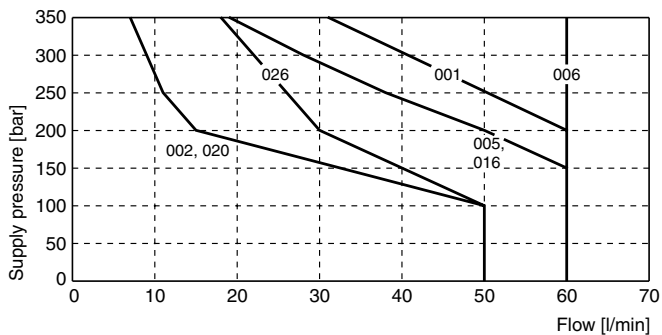
The diagram below specifies the shift limits for valves with AC and DC solenoids. The specifications apply to a viscosity of 40 mm<sup>2</sup>/s and balanced flow conditions. The shift limits can be considerably lower at unbalanced flow conditions. To avoid flow rates beyond the shift limits, a plug-in orifice can be inserted in the P port.

**Shift limit diagram with DC solenoid**



Measured with HLP46 at 50 °C, 90 % U<sub>nom</sub> and warm solenoids

**Shift limit diagram with AC solenoid**

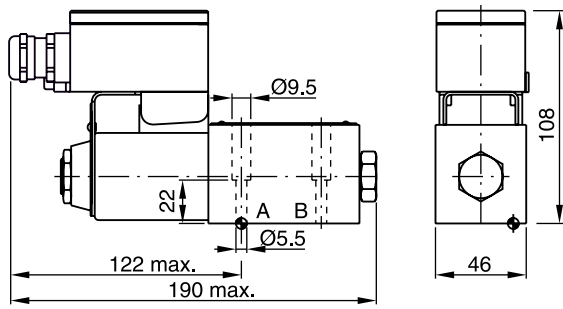


Measured with HLP46 at 50 °C, 95 % U<sub>nom</sub> and warm solenoids

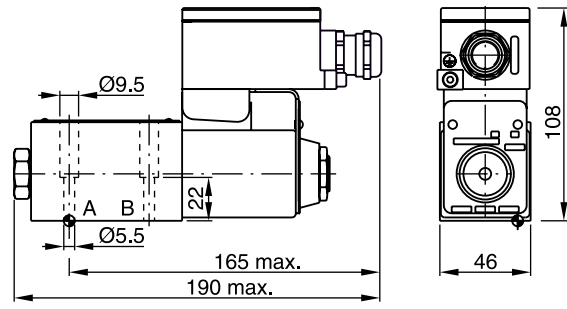


**Dimensions**

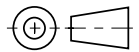
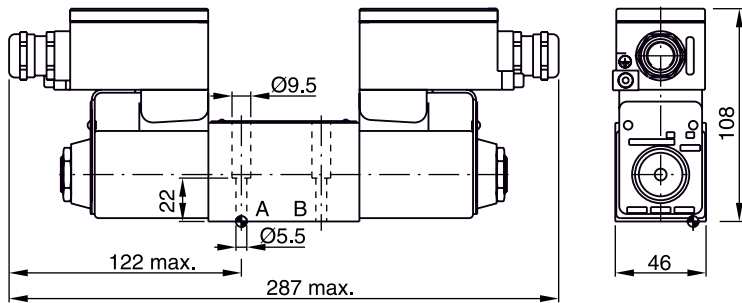
**B, E -style**





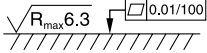


**H, K -style**



**C, D -style**



Surface finish	 Kit	 Kit	 Kit	 Kit
	BK375	4x M5x30 ISO 4762-12.9	7.6 Nm ±15 %	NBR: SK-D1VW-N-91 FPM: SK-D1VW-V-91

**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  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:

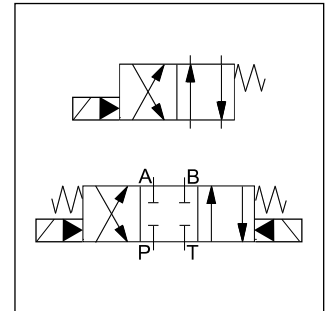
- D31DW NG10 (standard)
- D31NW NG10 (high flow)
- D41VW NG16
- D91VW NG25 (for port diameter up to 32 mm)
- D111VW NG32

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

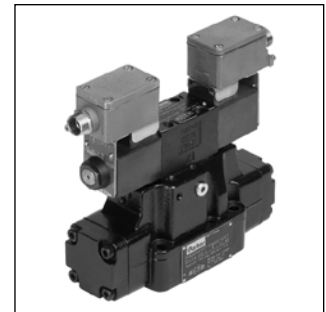
Additionally spools with a P to T connection in the de-energized position need an external pressure supply (external inlet) or an integral check valve.



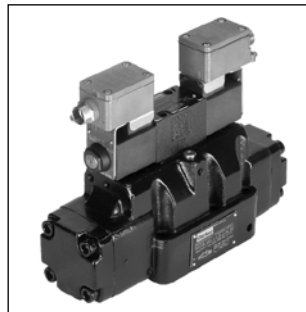
D31DW



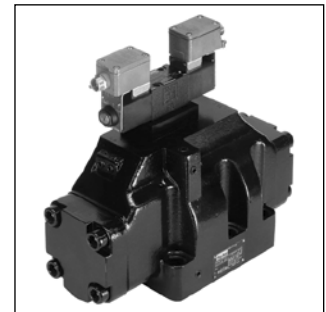
D31NW



D41VW

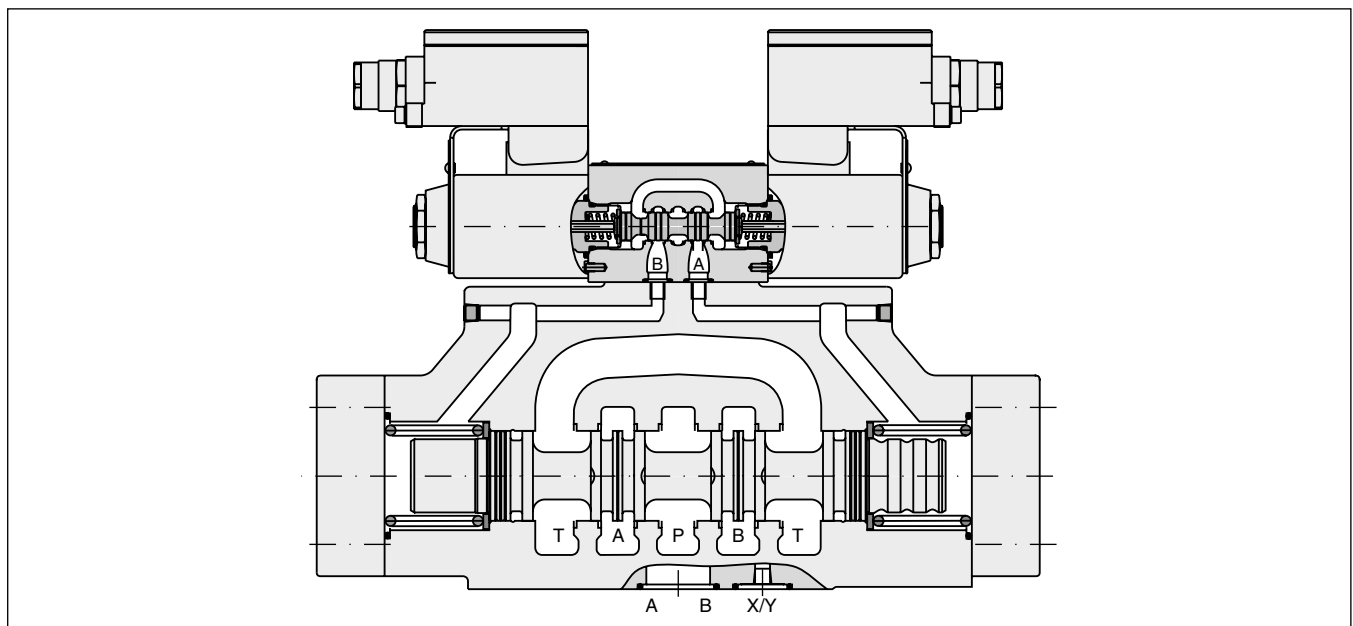


D91VW




D111VW

**D91VW**

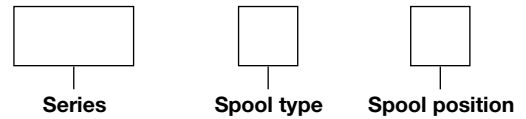


**Technical Data**

<b>General</b>					
Design	Directional spool valve				
Actuation	Solenoid				
Series	<b>D31DW</b>	<b>D31NW</b>	<b>D41VW</b>	<b>D91VW</b>	<b>D111VW</b>
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	DIN 24340 A10	DIN 24340 A16	DIN 24340 A25	DIN 24340 A32
	ISO 4401	ISO 4401	ISO 4401	ISO 4401	ISO 4401
	NFPA D05	NFPA D05	NFPA D07	NFPA D08	NFPA D10
CETOP RP 121-H					
Mounting position	unrestricted, preferably horizontal				
Ambient temperature [°C]	-20...+60				
MTTF <sub>p</sub> value [years]	75				
<b>Hydraulic</b>					
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] / [mm <sup>2</sup> /s]	2.8...400				
Viscosity recommended [cSt] / [mm <sup>2</sup> /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] *depending on spool	up to 100*	up to 150*	up to 200*	up to 800*	up to 5000*
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		
<b>Static / Dynamic</b>					
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
<b>Electrical characteristics</b>					
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	<b>J</b>		<b>N</b>		<b>P</b>
	24 V =	230V / 50 Hz		110V / 50 Hz	
Supply voltage / ripple [V]	±10		±10		±10
Tolerance supply voltage [%]	1.0		0.12		0.25
Current consumption [A]	24		24		24
Power consumption [W]	24		24		24
Solenoid connection	Box with M20x1.5 entry for cable glands. Solenoid identification as per ISO 9461.				
Wiring min. [mm <sup>2</sup> ]	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
	a 0 b
001 <sup>2)</sup>	
002 <sup>2)</sup>	
003 <sup>3)</sup>	
004 <sup>3)</sup>	
005 <sup>3)</sup>	
006 <sup>3)</sup>	
009 <sup>1)2)</sup>	
011 <sup>3)</sup>	
015 <sup>3)</sup>	
016 <sup>3)</sup>	
021 <sup>3)</sup>	
022 <sup>3)</sup>	

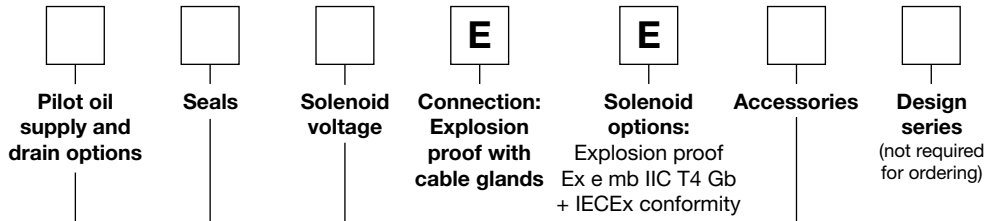
2 position spool	
Code	Spool type
	a b
020 <sup>2)</sup>	
030 <sup>2)</sup>	

3 position spool		
Code	Spool position	
C <sup>2)</sup>		3 positions. Spring offset in position "0". Operated in position "a" or "b".
	Standard                      Spool type 009	
E <sup>2)</sup>	 Operated in position "a".	 Operated in position "b".
F <sup>2)</sup>	 Spring offset in position "b".	 Spring offset in position "a".
K <sup>2)</sup>	 Operated in position "b".	 Operated in position "a".
M <sup>2)</sup>	 Spring offset in position "a".	 Spring offset in position "b".
R <sup>3)4)</sup>	 No centre in offset position.	 No centre in offset position.
S <sup>3)4)</sup>	 No centre in offset position.	 No centre in offset position.

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

1) Consider specific spool position.  
2) All sizes (D31, D41, D 91, 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 <sup>4)7)</sup>	Stroke adjustment side B
3E <sup>4)7)</sup>	Stroke adjustment side A
3F <sup>4)7)</sup>	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 <sup>5)</sup>	Integral check valve	External
4 <sup>6)</sup>	Internal	Internal
5	External	Internal
6 <sup>5)</sup>	Integral check valve	Internal

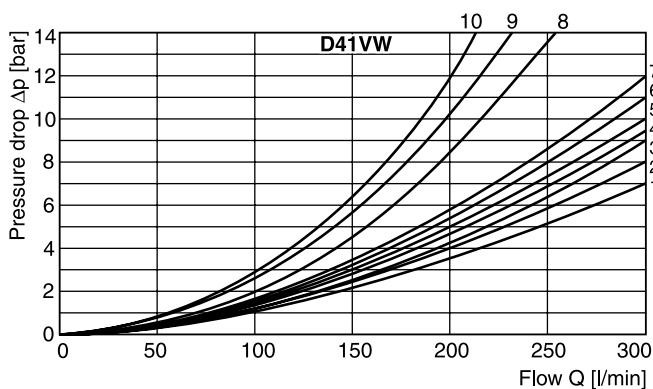
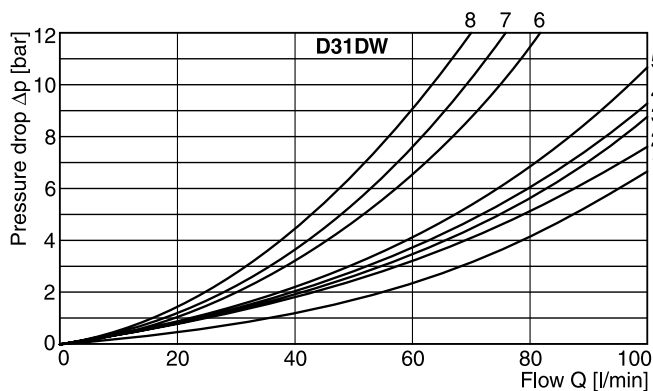
Further spool types on request.

**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.

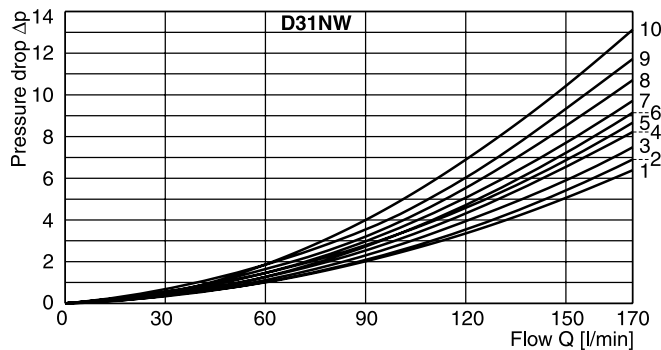
**D31DW and D41VW**

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

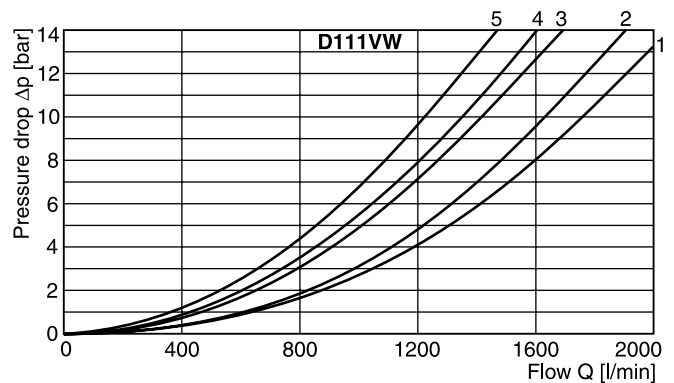
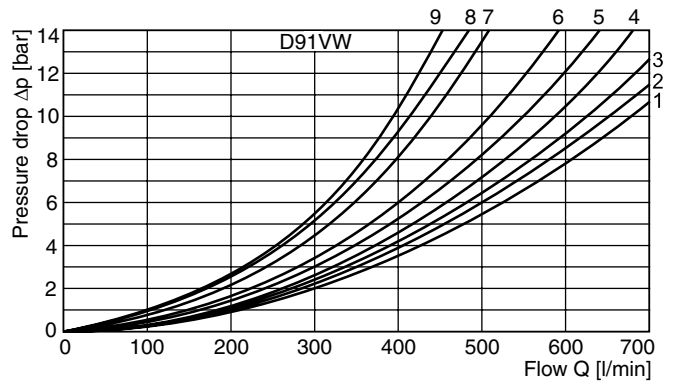


All characteristic curves measured with HLP46 at 50 °C.

**Flow Curves**

**D91VW and D111VW**

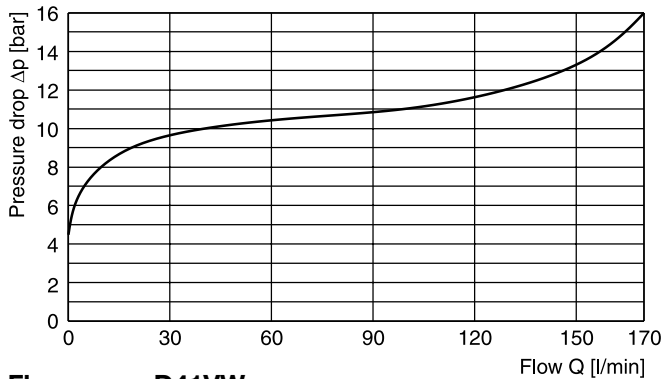
Spool Code	Curve number									
	P-A		P-B		P-T		A-T		B-T	
	D9	D11	D9	D11	D9	D11	D9	D11	D9	D11
001	3	5	2	5	-	-	3	4	5	1
002	2	5	1	5	1	5	3	4	5	1
003	4	-	2	-	-	-	3	-	6	-
004	4	-	3	-	-	-	3	-	5	-
005	1	-	2	-	-	-	4	-	5	-
006	2	-	2	-	-	-	4	-	6	-
009	4	3	7	3	8	2	4	3	9	1
011	3	-	2	-	-	-	3	-	5	-
015	3	-	3	-	-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



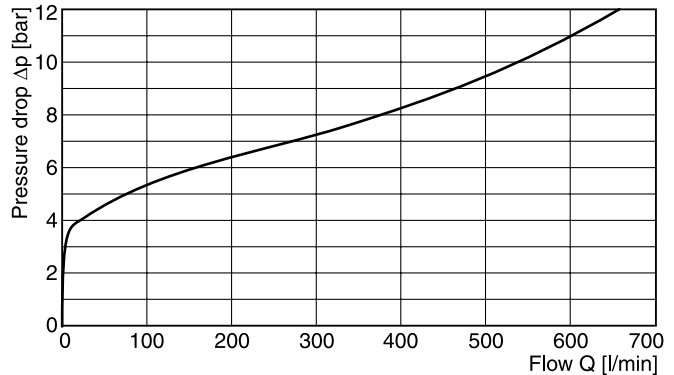
**Integral check valve in the P port**

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.

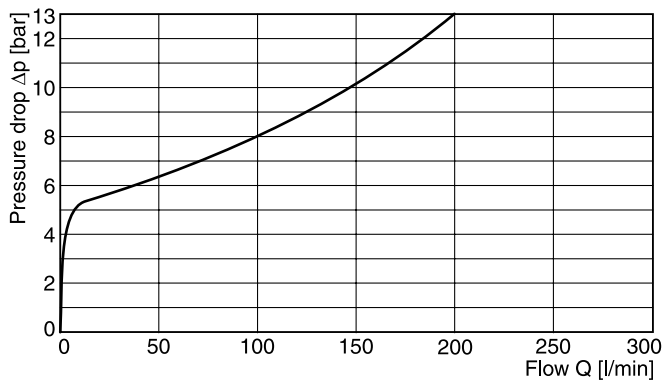
**Flow curve D31NW**



**Flow curve D91VW**

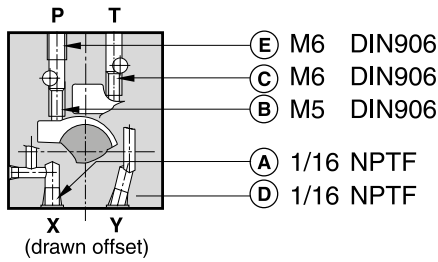


**Flow curve D41VW**



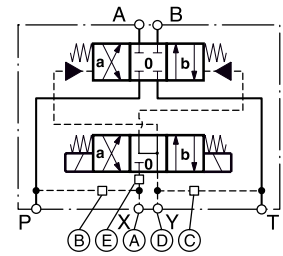
Pilot Oil Options

D31DW

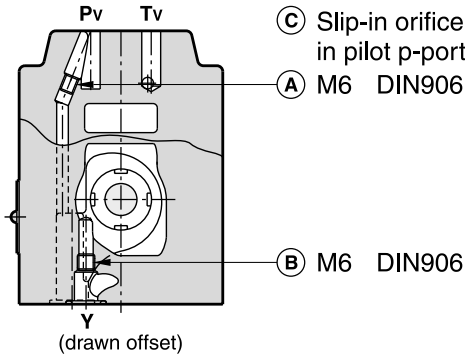


○ open, ● closed

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

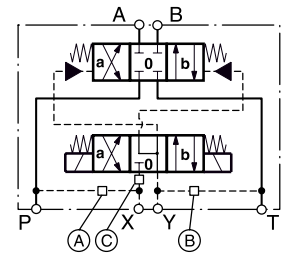


D31NW

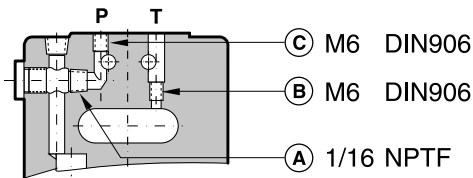


○ open, ● closed

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

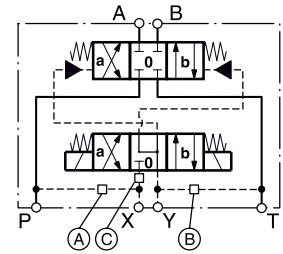


D41VW

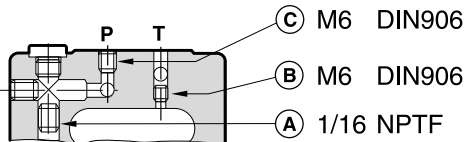


○ open, ● closed

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

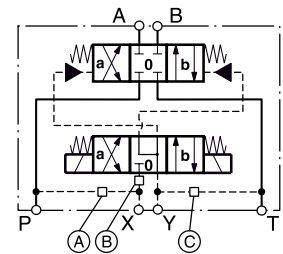


D91VW

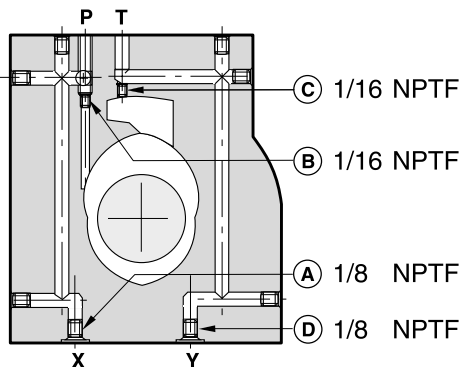


○ open, ● closed

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

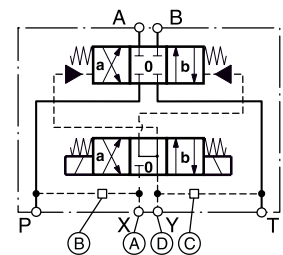


D111VW



○ 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	●	○	○

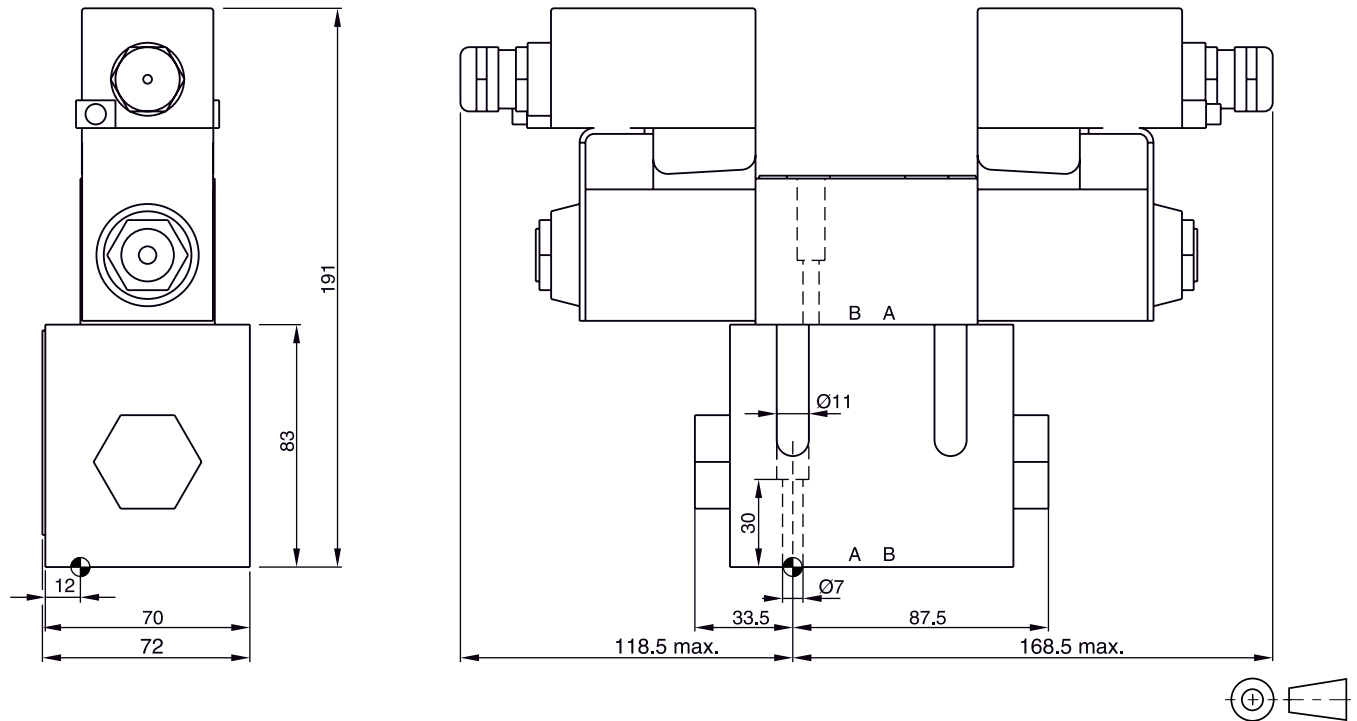


All orifice sizes for standard valves



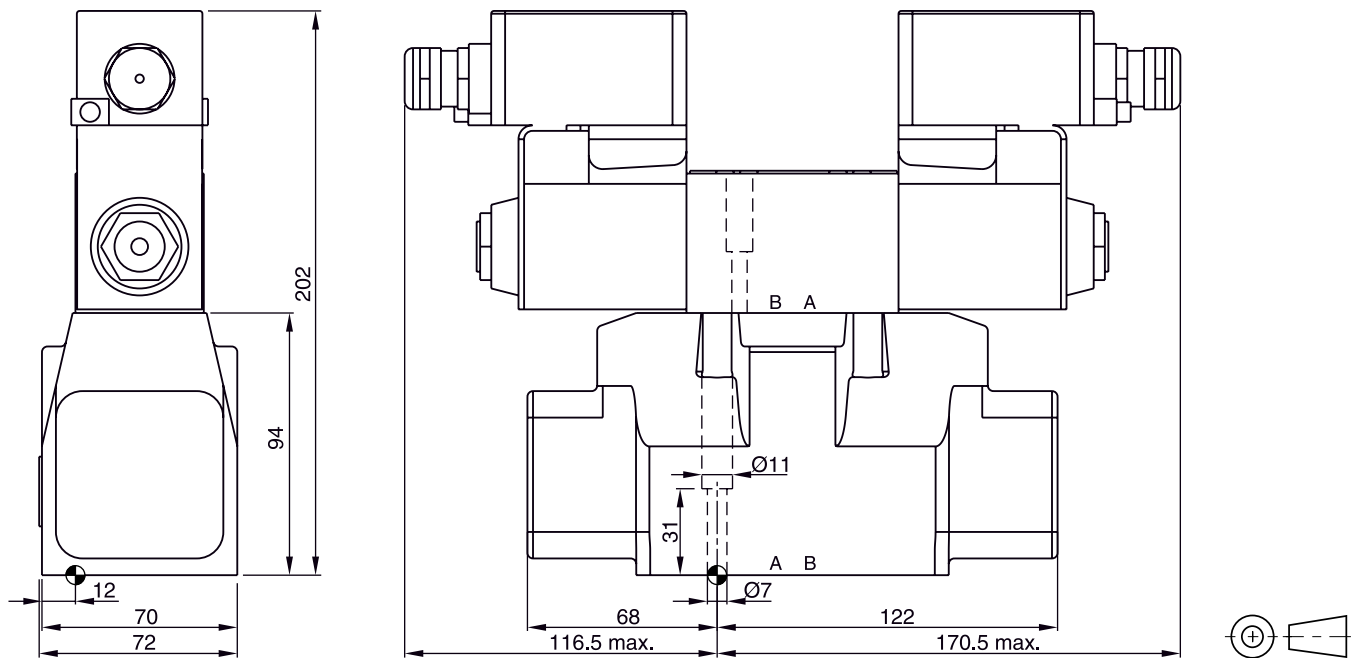
**Dimensions**

**D31DW**



Surface finish	Kit	Kit	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-D31DW-N-91 FPM: SK-D31DW-V-91

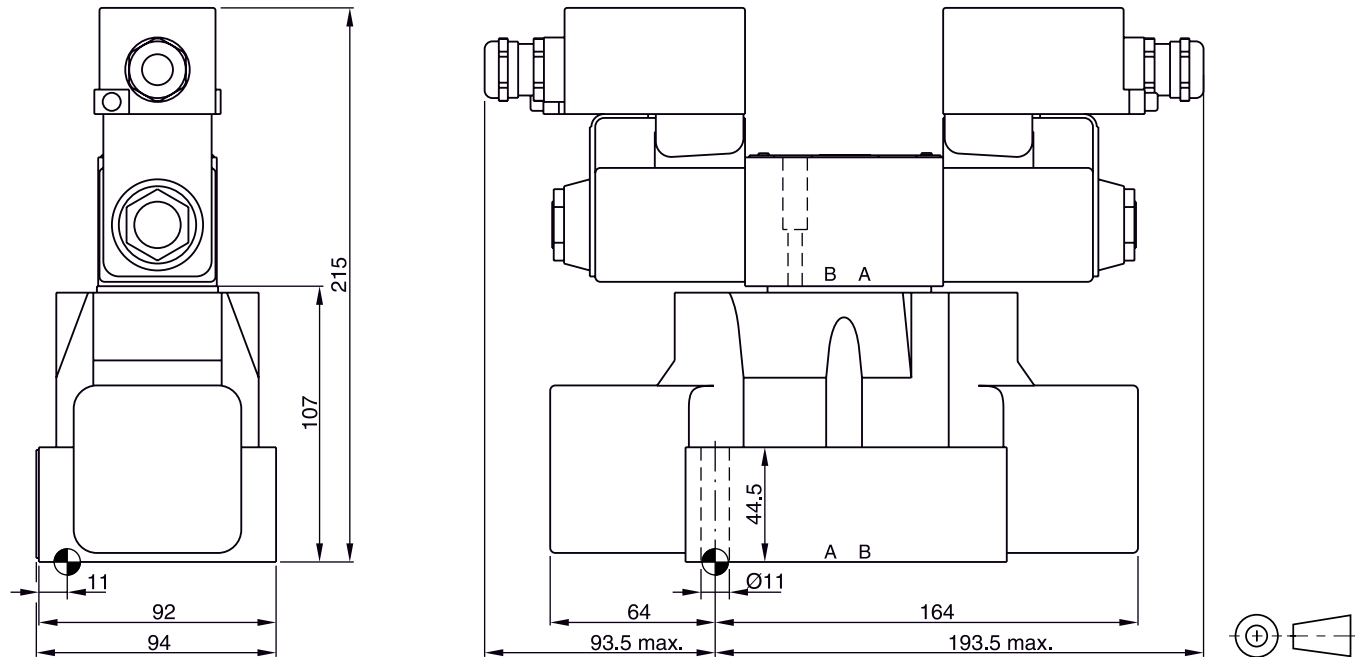
**D31NW**



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-4D02V-B1 FPM: SK-4D02V-B5

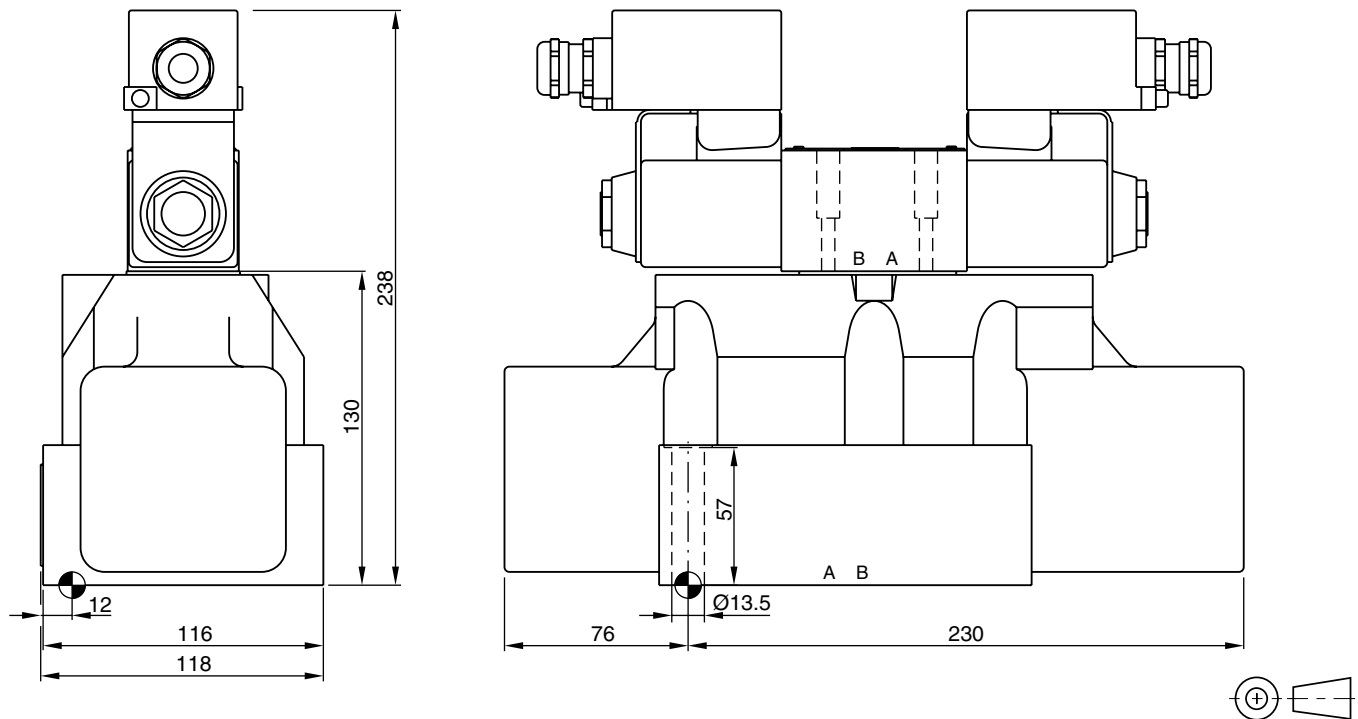
**Dimensions**

**D41VW**



Surface finish	Kit	Kit	Kit	Kit
	BK320	4x M10x60 2x M6x55 ISO 4762-12.9	63 Nm ± 15 % 13.2 Nm ± 15 %	NBR: SK-D41VW-N-91 FPM: SK-D41VW-V-91

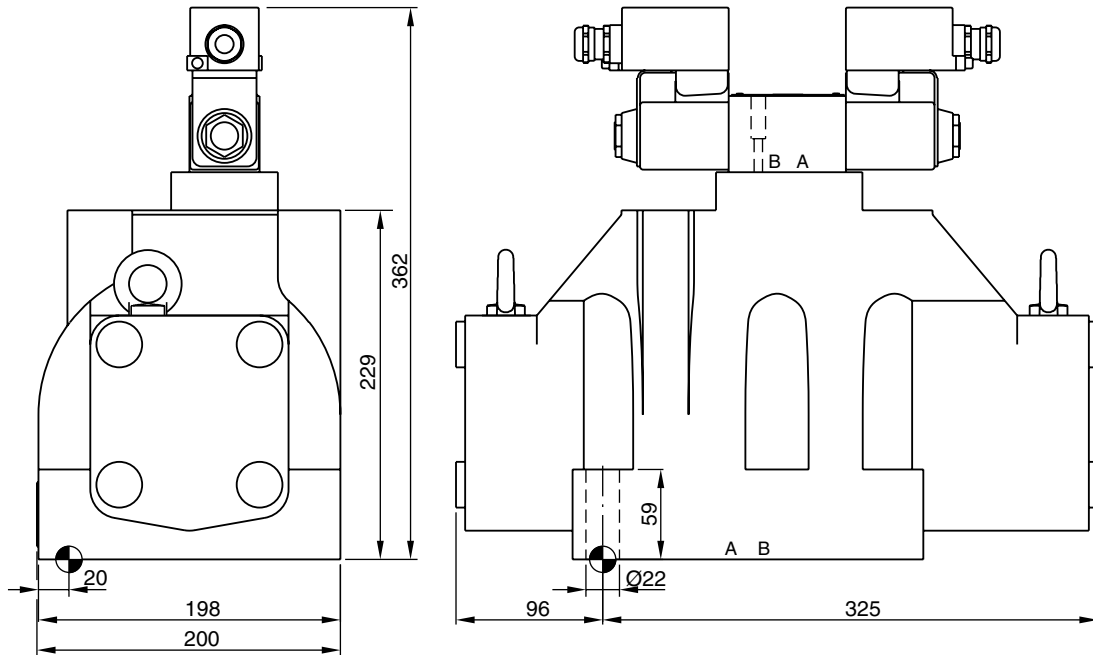
**D91VW**





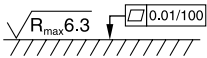


Surface finish	Kit	Kit	Kit	Kit
	BK385	4x M6x40 ISO 4762-12.9	13.2 Nm ± 15 %	NBR: SK-D81VW-N-91 / SK-D91VW-N-91 FPM: SK-D81VW-V-91 / SK-D91VW-V-91

**Dimensions**

**D111VW**



Surface finish	 Kit	 Kit	 Kit	 Kit
	BK386	6x M20x90 ISO 4762-12.9	517 Nm ±15 %	NBR: SK-D111VW-N-91 FPM: SK-D111VW-V-91

**Characteristics**

The D1FB\*EE series with explosion proof solenoids is based on the standard D1FB series. The specific solenoid design allows the usage in hazardous environments. The explosion proof class is

CE  II 2 G

Ex e mb IIC T4 Gb

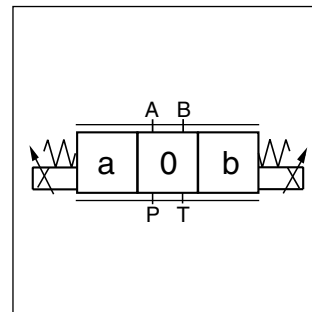
for use in zone 1 and 2 (conform to ATEX).

Additionally the solenoids have IECEx conformity.

The parameters can be saved, changed and duplicated in combination with the digital power amplifier PWD00A-400 (to be used in an explosion proof cabinet or outside of the hazardous area).

The valve parameters can be edited with the common ProPxD software.

The D1FB valves can be ordered with spool/sleeve design (D1FB\*0) for maximum precision as well as spool/body design (D1FB\*3) for high nominal flow - see functional limit curves for maximum flow capability.

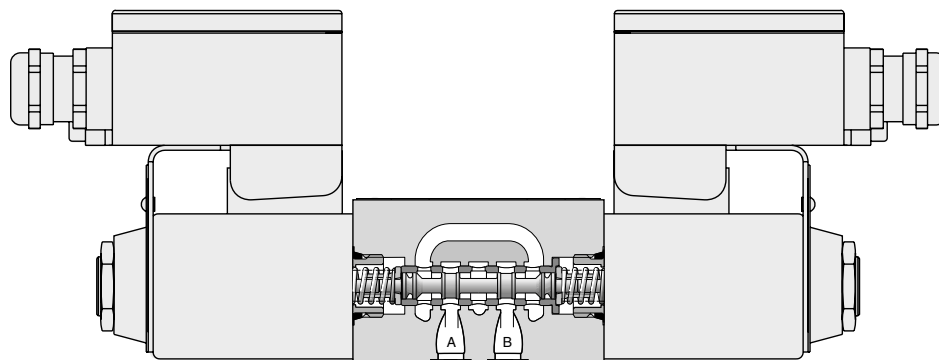


**Features**

- Spool/sleeve and spool/body
- High repeatability from valve to valve
- Low hysteresis
- Manual override
- Optional: coil to permit ambient temperature up to +60 °C, modification XG371

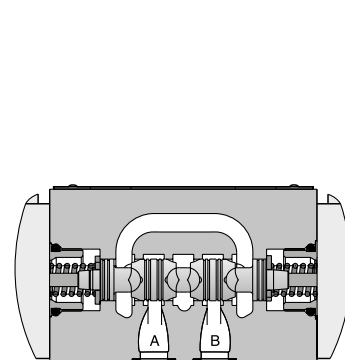
**D1FB\*0\*EE**

Spool/sleeve design

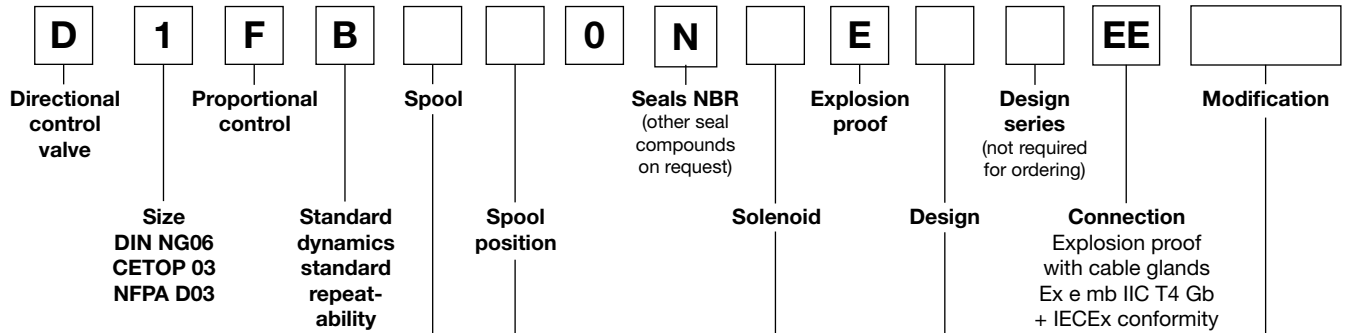


**D1FB\*3\*EE**

Spool/body design



Ordering Code



D1FB\*0\*EE: Spool/sleeve design

Code	Spool type	Flow [l/min] at Δp 5 bar per metering edge
E01C E01F E01H		6 12 20
E02C E02F E02H		6 12 20
E03C E03F E03H		6 12 20
B31F B31H	$Q_B = Q_A / 2$ 	12 / 6 20 / 10
B32F B32H	$Q_B = Q_A / 2$ 	12 / 6 20 / 10

D1FB\*3\*EE: Spool/body design

Code	Spool type	Flow [l/min] at Δp 5 bar per metering edge
E01F E01H E01K		10 20 30
E02F E02H E02K		10 20 30
B31F B31H B31K	$Q_B = Q_A / 2$ 	10 / 15 20 / 10 30 / 15
B32F B32H B32K	$Q_B = Q_A / 2$ 	10 / 15 20 / 10 30 / 15

Code	Modification
omit	Standard
XG371	Coil to permit ambient temperature up to +60 °C

Code	Design
0	Spool/sleeve design
3	Spool/body design

Code	Solenoid
K	12 V / 2.3 A
J	24 V / 1.15 A
J*XG371	24 V / 1.0 A

Code	Spool position
C	
E	
K	

**Technical Data**

General			
Design	Direct operated proportional DC valve		
Actuation	Proportional solenoid		
Size	NG06/CETOP 03/NFPA D03		
Mounting interface	DIN 24340 / ISO 4401 / CETOP RP121 / NFPA		
Mounting position	unrestricted		
Ambient temperature	[°C]	-20...+40; XG371: -20...+60	
MTTF <sub>D</sub> value	[years]	150	
Weight	[kg]	3.5 (2 solenoids), 2.5 (1 solenoid)	
Hydraulic			
Max. operating pressure	[bar]	Ports P, A, B 350; Port T 210	
Max. pressure drop PABT / PBAT	[bar]	350	
Fluid	Hydraulic oil as per DIN 51524 ...51535, other on request		
Fluid temperature	[°C]	-20...+40; XG371: -20...+60	
Viscosity permitted	[cSt] / [mm <sup>2</sup> /s]	20...400	
Viscosity recommended	[cSt] / [mm <sup>2</sup> /s]	30...80	
Filtration	ISO 4406; 18/16/13		
		D1FB*0*EE (Spool/sleeve)	D1FB*3*EE (Spool/body)
Nominal flow at Δp = 5 bar per control edge *	[l/min]	6 / 12 / 20	10 / 20 / 30
Leakage at 100 bar	[ml/min]	<50	<60
Overlap	[%]	25, electrically normalized at 10 (see flow characteristics)	
Static / Dynamic			
Step response at 100 % step	[ms]	30	30
Hysteresis	[%]	<4	<6
Temperature drift solenoid current	[%/K]	<0.02	
Electrical characteristics			
Duty ratio	[%]	100	
Protection class	CE $\langle$ Ex $\rangle$ II 2 G, Ex e mb IIC T4 Gb, IP66 (plugged and mounted correctly)		
Solenoid	Code	<b>J</b>	<b>J*XG371</b>
Supply voltage	[V]	24	24
Current consumption	[A]	1.15	1.0
Resistance	[Ohm]	12.0	12.0
Solenoid connection	Box with M20x1.5 entry for cableglands. Solenoid identifications per ISO 9461.		
Wiring min.	[mm <sup>2</sup> ]	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.

\* Flow rate for different Δp per control edge:

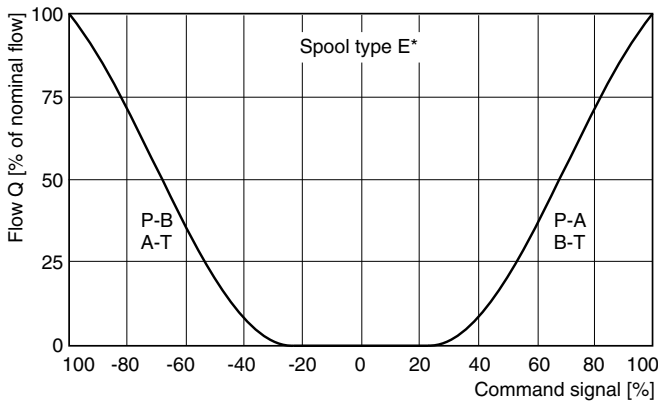
$$Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$$

**Characteristic Curves**

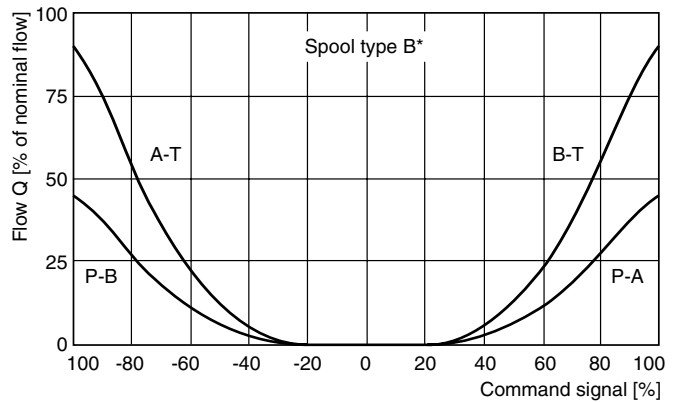
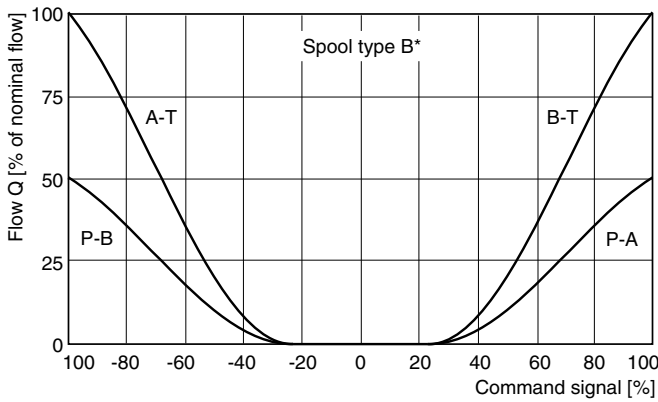
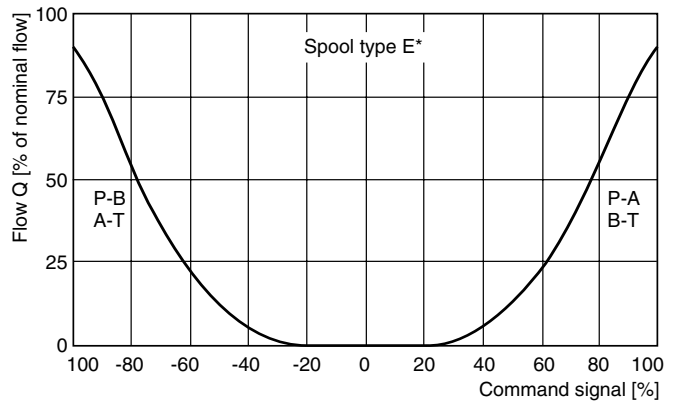
**Flow characteristics**

at  $\Delta p = 5$  bar per metering edge

**D1FB\*0\*EE**



**D1FB\*0\*EEXG371**

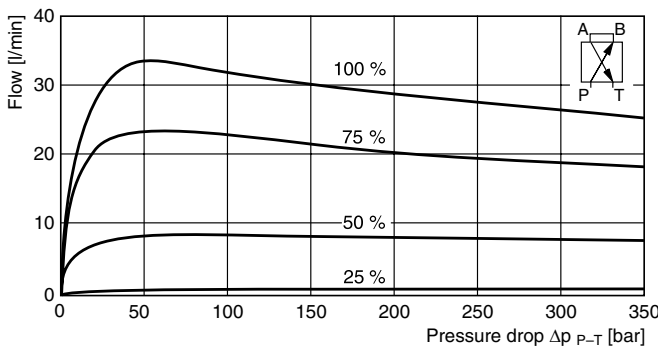


**Functional limits**

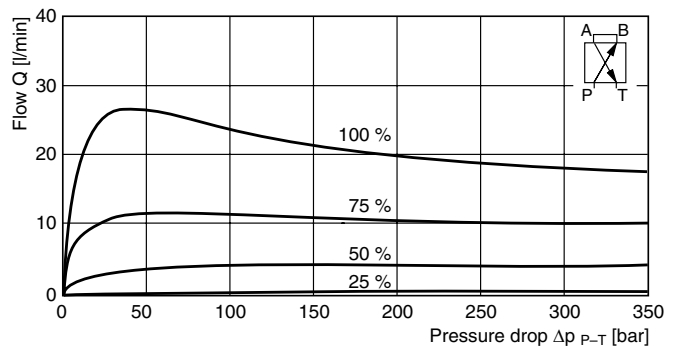
at 25 %, 50 %, 75 % and 100 % command signal (symmetric flow)

At asymmetric flow a reduced flow limit has to be considered – typically approx. 10 % lower.

**Spool type E01H**



**Spool type E01H\*XG371**



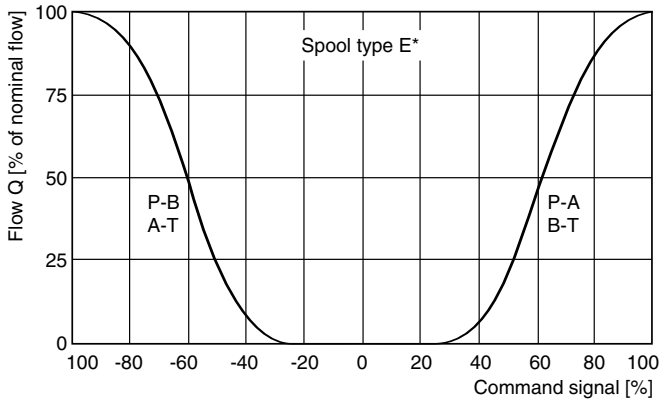
All characteristic curves measured with HLP46 at 50 °C.

**Characteristic Curves**

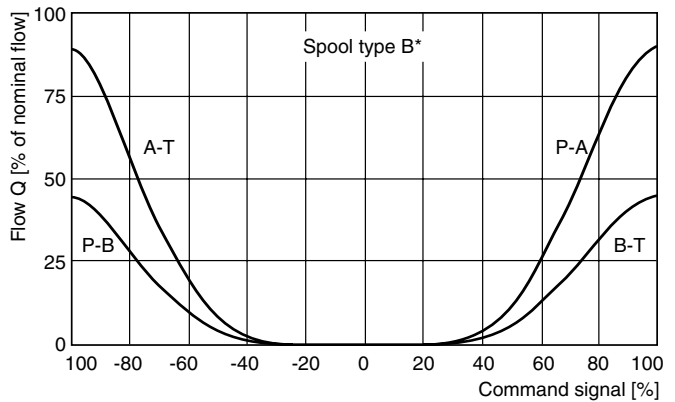
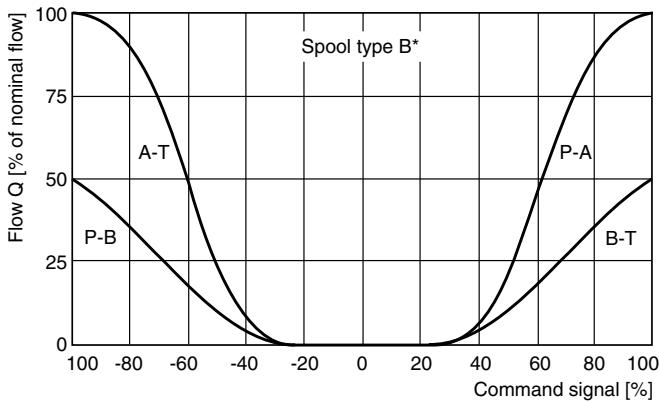
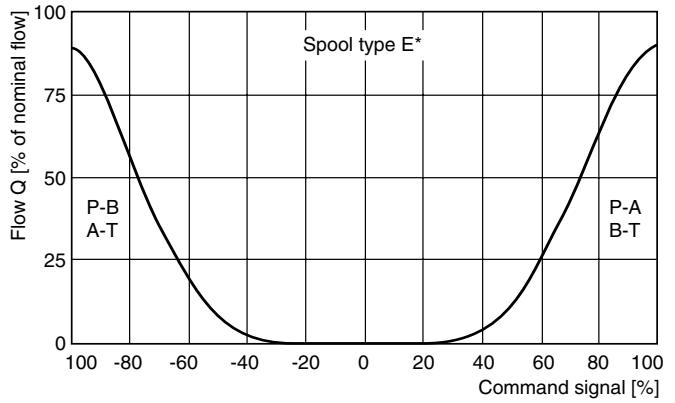
**Flow characteristics**

at  $\Delta p = 5$  bar per metering edge

**D1FB\*3\*EE**



**D1FB\*3\*EEXG371**

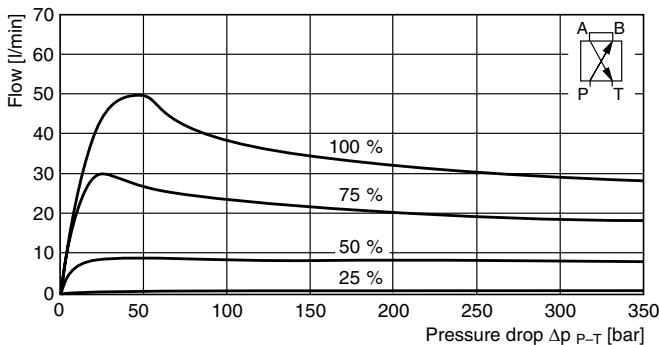


**Functional limits**

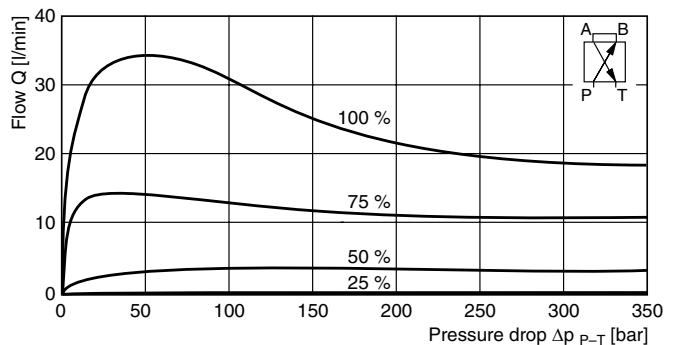
at 25 %, 50 %, 75 % and 100 % command signal (symmetric flow)

At asymmetric flow a reduced flow limit has to be considered – typically approx. 10 % lower.

**Spool type E01K**



**Spool type E01K\*XG371**

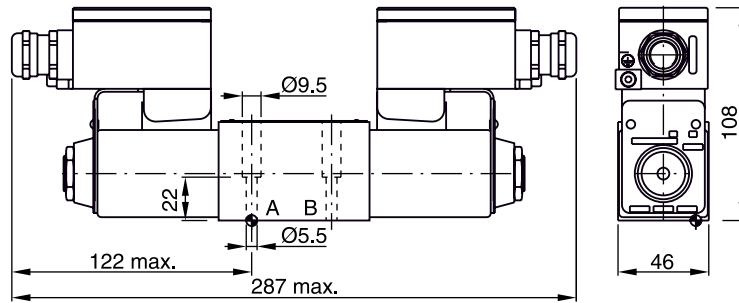


All characteristic curves measured with HLP46 at 50 °C.

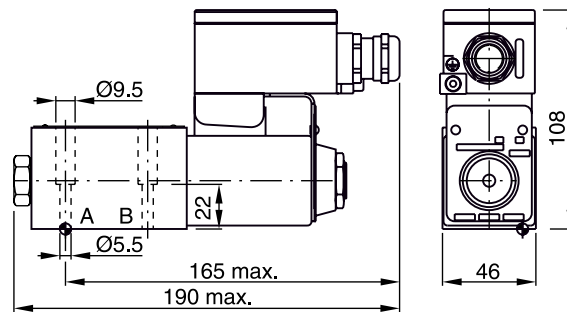


**Dimensions**

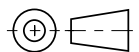
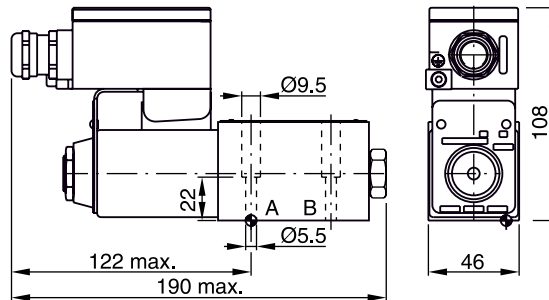
**D1FB\*C\*EE**





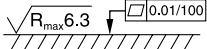


**D1FB\*K\*EE**



**D1FB\*E\*EE**



Surface finish	 Kit	 Kit	 Kit	 Kit NBR
	BK375	4x M5x30 ISO 4762-12.9	7.6 Nm ±15 %	SK-D1FB

**Characteristics**

The D1FV\*EE series with explosion proof solenoids is based on the standard D1FV series. The specific solenoid design allows the usage in hazardous environments. The explosion proof class is

CE  $\text{Ex}$  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.

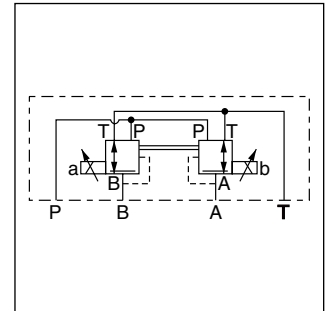
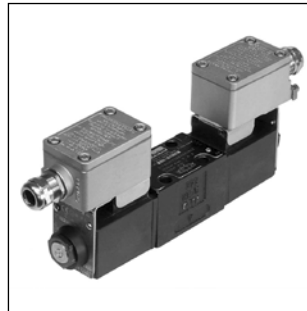
The parameters can be saved, changed and duplicated in combination with the digital power amplifier PWD00A-400 (to be used in an explosion proof cabinet or outside of the hazardous area).

The valve parameters can be edited with the common ProPxD software.

The D1FV valves control the pressure in the A or B ports using the barometric feedback principle.

**Features**

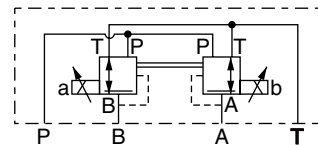
- Barometric feedback
- High repeatability from valve to valve
- Low hysteresis
- Manual override
- Optional: coil to permit ambient temperature up to +60 °C, modification XG371



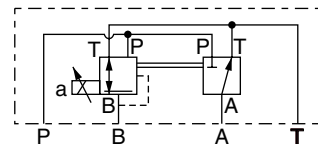
Example function C

**Schematics**

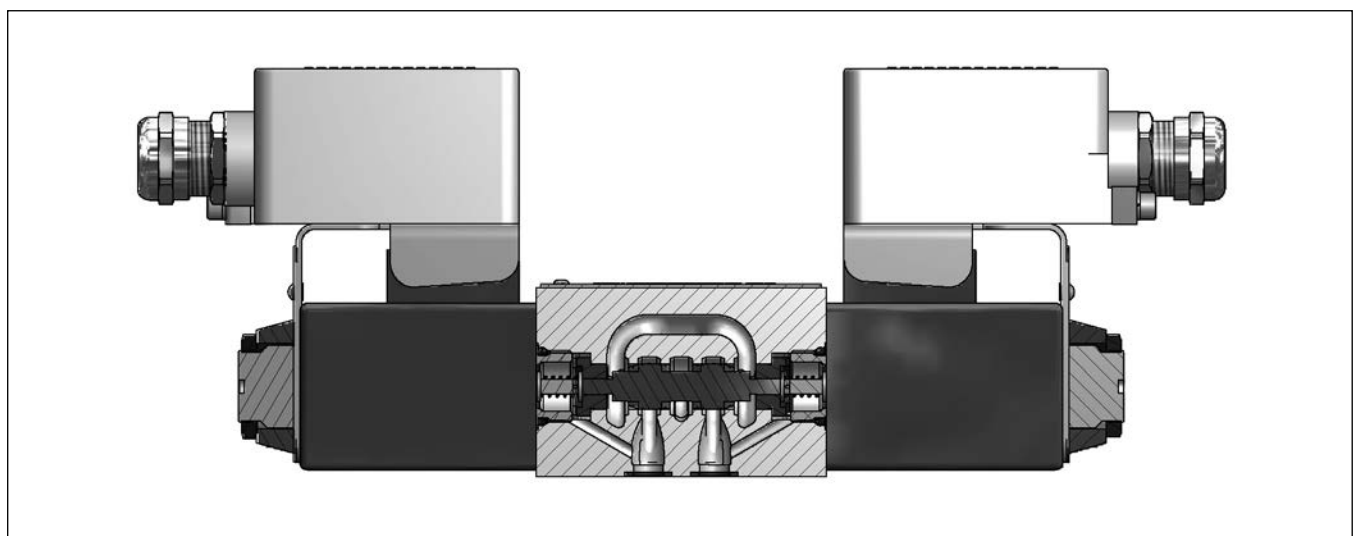
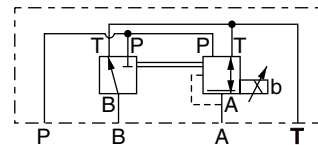
Control function C



Control function E



Control function K



Ordering Code / Curves

Ordering code

<b>D</b>	<b>1</b>	<b>F</b>	<b>V</b>	<b>E02</b>	<b>C</b>		<b>0</b>	<b>V</b>		<b>E</b>	<b>3</b>		<b>EE</b>	
Proportional pressure reducing valve	Proportional control		Spool	Control function			Seals FPM	Explosion proof	Solenoid	Spool/body design	Design series (not required for ordering)	Connection	Modification	
	Size DIN NG06 CETOP 03 NFPA D03			Pressure range 25 bar								Explosion proof with cable glands Ex e mb IIC T4 Gb + IECEx conformity		

Code	Spool position
C	
E	
K	

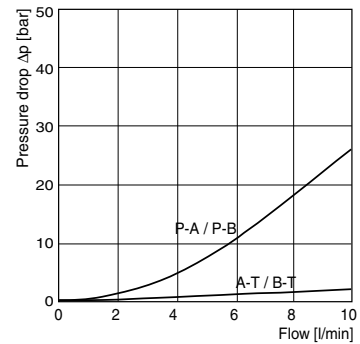
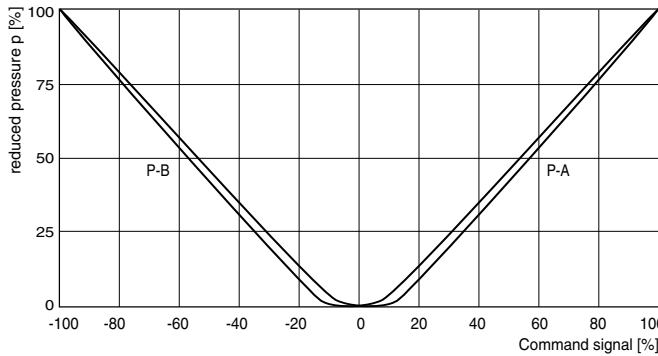
  

Code	Modification
omit	Standard
XG371	Coil to permit ambient temperature up to +60 °C

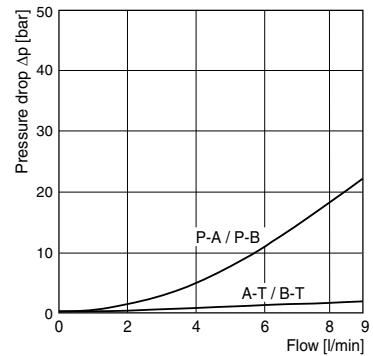
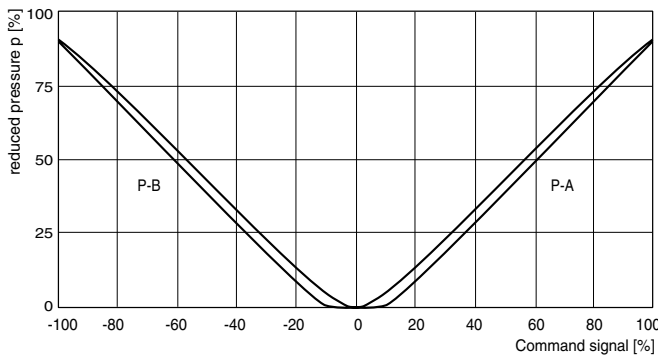
  

Code	Solenoid
K	12 V / 2.3 A
J	24 V / 1.15 A
J*XG371	24 V / 1.0 A

Characteristic curves  
Standard



Characteristic curves  
XG371



All characteristic curves measured with HLP46 at 50 °C.

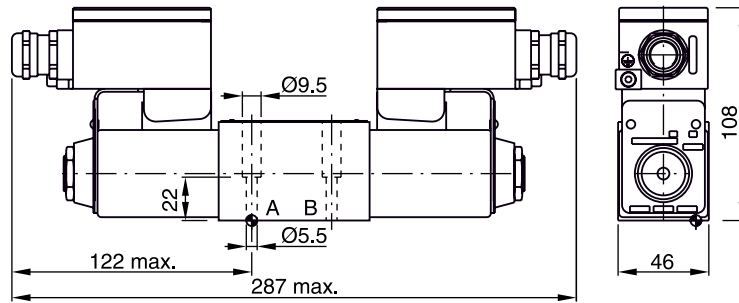
**Technical Data**

General			
Design	Direct operated proportional pressure reducing valve		
Actuation	Proportional solenoid		
Size	NG06 / CETOP 03 / NFPA D03		
Mounting interface	DIN 24340 / ISO 4401 / CETOP RP121 / NFPA		
Mounting position	unrestricted		
Ambient temperature	[°C]	-20...+40; XG371: -20...+60	
MTTF <sub>D</sub> value	[years]	150	
Weight	[kg]	3.5 (2 solenoids), 2.5 (1 solenoid)	
Hydraulic			
Max. operating pressure	[bar]	Ports P, A, B 350; Port T 185	
Max. pressure drop PABT / PBAT	[bar]	350	
Fluid	Hydraulic oil as per DIN 51524...51535, other on request		
Fluid temperature	[°C]	-20...+40; XG371: -20...+60	
Viscosity	permitted	[cSt] / [mm <sup>2</sup> /s]	20...400
	recommended	[cSt] / [mm <sup>2</sup> /s]	30...80
Filtration	ISO 4406; 18/16/13		
Max. flow	[l/min]	10	
Min. primary pressure	[bar]	30	
Static / Dynamic			
Hysteresis	[%]	<4	
Temperature drift solenoid current	[%/K]	<0.02	
Electrical characteristics			
Duty ratio	[%]	100	
Protection class	CE $\langle \text{Ex} \rangle$ II 2 G, Ex e mb IIC T4 Gb, IP66 (plugged and mounted correctly)		
Solenoid	Code	<b>J</b>	<b>J*XG371</b>
Supply voltage	[V]	24	24
Current consumption	[A]	1.15	1.0
Resistance	[Ohm]	12.0	12.0
Solenoid connection	Box with M20x1.5 entry for cableglands. Solenoid identifications per ISO 9461.		
Wiring min.	[mm <sup>2</sup> ]	3 x 1.5 recommended	
Wiring length max.	[m]	50 recommended	

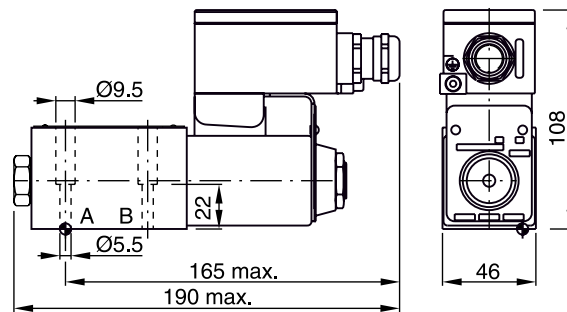
With electrical connections the protective conductor (PE  $\perp$ ) must be connected according to the relevant regulations.

**Dimensions**

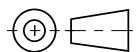
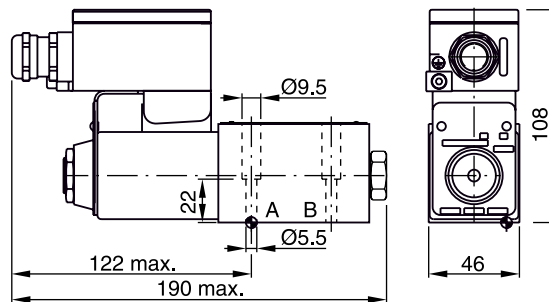
**D1FV\*C\*EE**





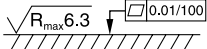


**D1FV\*K\*EE**



**D1FV\*E\*EE**



Surface finish	 Kit	 Kit	 Kit	 Kit NBR
	BK375	4x M5x30 ISO 4762-12.9	7.6 Nm ±15%	SK-D1FB

**Characteristics**

The series of pilot operated proportional directional valves D\*1FB\*EE is offered in 4 sizes:

- D31FB\*EE - NG10 (CETOP 05)
- D41FB\*EE - NG16 (CETOP 07)
- D91FB\*EE - NG25 (CETOP 08)
- D111FB\*EE - NG32 (CETOP 10)

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

CE  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.

The parameters can be saved, changed and duplicated in combination with the digital power amplifier PWD00A-400 (to be used in an explosion proof cabinet or outside of the hazardous area).

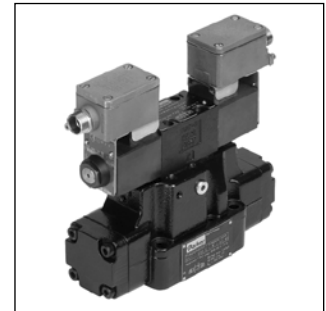
The valve parameters can be edited with the common ProPxD software.

**Features**

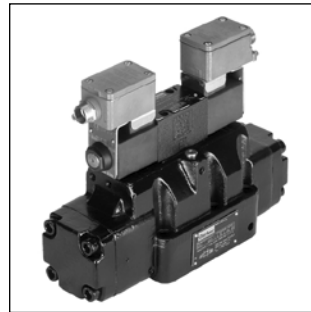
- Progressive flow characteristics for sensitive adjustment of flow rate
- High flow capacity
- Optional: coil to permit ambient temperature up to +60 °C, modification XG371



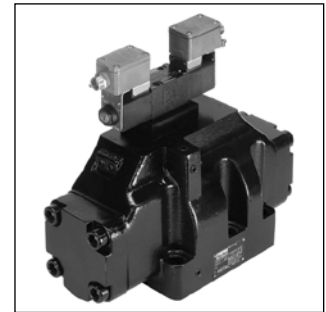
D31FB



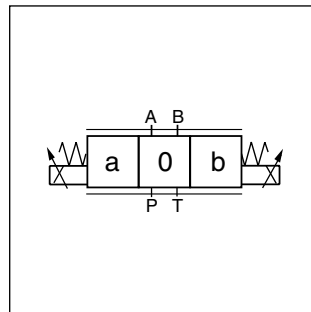
D41FB



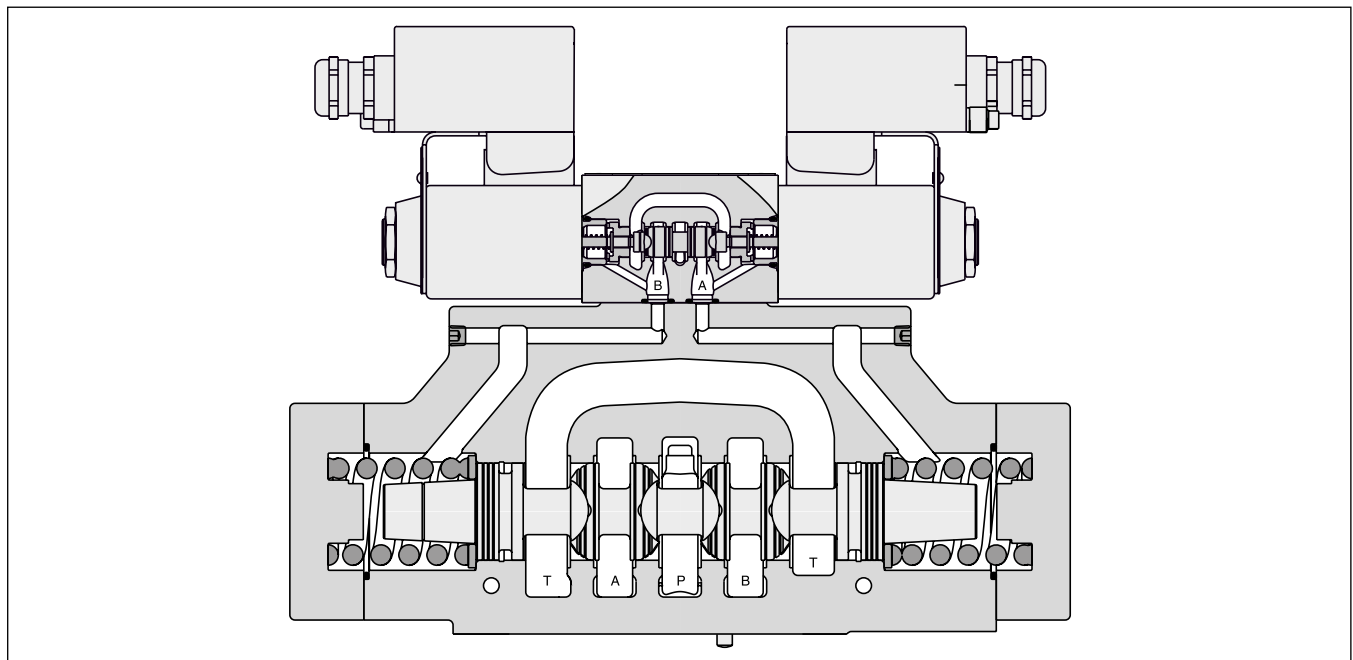
D91FB



D111FB



**D91FB\*EE**



Ordering Code

D\*1FB

<b>D</b>		<b>1</b>	<b>F</b>	<b>B</b>							<b>E</b>	<b>0</b>		<b>EE</b>		
Directional control valve	Size	NG06 pilot	Proportional control	Dynamics standard	Spool type	Flow	Spool position	Pilot connection	Seals	Solenoid description	Explosion proof	Valve accessories	Design series	Connection: Explosion proof with cable glands Ex e mb IIC T4 Gb + IECEX conformity	Modification	
														Code	Modification	
														omit	Standard	
														XG371	Coil to permit ambient temperature up to +60 °C	
														Code	Solenoid description	
														K	12 V / 2,3 A	
														J	24 V / 1,15 A	
														J*XG371	24 V / 1,0 A	
														Code	Seals	
														N	NBR	
														V	FPM	
														Code	Inlet	Drain
														1	Internal	External
														2	External	External
														4	Internal	Internal
														5	External	Internal
														Code	Spool position	
														C		
														E		
														K		

Code	Nominal size
3	NG10 / CETOP 05
4	NG16 / CETOP 07
9 <sup>1)</sup>	NG25 / CETOP 08
11	NG32 / CETOP 10

Code	Spool type
E01	
E02	
B31	$Q_B = Q_A / 2$ 
B32	$Q_B = Q_A / 2$ 


  


Code	Flow [l/min]			
	at $\Delta p = 5$ bar per metering edge			
	D31	D41	D91	D111
B	-	100 <sup>2)</sup>	-	-
C	75 <sup>2)</sup>	130 <sup>2)</sup>	-	-
D	90	-	-	-
E	120	-	250 <sup>2)</sup>	-
F	-	200	-	-
H	-	-	400	-
L	-	-	-	1000

<sup>1)</sup> With enlarged connections Ø 32 mm  
<sup>2)</sup> Not for spool type B31 and B32

**Technical Data**

General					
Design	Pilot operated DC valve				
Actuation	Proportional solenoid				
Size	<b>NG10 (CETOP 05)</b>	<b>NG16 (CETOP 07)</b>	<b>NG25 (CETOP 08)</b>	<b>NG32 (CETOP 10)</b>	
Mounting interface	DIN 24340 / ISO 4401 / CETOP RP121 / NFPA				
Mounting position	unrestricted				
Ambient temperature	[°C]	-20...+40 ; XG371: -20...+60			
MTTF <sub>D</sub> value	[years]	75			
Weight	[kg]	9.4	12.8	20.3	69.3
Hydraulic					
Max. operating pressure	[bar]	Pilot drain internal: P, A, B, X 350; T, Y 185 (NG10: T, Y 15)			
	[bar]	Pilot drain external: P, A, B, T, X 350; Y 185 (NG10: Y 15)			
Fluid	Hydraulic oil as per DIN 51524...51535, other on request				
Fluid temperature	[°C]	-20...+40; XG371: -20...+60			
Viscosity		20...400			
permitted	[cSt] / [mm <sup>2</sup> /s]	30...80			
recommended	[cSt] / [mm <sup>2</sup> /s]				
Filtration	ISO 4406; 18/16/13				
Nominal flow at Δp = 5 bar per control edge *	[l/min]	75/90/120	130/200	250/400	1000
Leakage at 100 bar	[ml/min]	100	200	600	1000
Pilot supply pressure	[bar]	min. 30 (+ T/Y pressure)			
	[bar]	max. 350			
	[bar]	optimal dynamics at 50			
Pilot flow at 100bar	[l/min]	<0.5	<1.2	<1.2	<1.2
Pilot flow, step response	[l/min]	2.0	1.9	4.5	18
Static / Dynamic					
Step response at 100 % step	[ms]	50	75	100	180
Hysteresis	[%]	<5			

Electrical characteristics				
Duty ratio	[%]	100		
Protection class	CE  II 2 G , Ex e mb IIC T4 Gb, IP66 (plugged and mounted correctly)			
Solenoid	Code	<b>J</b>	<b>K</b>	<b>K*XG371</b>
Supply voltage	[V]	24	12	12
Current consumption	[A]	1.15	2.3	2.0
Resistance	[Ohm]	12.0	3.0	3.0
Solenoid connection	Box with M20x1.5 entry for cableglands. Solenoid identifications per ISO 9461.			
Wiring min.	[mm <sup>2</sup> ]	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.

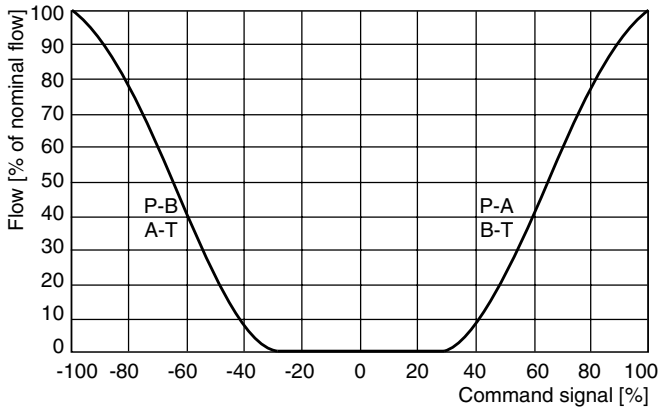
\* Flow rate for different Δp per control edge:

$$Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$$

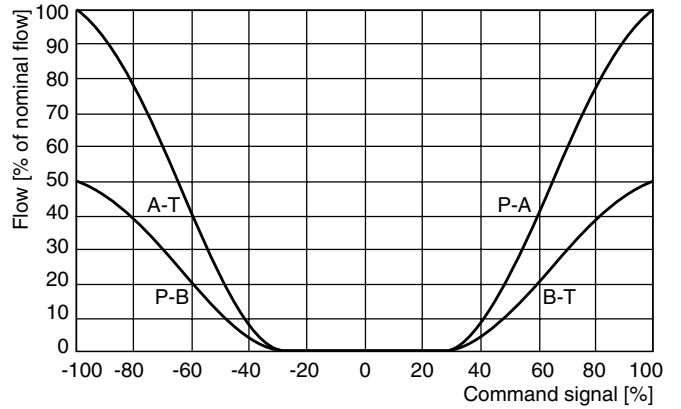


**Curves**

**Flow characteristics D\*1FB**  
 at  $\Delta p = 5$  bar per metering edge  
 Spool code **E\***

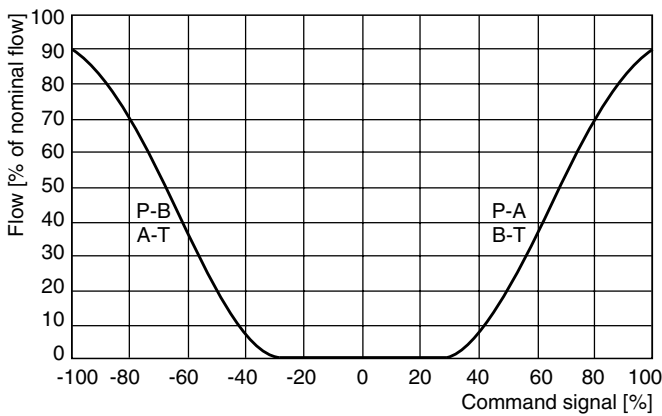


Spool code **B\***

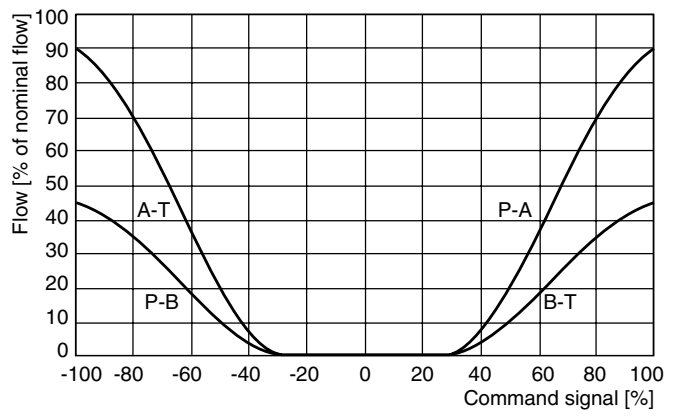


**Flow characteristics D\*1FB\*XG371**

Spool code **E\***



Spool code **B\***

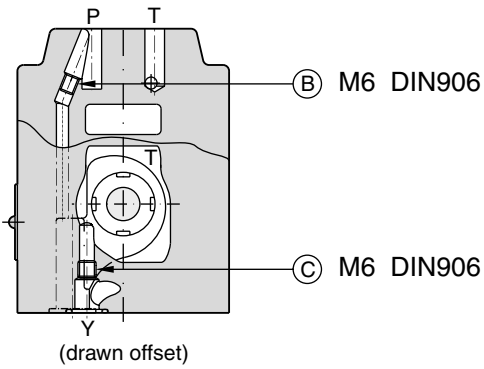


All characteristic curves measured with HLP46 at 50 °C.

**Pilot Oil Options**

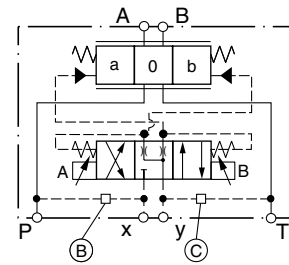
**Pilot oil inlet (supply) and outlet (drain)**

**D31FB**

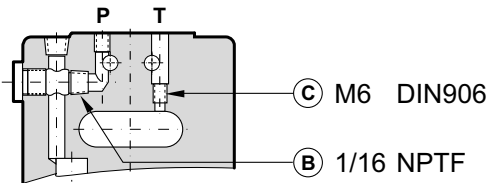


○ open, ● closed

Pilot oil		B	C
Inlet	Drain		
internal	external	○	●
external	external	●	●
internal	internal	○	○
external	internal	●	○

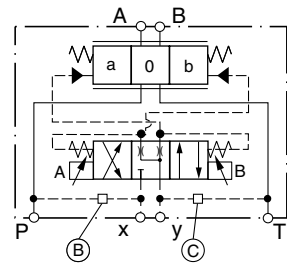


**D41FB**

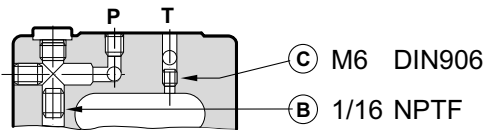


○ open, ● closed

Pilot oil		B	C
Inlet	Drain		
internal	external	○	●
external	external	●	●
internal	internal	○	○
external	internal	●	○

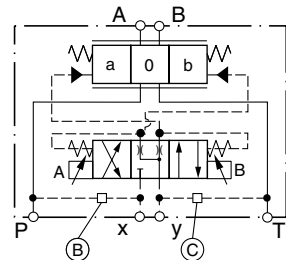


**D91FB**

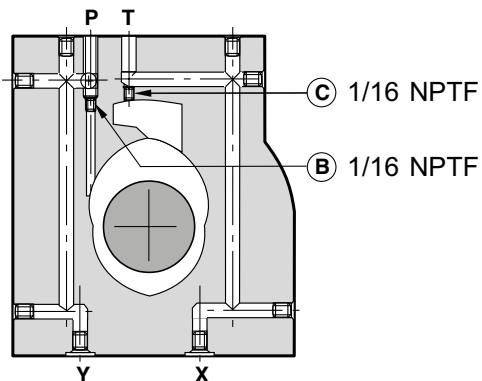


○ open, ● closed

Pilot oil		B	C
Inlet	Drain		
internal	external	○	●
external	external	●	●
internal	internal	○	○
external	internal	●	○

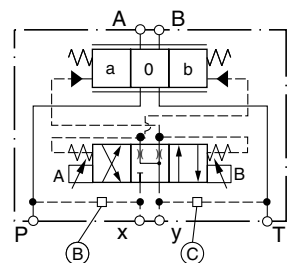


**D111FB**



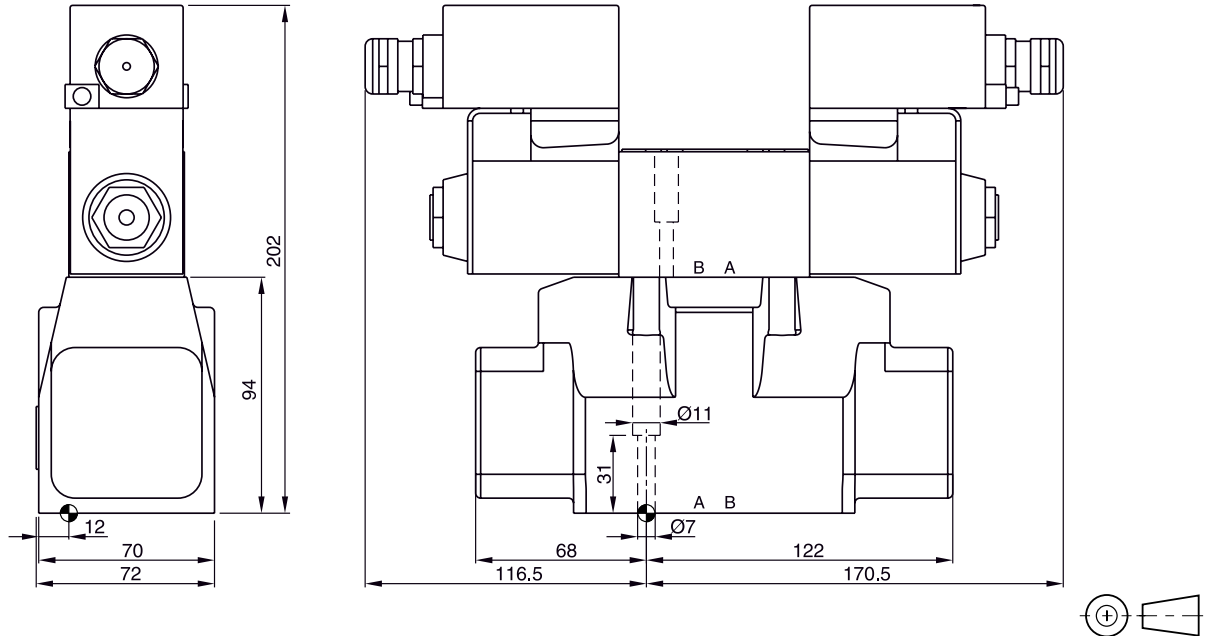
○ open, ● closed

Pilot oil		B	C
Inlet	Drain		
internal	external	○	●
external	external	●	●
internal	internal	○	○
external	internal	●	○



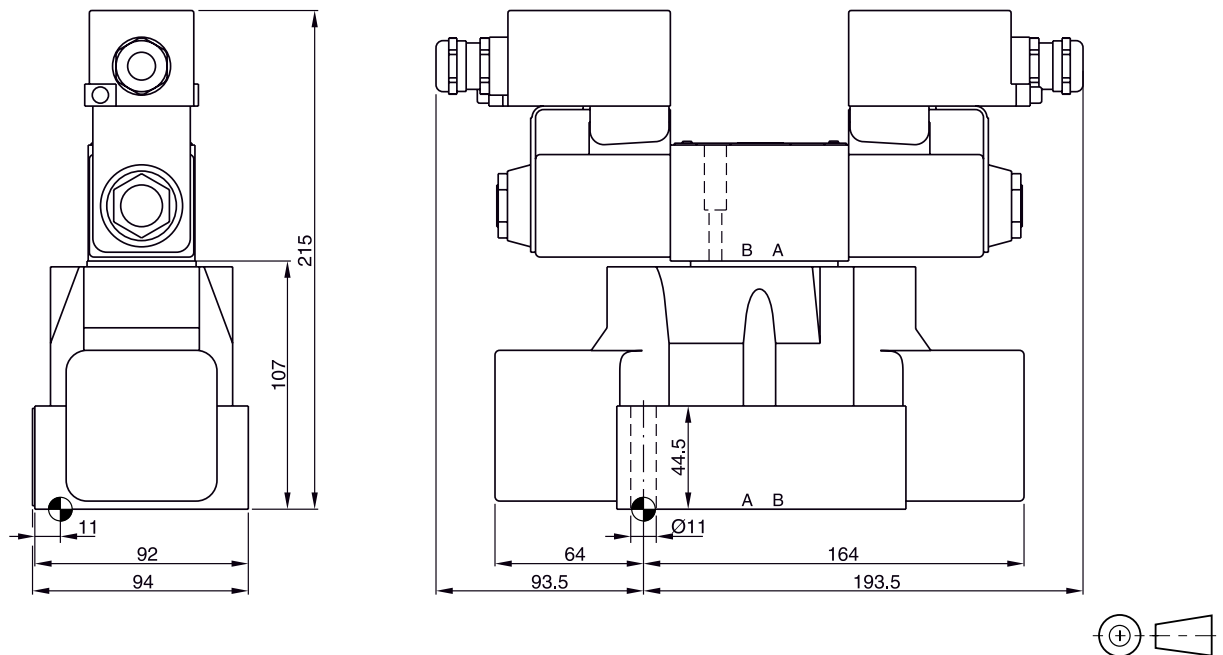
**Dimensions**

**D31FB**



Surface finish	Kit	Kit	Kit	Kit
	BK385	4x M6x40 ISO 4762-12.9	13.2 Nm ±15 %	NBR: SK-D31FB FPM: SK-D31FB-V

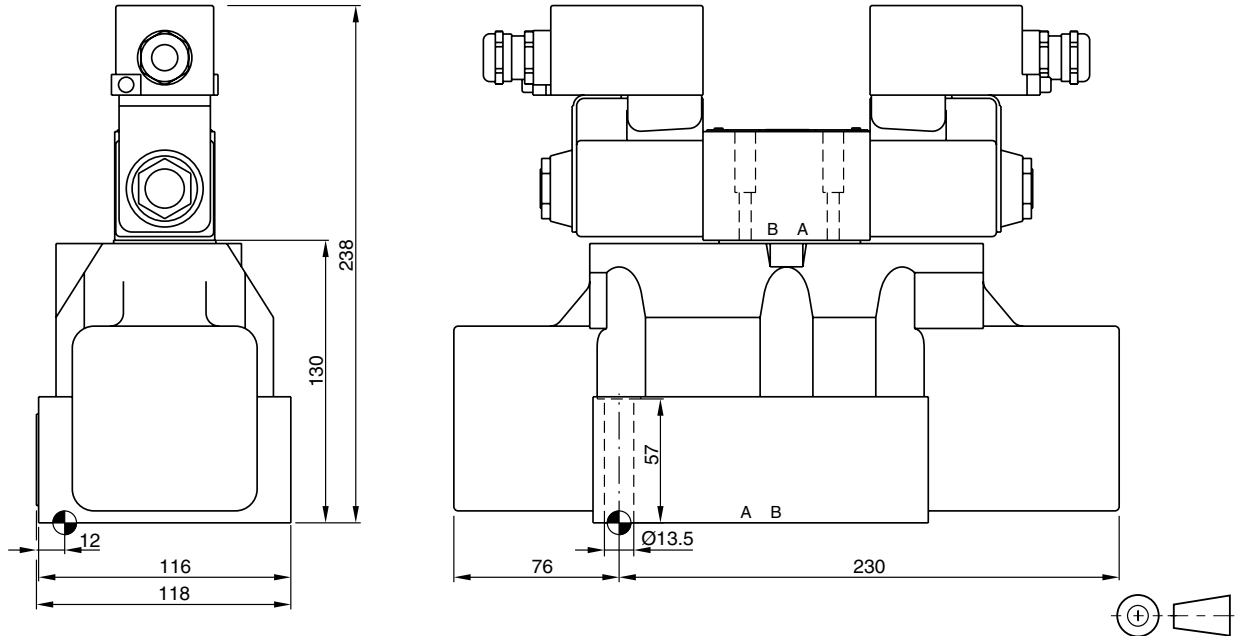
**D41FB**





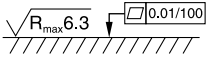


Surface finish	Kit	Kit	Kit	Kit
	BK320	2x M6x55 4x M10x60 ISO 4762-12.9	13.2 Nm ±15 % 63 Nm ±15 %	NBR: SK-D41FB FPM: SK-D41FB-V

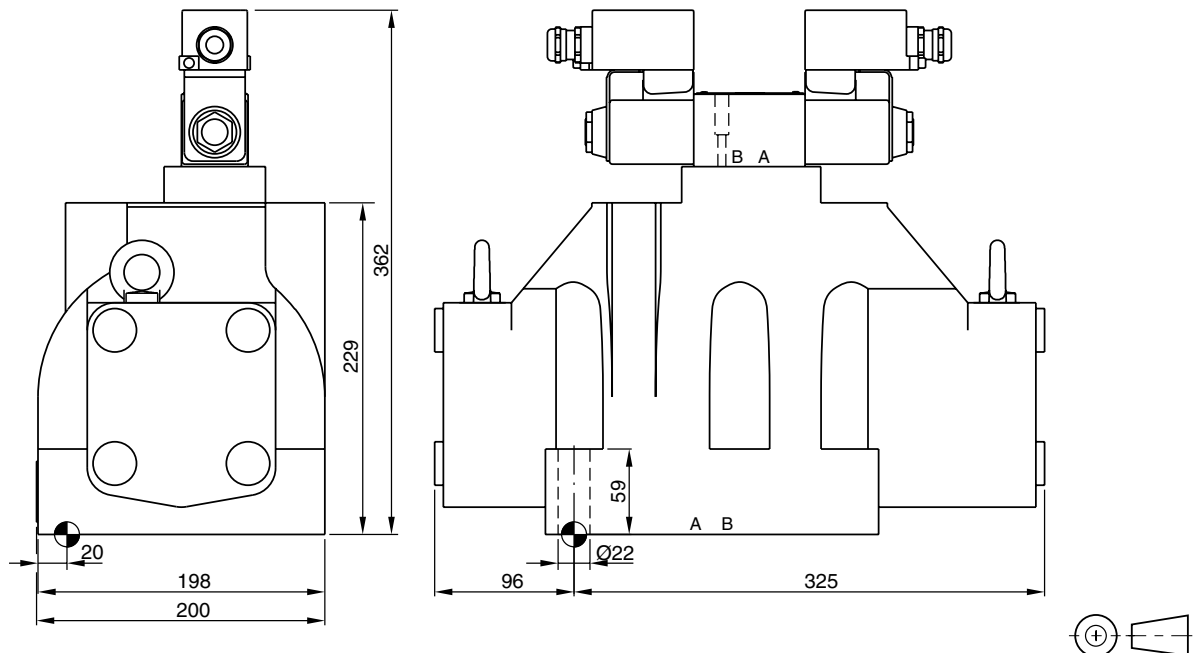
Dimensions





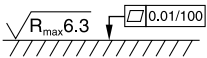
D91FB



Surface finish	 Kit			 Kit
	BK360	6x M12x75 ISO 4762-12.9	108 Nm ±15 %	NBR: SK-D91FB FPM: SK-D91FB-V

D111FB



Surface finish	 Kit			 Kit
	BK386	6x M20x90 ISO 4762-12.9	517 Nm ±15 %	NBR: SK-D111FB FPM: SK-D111FB-V



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