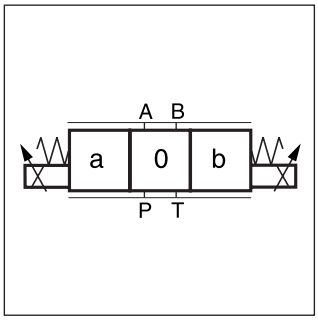
* VCD® = Voice Coil Drive technology

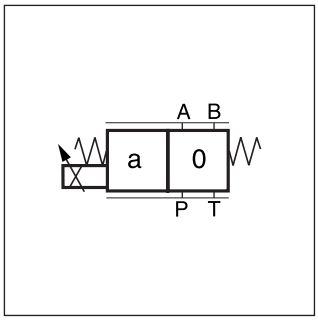
Notes

The D1FB directional control valve of the nominal size NG6 (CETOP3) provides variable flow rates.

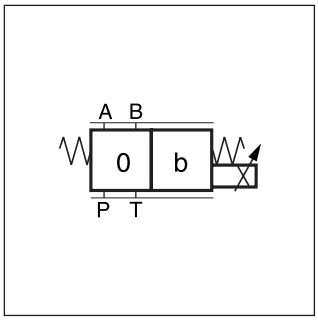
Due to a spool and sleeve combination with wire EDM window geometry and a special manufacturing adjustment, the valve achieves excellent repeatability from valve to valve and high precision. The D1FB is suited for standard applications particularly with regard to functions on identical machines, which need only to be adjusted once. In combination with the digital power amplifier PWD00A-400, the valve parameters can be saved, changed and duplicated.



D1FB*C



D1FB*E

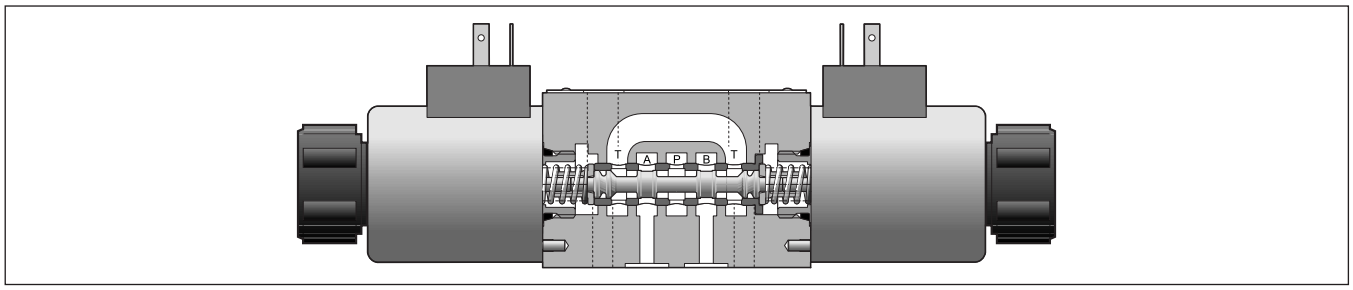


D1FB*K

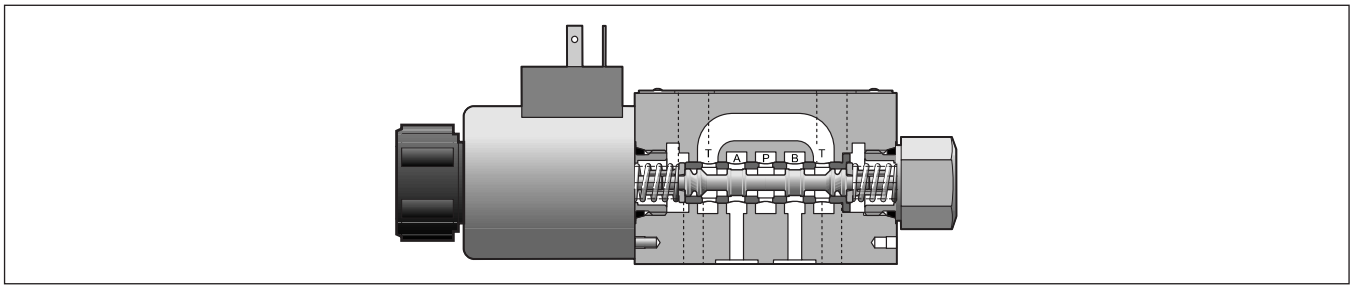
Technical features

- Spool/sleeve design
- High repeatability from valve to valve
- Low hysteresis
- Manual override
- Fail-safe centre position

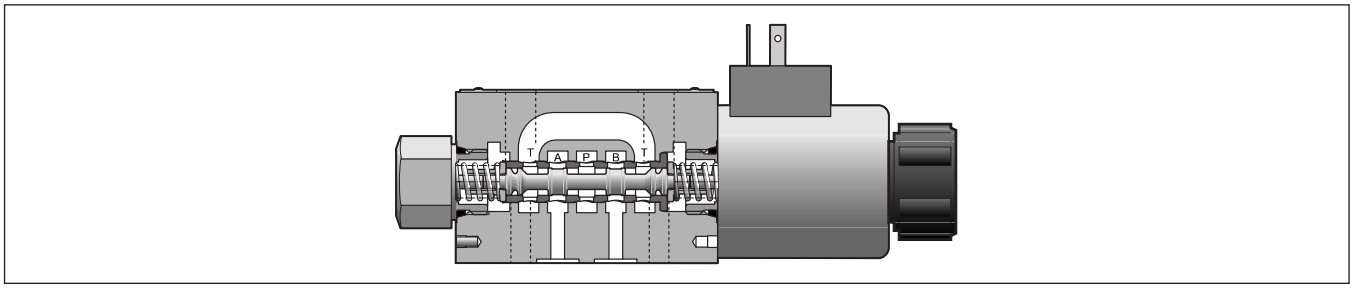
D1FB*C



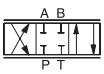
D1FB*E

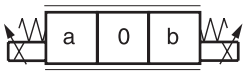
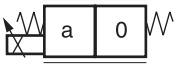
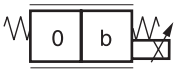


D1FB*K



D	1	F	B			0	N	M	W	0
Directional control valve	**Size DIN NG06 CETOP 03 NFPA D03**	**Proportional control**	**Standard dynamics standard repeatability**	**Spool type**	**Spool position**		**Seals NBR** (other seal compounds on request)	**Solenoid description 9V/2.7A** (other voltage on request)	**Connector as per EN 175301-803 without plug***	**Spool/sleeve design**

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

Code	Spool position
C	
E	
K	

Bold letters =
Short-term availability

* Please order plugs separately.
See chapter 3 accessories.

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...+60
Weight	[kg]	2.2
Vibration resistance	[g]	25 acc. DIN IEC68, part 2-6
Hydraulic		
Max. operating pressure	[bar] [bar]	Ports P, A, B 350; Port T 250
Fluid		Hydraulic oil as per DIN 51524...535, other on request
Fluid temperature	[°C]	-20...+60
Viscosity		
permitted	[cSt] / [mm²/s]	20...380
recommended	[cSt] / [mm²/s]	30...80
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)
Nominal flow at Δp=5bar per control edge *	[l/min]	6 / 12 / 20
Leakage at 100 bar	[ml/min]	<50
Static / Dynamic		
Hysteresis	[%]	<4
Electrical characteristics		
Duty ratio	[%]	100
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)
Solenoid		Code "M"
Supply voltage	[V]	9
Current consumption	[A]	2.7
Resistance	[Ohm]	2.7
Coil insulation class		F (155 °C)
Electrical connection		Connector as per EN 175301-803
Wiring min.	[mm²]	3x1.5 (AWG 16) overall braid shield
Wiring lenght max.	[m]	50

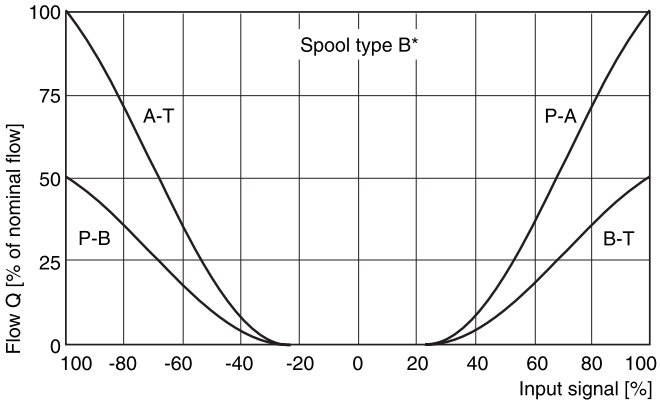
* Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

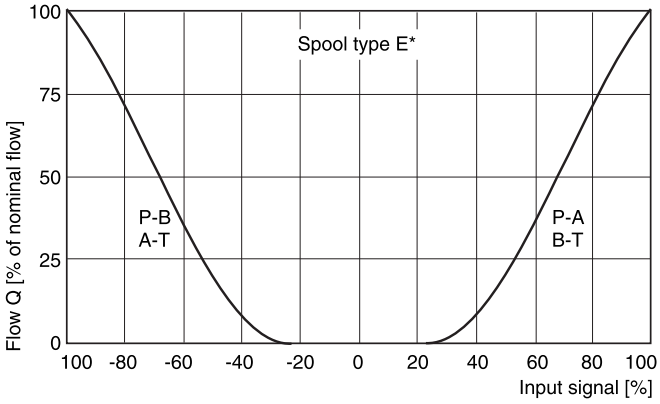
3

Flow characteristics

at Δp = 5 bar per metering edge

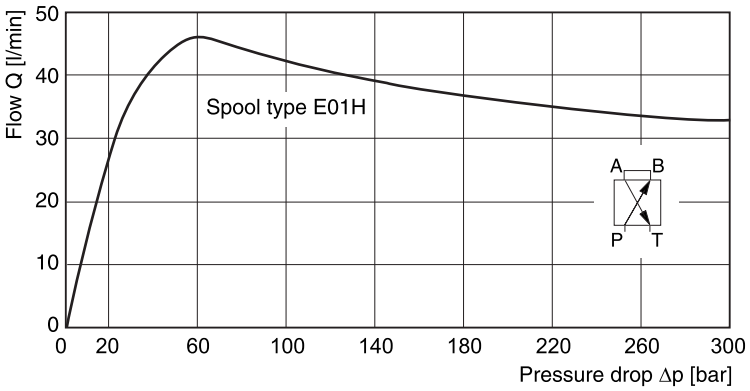
Fluid viscosity 40cSt at 50°C





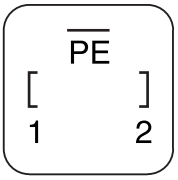
Flow limit

100% command signal



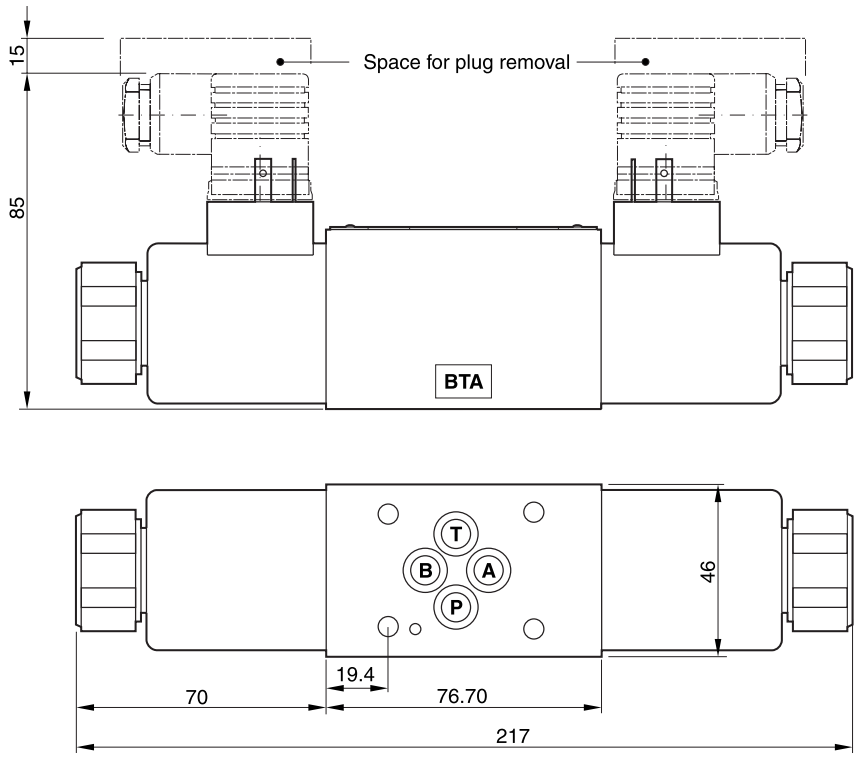
Plug

Solenoid coil

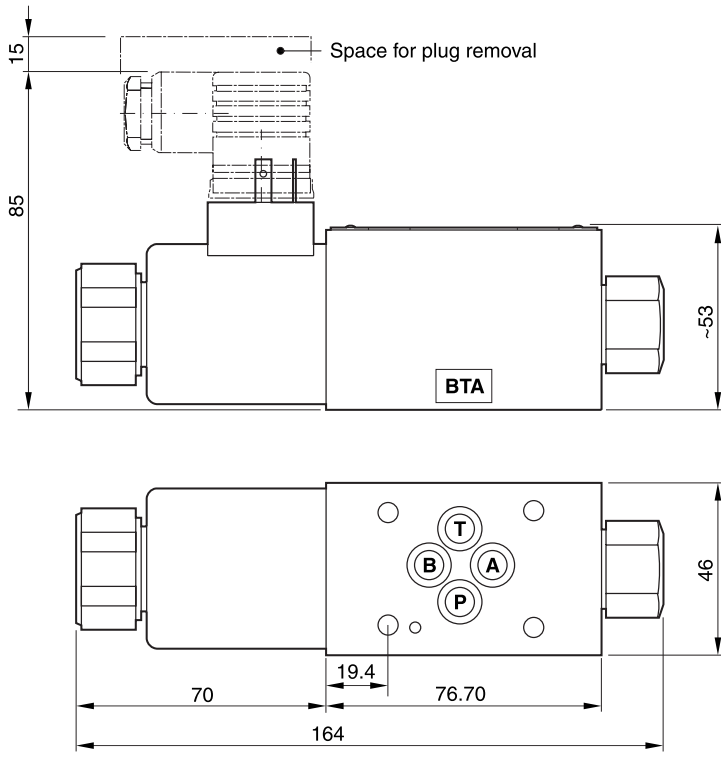


1 = coil connection
2 = coil connection
PE = ground potential

D1FB*C

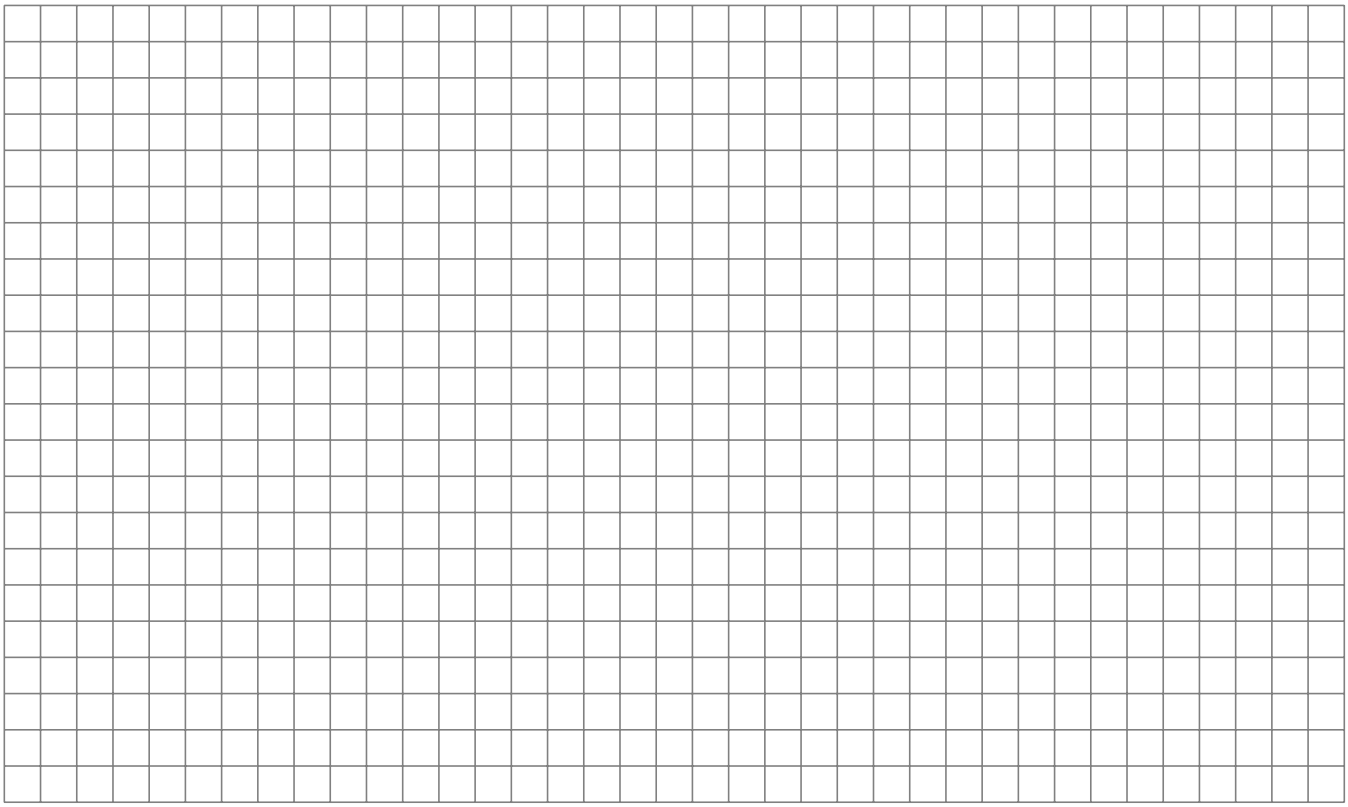


D1FB*K



Surface finish	Kit			Kit NBR
R_{max}6.3 ⏥ 0.01/100	BK375	4x M5x30 DIN 912 12.9	7.6 Nm ±15%	SK-D1FB-N

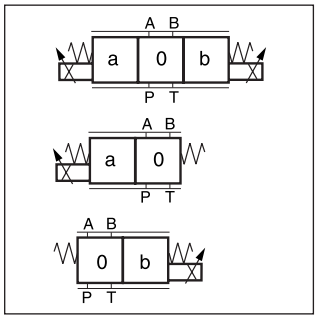
Notes



The proportional directional valves 4DP01 and 4DPE01 (NG06) are offered under Denison brand name.

The spool in body design provides high flow rates at a good level of precision. The 4DPE01 series has a 3-chamber body and is suitable for basic proportional functions such as following a flow profile with acceleration and deceleration ramps.

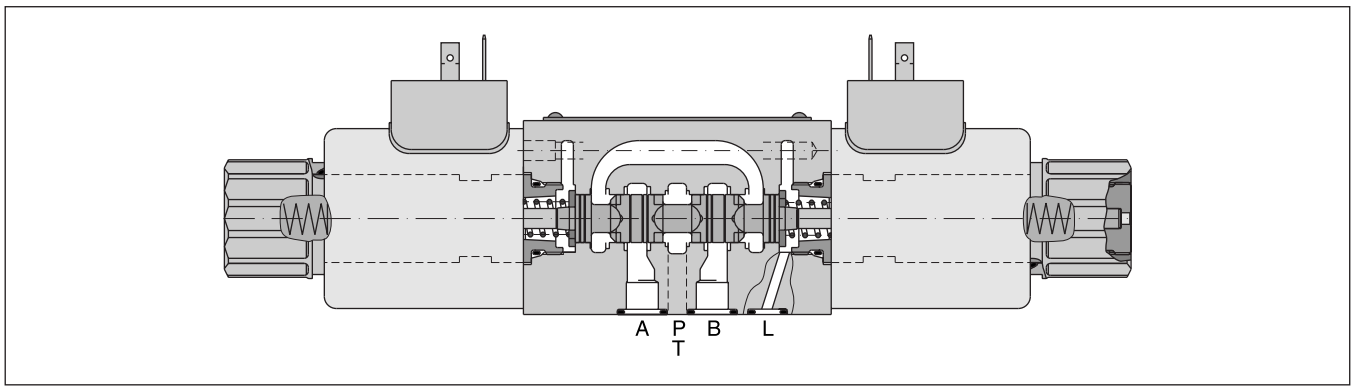
In combination with the digital power amplifier PWD00A-400, the valve parameters can be saved, changed and duplicated.



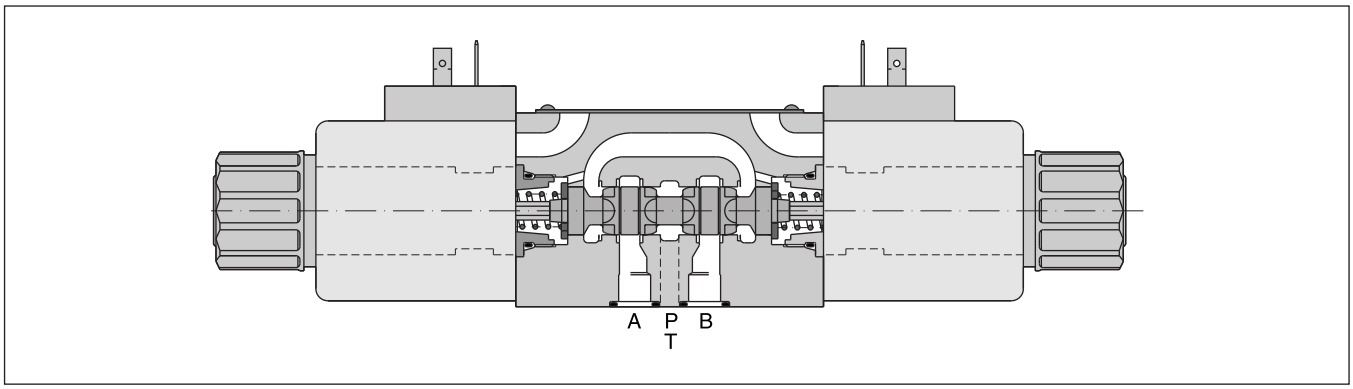
Technical features

- Spool in body design
- High flow rates
- Low hysteresis
- Manual override
- Fail-safe centre position
- Economical series 4DPE01

4DP01



4DPE01



3

4DP		01	–		E			–			–	G12	
Directional prop. control valve	Series	Size DIN NG06 CETOP 03 NFPA D03		Body	Control	Spool type	Flow		Spool position	Design series	Seals	Solenoid [1] 12V/2.2A	Connector as per EN 175301-803

Code	Series
omit	Standard
E	Electronic

Code	Body
3	Standard
L	With drain port "L" (only 4DP01: for tank pressure > 160bar)

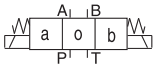
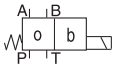
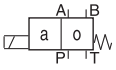
Code	Connectors
omit	Not supplied
C1	PG11

Code	Seals
1	NBR
5	FPM

Code	Design series
B	4DP01
A	4DPE01

3 position spools	
Code	Spool type
Spool position 03	
02	a 0 b 
43	

2 position spools	
Code	Spool type
Spool position 05	
12	0 b 
13	
Spool position 06	
12	a 0 
13	

3 position spools		
Code	Spool position	
03		3 positions. Spring offset in position “0“.
05		2 positions. Spring offset in position “0“. Energized to “b“.
06		2 positions. Spring offset in position “0“. Energized to “a“.

Code	Flow
4DP01	
F10	10 l/min
F20	20 l/min
F30	30 l/min
4DPE01	
Q10	10 l/min
Q20	20 l/min
Q30	30 l/min

[1] Onboard electronics on request

General		
Design		Direct operated proportional DC valve
Actuation		Proportional solenoid
Size		DIN NG6 / CETOP 03 / NFPA D03
Mounting interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA
Mounting position		unrestricted, preferably horizontal
Ambient temperature	[°C]	-20...+50
Weight	[kg]	1.8 (1 solenoid) 2.3 (2 solenoids)
Hydraulic		
Max. operating pressure	[bar]	Ports P, A, B 350;
	[bar]	Port T 4DPE01: 110, 4DP01: 210 (with port L), 160 (without port L), Port L 10 .....
Fluid		Hydraulic oil as per DIN 51524/25, other on request
Fluid temperature	[°C]	-20...+80
Viscosity		
permitted	[cSt] / [mm^2/s]	10...650
recommended	[cSt] / [mm^2/s]	30
Filtration		ISO 4406 (1999) 18/16/13
Nominal flow at Δp=5bar per control edge *	[l/min]	10 / 20 / 30
Leakage at 100 bar	[ml/min]	<50
Static / Dynamic		
Hysteresis	[%]	4DPE01 ≤ 10, 4DP01 ≤ 5
Electrical characteristics		
Duty ratio	[%]	100 ED
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)
Solenoid		Code G12, G24 (only 4DP01)
Supply voltage	[V]	12, 24
Current max.	[A]	2.2
Resistance	[Ohm]	3.7
Coil insulation class		H (180 °C)
Solenoid connection		Connector as per EN 175301-801
Wiring min.	[mm^2]	3x1.5 (AWG 16) overall braid shield
Wiring lenght max.	[m]	50

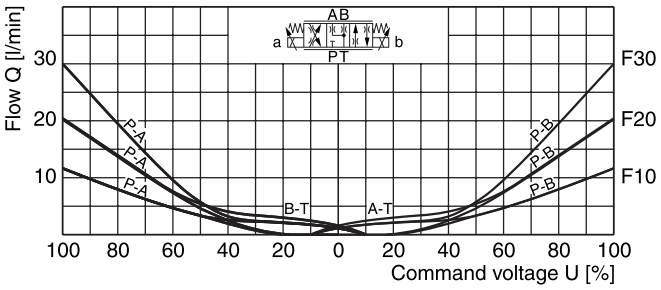
* Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

3

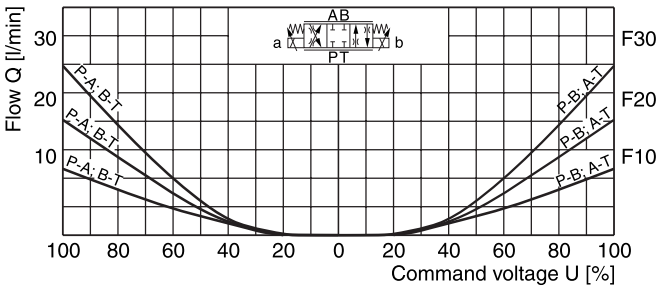
Flow characteristics 4DP01

at Δp = 5 bar per metering edge
Fluid viscosity 40cSt at 50°C

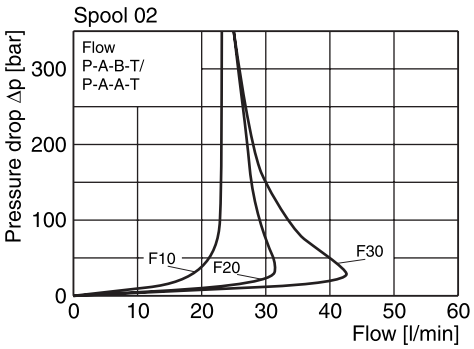
Spool 02

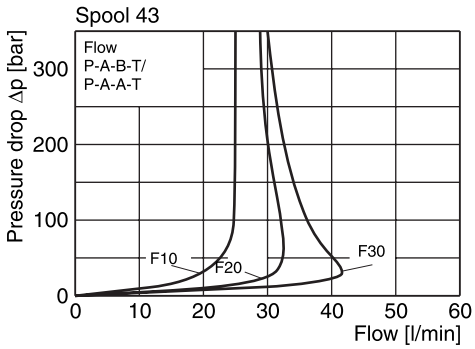


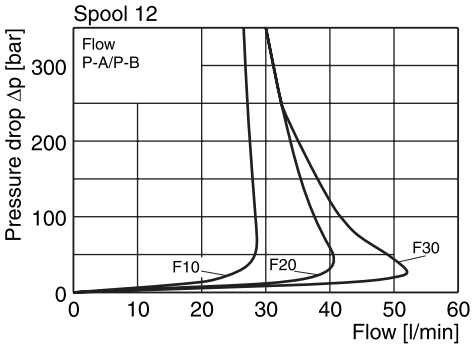
Spool 43

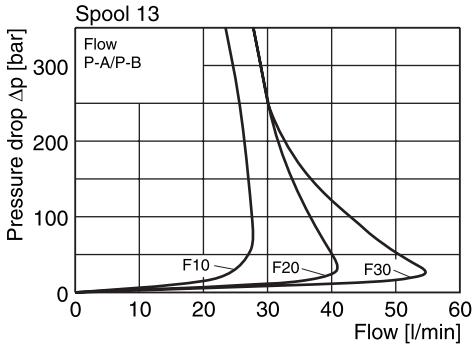


Flow limit





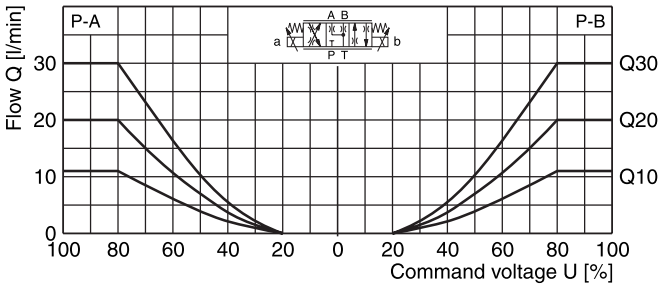




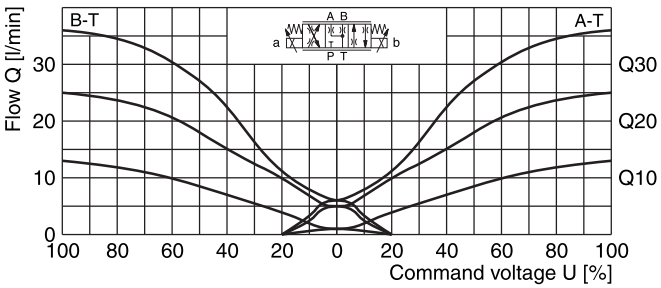
Flow characteristics 4DPE01

at Δp = 5 bar per metering edge
Fluid viscosity 40cSt at 50°C

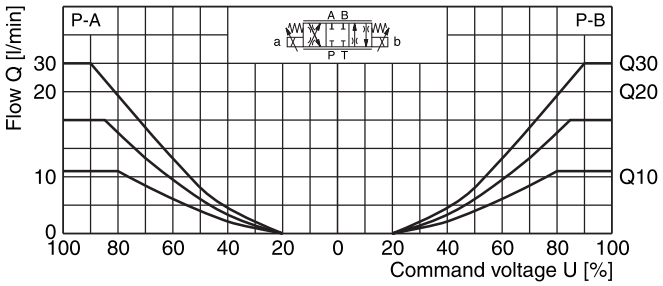
Spool 02



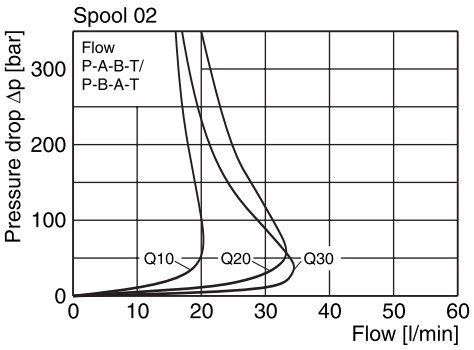
Spool 02

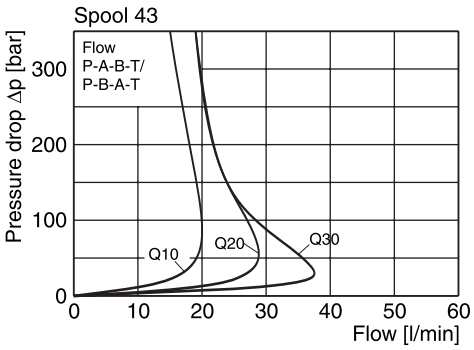


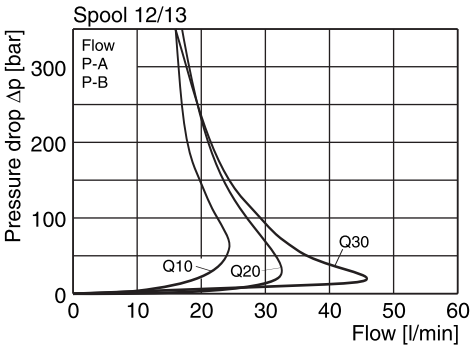
Spool 43



Flow limit

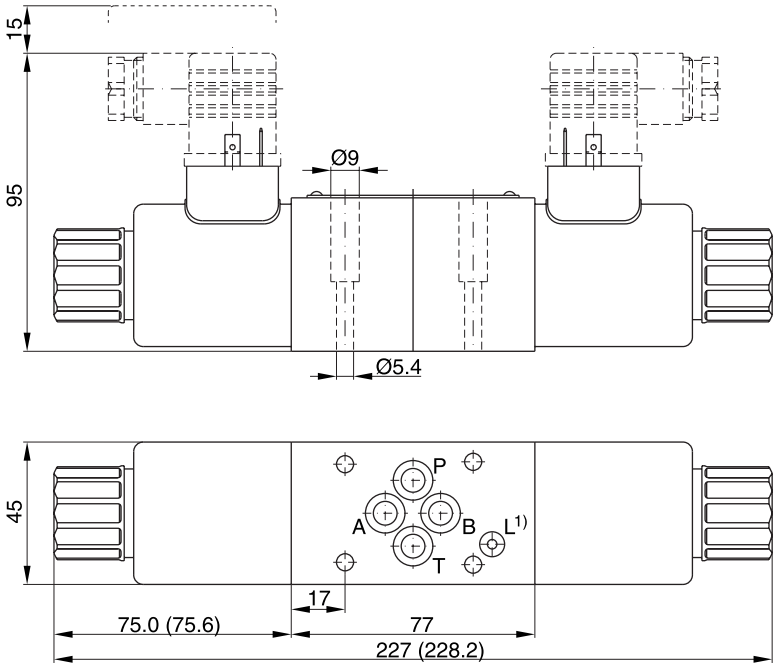






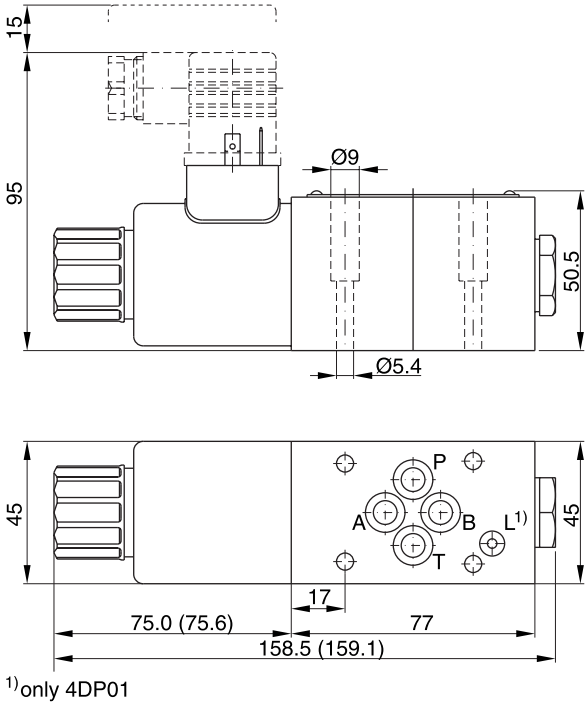
3

4DP01*03
4DPE01*03



1) only 4DP01

4DP01*06
4DPE01*06

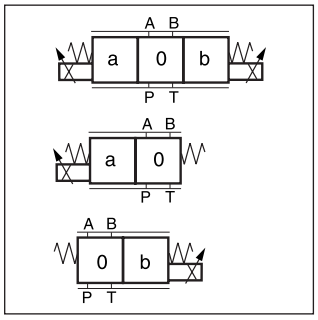


1) only 4DP01

Surface finish	Kit			Kit NBR
R_{max}6.3 ⏥ 0.01/100	BK375	4x M5x30 DIN 912 10.4	8.3 Nm	SK-D1FB-N

The D3FB directional control valve of the nominal size NG10 (CETOP 05) provides variable flow rates.

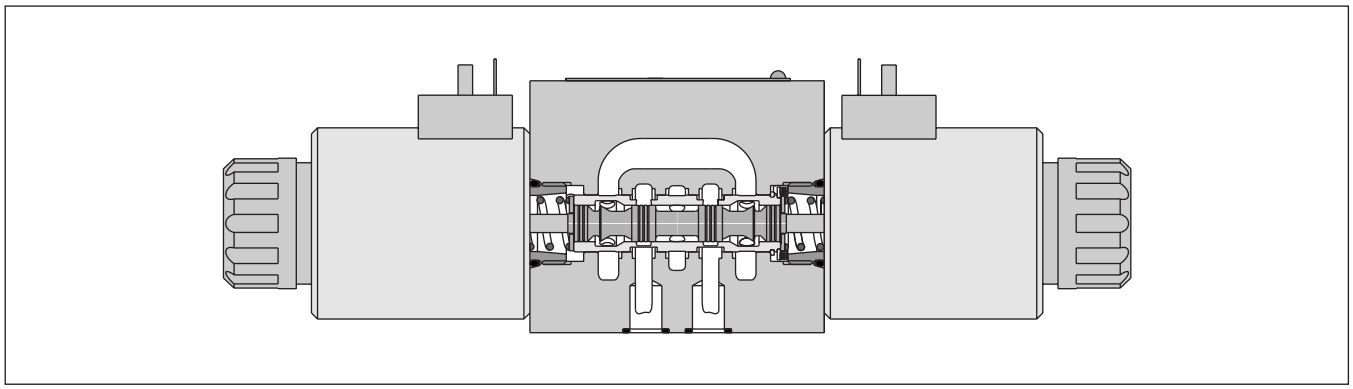
In combination with the digital power amplifier PWD00A-400, the valve parameters can be saved, changed and duplicated.



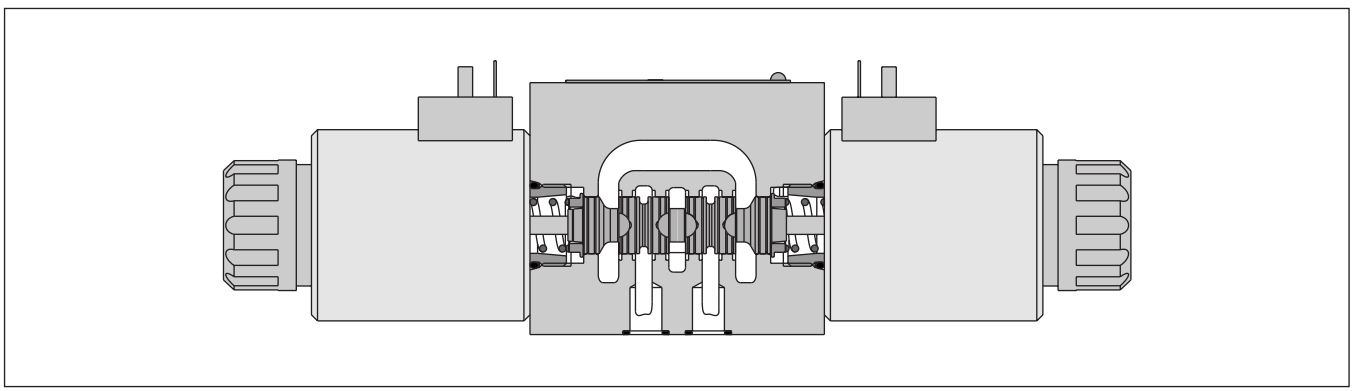
Technical features

- Spool/sleeve design, spool/body design
- High repeatability from valve to valve
- Low hysteresis
- Manual override
- Fail-safe centre position

D3FB*C*0
(Spool in sleeve design)



D3FB*C*3
(Spool in body design)

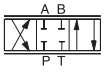


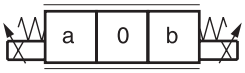
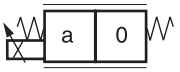
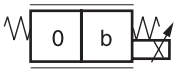
3

D3FB*0

Spool in sleeve design

D	3	F	B			0	N	K	W	0
DC valve	Size DIN NG10 CETOP 05 NFPA D05	Flow control		Spool type	Design		Seal NBR (other seal compounds on request)	Solenoid 12 VDC/2.95A	Connector as per EN 175301-803 without plug*	Spool sleeve design

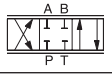
Code	Spool type	Flow [l/min] at Δp 5bar per metering edge
E01M E01S		40 60
E02M E02S		40 60

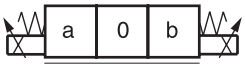
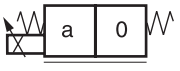
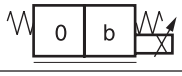
Code	Design
C	
E	
K	

D3FB*3

Spool in body design

D	3	F	B			0	N	K	W	3
DC valve	Size DIN NG10 CETOP 05 NFPA D05	Flow control		Spool type	Design		Seal NBR (other seal compounds on request)	Solenoid 12 VDC/2.95A	Connector as per EN 175301-803 without plug*	Spool body design

Code	Spool type	Flow [l/min] at Δp 5bar per metering edge
E01U		80
E02U		80

Code	Design
C	
E	
K	

* Please order plugs separately.
See chapter 3 accessories.

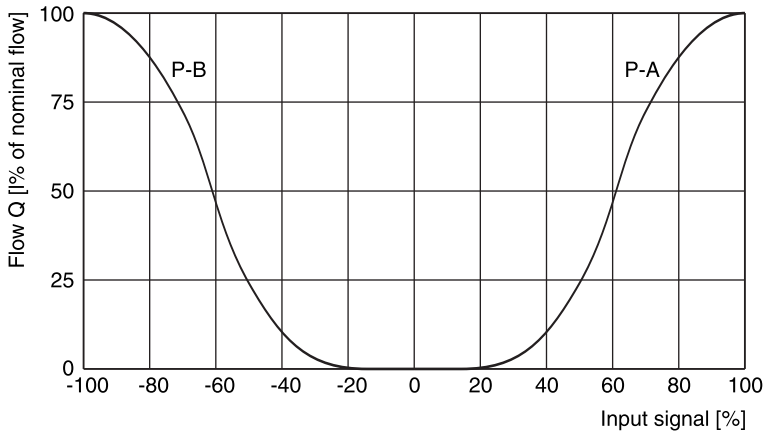
General		
Design		Direct operated proportional DC valve
Actuation		Proportional solenoid
Size		NG10 / CETOP 05 / NFPA D05
Mounting interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA
Mounting position		unrestricted
Ambient temperature	[°C]	-20...+60
Weight	[kg]	7.6
Vibration resistance	[g]	25 acc. DIN IEC68, part 2-6
Hydraulic		
Max. operating pressure	[bar]	Ports P, A, B 350, T 210
Fluid		Hydraulic oil as per DIN 51524...535, other on request
Fluid temperature	[°C]	-20...+60
Viscosity		
permitted	[cSt] / [mm²/s]	20...380
recommended	[cSt] / [mm²/s]	30...80
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)
Nominal flow at Δp=5bar per control edge *		
D3FB*0	[l/min]	40 and 60
D3FB*3	[l/min]	80
Leakage at 100 bar	[ml/min]	<100
Static		
Hysteresis D3FB*0	[%]	<4
D3FB*3	[%]	<5
Electrical characteristics		
Duty ratio	[%]	100 ED; CAUTION: Coil temperature up to 155°C possible
Protection class		IP 65 in accordance with EN 60529 (plugged and mounted)
Solenoid	Code	K
Supply voltage	[V]	12
Current consumption	[A]	2.95
Power consumption	[W]	35.4
Resistance	[Ohm]	3.84
Solenoid connection		Connector as per EN 175301-803
Wiring min.	[mm²]	3 x 1.5 recommended
Wiring lenght max.	[m]	50 recommended

* Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

3

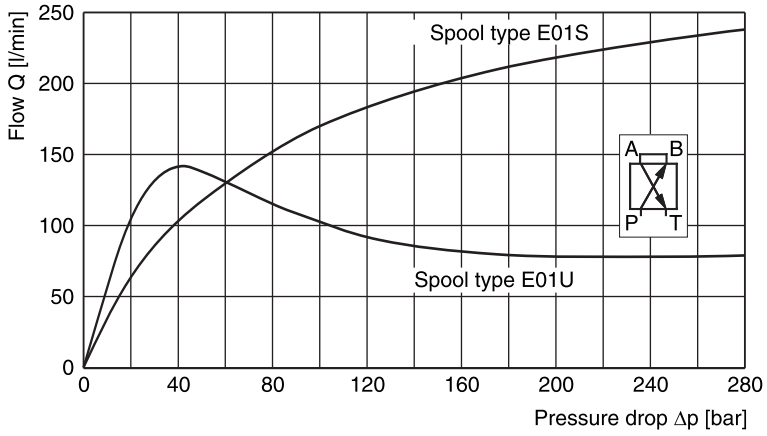
Flow characteristics

at Δp = 5 bar per metering edge
Fluid viscosity 40cSt at 50°C



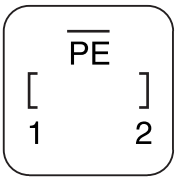
Flow limit

100% command signal



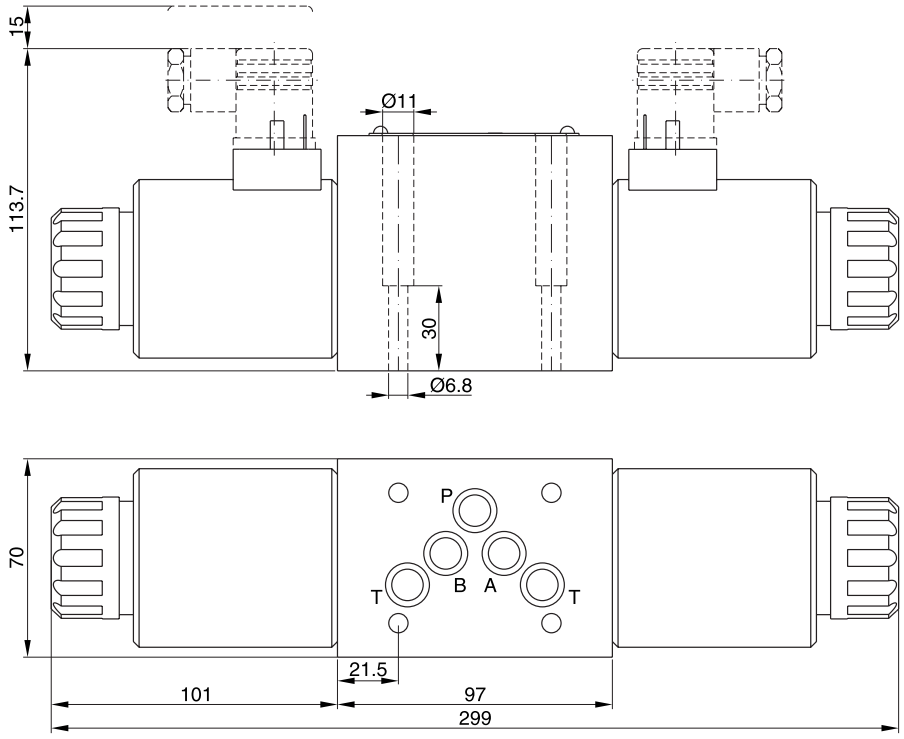
Plug

Solenoid coil

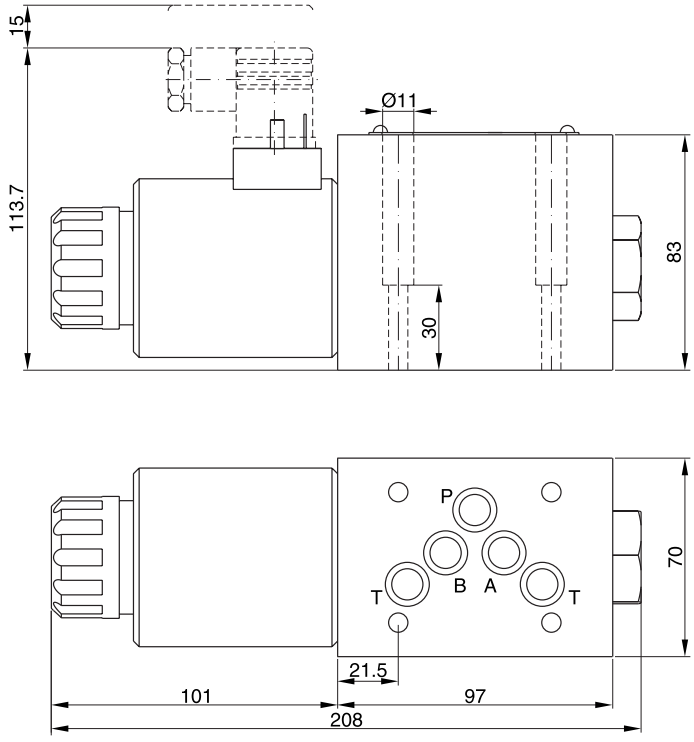


1 = coil connection
2 = coil connection
PE = ground potential

D3FB*C



D3FB*K



Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK385	4x M6x40 DIN 912 12.9	13.2 Nm ±15%	SK-D3FB-N

D3FB_UK.INDD CM

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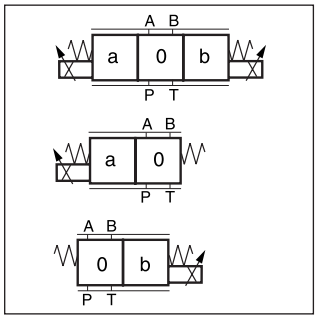
Notes

The proportional directional valves 4DP02 of the nominal size NG10 (CETOP 05) are offered under Denison brand name.

The spool in body design provides high flow rates at a good level of precision.

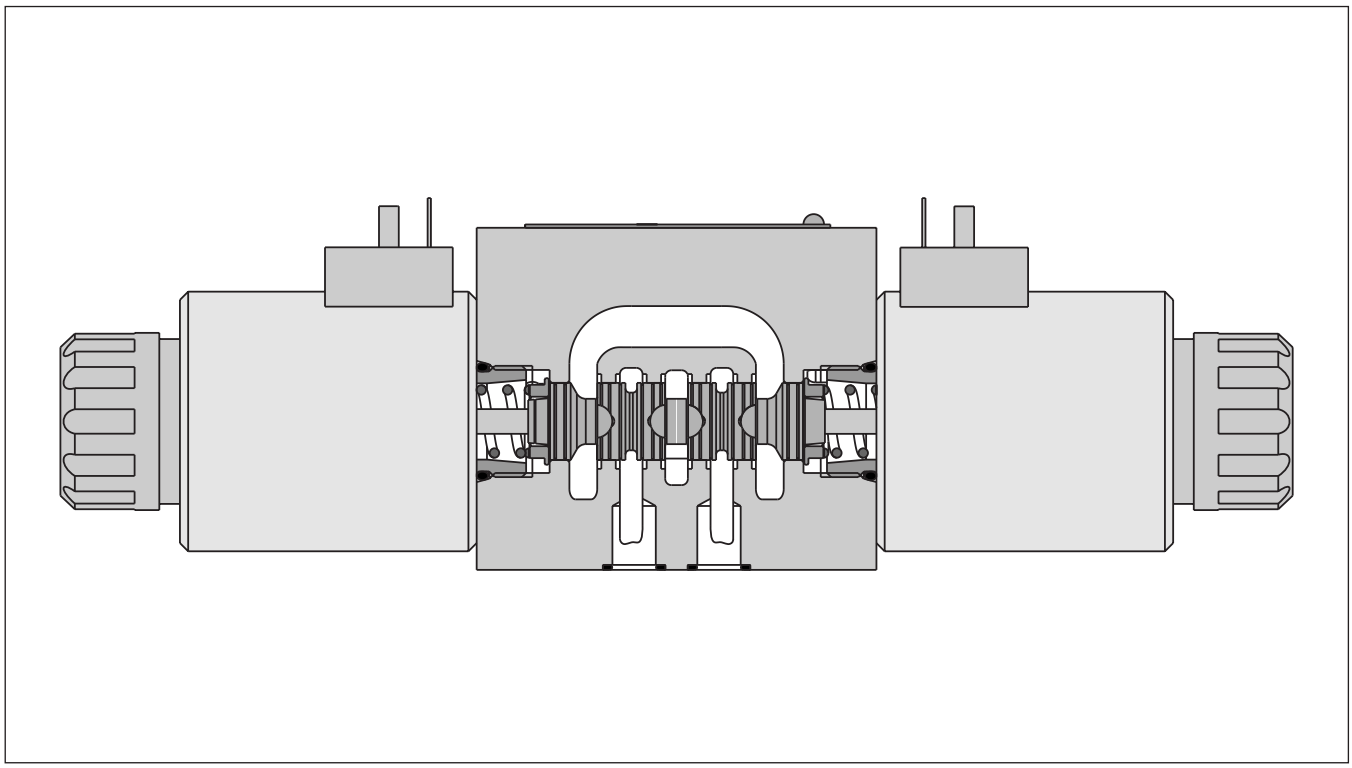
In combination with the digital power amplifier PWD00A-400, the valve parameters can be saved, changed and duplicated.



Technical features

- Spool in body design
- High flow rates
- Low hysteresis
- Manual override
- Fail-safe centre position

4DP02



4DP	02	–	3	E			–		C		G12	
Prop. directional valve	Size DIN NG10 CETOP 05 NFPA D05		Body	Control	Spool type	Flow		Spool position	Design series	Seals	Solenoid 12V/2.95A	Connector as per EN 175301-803

3

Spool position 03	
Code	Spool type
02	a 0 b 
43	

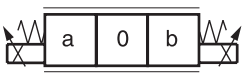
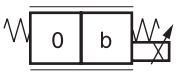
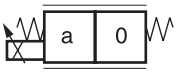
Spool position 05	
Code	Spool type
12	0 b 
13	

Spool position 06	
Code	Spool type
12	a 0 
13	

Code	Flow
F40	40 l/min
F60	60 l/min
F80	80 l/min

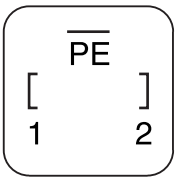
Code	Connector
omit	not supplied
C1	PG11

Code	Seals
1	NBR
5	FPM

Code	Spool position	
03		3 positions spring offset in pos. "0".
05		2 positions spring offset in pos. "0", energized to "a".
06		2 positions spring offset in pos. "0", energized to "b".

Plug

Solenoid coil



1 = coil connection
2 = coil connection
PE = ground potential

General		
Design		Direct operated proportional DC valve
Actuation		Proportional solenoid
Size		NG10 / CETOP 05 / NFPA D05
Mounting interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA
Mounting position		unrestricted
Ambient temperature	[°C]	-20...+60
Weight	[kg]	7.6
Vibration resistance	[g]	25 acc. DIN IEC68, part 2-6
Hydraulic		
Max. operating pressure	[bar]	Ports P, A, B 350, T 210
Fluid		Hydraulic oil as per DIN 51524...535, other on request
Fluid temperature	[°C]	-20...+60
Viscosity permitted	[mm²/s]	20...380
recommended	[mm²/s]	30...80
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)
Flow nominal at Δp=5bar per control edge *	[l/min]	40, 60 and 80
Leakage at 100 bar	[ml/min]	<100
Static / Dynamic		
Hysteresis	[%]	<5
Electrical characteristics		
Duty ratio	[%]	100 ED; CAUTION: Coil temperature up to 155°C possible
Protection class		IP 65 in accordance with EN 60529 (plugged and mounted)
Solenoid	Code	K
Supply voltage	[V]	12
Current consumption	[A]	2.95
Power consumption	[W]	35.4
Resistance	[Ohm]	3.84
Solenoid connection		Connector as per EN 175301-803
Wiring min.	[mm²]	3 x 1.5 recommended
Wiring lenght max.	[m]	50 recommended

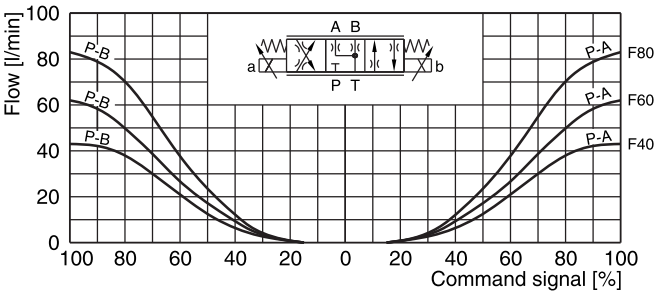
* Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

3

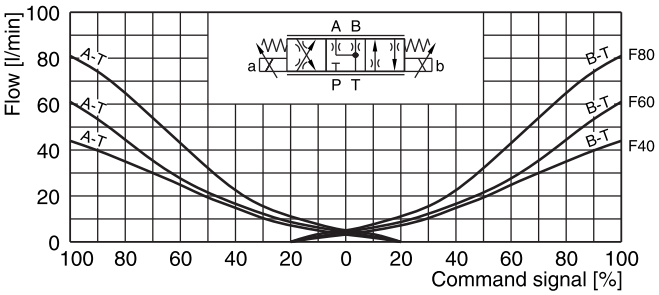
Flow characteristics

at Δp = 5 bar per metering edge
Fluid viscosity 40cSt at 50°C

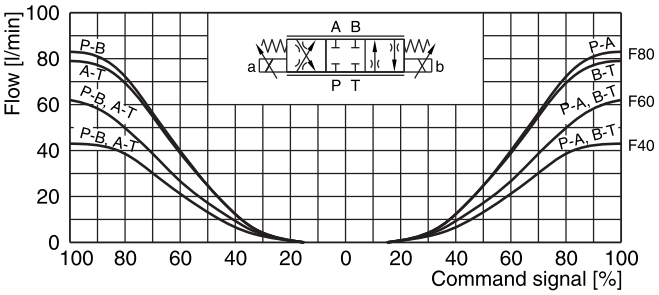
Spool 02 / P-A; P-B



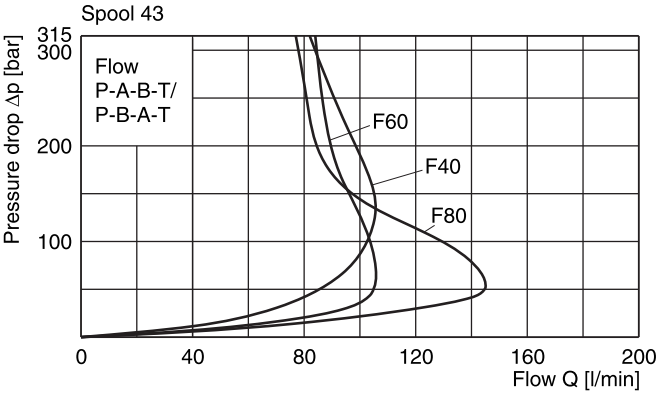
Spool 02 / A-T; B-T

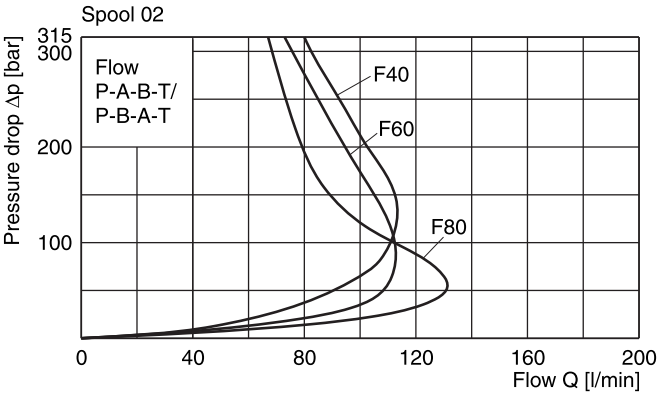


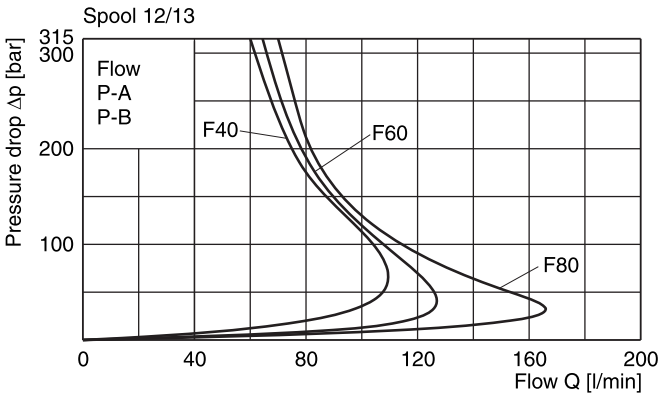
Spool 43



Flow limit







4DP02_UK.INDD CM

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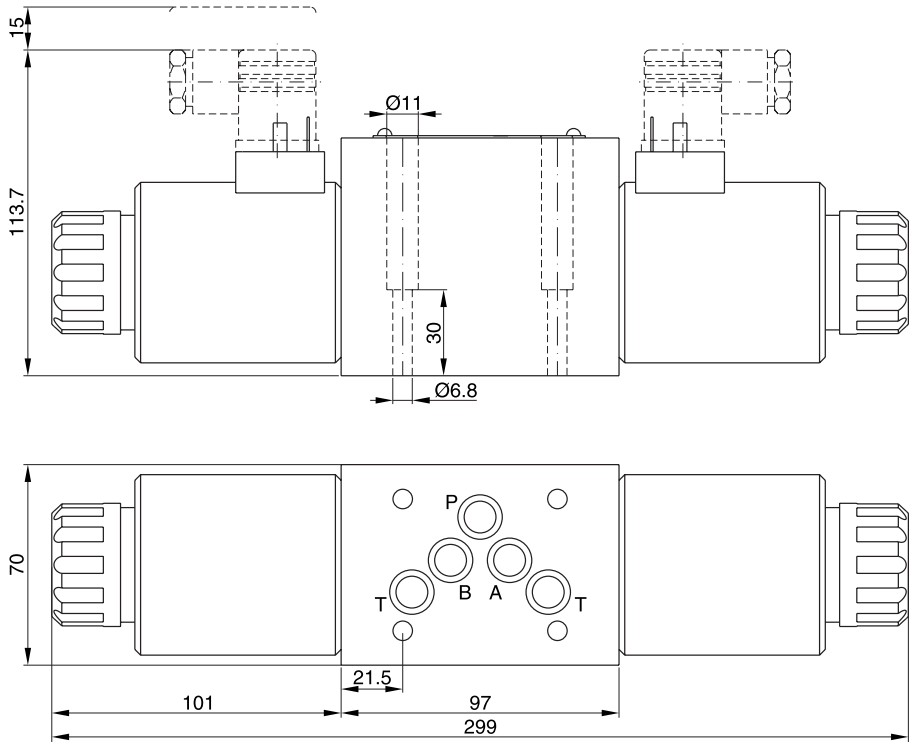
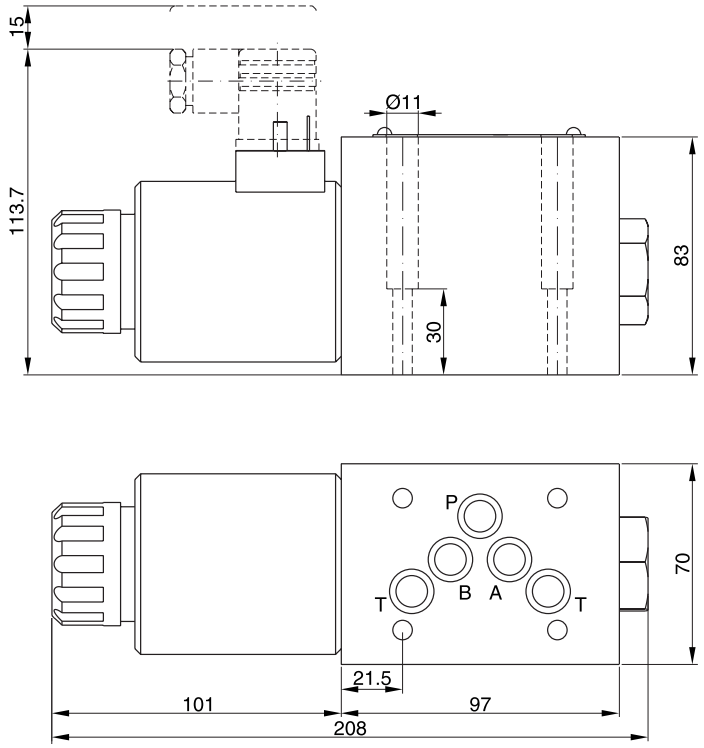
4DP02*03



4DP02*05



Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK385	4x M6x40 DIN 912 12.9	11 Nm ±15%	SK-D3FB-N

4DP02_UK.INDD CM

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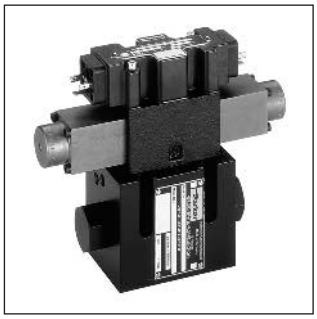
Kaarst, Germany

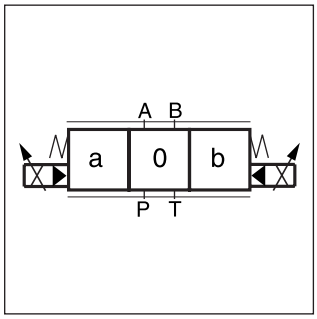
Notes

The D*1FW pilot operated proportional DC valve is available in sizes NG10 (CETOP05), NG16 (CETOP07) and NG25 (CETOP08).

Typical applications include reproducible control of actuator speed in rapid / slow speed profiling and smooth acceleration and deceleration performance.

In combination with the digital power amplifier PWD00A-400, the valve parameters can be saved, changed and duplicated.

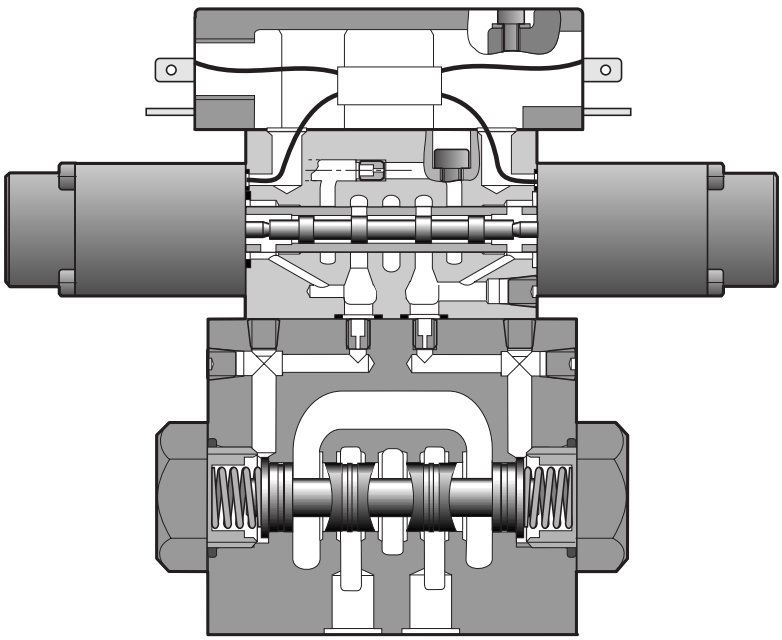




Technical features

- Progressive flow characteristics for sensitive adjustment of flow rate
- Fail-safe centre position
- Centre position monitoring optional
- D31FW - NG10 (CETOP05)
- D41FW - NG16 (CETOP07)
- D91FW - NG25 (CETOP08)

D31FW

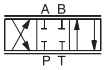
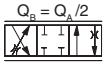
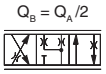


D		1	F	W			C		N		W		
Directional control valve	Size	NG06 pilot	Proportional control	Dynamics standard	Spool type	Flow	Spool position	Pilot connection	Seal NBR (other seal compound on request)	Solenoid description (other voltage on request)	Connector as per EN 175301-803 without plug*	Valve accessories	Design series

3

Code	Nominal size
3	**NG10 / CETOP05**
4	**NG16 / CETOP07**
9 [1]	**NG25 / CETOP08**

[1] with enlarged connections Ø 32 mm

Code	Spool type
E01	
E02	
B31	
B32	

Code	Flow [l/min] at Δp = 5bar per metering edge		
	D31	D41	D91
C	**75**	-	-
D [2]	**90**	-	-
E [2]	**120**	-	-
F	-	**200**	-
H	-	-	**400**

[2] leigh flow version

Code	Valve accessories
0	**Standard**
8	**Monitor switch**

Code	Solenoid description
L	**6 V/2.5A**
K [3]	**12 V/2.2A**

[3] Flow code D/E (leigh flow)

Code	Inlet	Drain
1	**Internal**	**External**
2	**External**	**External**
4	**Internal**	**Internal**
5	**External**	**Internal**

Bold letters =
Short-term availability

* Please order plugs separately.
See chapter 3 accessories.

General					
Design		Pilot operated DC Valve			
Actuation		Proportional solenoid			
Size		**NG10 (CETOP05)** Standard version	**NG10 (CETOP05)** High flow version	**NG16 (CETOP07)**	**NG25 (CETOP08)**
Mounting interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA			
Mounting position		unrestriced			
Ambient temperature	[°C]	-20...+60			
Weight	[kg]	7.1	8.1	10.8	19
Hydraulic					
Max. operating pressure	[bar]	Ports P, A, B, T, X 350; Port Y 10			
Fluid		Hydraulic oil as per DIN 51524...535, other on request			
Fluid temperature	[°C]	-20...+60			
Viscosity					
permitted	[cSt] / [mm²/s]	20...380			
recommended	[cSt] / [mm²/s]	30...80			
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			
Nominal flow at ΔP=5 bar per control edge *	[l/min]	75	90 (code D) 120 (code E)	200	400
Leakage at 100 bar	[ml/min]	100	130	200	600
Pilot supply pressure	[bar]	20-350 (optimal dynamics at 50)			
Pilot flow at 100bar	[l/min]	<1.2	<0.5	<1.2	<1.2
Pilot flow, step response	[l/min]	0.8	3.5	1.7	3.8
Static / Dynamic					
Step response at 100% step	[ms]	60	50	75	100
Hysteresis	[%]	<5			
Electrical characteristics					
Duty ratio	[%]	100			
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)			
Solenoid	Code	L	K	L	L
Supply voltage	[V]	6	12	6	6
Current consumption	[A]	2.5	2.2	2.5	2.5
Resistance	[Ohm]	2.2	3.7	2.2	2.2
Coil insulation class		F (155 °C)			
Electrical connection		Connector as per EN 175301-803			
Wiring min.	[mm²]	3x1.5 (AWG 16) overall braid shield			
Wiring lenght max.	[m]	50			
Electrical monitor switch					
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)			
Ambient temperature	[°C]	0-70			
Supply voltage/ripple	[V]	18...42, ripple <10% eff.			
Current consumption without load	[mA]	<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			
EMV		EN 50081-1 / EN50082-2			
Max. tol. ambient field strength	[A/m]	1200			
Min. distance to next AC solenoid	[m]	0.1			
Interface		4+PE acc. IEC 61076-2-101 (M12)			
Wiring min.	[mm²]	5x0.5 (AWG 20) overall braid shield			
Wiring lenght max.	[m]	50			

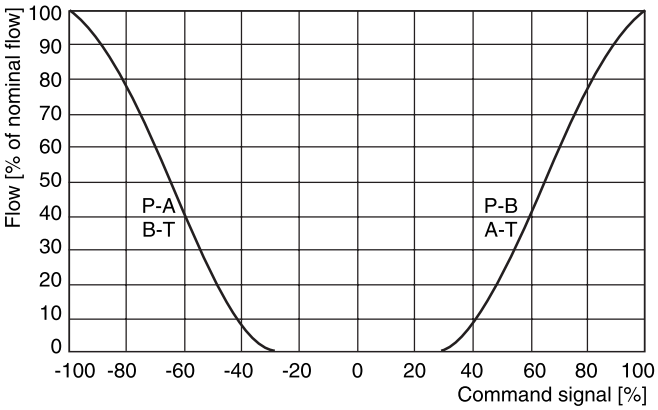
* Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

3

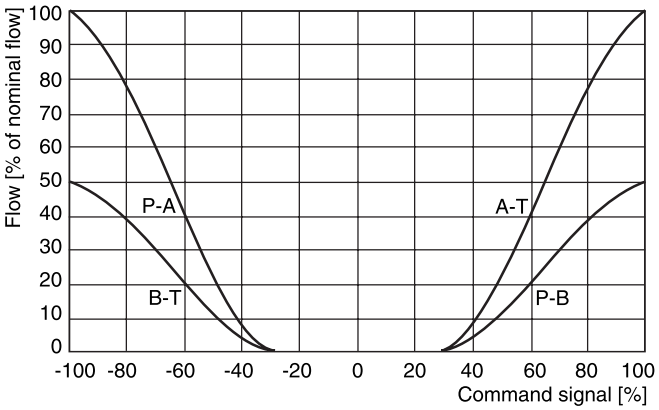
Flow characteristics
at Δp = 5 bar per metering edge

D*1FW

Spool code **E***

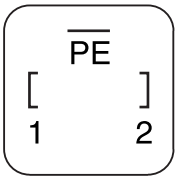


Spool code **B***



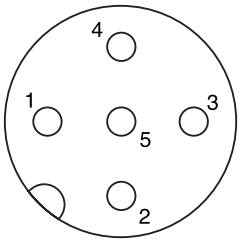
Plug

Solenoid coil

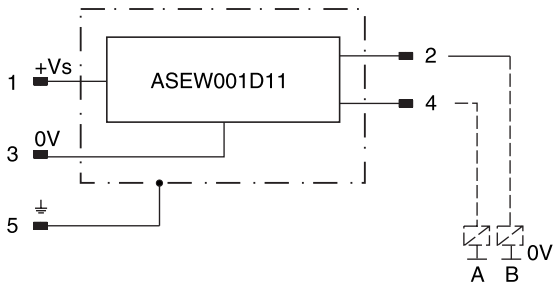


1 = coil connection
2 = coil connection
PE = ground potential

Monitor switch M12x1 pin assignment



1 + Supply 18...42V
2 output B (normally closed)
3 0V
4 output A (normally closed)
5 Earth ground

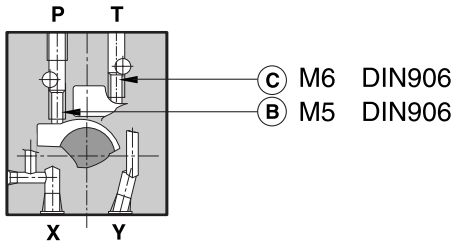


Signal	Output A (pin 4)	Output B (pin 2)
neutral	closed	closed
	open	closed
	closed	open

The neutral position is monitored. The signal changes after less than 10% of the spool stroke.

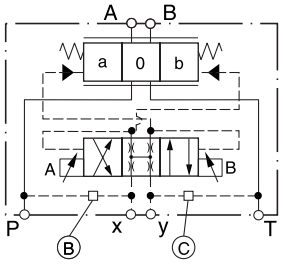
Pilot oil inlet (supply) and outlet (drain)

D31FW (standard version)

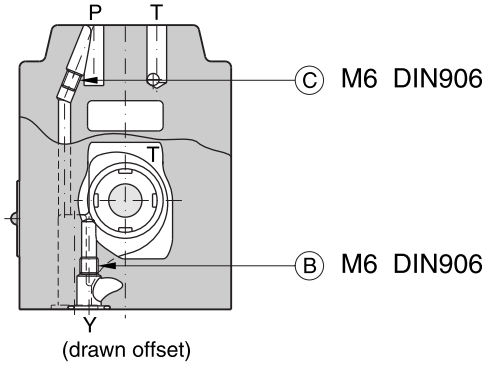


○ open, ● closed

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

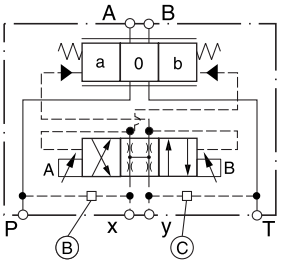


D31FW (high flow version)

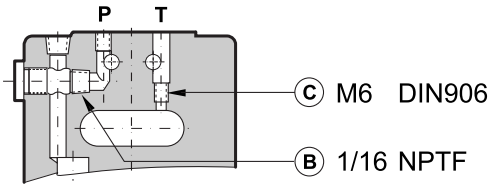


○ open, ● closed

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

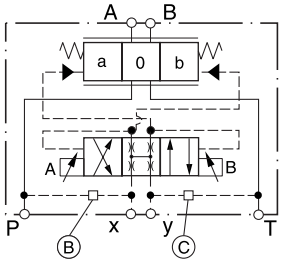


D41FW

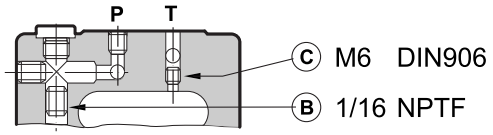


○ open, ● closed

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

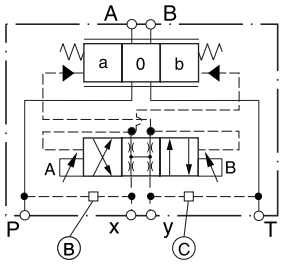


D91FW



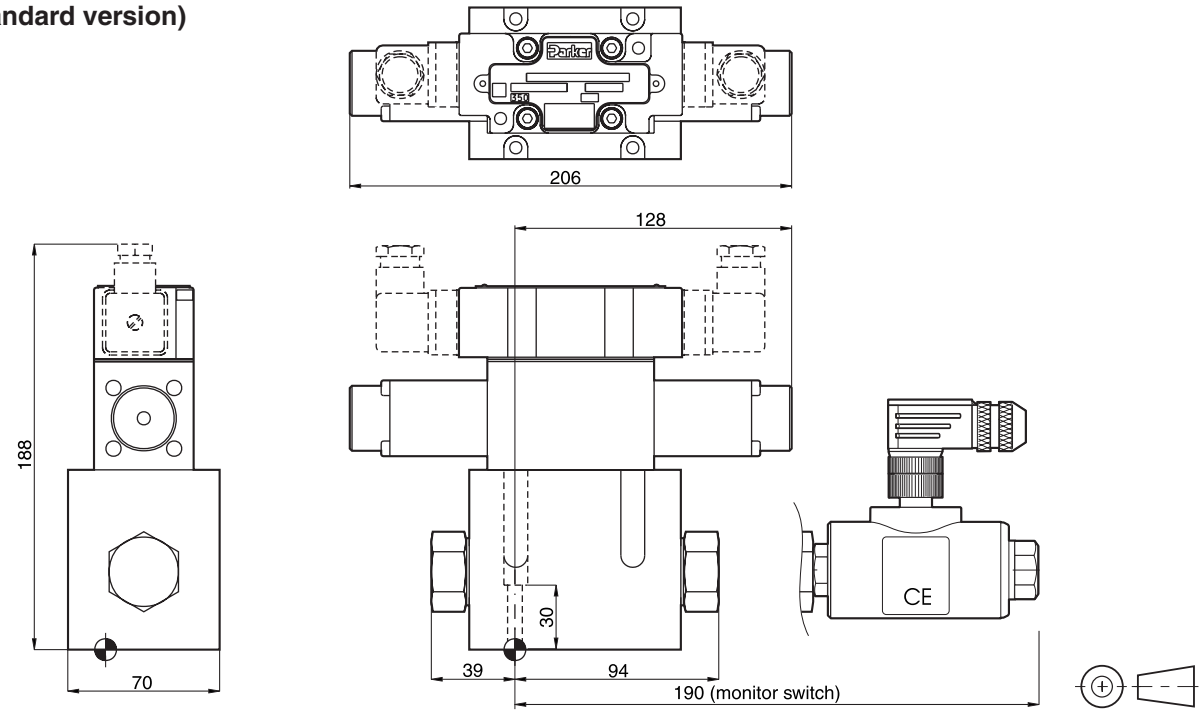
○ open, ● closed

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



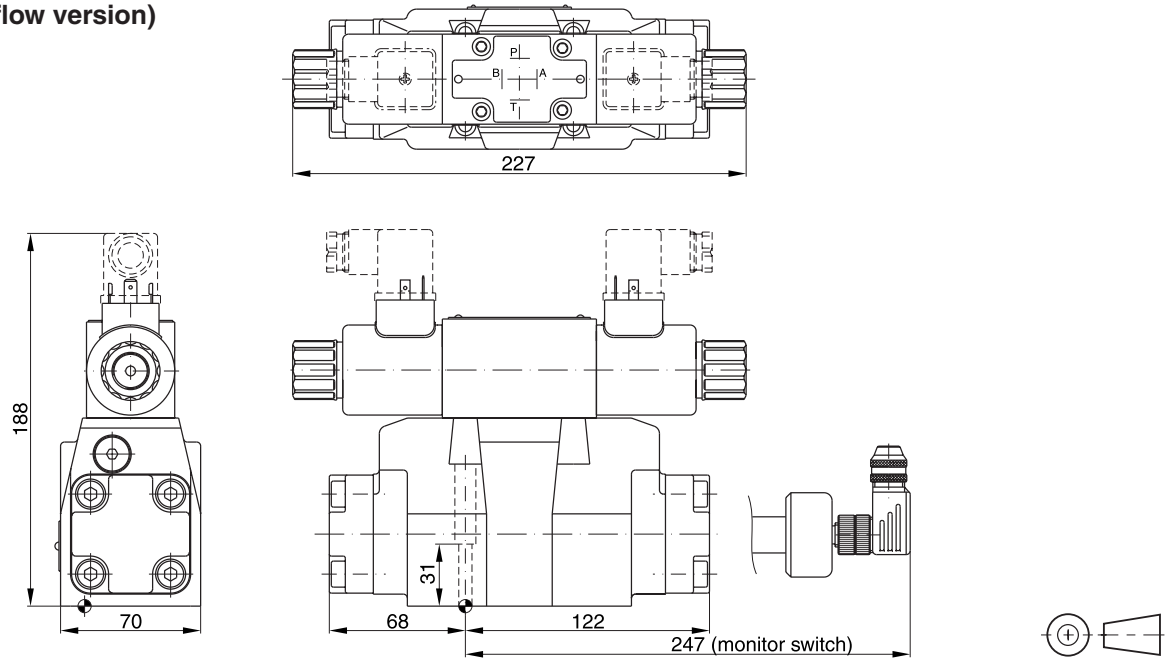
3

D31FW (standard version)



Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK385	4x M6x40 DIN 912 12.9	13.2 Nm ±15%	SK-D31FW-N20

D31FW (high flow version)

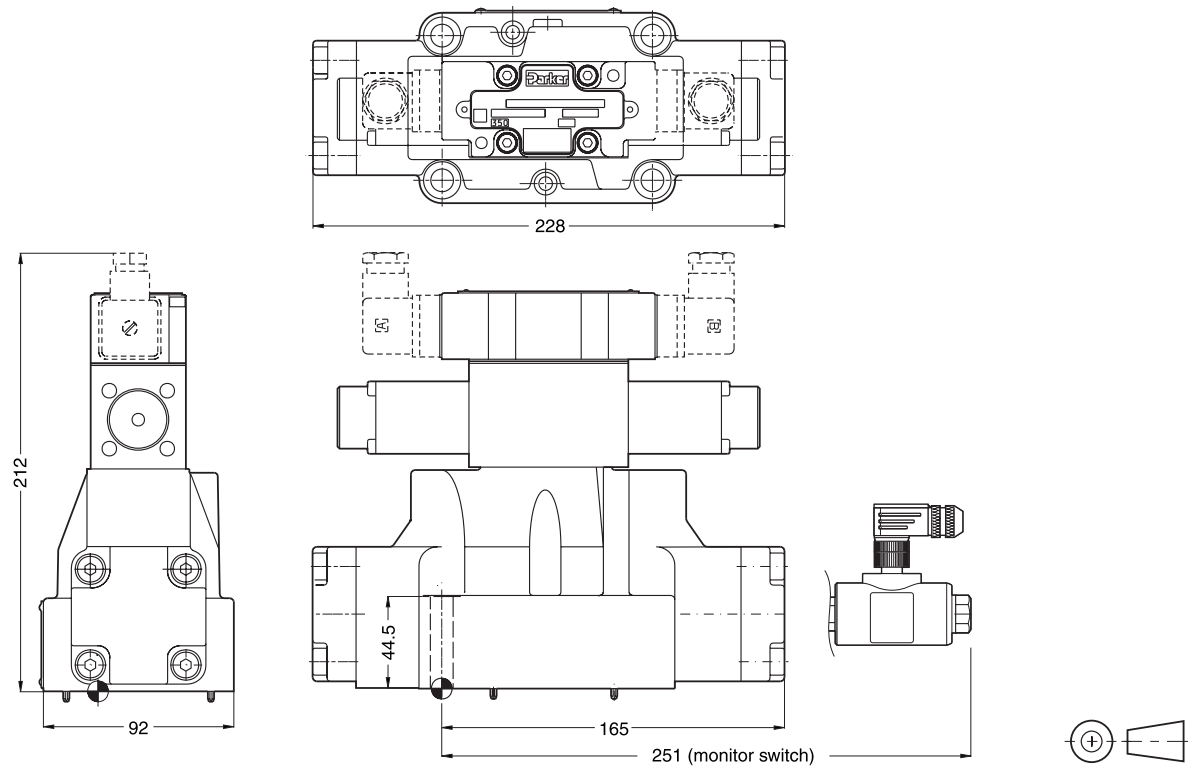


Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK385	4x M6x40 DIN 912 12.9	13.2 Nm ±15%	on request

DFW_UK.INDD CM

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

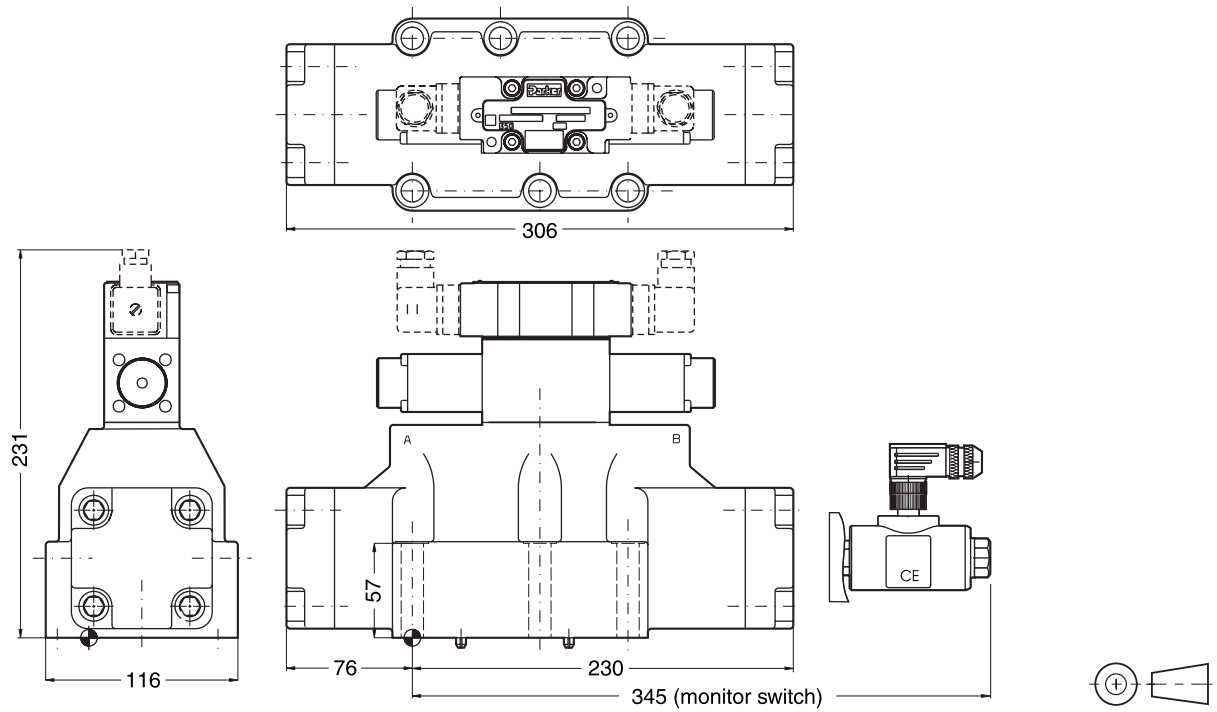
D41FW



Surface finish	Kit			Kit NBR
R_{max}6.3 0.01/100	BK320	2x M6x55 4x M10x60 DIN 912 12.9	13.2 Nm ±15% 63 Nm ±15%	SK-D41FW-N20

3

D91FW



Surface finish	Kit			Kit NBR
R_{max}6.3 0.01/100	BK360	6x M12x95 DIN 912 12.9	108 Nm ±15%	SK-D91FW-N20

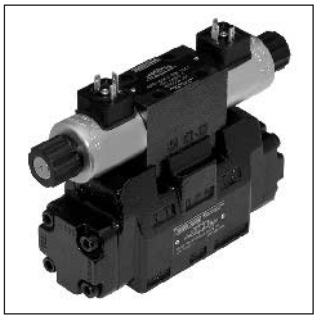
The pilot operated proportional DC valves 4DP02V (NG10), 4DP03 (NG16) and 4DP06 (NG25) are offered under Denison brand name.

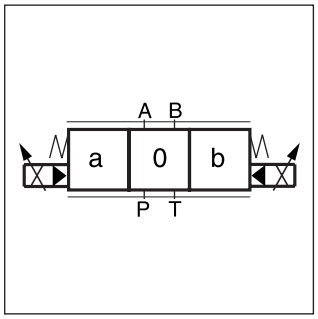
Typical applications include reproducible control of actuator speed in rapid / slow speed profiling, and smooth acceleration and deceleration performance.

In combination with the digital power amplifier PWD00A-400, the valve parameters can be saved, changed and duplicated.

Technical features

- Progressive flow characteristics for sensitive adjustment of flow rate
- Fail-safe centre position
- Centre position monitoring optional



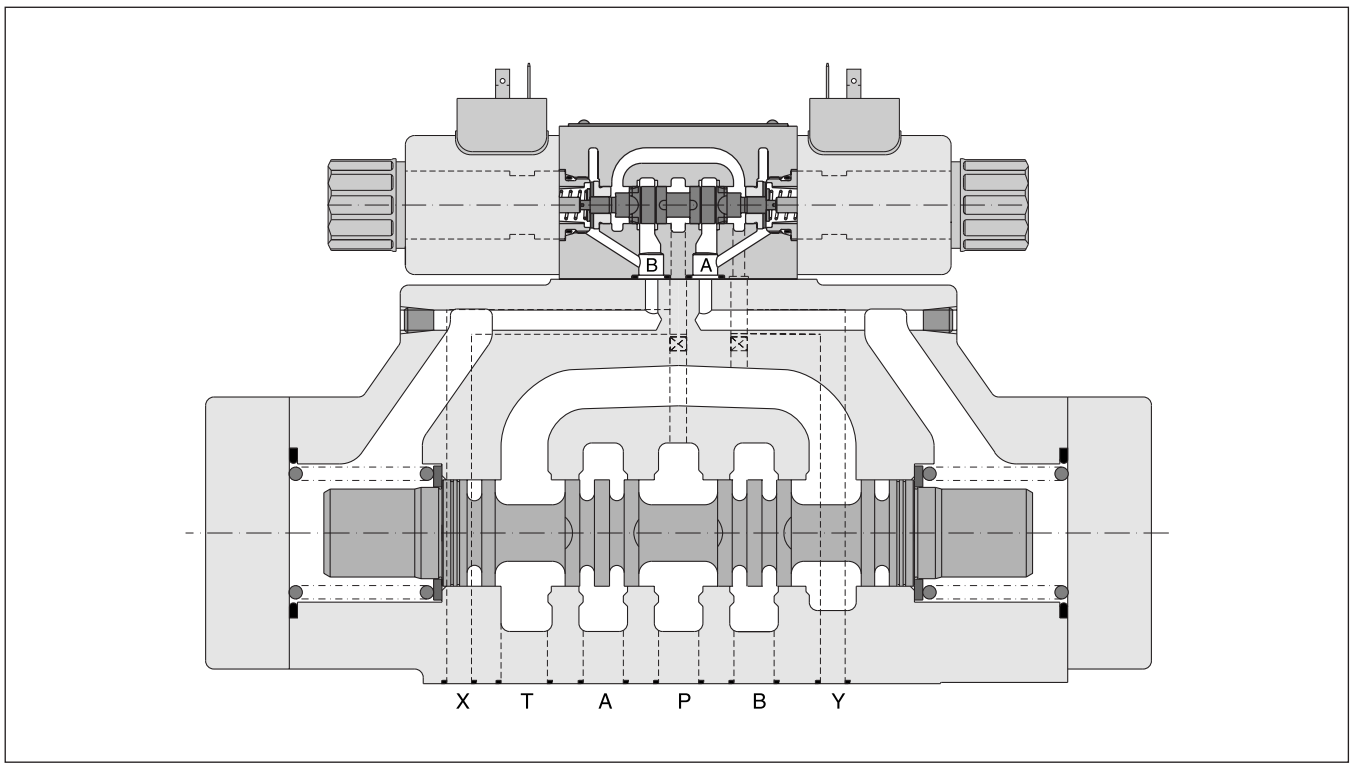


4DP02V

4DP03

4DP06

4DP06

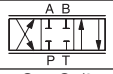
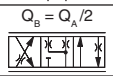
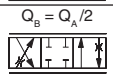


3

4DP	□	□	E	□	□	□	□	□
Directional prop. control valve	Size	Body	Control solenoid operated	Spool type	Flow	Spool position	Design series	Seals

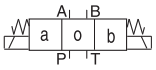
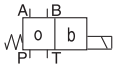
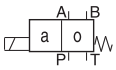
Code	Size
02	NG10
03	NG16
06	NG25

Code	Body
V	for 4DP02V
3	for 4DP03/06

Code	Spool type
02	
43	
B2	
B3	

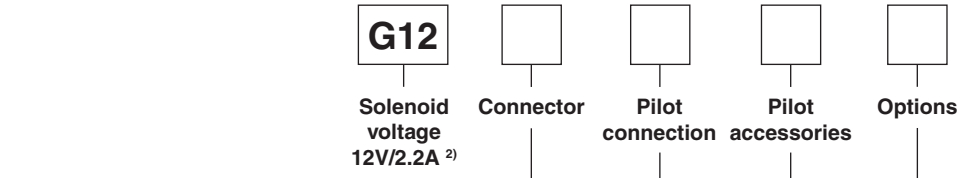
Code	Flow
4DP02V	
F90[1)]	90 l/min
F120	120 l/min
4DP03	
F100[1)]	100 l/min
F130[1)]	130 l/min
F200	200 l/min
4DP06	
F200[1)]	200 l/min
F250[1)]	250 l/min
F400	400 l/min

[1)] Not available for spools B2 and B3

3 position spools		
Code	Spool position	
03		3 positions. Spring offset in position “0“.
05		2 positions. Spring offset in position “0“. Energized to “b“.
06		2 positions. Spring offset in position “0“. Energized to “a“.

Code	Seals
1	NBR
5	FPM

Code	Design series
A	4DP02V
B	4DP03
B	4DP06



Code	Options
omit	standard
N0	Without manual override

Code	Connector
omit	Not supplied
C1	PG11

Code	Pilot accessories
omit	standard

Code	Pilot connection
omit	X, Y external
X	internal X, external Y
Y	external X, internal Y
XY	internal X, internal Y

2) Onboard electronics on request

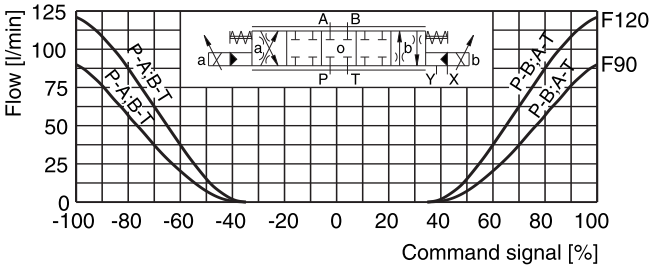
3

General				
Design		Pilot operated DC Valve		
Actuation		Proportional solenoid		
Size		**4DP02V NG10 (CETOP 05)**	**4DP03 NG16 (CETOP 07)**	**4DP06 NG25 (CETOP 08)**
Mounting interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA		
Mounting position		unrestricted, preferably horizontal		
Ambient temperature	[°C]	-20...+50		
Weight	[kg]	7.6 (1 sol.) 8.1 (2 sol.)	10.5 (1 sol.) 10.9 (2 sol.)	18.7 (1 sol.) 19.1 (2 sol.)
Hydraulic				
Max. operating pressure	[bar]	Ports P, A, B, X max. 350 bar, T max. 15 bar (350 at external drain) Y max. 15 bar		
Fluid		Hydraulic oil as per DIN 51524...535, other on request		
Fluid temperature	[°C]	-20...+80		
Viscosity				
permitted	[cSt] / [mm²/s]	10...650		
recommended	[cSt] / [mm²/s]	30		
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)		
Flow nominal at ΔP=5 bar per control edge *	[l/min]	90/120	200	400
Leakage at 100 bar	[ml/min]	100	200	600
Pilot supply pressure	[bar]	20-350 (optimal dynamics at 50)		
Pilot flow at 100bar	[l/min]	<1.2		
Pilot flow, step response	[l/min]	0.8	1.7	3.8
Static / Dynamic				
Step response at 100% step	[ms]	60	75	100
Hysteresis	[%]	<5		
Electrical characteristics				
Duty ratio	[%]	100		
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)		
Solenoid		Code G12		
Supply voltage	[V]	12		
Current max.	[A]	2.2		
Resistance	[Ohm]	3.7		
Coil insulation class		F (155 °C)		
Solenoid connection		Connector as per EN 175301-803		
Wiring min.	[mm²]	3x1.5 (AWG 16) overall braid shield		
Wiring lenght max.	[m]	50		

* Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

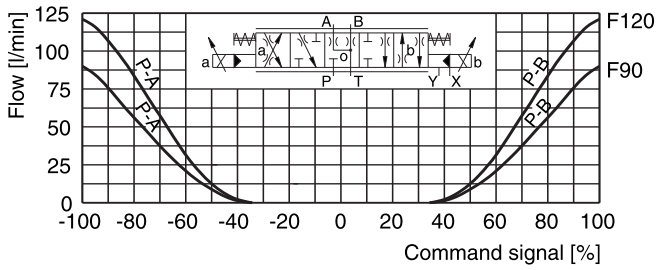
Flow characteristics
at Δp = 5 bar per metering edge
Fluid viscosity 40 cSt at 50°C

Spool 43

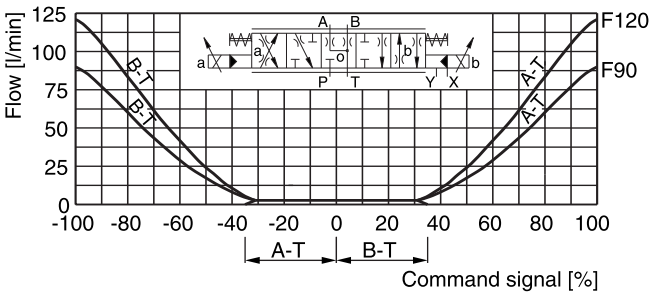


4DP02V
Spool code **02, 43**

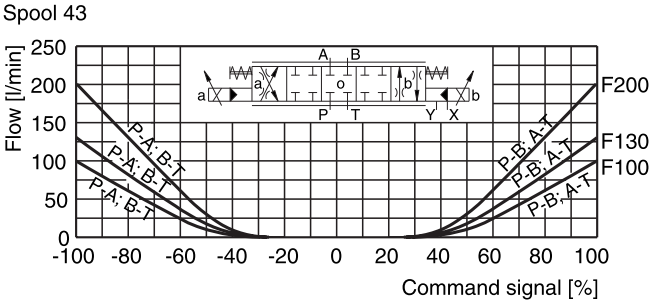
Spool 02 / P-A; P-B



Spool 02 / B-T; A-T

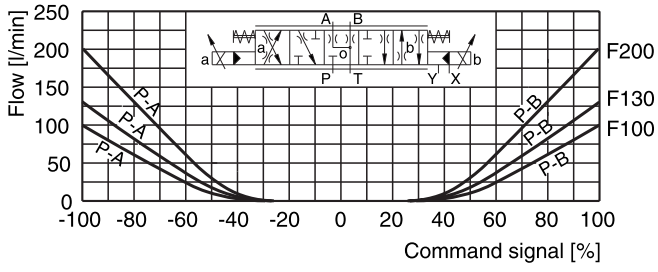


Spool 43

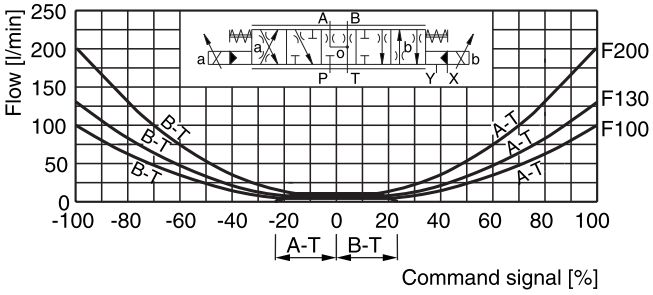


4DP03
Spool code **02, 43**

Spool 02 / P-A; P-B



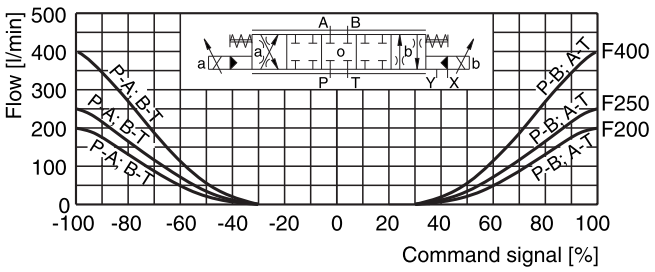
Spool 02 / B-T; A-T



3

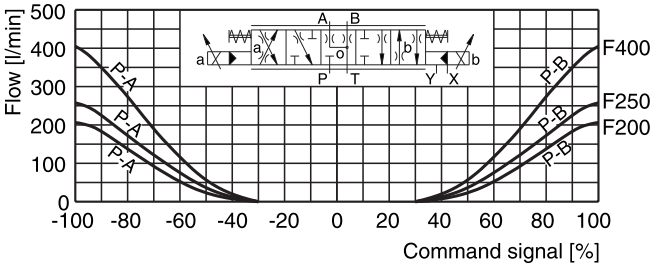
Flow characteristics
at Δp = 5 bar per metering edge

Spool 43

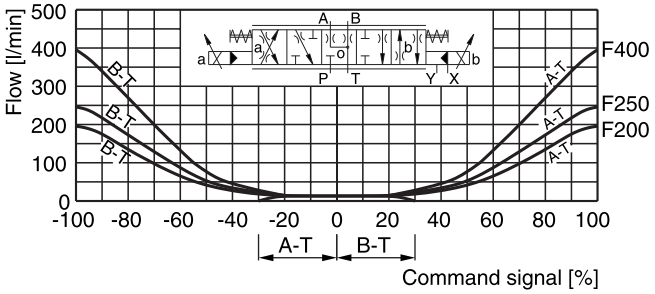


4DP06
Spool code **02, 43**

Spool 02 / P-A; P-B

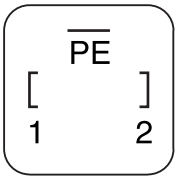


Spool 02 / B-T; A-T



Plug

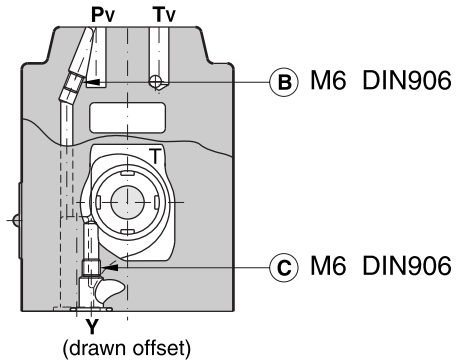
Solenoid coil



1 = coil connection
2 = coil connection
PE = ground potential

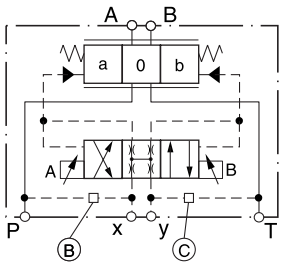
Pilot oil inlet (supply) and outlet (drain)

4DP02V

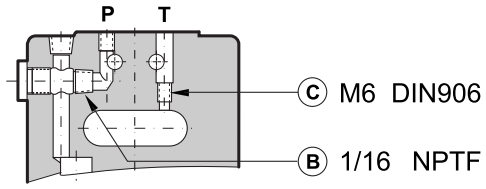


○ **open,** ● **closed**

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

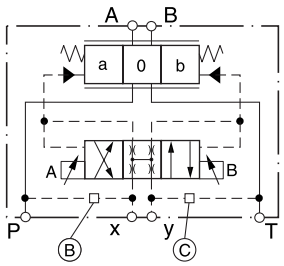


4DP03

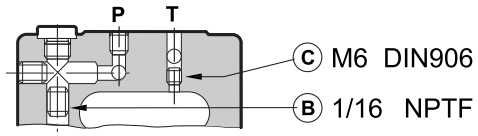


○ **open,** ● **closed**

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

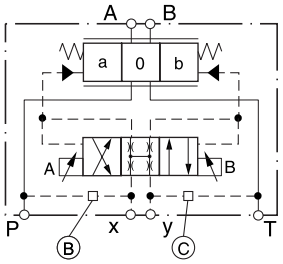


4DP06



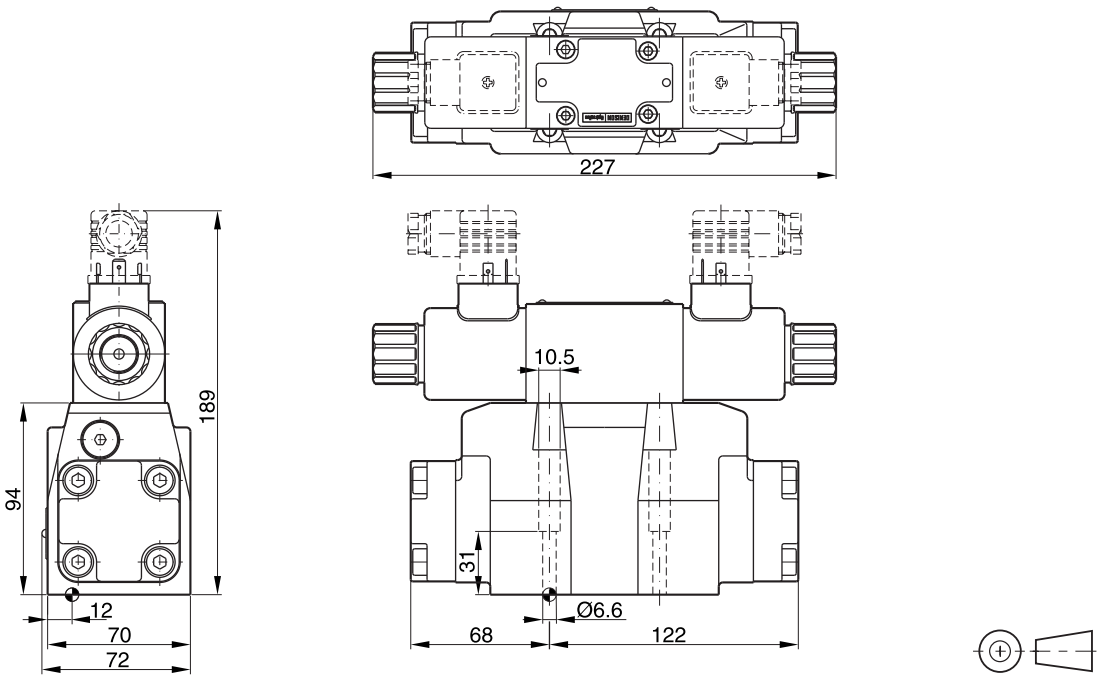
○ **open,** ● **closed**

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



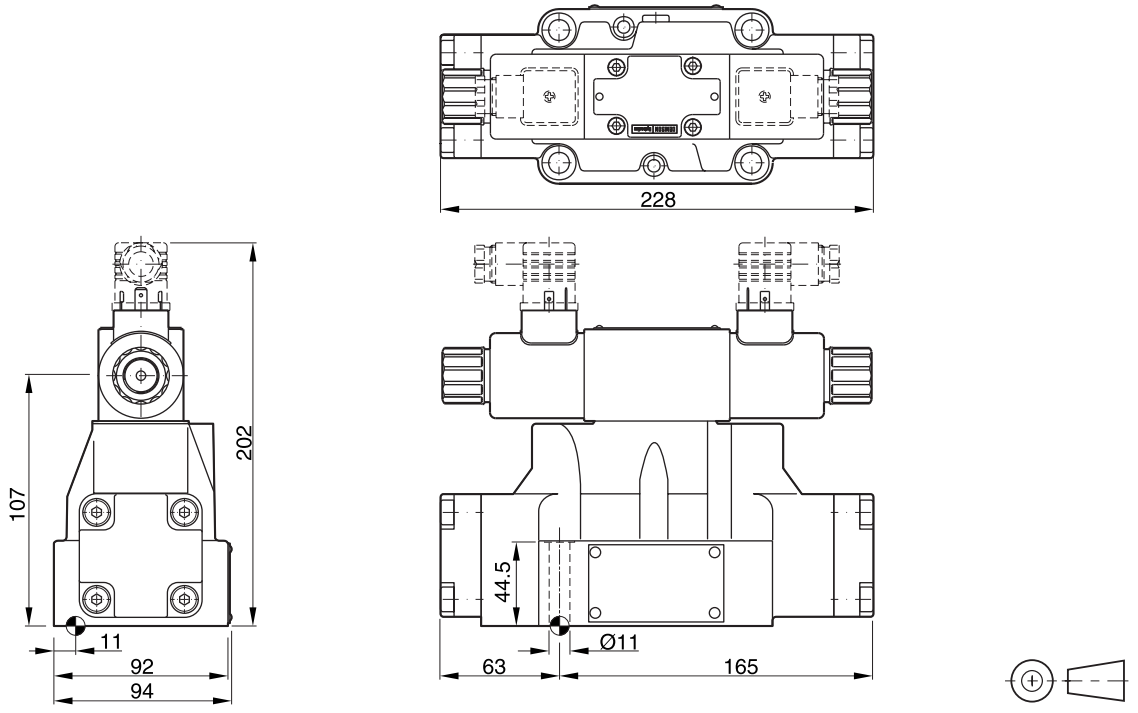
3

4DP02V



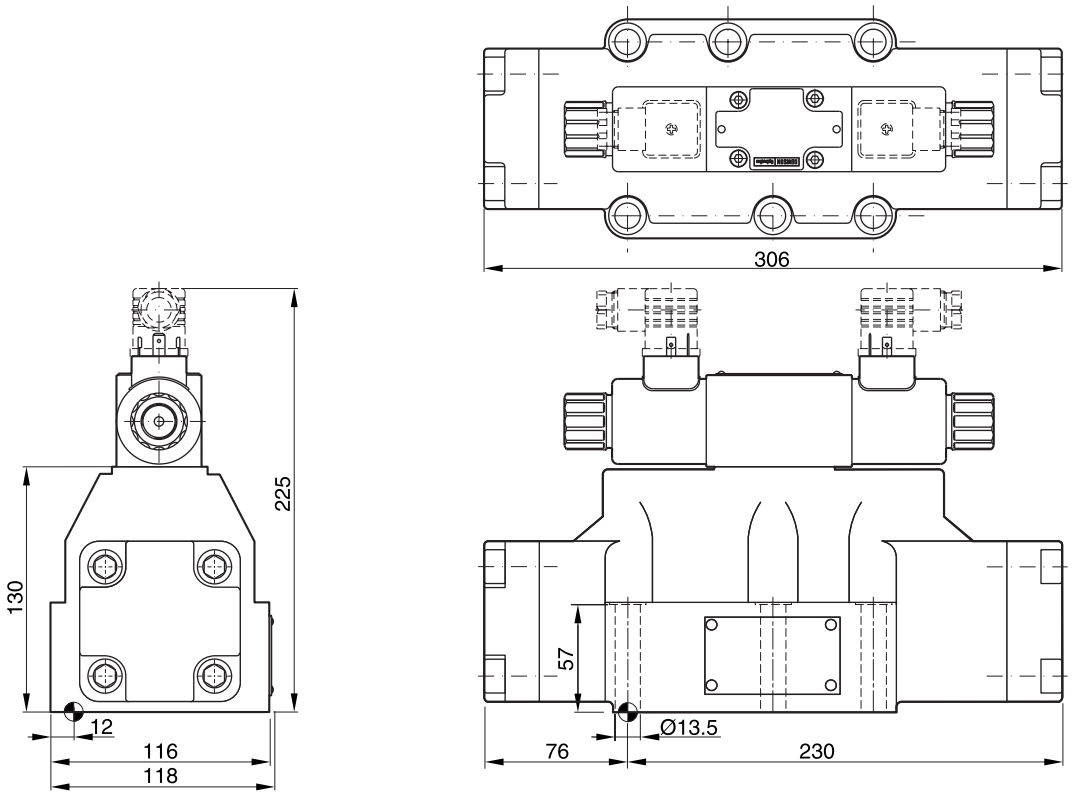
Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK385	4x M6x40 DIN 912 12.9	13.2 Nm ±15%	Seal kit on request.

4DP03



Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK320	2x M6x55 4x M10x60 DIN 912 12.9	13.2 Nm ±15% 63 Nm ±15%	Seal kit on request.

4DP06



Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK360	6x M12x95 DIN 912 12.9	108 Nm ±15%	Seal kit on request.

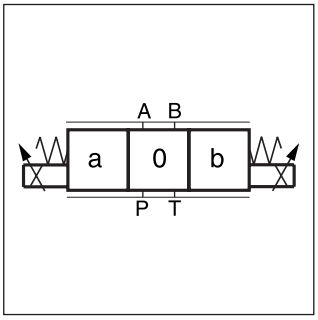
Notes

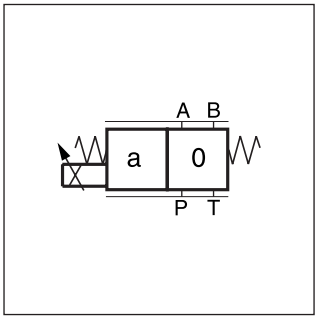
The D1FT directional control valve of the nominal size NG6 (CETOP 3) is a proportional valve providing variable flow rates.

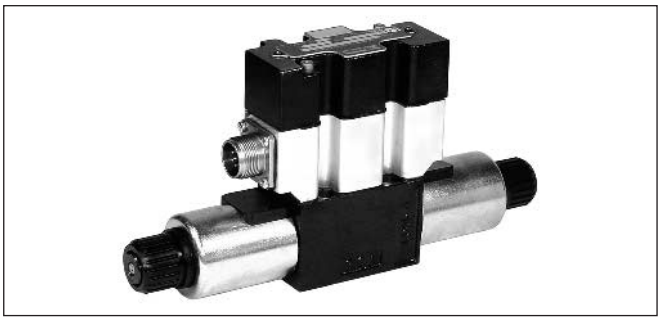
This valve is used with integrated control electronics. Typical applications are soft switching via adjustable ramps for the reduction of hydraulic and mechanical shocks, and electrically adjustable flow rates / speeds for automating machine functions.

Technical features

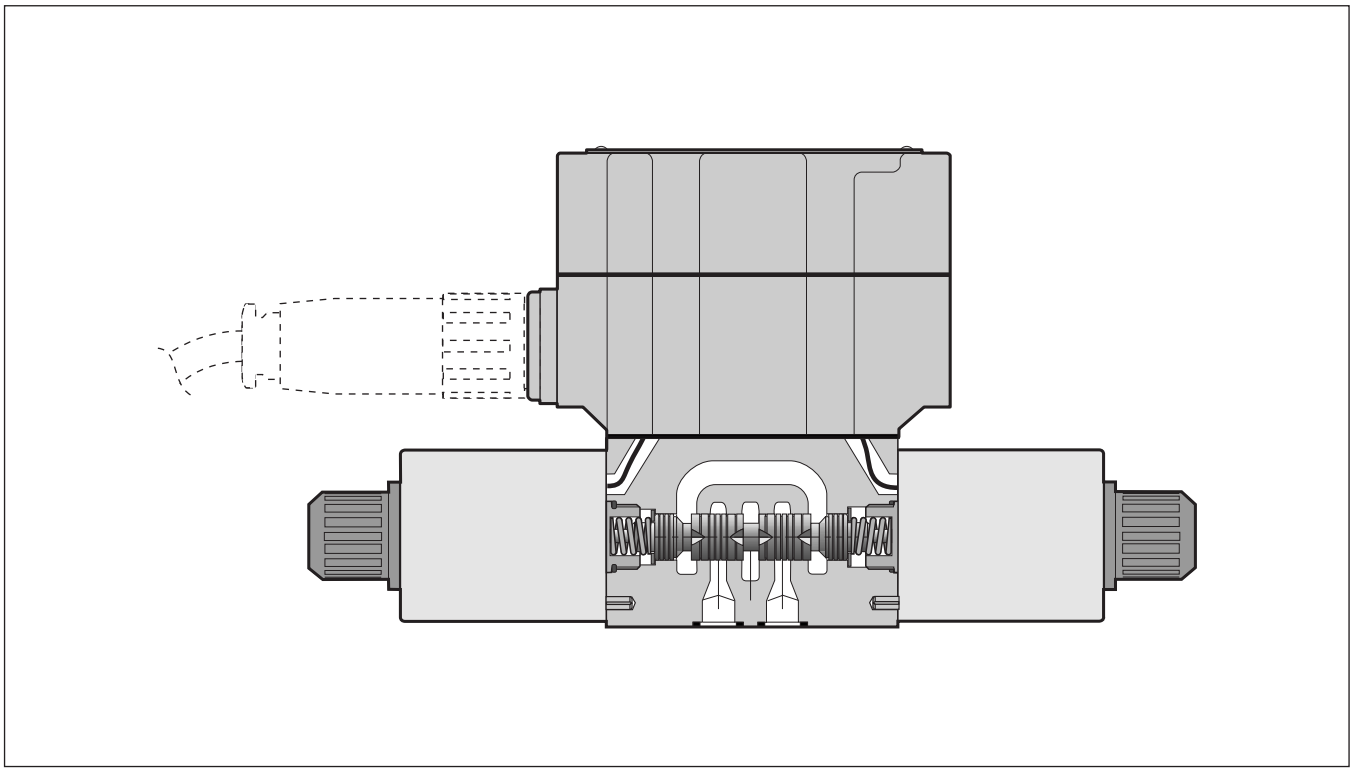
- Integrated control electronics with ramp adjustment
- Progressive flow characteristics for sensitive adjustment of flow rate
- Spring centred spool
- Manual override





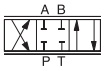
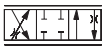


D1FT

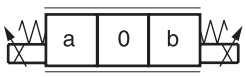
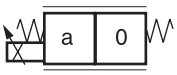
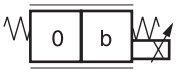


D	1	F	T			N		0	0	
Directional control valve	Size NG06/ CETOP03 NFPA D03	Proportional control	DC valve (with integr. electronics)	Spool type	Spool position	Seal NBR (other seal compound on request)	Electronic design	Electronic accessories	Valve accessories	Design series

3

Code	Spool type	Flow [l/min] at Δp 5bar per metering edge
E01C E01F E01H		7.5 15 20
E02C E02F E02H		7.5 15 20
B31F	$Q_B = Q_A/2$ 	15 / 7.5
B32F	$Q_B = Q_A/2$ 	15 / 7.5

Code	Voltage
F	Voltage input 0...±10V with reference output +10V / -10V
G	Current input 0...±20mA

Code	Spool position
C	
E	
K	

Please order plugs separately.
See chapter 3 accessories.

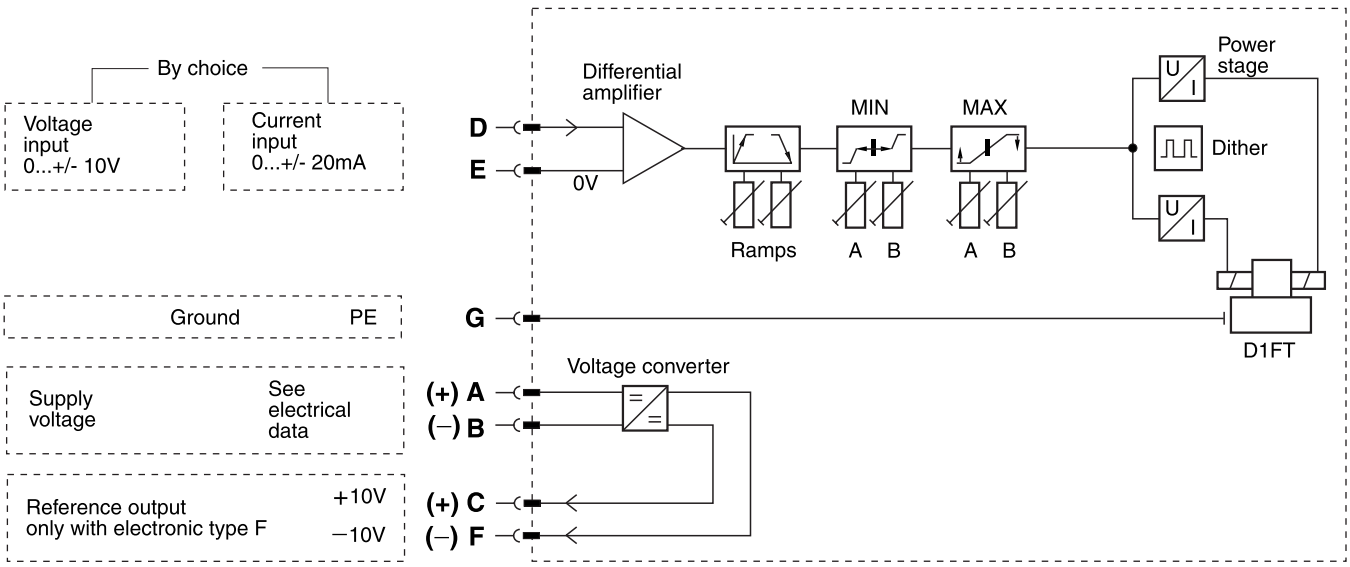
General		
Design		Direct operated DC Valve with onboard electronics
Actuation		Proportional solenoid
Size		NG06 / (CETOP03) / NFPA D03
Mounting interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA
Mounting position		unrestricted
Ambient temperature	[°C]	-20...+60
Weight	[kg]	1.9
Hydraulic		
Max. operating pressure	[bar]	Ports P, A, B 350; Port T 35
Fluid		Hydraulic oil as per DIN 51524...535, other on request
Fluid temperature	[°C]	0...60
Viscosity permitted	[cSt] / [mm²/s]	20...380
recommended	[cSt] / [mm²/s]	30...80
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)
Nominal flow at Δp=5bar per control edge [1]	[l/min]	7.5 / 15 / 20
Leakage at 100 bar	[ml/min]	<200
Static / Dynamic		
Step response at 100% step	[ms]	90
Hysteresis	[%]	< 8
Electrical characteristics		
Duty ratio	[%]	100
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)
Supply voltage/ripple	[V]	14.5 ... 30, ripple <5% eff. surge free, 0...+10V P->A
Current consumption max.	[A]	2.8
Input signal [2]		
Voltage	[V]	10...0...-10, ripple <0.01% eff., surge free, 0...+10V P->A
Impedance	[kOhm]	100
Current	[mA]	20...0...-20, ripple <0.01% eff., surge free, 0...+20mA P->A
Impedance	[Ohm]	500
Differential input max.	[V]	30 for terminal D and E against PE
Ramp	[s]	0...3
Pre-fusing	[A]	6.3 medium lag
EMC		EN 50081-1 / EN50082-2
Coil insulation class		F (155 °C)
Electrical connection		6+PE acc. EN 175201-804
Wiring min.	[mm²]	7x1.0 (AWG 18) overall braid shield
Wiring lenght max.	[m]	50

[1] Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

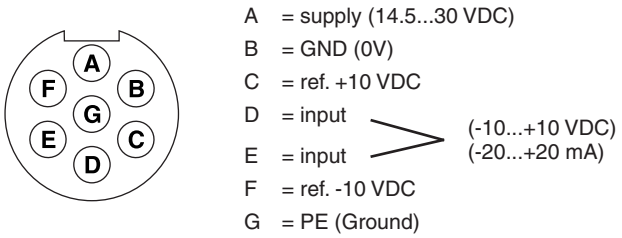
[2] Inverse polarity on request

3

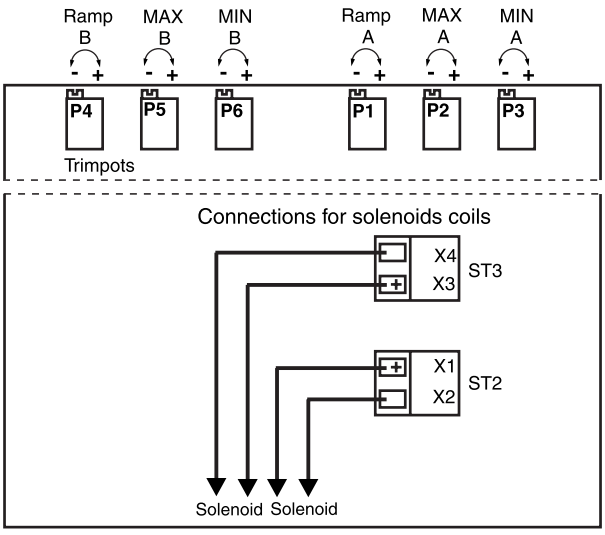
Block diagram



Central connector 6 + PE



Arrangement of the potentiometers



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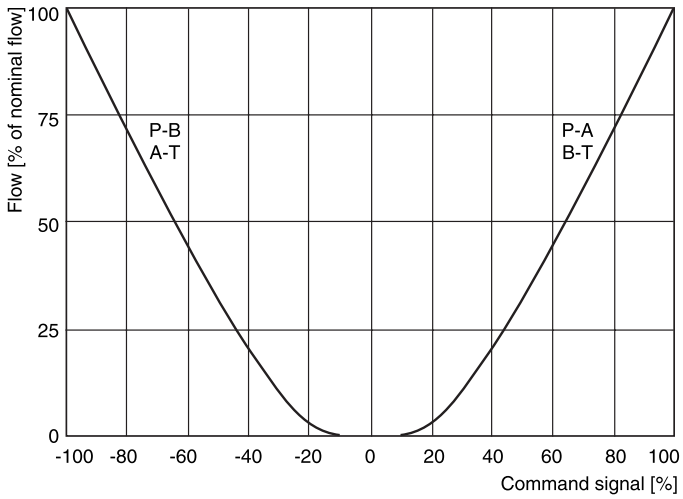
Kaarst, Germany

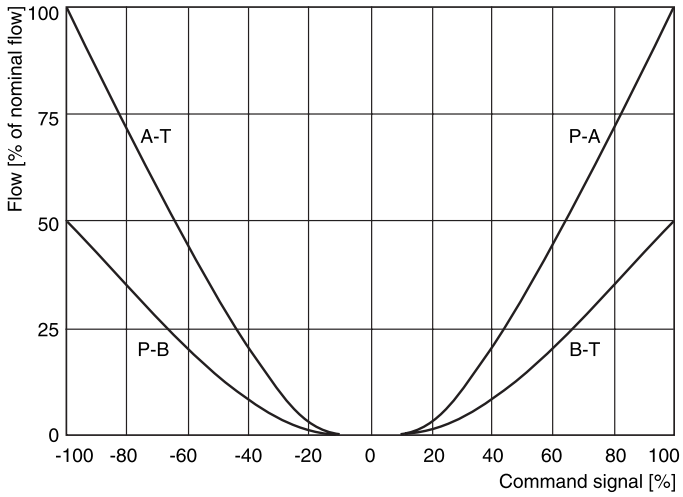
Flow characteristics

Spool code **E***

at Δp 5bar per metering edge

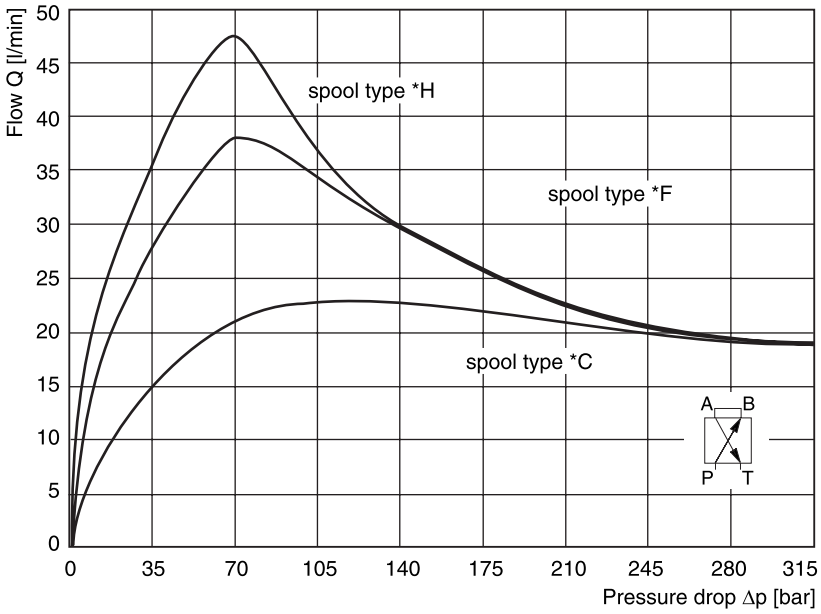


Spool code **B***

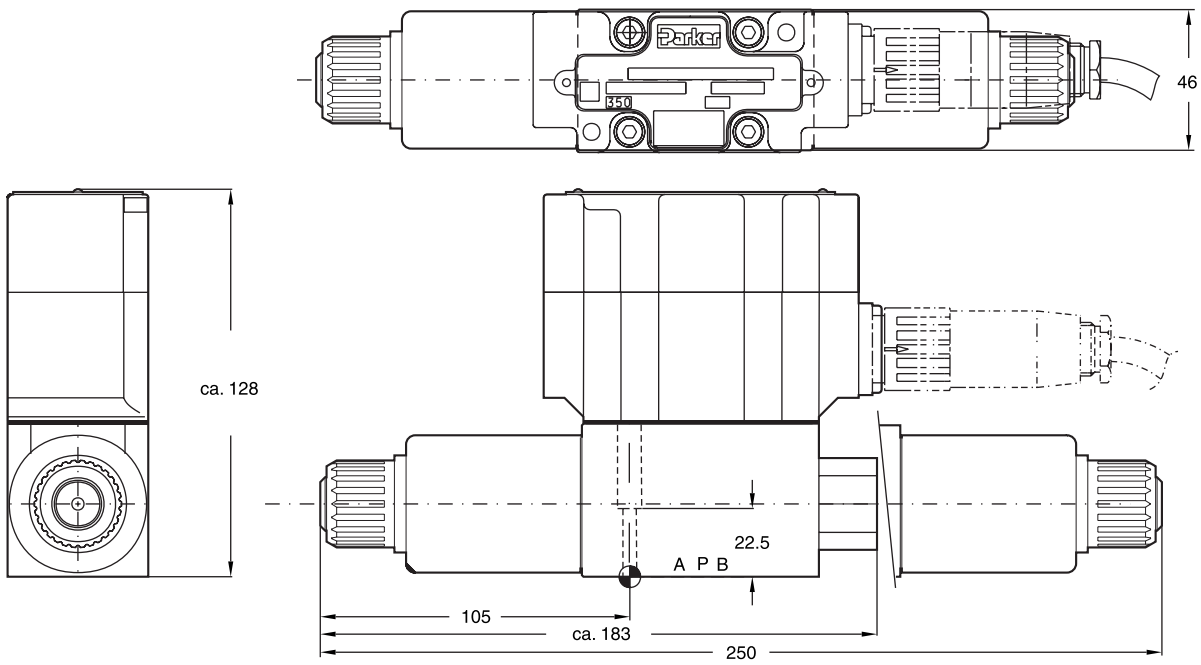


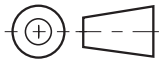
Flow limit

100% command signal



3





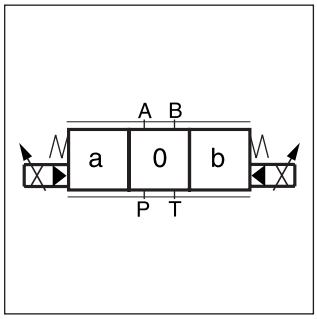
Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK375	4x M5x30 DIN 912 12.9	7.6 Nm ±15%	SK-D1FT-N30

The D*1FT pilot operated proportional DC valves are available in sizes NG10 (CETOP05), NG16 (CETOP07) and NG25 (CETOP08).

The D*1FT onboard electronics offers features as adjustable ramps and overlap compensation.

Typical applications include reproducible control of actuator speed in rapid / slow speed profiling, and smooth acceleration and deceleration performance.

D31FT

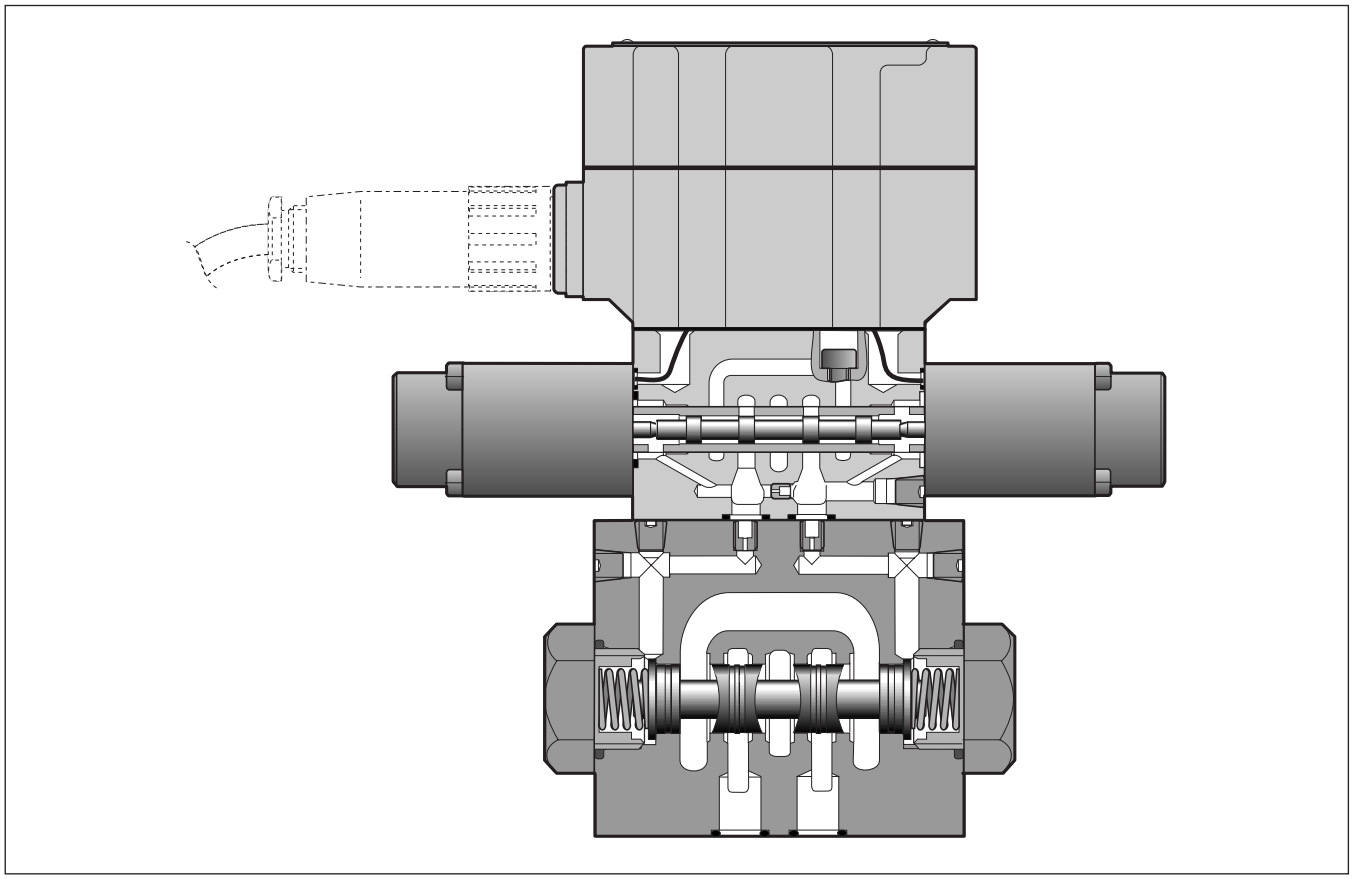


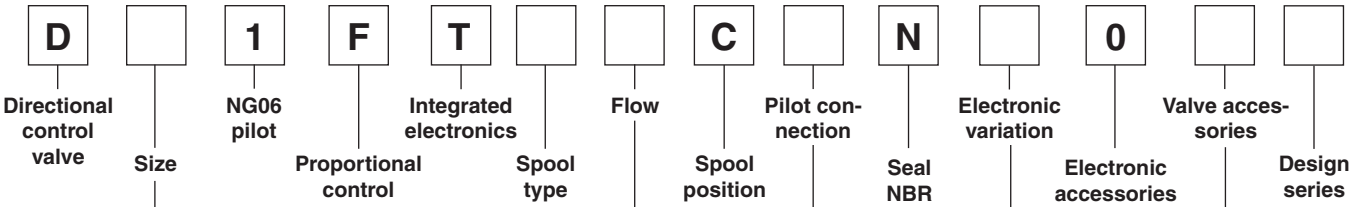
Technical features

- Progressive flow characteristics for sensitive adjustment of flow rate
- Fail-safe centre position
- Center position monitoring optional
- Onboard electronics with adjustable
  – ramps
  – overlap compensation
  – zero offset
- D31FT – NG 10 (CETOP05)
- D41FT – NG 16 (CETOP07)
- D91FT – NG 25 (CETOP08)

CE

D31FT





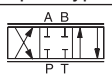
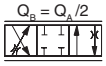
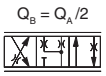
3

Code	Size
3	**NG10 / CETOP05**
4	**NG16 / CETOP07**
9 *	**NG25 / CETOP08**

* with enlarged connections Ø 32 mm

Code	Valve accessories
0	**Standard**
8	**Monitor switch**

Code	Electronic variation
F	**Voltage input 0...±10V, with reference output +10V/-10V**
G	**Current input 0...±20mA**

Code	Spool type
E01	
E02	
B31	
B32	

Code	Inlet	Drain
1	**Internal**	**External**
2	**External**	**External**
4	**Internal**	**Internal**
5	**External**	**Internal**

Code	Flow [l/min] at Δp = 5bar per metering edge		
	D31	D41	D91
C	**75**	-	-
F	-	**200**	-
H	-	-	**400**

Bold letters =
Short-term availability

Please order plugs separately.
See chapter 3 accessories.

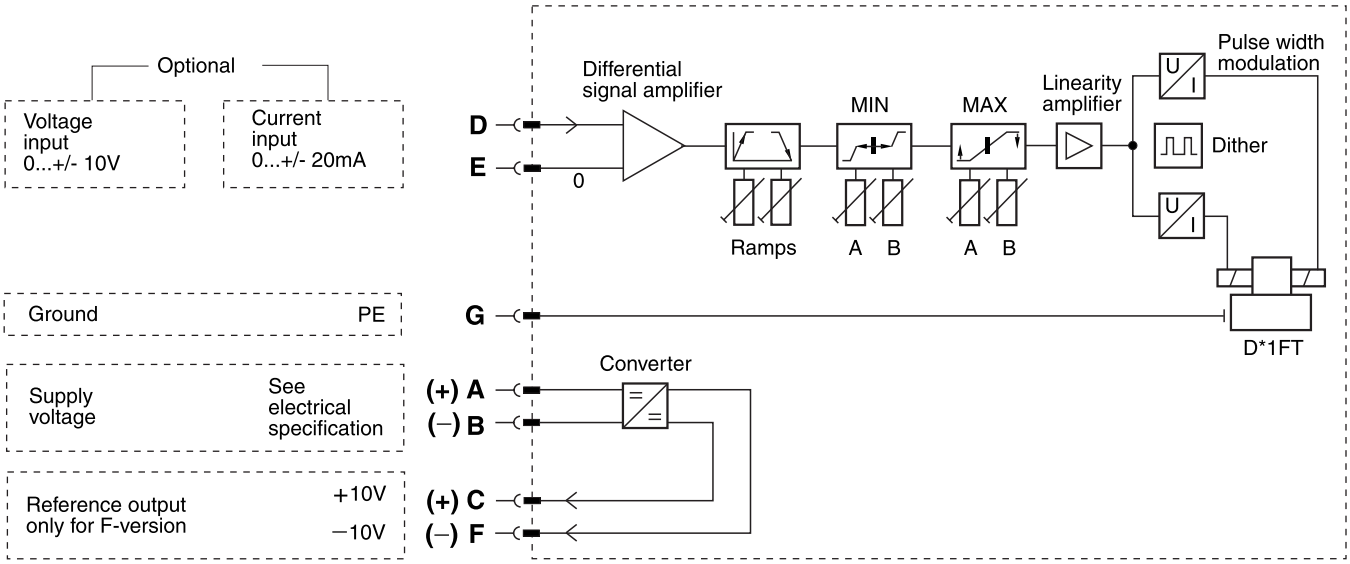
General				
Design		Pilot operated DC Valve		
Actuation		Proportional solenoid		
Size		**NG10 (CETOP05)**	**NG16 (CETOP07)**	**NG25 (CETOP08)**
Mounting interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA		
Mounting position		unrestriced		
Ambient temperature	[°C]	-20...+60		
Weight	[kg]	7.3	11.1	19.3
Hydraulic				
Max. operating pressure	[bar]	Ports P, A, B, T, X 350; Port Y 10		
Fluid		Hydraulic oil as per DIN 51524...535, other on request		
Fluid temperature	[°C]	-20...+60		
Viscosity permitted	[cSt] / [mm²/s]	20...380		
recommended	[cSt] / [mm²/s]	30...80		
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)		
Nominal flow [1]	[l/min]	75	200	400
Leakage at 100 bar	[ml/min]	100	200	600
Pilot supply pressure	[bar]	20-350 (optimal dynamics at 50)		
Pilot flow at 100bar	[l/min]	< 1.2		
Pilot flow, step response	[l/min]	0.8	1.7	3.8
Static / Dynamic				
Step response at 100% step	[ms]	60	75	100
Hysteresis	[%]	< 5		
Sensitivity	[%]	< 1		
Electrical characteristics				
Duty ratio	[%]	100		
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)		
Supply voltage/ripple	[V]	14.5 ... 30, ripple < 5% eff. surge free		
Current consumption max.	[A]	2.8		
Input signal [2]				
Voltage	[V]	10...0...-10, ripple < 0.01% eff., surge free, 0...+10V P → B		
Impedance	[kOhm]	100		
Current	[mA]	20...0...-20, ripple < 0.01% eff., surge free, 0...+20mA P → B		
Impedance	[Ohm]	500		
Differential input max.	[V]	30 for terminal D and E against PE		
Ramp	[s]	0...3		
Pre-fusing	[A]	6.3 medium lag		
EMC		EN 50081-2 / EN50082-2		
Coil insulation class		F (155 °C)		
Electrical connection		6+PE acc. EN 175201-804		
Wiring min.	[mm²]	6x1.0 (AWG 18) overall braid shield		
Wiring lenght max.	[m]	50		
Electrical monitor switch				
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)		
Ambient temperature	[°C]	0-70		
Supply voltage/ripple	[V]	18...42, ripple < 10% eff.		
Current consumption without load	[mA]	< 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		EN 50081-1 / EN50082-2		
Max. tol. ambient field strength	[A/m]	1200		
Min. distance to next AC solenoid	[m]	0.1		
Interface		4+PE acc. IEC 61076-2-101 (M12)		
Wiring min.	[mm²]	5x0.5 (AWG 20) overall braid shield		
Wiring lenght max.	[m]	50		

[1] Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

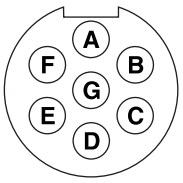
[2] Inverse polarity on request

3

Block diagram

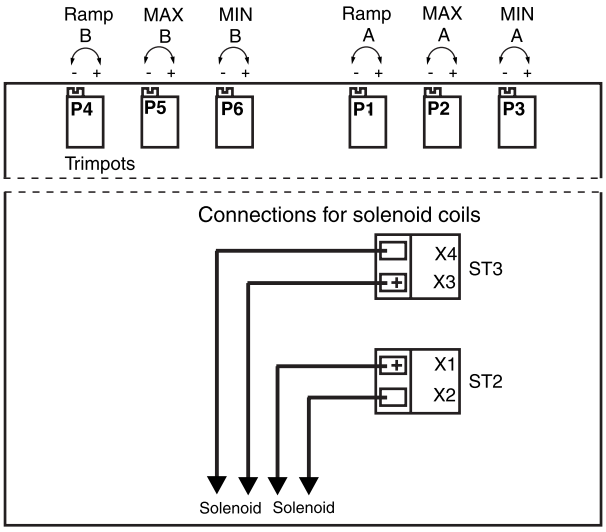


Central connector 6 + PE



A = supply (14.5...30 VDC)
B = GND (0V)
C = ref. +10 VDC
D = input
E = input
(-10...+10 VDC)
(-20...+20 mA)
F = ref. -10 VDC
G = PE (Ground)

Mechanical arrangement of the potentiometers



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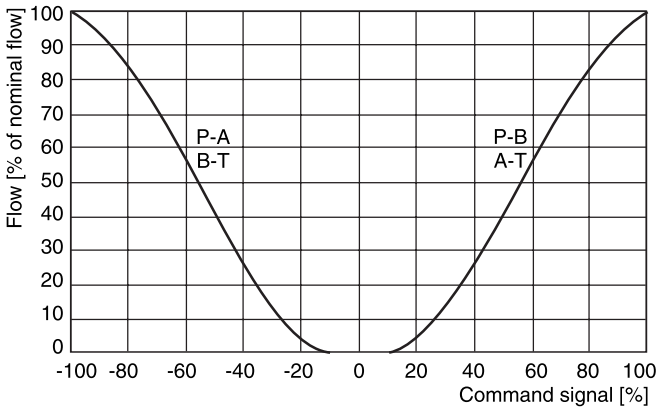
Kaarst, Germany

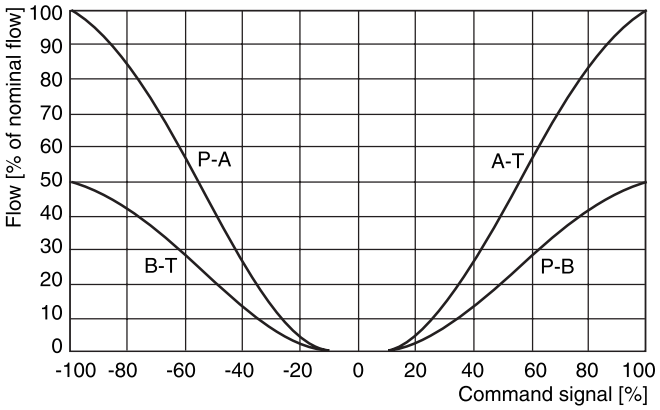
Flow characteristics
at Δp = 5bar per metering edge

D*1FT

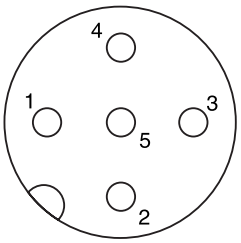
Spool code **E***



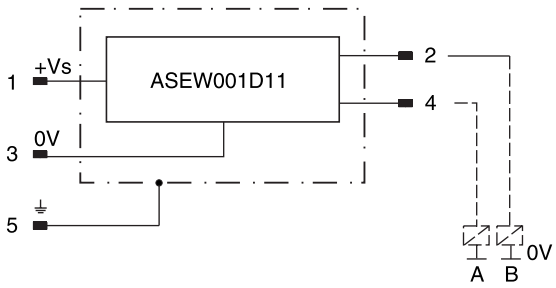
Spool code **B***



Monitor switch M12x1 pin assignment



1 + Supply 18...42V
2 output B (normally closed)
3 0V
4 output A (normally closed)
5 Earth ground



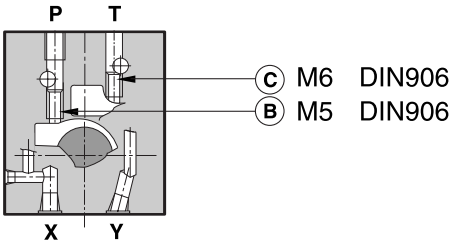
Signal	Output A (pin 4)	Output B (pin 2)
neutral	closed	closed
	open	closed
	closed	open

The neutral position is monitored. The signal changes after less than 10% of the spool stroke.

3

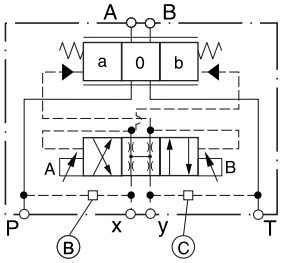
Pilot oil inlet (supply) and outlet (drain)

D31FT

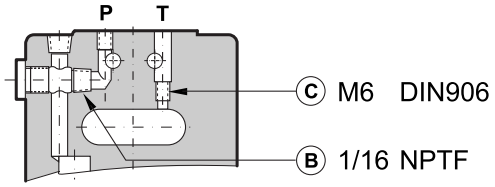


○ open, ● closed

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

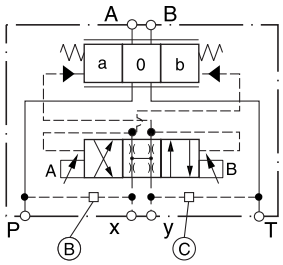


D41FT

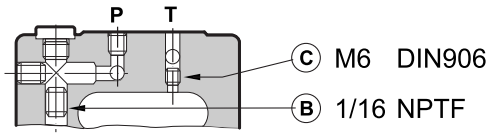


○ open, ● closed

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

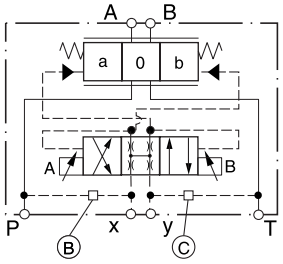


D91FT

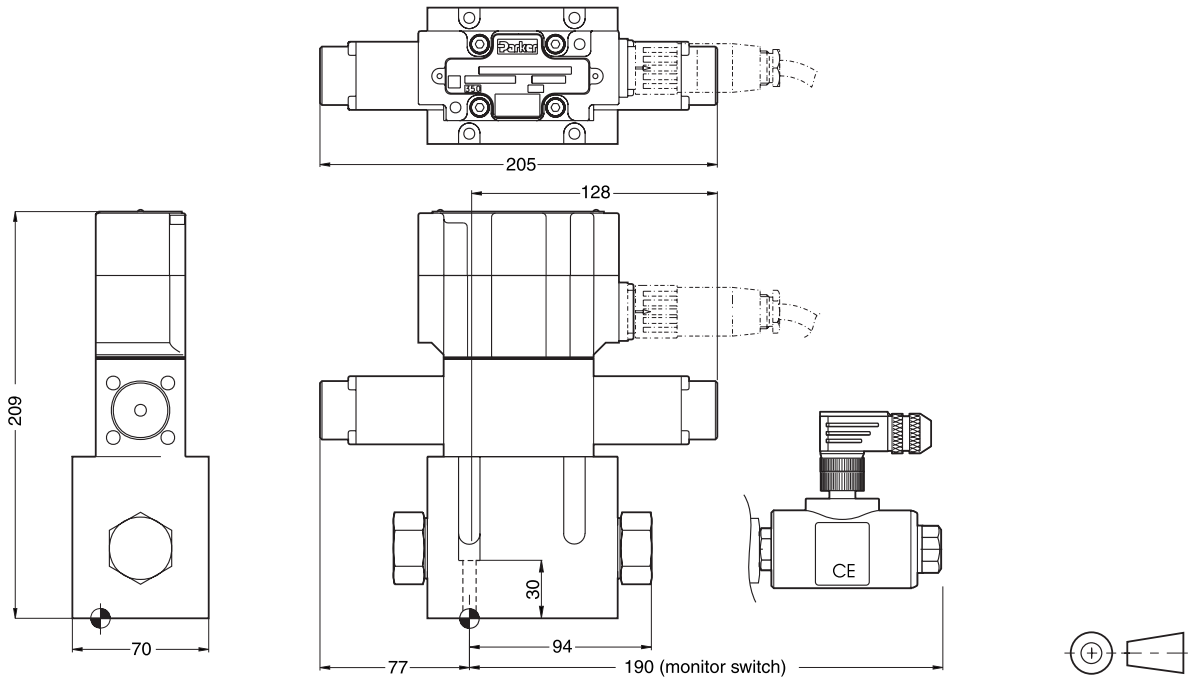


○ open, ● closed

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

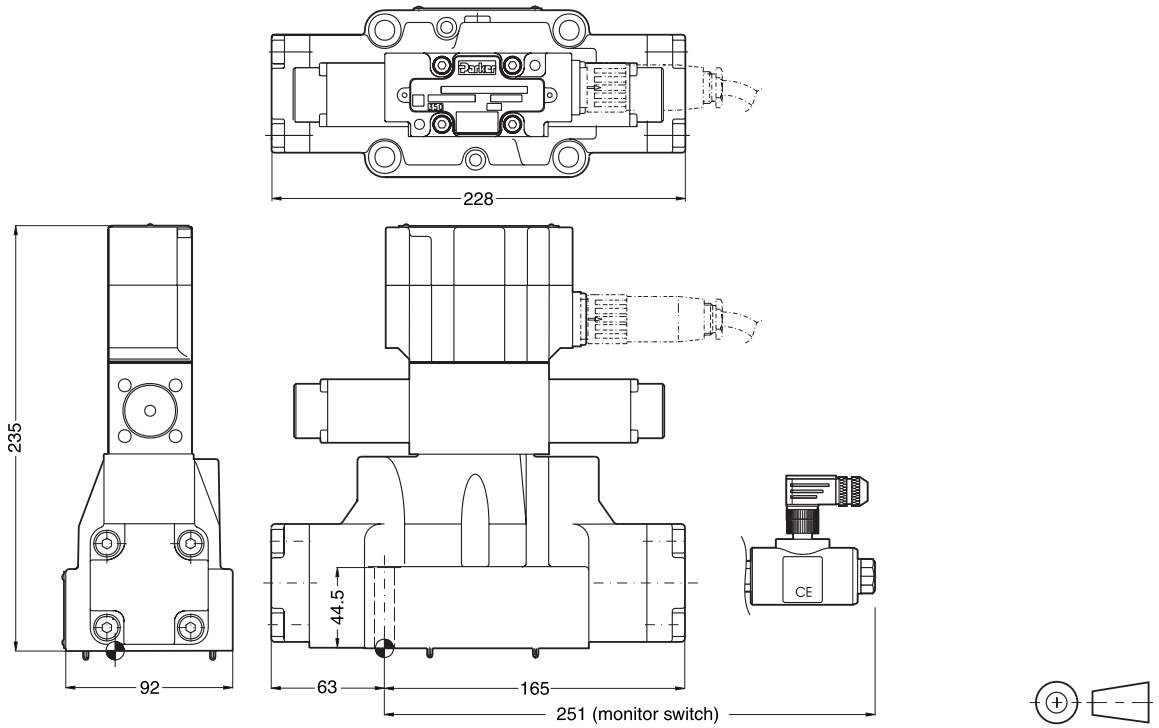


D31FT



Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK385	4x M6x40 DIN 912 12.9	13.2 Nm ±15%	SK-D31FT-N30

D41FT



Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK320	2x M6x55 4x M10x60 DIN 912 12.9	13.2 Nm ±15% 63 Nm ±15%	SK-D41FT-N30

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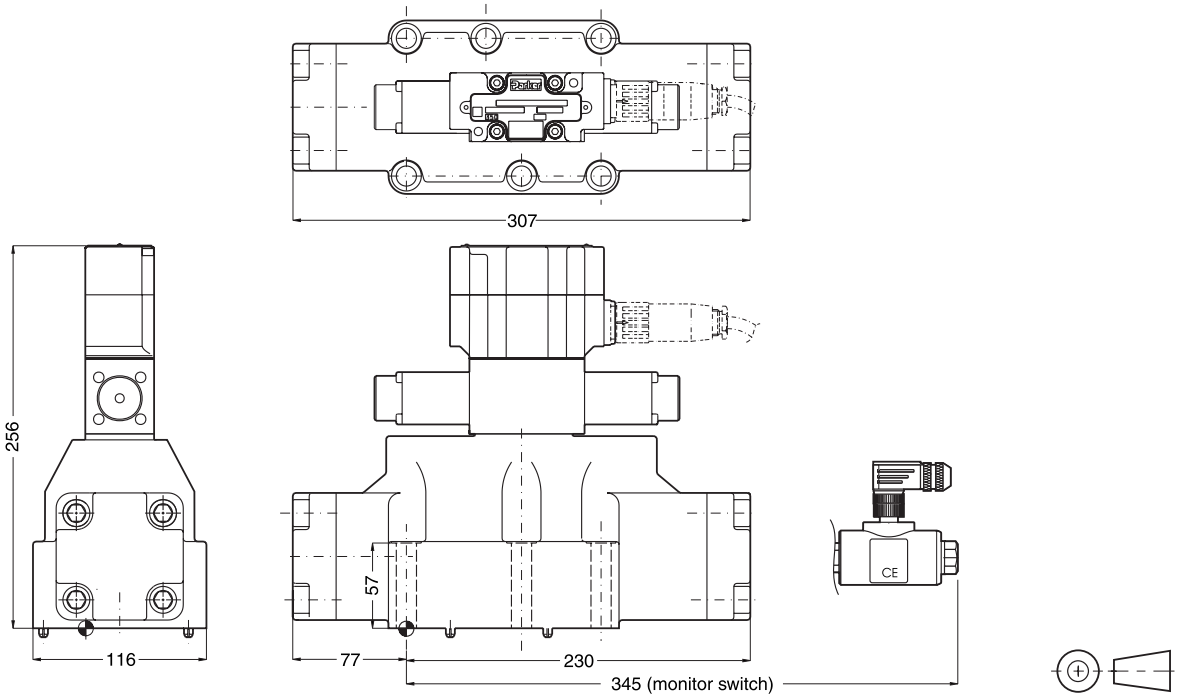
3

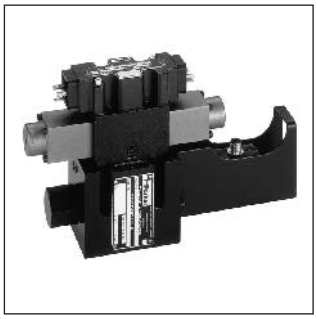
D91FT

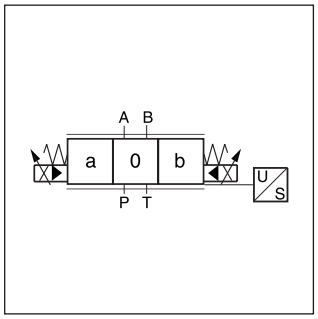


Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK360	6x M12x95 DIN 912 12.9	108 Nm ±15%	SK-D91FT-N20

The proportional directional control valves D*1FS are high performance, pilot operated solenoid valves with electronic spool position feedback. The performance is characterised by high resolution flow control, low hysteresis, high repeatability and good dynamic performance. Typical applications include precise and reproducible control of actuator speed in rapid / slow speed profiling and smooth acceleration and decellaration.

In combination with the digital power amplifier PWDXXA-40*, the valve parameters can be saved, changed and duplicated.



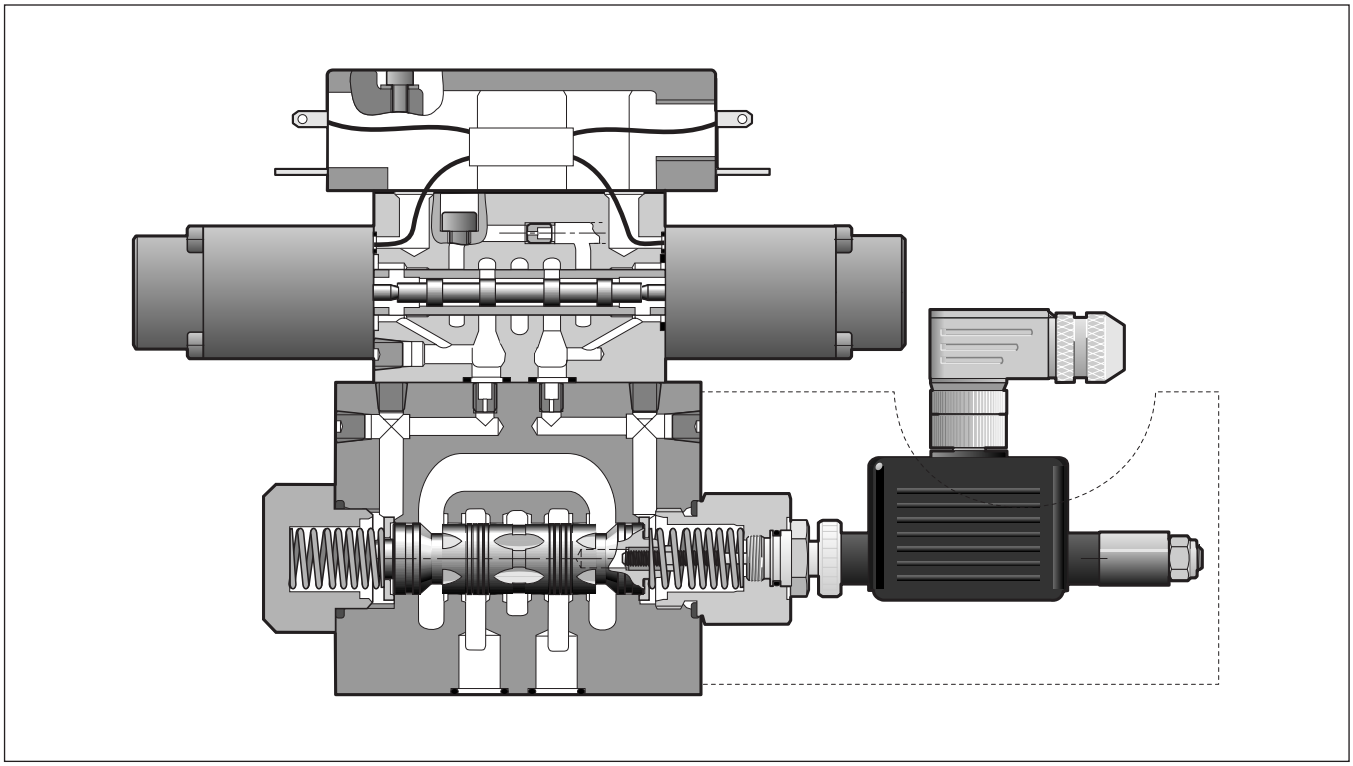


Technical features

- Sensitive flow rate adjustment
- Spool position feedback
- Fail-safe centre position
- Center position monitoring optional
- D31FS – NG 10 (CETOP05)
- D41FS – NG 16 (CETOP07)
- D81/91FS – NG 25 (CETOP08)
- D111FS – NG 32 (CETOP10)

CE

D*1FS

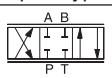
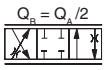
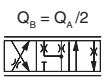
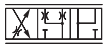


3

D		1	F	S				N		W		
Directional control valve	Size	NG06 pilot	Proportional control	with spool position feedback (plug included)	Spool type	Flow	Pilot connection	Seal NBR (other seal compound on request)	Solenoid description	Connector as per EN 175301-803 without plug *	Valve accessories	Design series

Code	Size
3	**NG10 / CETOP05**
4	**NG16 / CETOP07**
8	**NG25 / CETOP08**
9 [1]	**NG25 / CETOP08**
11	**NG32 / CETOP10**

[1] with enlarged connections Ø 32 mm

Code	Spool type
E01	
E02	
B31	
B32	
B11	
B12	

Code	Flow [l/min] at Δp = 5bar per metering edge				
	D31	D41	D81	D91	D111
B	**45 (65)**	—	—	—	—
C	—	**120 (180)**	—	—	—
E	—	—	**300 (360)**	—	—
H	—	—	—	**400 (360)**	—
L	—	—	—	—	**1000 (850)**

( ) flow for spool B11/B12

Code	Valve accessories
0	**Standard**
8 [2]	**Monitor switch**

[2] not for D31FS, D111FS

Code	Solenoid description
L	**6 VDC / 2.5A** (to use digital power amplifier)

Code	Inlet	Drain
1	**Internal**	**External**
2	**External**	**External**
4	**Internal**	**Internal**
5	**External**	**Internal**

Bold letters =
Short-term availability

* Please order plugs separately.
See chapter 3 accessories.

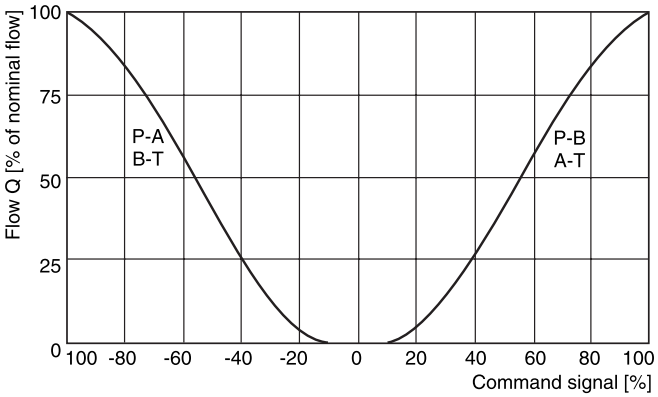
General					
Design		Pilot operated DC Valve			
Actuation		Proportional solenoid			
Size		**NG10 (CETOP05)**	**NG16 (CETOP07)**	**NG25 (CETOP08)**	**NG32 (CETOP10)**
Mounting interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA			
Mounting position		unrestricted			
Ambient temperature	[°C]	-20...+60			
Weight	[kg]	7.1	10.8	19	62
Vibration resistance	[g]	25 acc. DIN IEC68, part 2-6			
Hydraulic					
Max. operating pressure	[bar]	Ports P, A, B, T, X 350; Port Y 10			
Fluid		Hydraulic oil as per DIN 51524...535, other by request			
Fluid temperature	[°C]	-20...+60			
Viscosity					
permitted	[cSt] / [mm²/s]	20...380			
recommended	[cSt] / [mm²/s]	30...80			
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			
Nominal flow at Δp=5bar per control edge *	[l/min]	45	120	300/400	1000
Leakage at 100 bar	[ml/min]	100	200	600	1000
Pilot supply pressure	[bar]	20-350 (optimal dynamics at 50)			
Pilot flow	[l/min]	<1.2			
Pilot flow, step response	[l/min]	0.8	1.7	3.8	7.6
Static / Dynamic					
Step response at 100% step	[ms]	35	60	80	200
Hysteresis	[%]	<0.5			
Sensitivity	[%]	<0.2			
Electrical characteristics					
Duty ratio	[%]	100			
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)			
Solenoid		Code "L"			
Supply voltage	[V]	6			
Current consumption	[A]	2.5			
Resistance	[Ohm]	2.2			
Coil insulation class		F (155 °C)			
Electrical connection		Connector as per EN 175301-803			
Wiring min.	[mm²]	3x1.5 (AWG 16) overall braid shield			
Wiring lenght max.	[m]	50			
Electrical monitor switch					
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)			
Ambient temperature	[°C]	0-70			
Supply voltage/ripple	[V]	18...42, ripple <10% eff.			
Current consumption without load	[mA]	<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		EN 50081-1 / EN50082-2			
Max. tol. ambient field strength	[A/m]	1200			
Min. distance to next AC solenoid	[m]	0.1			
Interface		4+PE acc. IEC 61076-2-101 (M12)			
Wiring min.	[mm²]	4x0.5 (AWG 20) overall braid shield			
Wiring lenght max.	[m]	50			
Electrical LVDT					
Protection class		IP65 in accordance with EN 60529			
Ambient temperature	[°C]	-20...+50			
Supply voltage/ripple	[V]	18...36, ripple <10% eff.			
Current consumption	[mA]	<50			
EMC		EN 50081-1 / EN50082-2			
Interface		4+PE acc. IEC 61076-2-101 (M12)			
Wiring min.	[mm²]	5x0.5 (AWG 20) overall braid shield			
Wiring lenght max.	[m]	50			

* Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

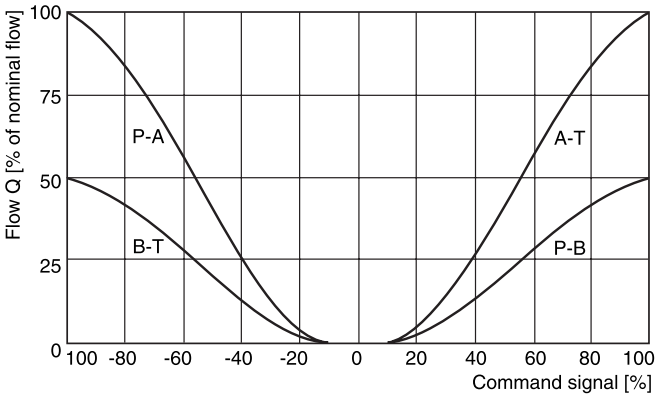
3

Flow characteristics
at Δp = 5bar per metering edge

Spool code **E***

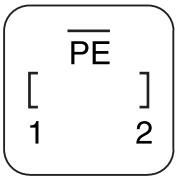


Spool code **B***



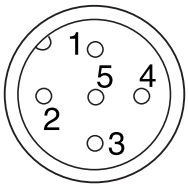
Plug

Solenoid coil



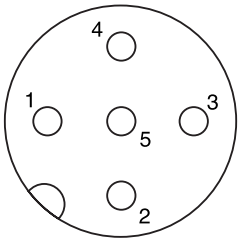
1 = coil connection
2 = coil connection
PE = ground potential

Spool position feedback

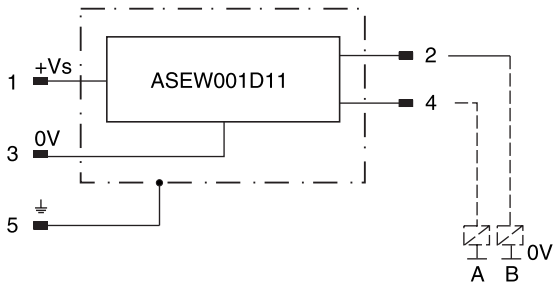


1 = output, actual spool position
2 = supply (18...36 VDC)
3 = GND (0V)
4 = not used
5 = PE (ground potential)

Monitor switch M12x1 pin assignment



1 + Supply 18...42V
2 output B (normally closed)
3 0V
4 output A (normally closed)
5 Earth ground

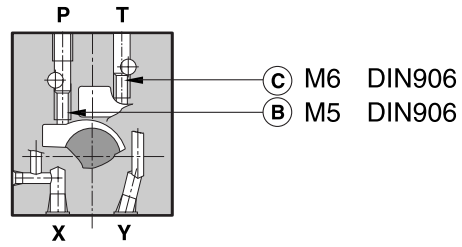


Signal	Output A (pin 4)	Output B (pin 2)
neutral	closed	closed
	open	closed
	closed	open

The neutral position is monitored. The signal changes after less than 10% of the spool stroke.

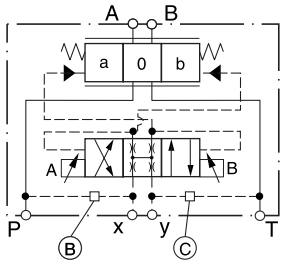
Pilot oil inlet (supply) and outlet (drain)

D31FS

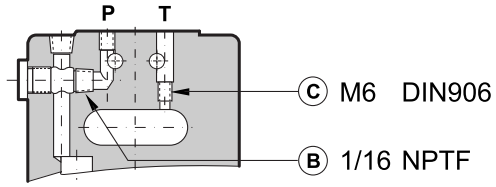


○ open, ● closed

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

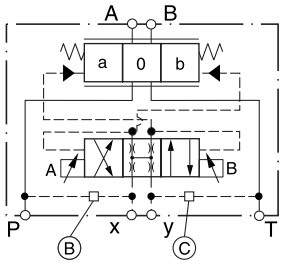


D41FS

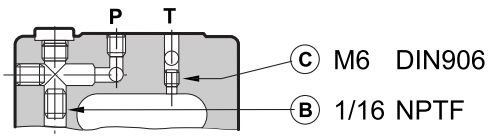


○ open, ● closed

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

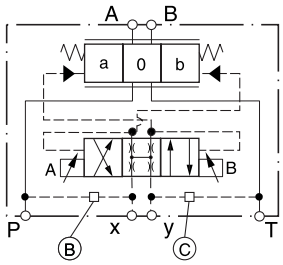


D81/91FS

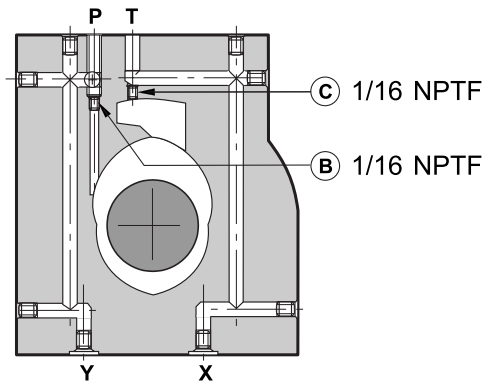


○ open, ● closed

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

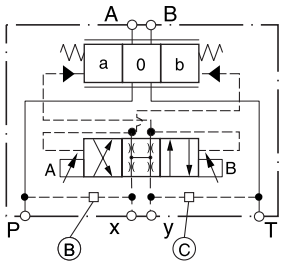


D111FS



○ open, ● closed

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



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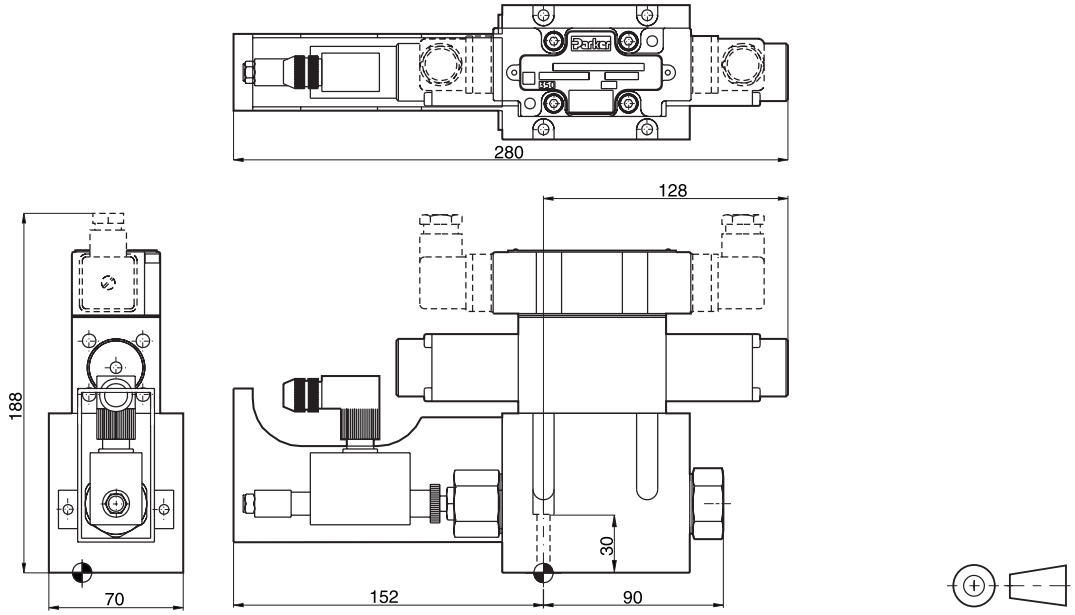
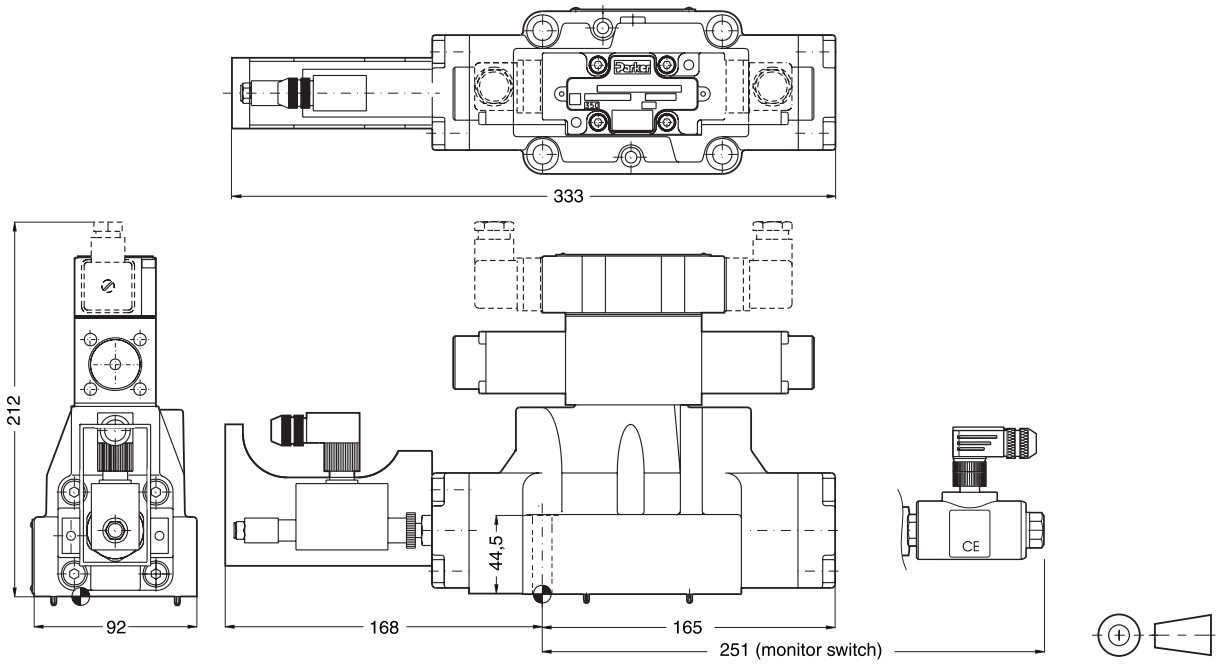
D31FS



Surface finish	Kit			Kit NBR
R_{max}6.3 ▱ 0.01/100	BK385	4x M6x40 DIN 912 12.9	13.2 Nm ±15%	SK-D31FS-N30

D41FS



Surface finish	Kit			Kit NBR
R_{max}6.3 ▱ 0.01/100	BK320	2x M6x55 4x M10x60 DIN 912 12.9	13.2 Nm ±15% 63 Nm ±15%	SK-D41FS-N30

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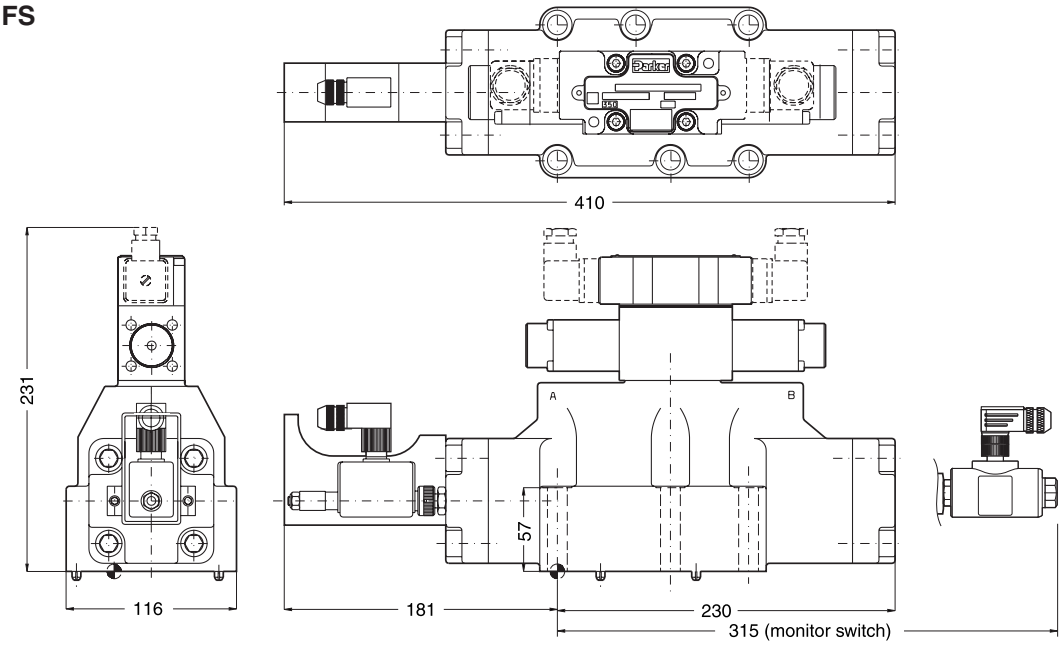
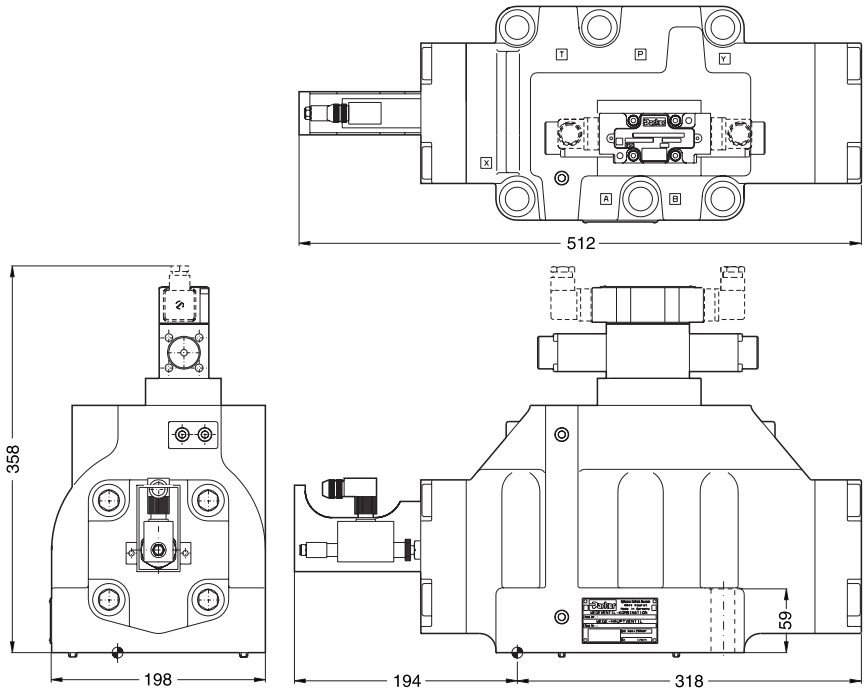
Kaarst, Germany

D81/91FS



Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK360	6x M12x95 DIN 912 12.9	108 Nm ±15%	SK-D81FS-N20 SK-D91FS-N20

D111FS



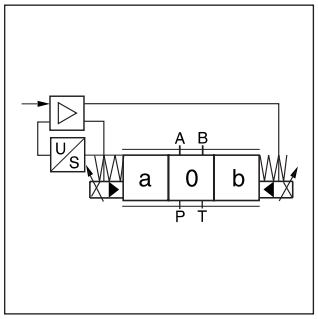
Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK386	6x M20x90 DIN 912 12.9	517 Nm ±15%	SK-D111FS-N20

Notes

The pilot operated proportional DC valves series of the D*1FH series are high-performance valves with electronic spool position feedback. These valves are available in sizes NG10 to NG32 (CETOP05 to CETOP10).

Typical applications are:

High precision and reproducible adjustment of flow rates, applications in rapid / creep speed with spool position monitoring for presses and dynamic position and p/Q closed loop systems.



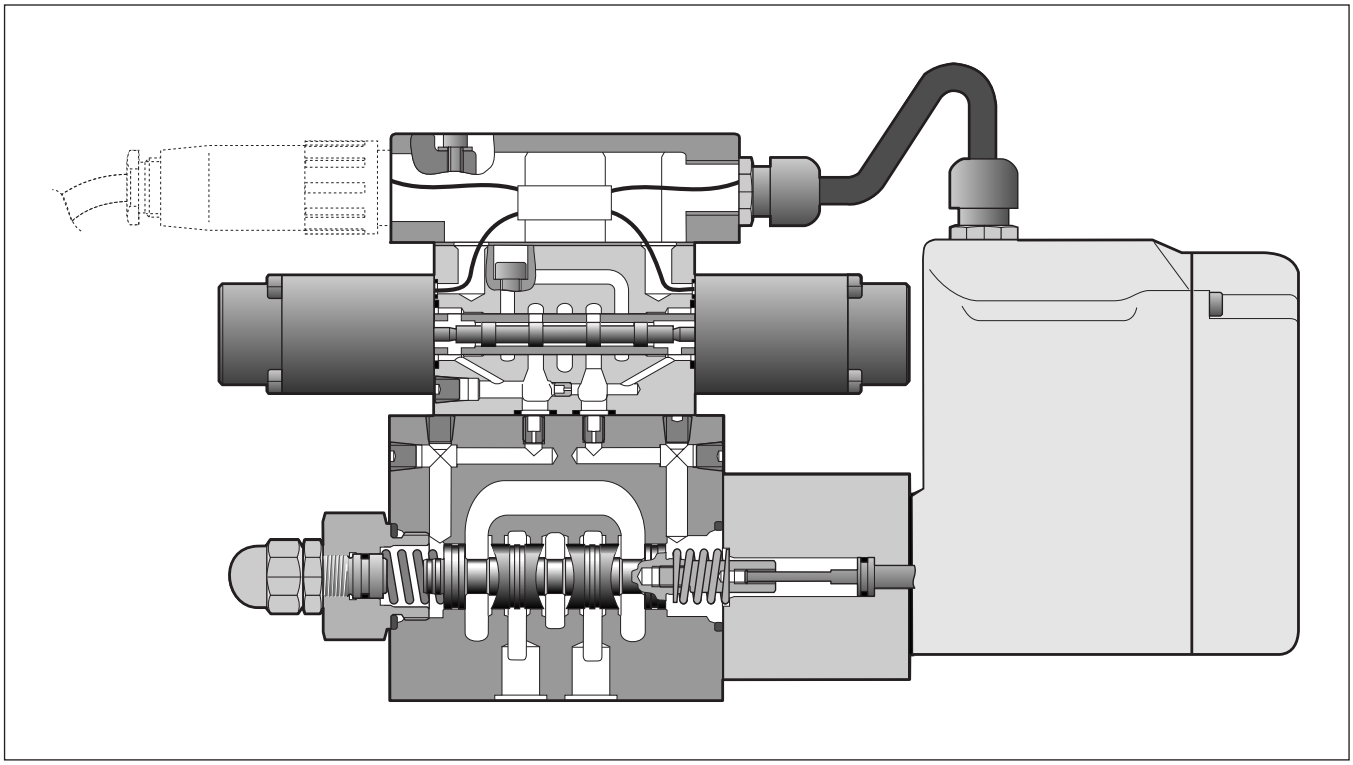
D91FH

Technical features

- Very low hysteresis
- Zero lap and overlap spool design available
- High dynamics
- Spool position feedback
- Center position monitoring optional
- D31FH – NG 10 (CETOP05)
- D41FH – NG 16 (CETOP07)
- D81/91FH – NG 25 (CETOP08)
- D111FH – NG 32 (CETOP10)

CE

D*1FH

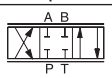
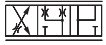


3

D		1	F	H				N		0		
Directional control valve	Size	NG06 pilot	Proportional control	High response	Spool type	Flow	Pilot connection	Seal NBR (other seal compound on request)	Electronic variation	Electronic accessories	Valve accessories	Design series

Code	Size
3	**NG10 / CETOP05**
4	**NG16 / CETOP07**
8	**NG25 / CETOP08**
9 [1]	**NG25 / CETOP08**
11	**NG32 / CETOP10**

[1] with enlarged connections Ø 32 mm

Code	Spool type
overlap	
E01	
E02	
B31	$Q_B = Q_A/2$ 
B32	$Q_B = Q_A/2$ 
B11 [3]	
B12 [3]	
zerolap [2]	
E52	
B61	$Q_B = Q_A/2$ 

[2] not for D111FH

[3] only Flow code for
D31FH* = Code C
D41FH* = Code F
D81/91 FH* = Code H
D111FH* = Code L

Code	Valve accessories
0	**Standard**
8 [4]	**Monitor switch**

[4] not for spool E52, B61

Code	Electronic variation
B	**Voltage input 0...±10V standard**
E	**Current input 0...±20mA**
S	**Current input 4...20mA**

Code	Inlet	Drain
1	**Internal**	**External**
2	**External**	**External**
4	**Internal**	**Internal**
5	**External**	**Internal**

Code	Flow [l/min] at Δp = 5bar per metering edge				
	D31	D41	D81	D91	D111
A	55	—	—	—	—
B	—	**105**	—	—	—
C	**80 (65)**	**140**	—	—	—
E	—	**190**	**250**	**250**	—
F	—	**240 (190)**	**310**	**310**	—
H	—	—	**400 (360)**	**400 (360)**	**500**
L	—	—	—	—	**1000 (850)**

( ) flow for spool B11/B12

Please order plugs separately.
See chapter 3 accessories.

Bold letters =
Short-term availability

DFH_UK.INDD CM

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

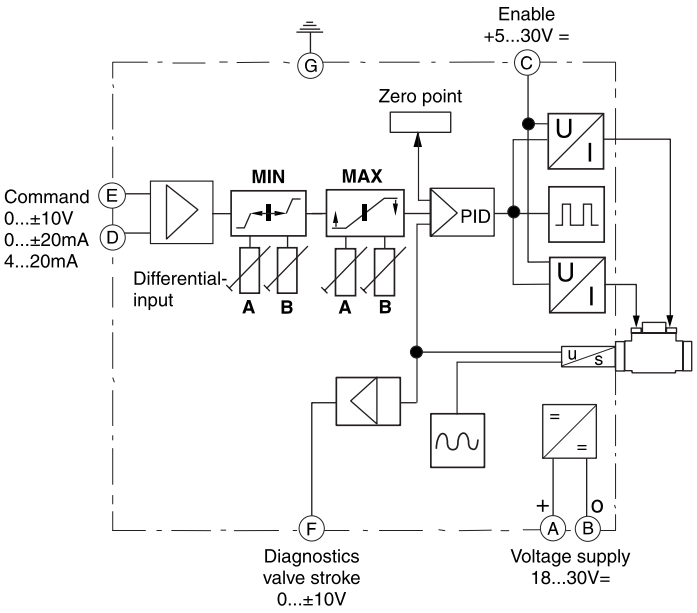
General					
Design		Pilot operated DC Valve with onboard electronic			
Actuation		Proportional solenoid			
Size		**NG10 (CETOP05)**	**NG16 (CETOP07)**	**NG25 (CETOP08)**	**NG32 (CETOP10)**
Mounting interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA			
Mounting position		unrestricted			
Ambient temperature	[°C]	-20...+60			
Weight	[kg]	8.1	11.6	20.7	62
Vibration resistance	[g]	25 acc. DIN IEC68, part 2-6			
Hydraulic					
Max. operating pressure	[bar]	Ports P, A, B, T, X 350; Port Y 10			
Fluid		Hydraulic oil as per DIN 51524...535, other on request			
Fluid temperature	[°C]	-20...+60			
Viscosity					
permitted	[cSt] / [mm²/s]	20...380			
recommended	[cSt] / [mm²/s]	30...80			
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)			
Nominal flow at Δp=5bar					1000
per control edge [1]	[l/min]	80	240	400	
Leakage at 100 bar	[ml/min]	100	200	600	100
Pilot supply pressure	[bar]	20-350 (optimal dynamics at 50)			
Pilot flow	[l/min]	<1.2			
Pilot flow, step response	[l/min]	2.0	4.1	9.0	18.0
Static / Dynamic					
Step response at 100% step	[ms]	25	45	65	150
Hysteresis	[%]	<0.1			
Sensitivity	[%]	<0.05			
Electrical characteristics					
Duty ratio	[%]	100			
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)			
Supply voltage/ripple	[V]	18 ... 30, ripple <5% eff., surge free			
Current consumption max.	[A]	2.0			
Input signal [2]					
Voltage	[V]	10...0...-10, ripple <0.01% eff., surge free, 0...+10V P—>B			
Impedance	[kOhm]	100			
Current	[mA]	20...0...-20, ripple <0.01% eff., surge free, 0...+20mA P—>B			
Impedance	[Ohm]	500			
Current	[mA]	4...12...20, ripple <0.01% eff., surge free, 12...20mA P—>A			
Impedance	[Ohm]	500			
Differential input max.	[V]	30 for terminal D and E against PE			
Pre-fusing	[A]	2.5 medium lag			
EMC		EN 50081-2 / EN50082-2			
Coil insulation class		F (155 °C)			
Electrical connection		6+PE acc. DIN 43563			
Wiring min.	[mm²]	7x1.0 (AWG 18) overall braid shield			
Wiring lenght max.	[m]	50			
Electrical monitor switch					
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)			
Ambient temperature	[°C]	0-70			
Supply voltage/ripple	[V]	18...42, ripple <10% eff.			
Current consumption without load	[mA]	<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		EN 50081-1 / EN50082-2			
Max. tol. ambient field strength	[A/m]	1200			
Min. distance to next AC solenoid	[m]	0.1			
Interface		4+PE acc. IEC 61076-2-101 (M12)			
Wiring min.	[mm²]	4x0.5 (AWG 20) overall braid shield			
Wiring lenght max.	[m]	50			

[1] Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

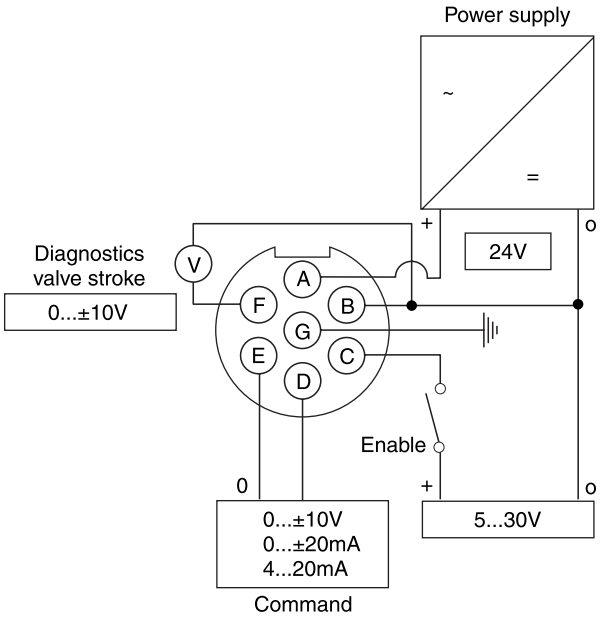
[2] Inverse polarity on request

3

Control system flow chart, valve electronics



Wiring



Enable input

The power stage is activated via pin C (enable input).

Supply voltage monitoring

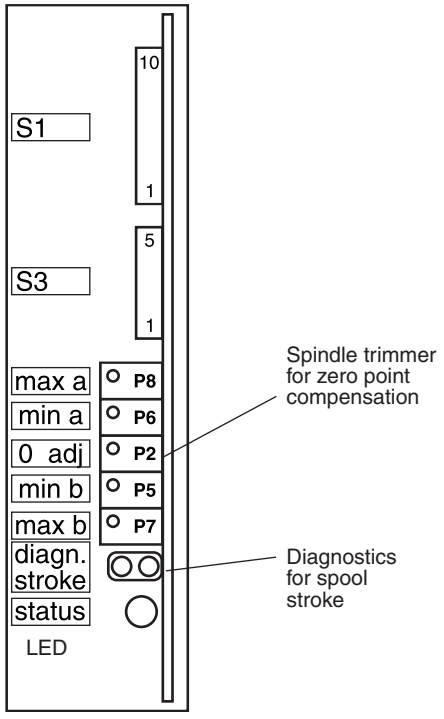
If the minimal supply voltage drops below, it is internally monitored and displayed via the status LED.

Control monitoring

A control error is indicated if there is an error in the control circuit of the valve.

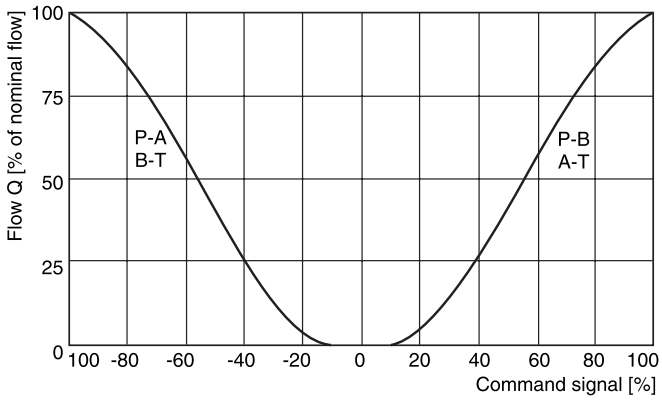
Display is green	Normal operation
Display off	Supply voltage is outside the permissible range of 18 ... 30V
Display is red	Control error

Arrangement of the potentiometers

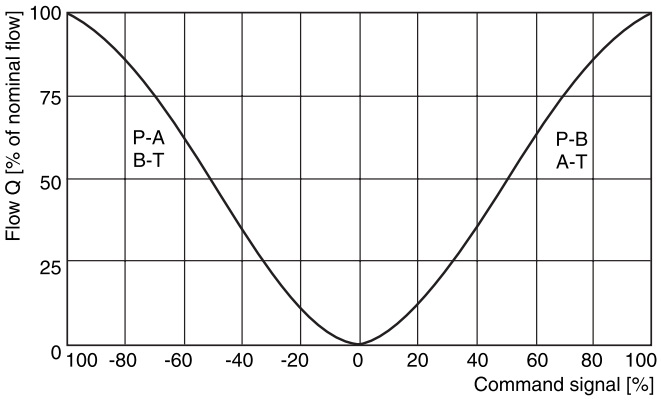


Flow characteristics
at Δp = 5bar per metering edge

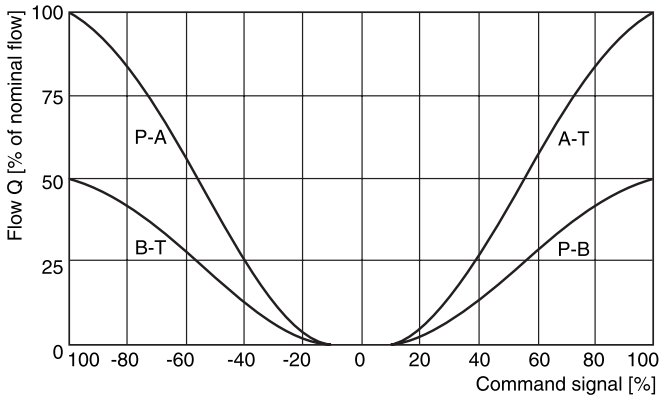
Spool types **E01, E02**



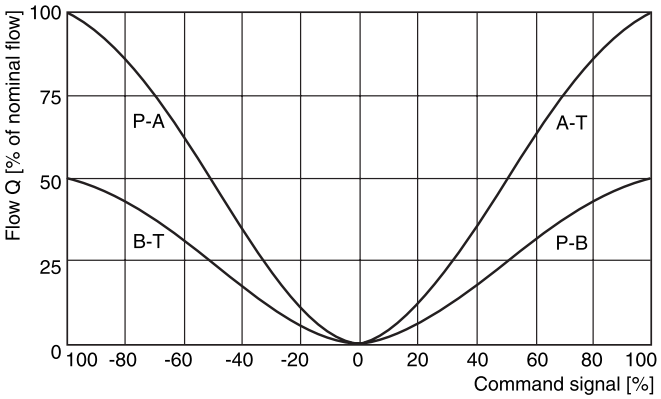
Spool type **E52**



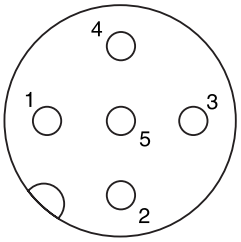
Spool types **B31, B32**



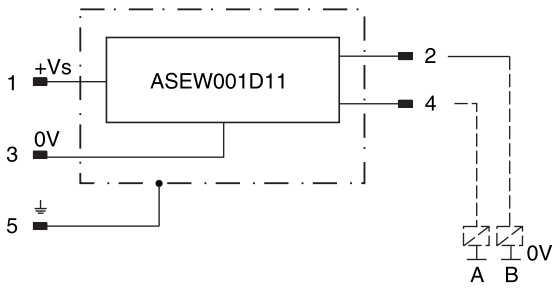
Spool type **B61**



Monitor switch M12x1 pin assignment



1 + Supply 18...42V
2 output B (normally closed)
3 0V
4 output A (normally closed)
5 Earth ground



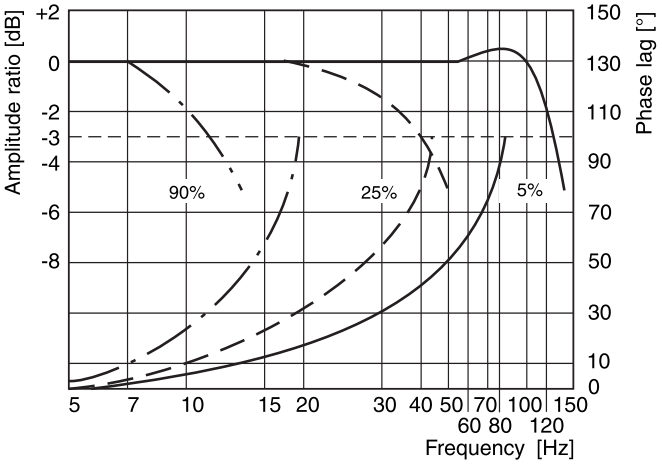
Signal	Output A (pin 4)	Output B (pin 2)
neutral	closed	closed
	open	closed
	closed	open

The neutral position is monitored. The signal changes after less than 10% of the spool stroke.

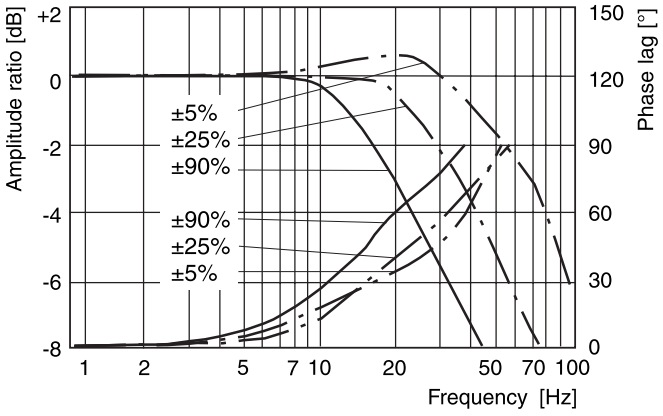
3

Frequency response

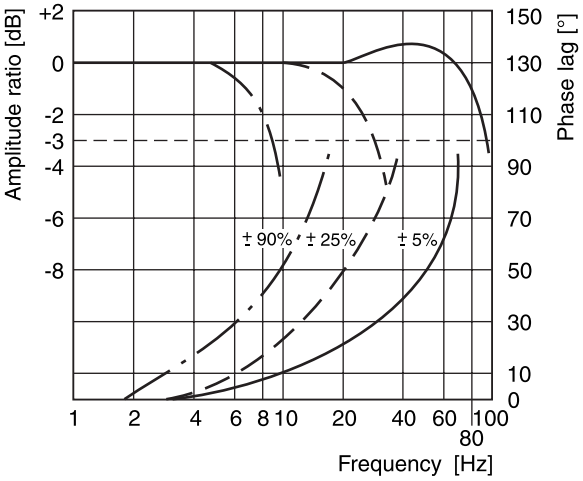
D31FH



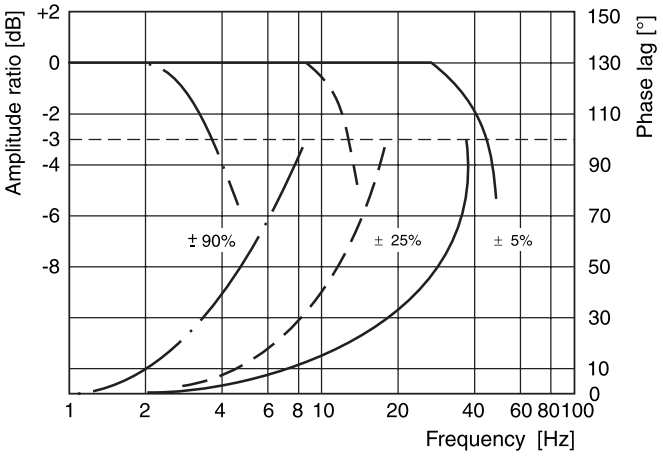
D81/91FH



D41FH



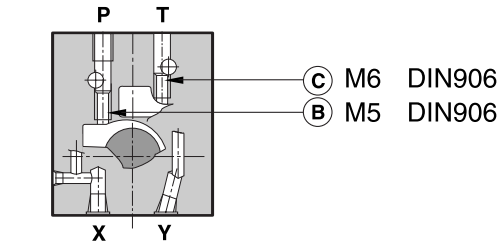
D111FH



3

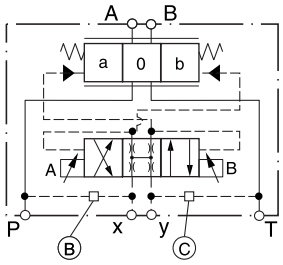
Pilot oil inlet (supply) and outlet (drain)

D31FH

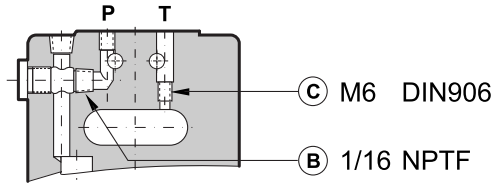


○ open, ● closed

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

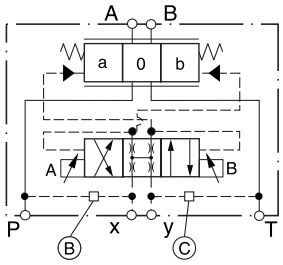


D41FH

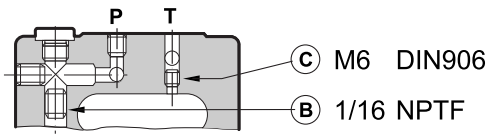


○ open, ● closed

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

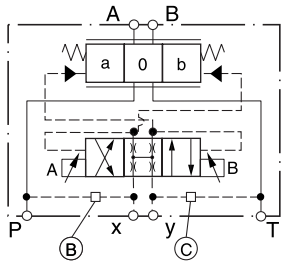


D81/91FH

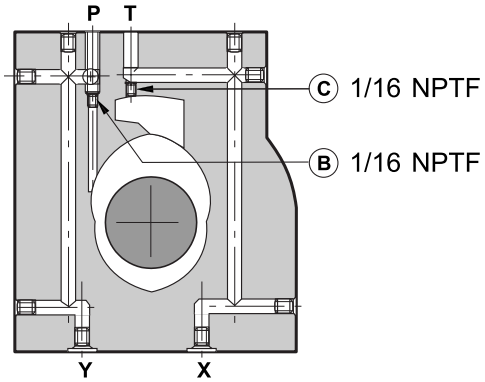


○ open, ● closed

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

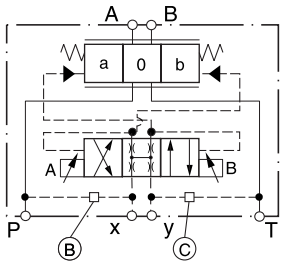


D111FH



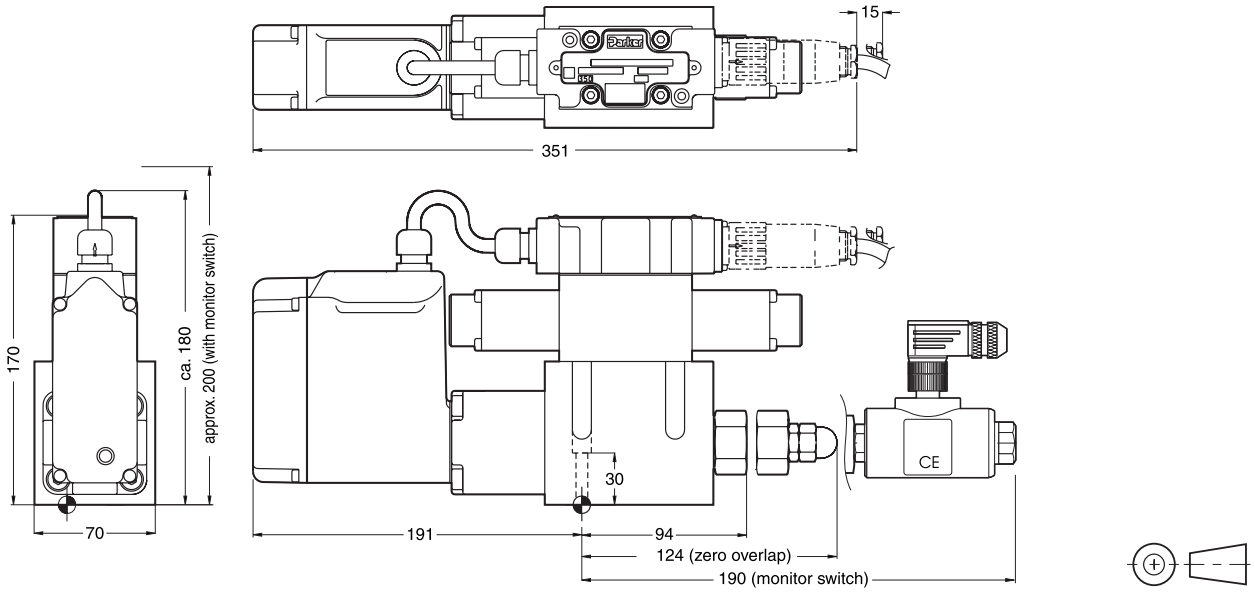
○ open, ● closed

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



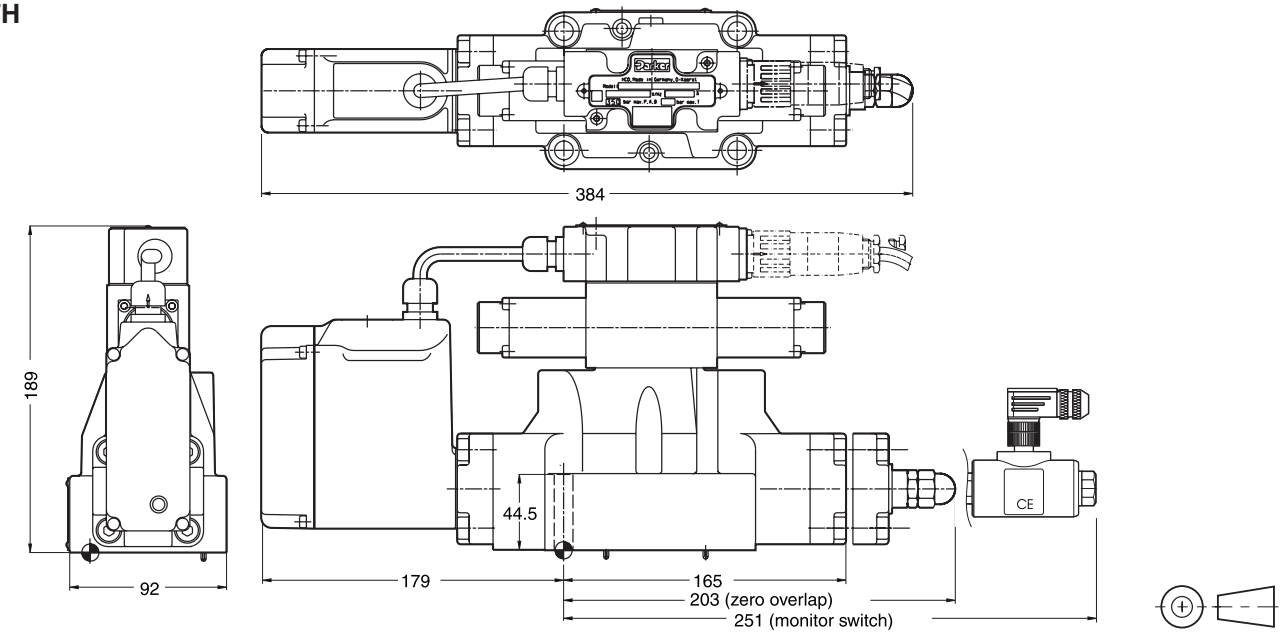
3

D31FH



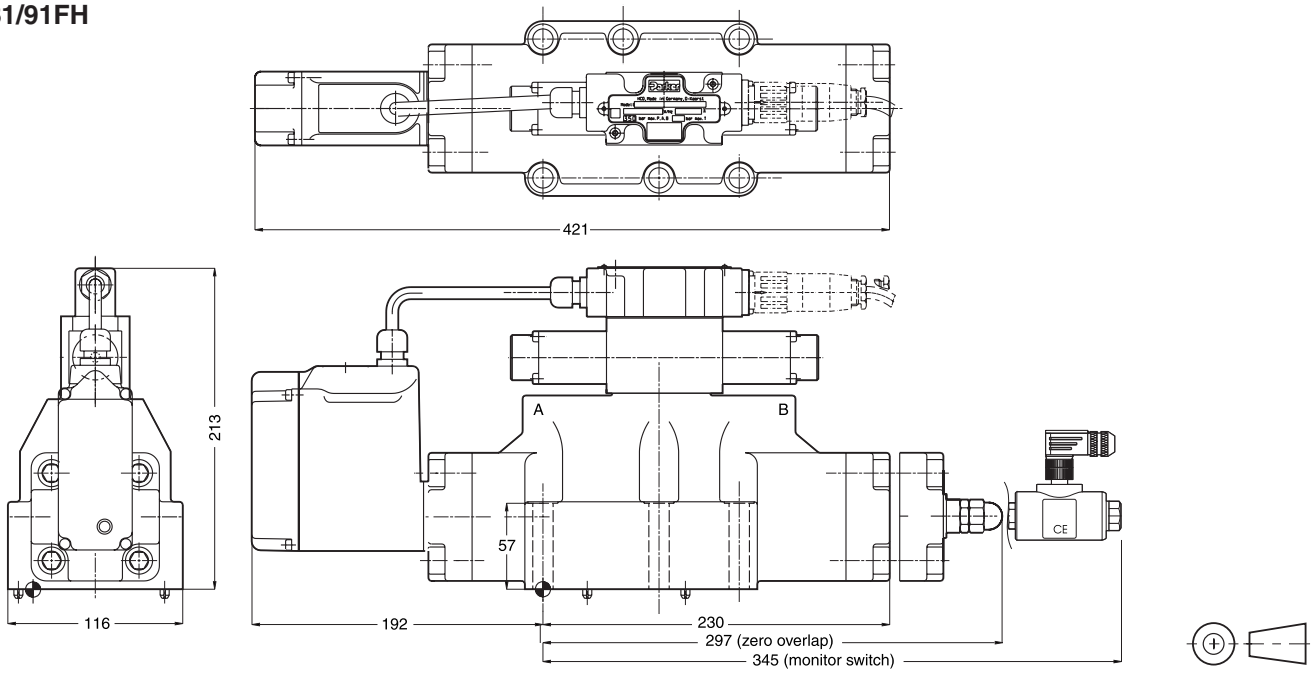
Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK385	4x M6x40 DIN 912 12.9	13.2 Nm ±15%	SK-D31FH-N35

D41FH



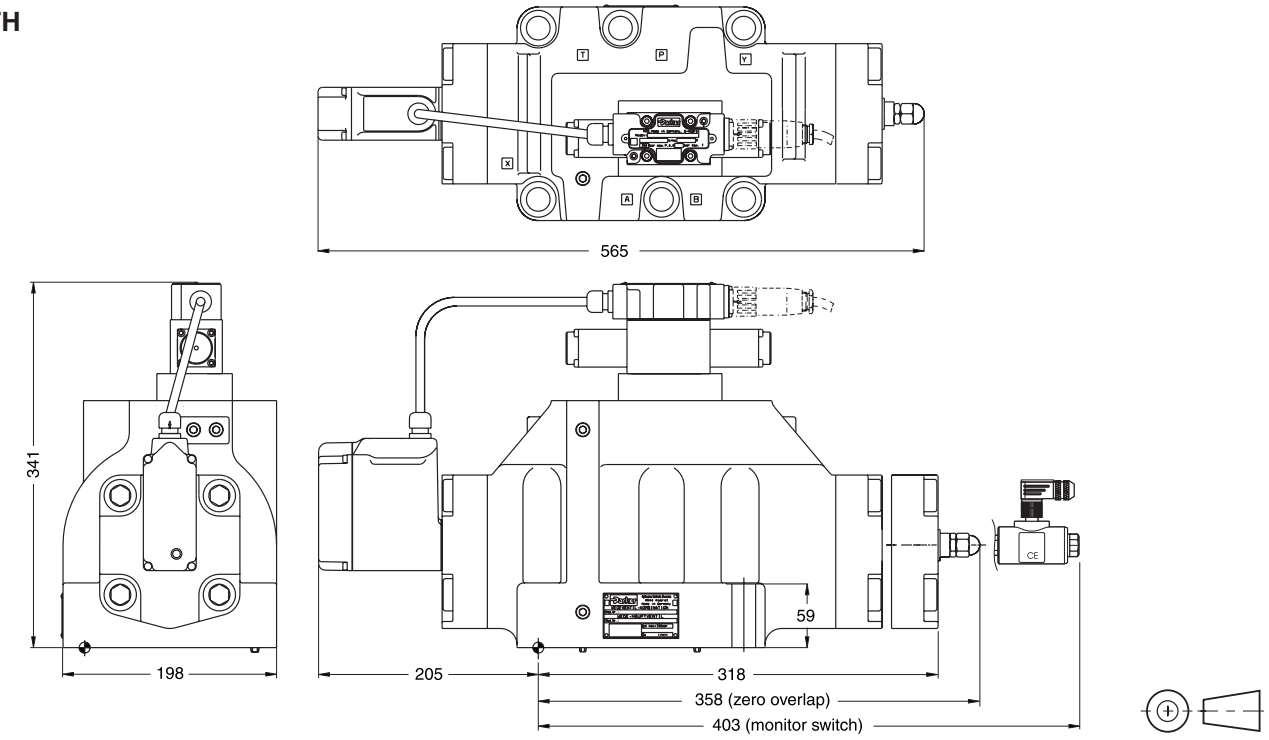
Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK320	2x M6x55 4x M10x60 DIN 912 12.9	13.2 Nm ±15% 63 Nm ±15%	SK-D41FH-N35

D81/91FH



Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK360	6x M12x95 DIN 912 12.9	108 Nm ±15%	SK-D91FH-N35

D111FH



Surface finish	Kit			Kit NBR
$\sqrt{R_{max}6.3}$ 0.01/100	BK386	6x M20x90 DIN 912 12.9	517 Nm ±15%	SK-D111FH-N35

DFH_UK.INDD CM

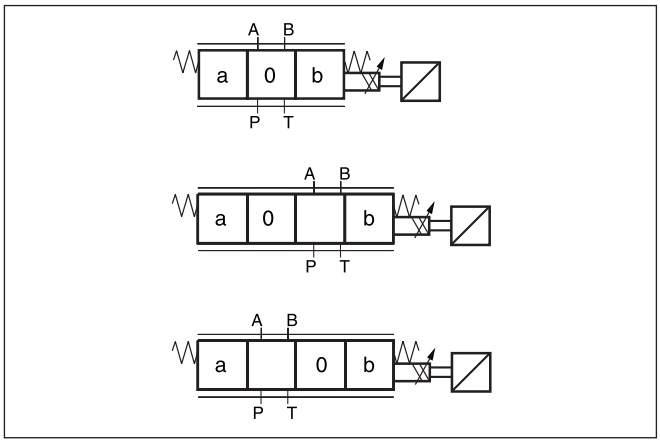
Parker Hannifin GmbH & Co. KG
Hydraulic Controls Division
Kaarst, Germany

Notes

The direct operated control valve D1FP of the nominal size NG06 (CETOP03) shows extremly high dynamics combined with maximum flow. First of all it is used for highest accuracy in positioning of hydraulic axis and controlling of pressure and velocity.

Driven by the new patented VCD® actuator the D1FP reaches the frequency response of real servovalves. Compared with solenoid driven valves the D1FP can also be used in applications with pressure drops up to 350bar across the valve. Because of the high flow capability the D1FP can be a substitute for NG10 valves in some cases.

A loss of the power supply lets the spool move in a defined position. All common input signals are available.

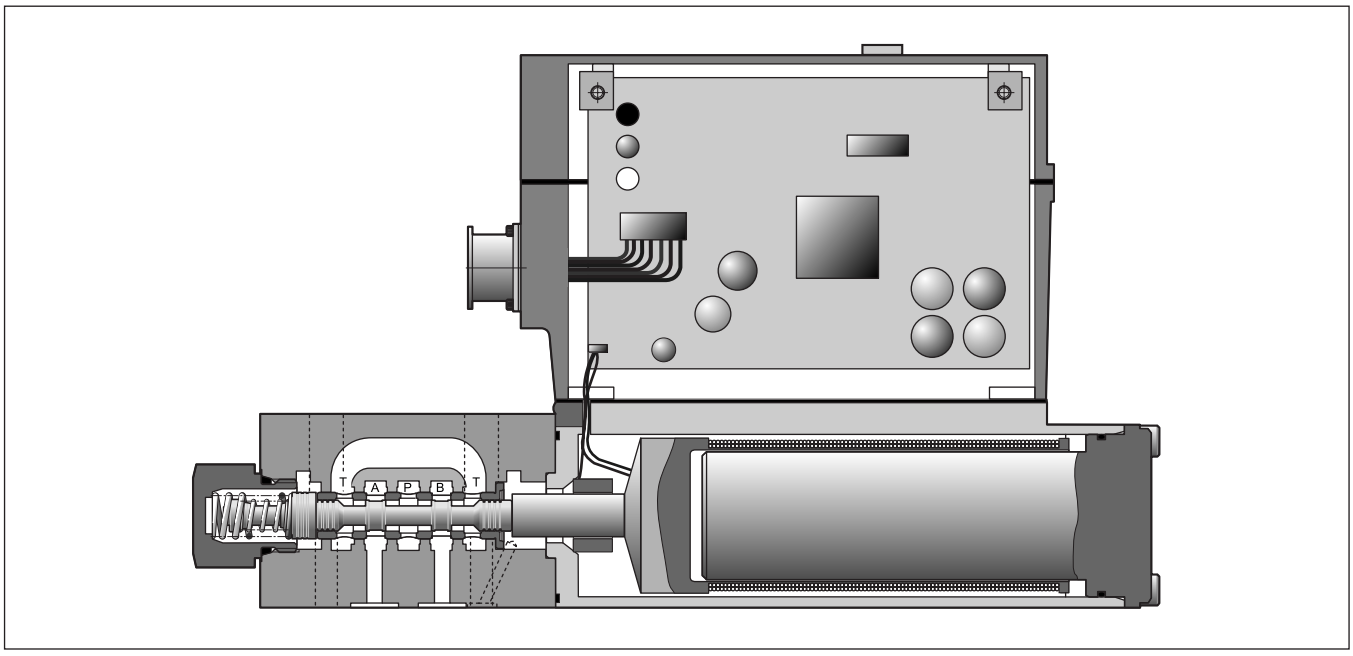


Technical features

- Real servovalve dynamics (-3dB/350Hz at ±5% input signal)
- No flow limit up to 350 bar pressure drop through the valve
- Max. tank pressure 350 bar (with external drain port y)
- High flow
- Defined spool positioning in case of power supply breakdown
- Onboard electronics

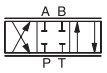
CE

D1FP



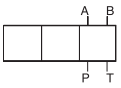
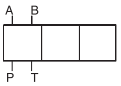
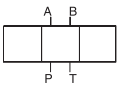
D	1	F	P			9	N			0	
Directional control valve	**Size DIN NG06 CETOP03 NFPA D03**	**Proportional control**	**VCD**	**Spool type**	**Spool position on power down [1]**	**Y-port (plugged) [4]**	**Seal NBR** (other seal compound on request)	**Command-signal**	**Acces-sories**	**Spool/ sleeve design**	**Design series**

3

Code	Spool type	Flow [l/min] at Δp 35bar per metering edge
Zerolap		
E50M **E50H** **E50F** **E50C** **E50B**		**40** **25** **12** **6** **3**
B60M	$Q_B = Q_A/2$ 	**40 / 20**
Overlap 25%		
E01M **E01H** **E01F** **E01C** **E01B**		**40** **25** **12** **6** **3**
B31M	$Q_B = Q_A/2$ 	**40 / 20**
E02M **E02H**		**40** **25**
B32M	$Q_B = Q_A/2$ 	**40 / 20**

Code	Connection type
0	**6 + PE acc. EN175201-804**
5	**11 + PE acc. EN175201-804**

Code	Signal	Flow direction
B	**+/- 10V**	**0...+10V -> P-A**
E	**+/- 20mA**	**0...+20mA -> P-A**
S	**4...20mA**	**12...20mA -> P-A**

Code	Spool pos. on power down
A [2]	
B [2]	
C [3]	

Bold letters =
Short-term availability

[1] On power down the spool moves in a defined position. This cannot be guaranteed in case of single flow path on the control edge A – T resp. B – T with pressure drops above 120 bar or contamination in the hydraulic fluid.

[2] approx. 10% opening, only zero lapped spools

[3] only for overlapped spools

[4] needs to be removed at tank pressure >35 bar

Please order plugs separately.
See chapter 3 accessories.

General		
Design		Direct operated proportional DC valve
Actuation		VCD® actuator
Size		NG06/CETOP03/NFPA D03
Mounting interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA
Mounting position		unrestricted
Ambient temperature	[°C]	-20...+50
Weight	[kg]	4.5
Vibration resistance	[g]	25 acc. DIN IEC68, part 2-6
Hydraulic		
Max. operating pressure	[bar]	Ports P, A, B 350
	[bar]	Port T max. 35, port Y max. 35 [1]
Fluid		Hydraulic oil as per DIN 51524...535, other on request
Fluid temperature	[°C]	-20...+60
Viscosity		
permitted	[cSt] / [mm²/s]	20...380
recommended	[cSt] / [mm²/s]	30...80
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)
Nominal flow at Δp=35bar per control edge [2]	[l/min]	3 / 6 / 12 / 25 / 40
Flow maximum	[l/min]	90 (at Δp=350bar over two control edges)
Leakage at 100 bar	[ml/min]	<400 (zero lapped spool); <50 (over lapped spool)
Static / Dynamic		
Step response at 100% step [3]	[ms]	<3.5
Frequency response (±5% signal) [3]	[Hz]	350 (amplitude ratio -3dB), 350 (phase lag -90°)
Hysteresis	[%]	<0.05
Sensitivity	[%]	<0.03
Temperature drift	[%/°K]	<0.025
Electrical characteristics		
Duty ratio	[%]	100
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)
Supply voltage/ripple	[V]	DC 22 ... 30, ripple <5% eff., surge free
Current consumption max.	[A]	3.5
Switch-on current typical	[A]	22 for 0.2 ms
Input signal		
Voltage	[V]	10...0...-10, ripple <0.01% eff., surge free, 0...+10V P->A
Impedance	[kOhm]	100
Current	[mA]	20...0...-20, ripple <0.01% eff., surge free, 0...+20mA P->A
Impedance	[Ohm]	250
Current	[mA]	4...12...20, ripple <0.01% eff., surge free, 12...20mA P->A <3.6 mA = disable, <3.8 mA = according to NAMUR NE43
Impedance	[Ohm]	250
Differential input max.		
Code 0	[V]	30 for terminal D and E against PE (terminal G)
Code 5	[V]	30 for terminal 4 and 5 against PE (terminal ⏚)
Enable signal (only code 5)	[V]	5...30, Ri = 9 kOhm
Diagnostic signal	[V]	+10...0...-10 / +Ub, rated max. 5mA
Pre-fusing	[A]	4.0 medium lag
EMC		EN 50081-2 / EN50082-2
Electrical connection	Code 0	6 + PE acc. EN 175201-804
	Code 5	11 + PE acc. EN 175201-804
Wiring min.		
Code 0	[mm²]	7x1.0 (AWG 18) overall braid shield
Code 5	[mm²]	12x1.0 (AWG 18) overall braid shield
Wiring lenght max.	[m]	50

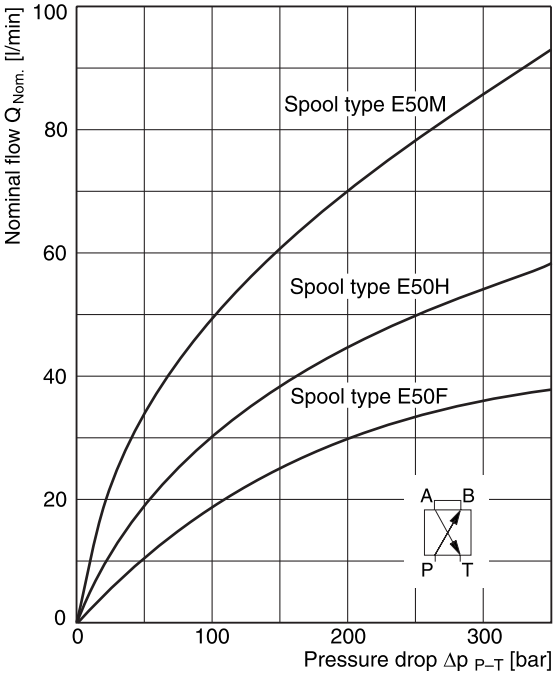
[1] For applications with p_T>35 bar the Y-port has to be connected and the plug in the Y-port has to be removed.

[2] Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

[3] Measured with load (100 bar pressure drop/two control edges)

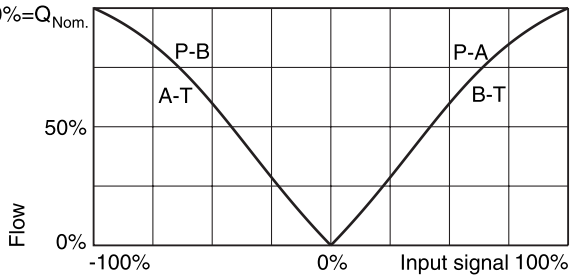
3

Functional limit (at 100% command signal)

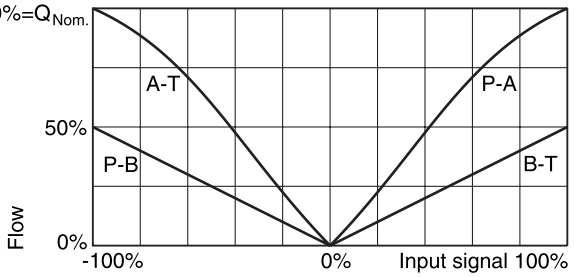


Flow curves

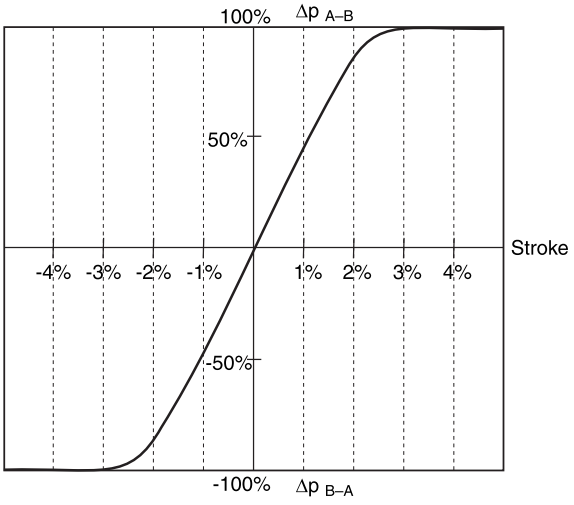
Spool type **E50**



Spool type **B60**

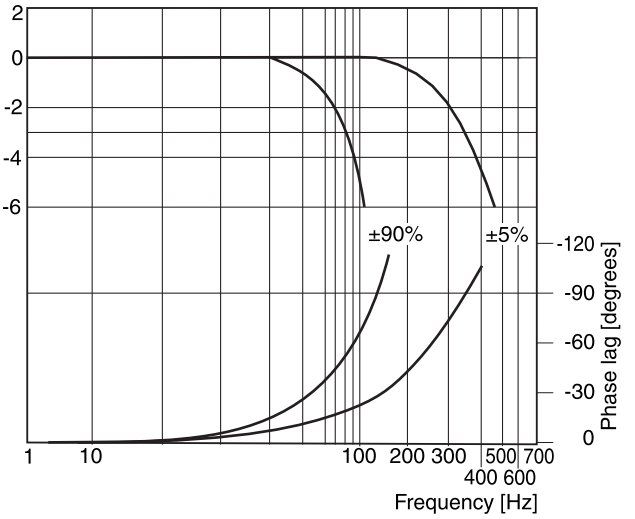


Pressure gain



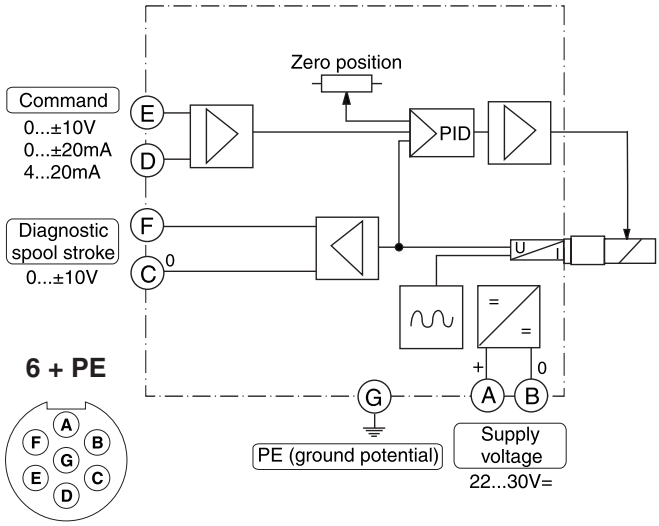
Frequency response

±5% input signal
±90% input signal

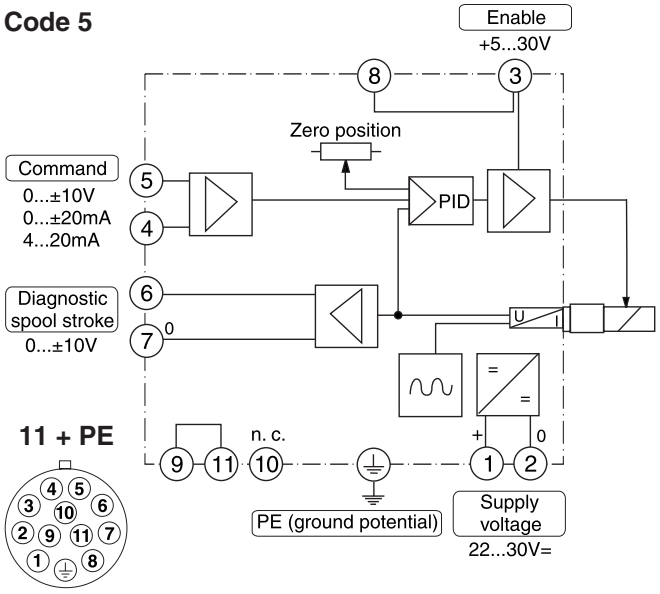


Block diagrams

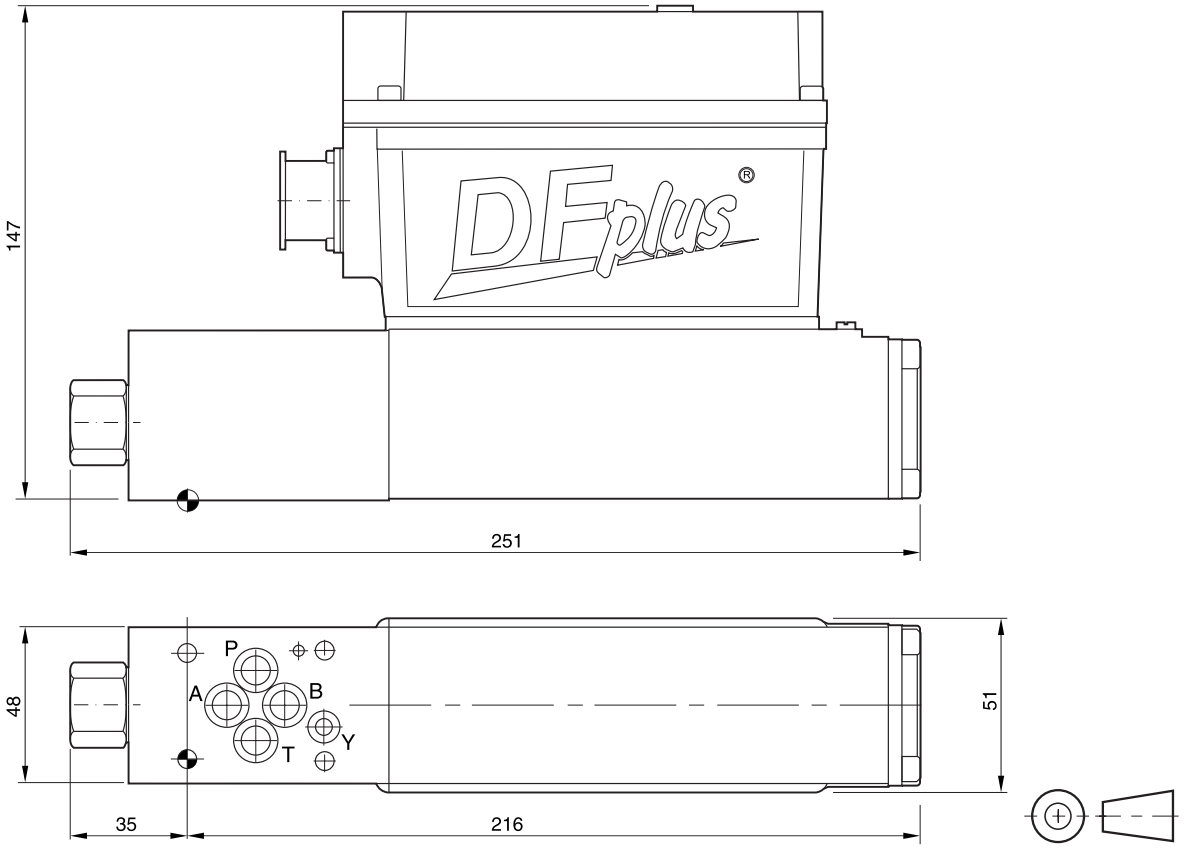
Code 0



Code 5



Dimensions



Surface finish	Kit		
R_{max}6.3 ⏥ 0.01/100	BK375	4x M5x30 DIN 912 12.9	7.6 Nm ±15%

D1FP_UK.INDD CM

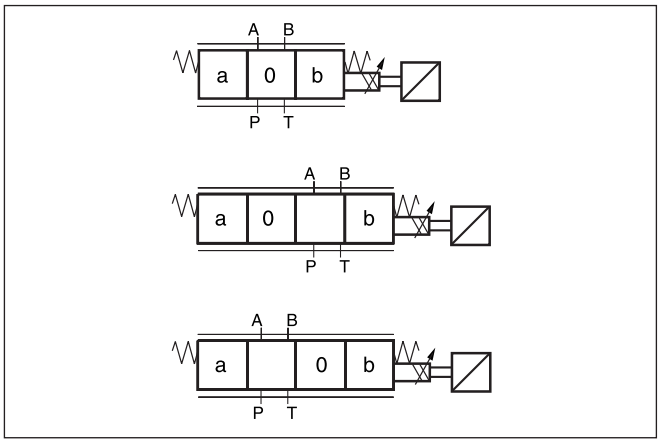
Parker Hannifin GmbH & Co. KG
Hydraulic Controls Division
Kaarst, Germany

Notes

The direct operated control valve D1FP*S of the nominal size 04 (ISO 10372) shows extremly high dynamics combined with maximum flow. The valve mounting pattern is designed to replace servovalves of size 04 (ISO 10372) with the D1FP*S.

Driven by the new patented VCD® technology the D1FP*S shows all advantages of the DFplus® series as robustness, high dynamics and no flow limit up to 350 bar. Additional features are low leakage and a defined spool position in case of power supply breakdown.

Maintenance and contamination restrictions correspond to common solenoid driven valves and pilot supply is not required. All common input signals are available.

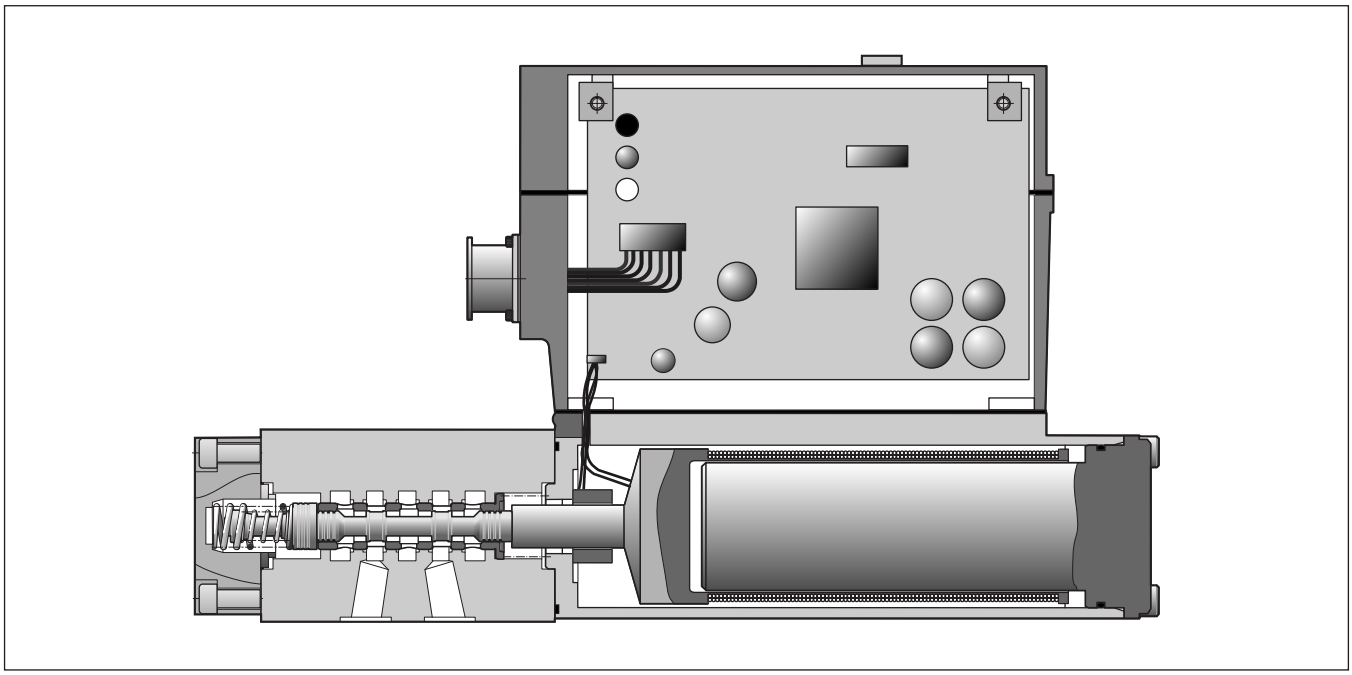


Technical features

- Servovalve size 04 (ISO 10372) mounting pattern
- Real servovalve dynamics (-3db/350Hz with ± 5% input signal)
- Low leakage
- No flow limit up to 350 bar pressure drop through the valve
- Max. tank pressure 350 bar (with external drain port y)
- High flow
- Defined spool positioning in case of power supply breakdown
- Onboard electronics

CE

D1FP*S

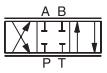


D1FPS_UK.INDD CM

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

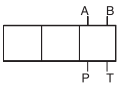
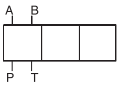
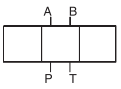
D	1	F	P			9	N			S	
Directional control valve	ISO 10372 size 04	Proportional control	VCD	Spool type	Spool position on power down [1]	Y-port (plugged) [4]	Seal NBR (other seal compound on request)	Command-signal	Acces-sories	Mounting interface ISO 10372	Design series

3

Code	Spool type	Flow [l/min] at Δp 35bar per metering edge
Zerolap		
E50M **E50H** **E50F** **E50C** **E50B**		**40** **25** **12** **6** **3**
B60M	$Q_B = Q_A/2$ 	**40 / 20**
Overlap 25%		
E01M **E01H** **E01F** **E01C** **E01B**		**40** **25** **12** **6** **3**
B31M	$Q_B = Q_A/2$ 	**40 / 20**
E02M **E02H**		**40** **25**
B32M	$Q_B = Q_A/2$ 	**40 / 20**

Code	Connection type
0	**6 + PE acc. EN175201-804**
5	**11 + PE acc. EN175201-804**

Code	Signal	Flow direction
B	**+/- 10V**	**0...+10V -> P-A**
E	**+/- 20mA**	**0...+20mA -> P-A**
S	**4...20mA**	**12...20mA -> P-A**

Code	Spool pos. on power down
A [2]	
B [2]	
C [3]	

Bold letters =
Short-term availability

[1] On power down the spool moves in a defined position. This cannot be guaranteed in case of single flow path on the control edge A – T resp. B – T with pressure drops above 120 bar or contamination in the hydraulic fluid.

[2] approx. 10% opening, only zero lapped spools

[3] only for overlapped spools

[4] needs to be removed at tank pressure >35 bar

Please order plugs separately.
See chapter 3 accessories.

General		
Design		Direct operated proportional DC valve
Actuation		VCD® actuator
Size		ISO 10372 size 04
Mounting interface [1]		Acc. ISO 10372-04-04-0-92 (x port used as y unpressurized tank)
Mounting position		unrestricted
Ambient temperature	[°C]	-20...+50
Weight	[kg]	4.5
Vibration resistance	[g]	25 acc. DIN IEC68, part 2-6
Hydraulic		
Max. operating pressure	[bar]	Ports P, A, B 350 Port T 35, port Y max. 35 [1]
Fluid		Hydraulic oil as per DIN 51524...535, other on request
Fluid temperature	[°C]	-20...+60
Viscosity		
permitted	[cSt] / [mm²/s]	20...380
recommended	[cSt] / [mm²/s]	30...80
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)
Nominal flow at Δp=35bar per control edge [2]	[l/min]	3 / 6 / 12 / 25 / 40
Flow maximum	[l/min]	90 (at Δp=350bar over two control edges)
Leakage at 100 bar	[ml/min]	<400 (zero lapped spool); <50 (over lapped spool)
Static / Dynamic		
Step response at 100% step [3]	[ms]	<3.5
Frequency response (±5% signal) [3]	[Hz]	350 (amplitude ratio -3dB), 350 (phase lag -90°)
Hysteresis	[%]	<0.05
Sensitivity	[%]	<0.03
Temperature drift	[%/°K]	<0.025
Electrical characteristics		
Duty ratio	[%]	100
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)
Supply voltage/ripple	[V]	22 ... 30, ripple <5% eff.
Current consumption max.	[A]	3.5
Switch-on current typical	[A]	22 for 0.2 ms
Input signal	[V]	10...0...-10, ripple <0.01% eff., surge free, 0...+10V P->A
Voltage	[kOhm]	100
Impedance	[mA]	20...0...-20, ripple <0.01% eff., surge free, 0...+20mA P->A
Current	[Ohm]	250
Impedance	[mA]	4...12...20, ripple <0.01% eff., surge free, 12...20mA P->A
Current		<3.6 mA = disable, <3.8 mA = according to NAMUR NE43
Impedance	[Ohm]	250
Differential input max.		
Code 0	[V]	30 for terminal D and E against PE (terminal G)
Code 5	[V]	30 for terminal 4 and 5 against PE (terminal ⏚)
Enable signal (only code 5)	[V]	5...30, Ri = 9 kOhm
Diagnostic signal	[V]	+10...0...-10 / +Ub, rated max. 5mA
Pre-fusing	[A]	4.0 medium lag
EMC		EN 50081-2 / EN50082-2
Electrical connection	Code 0	6 + PE acc. EN 175201-804
	Code 5	11 + PE acc. EN 175201-804
Wiring min.		
Code 0	[mm²]	7x1.0 (AWG 18) overall braid shield
Code 5	[mm²]	12x1.0 (AWG 18) overall braid shield
Wiring lenght max.	[m]	50

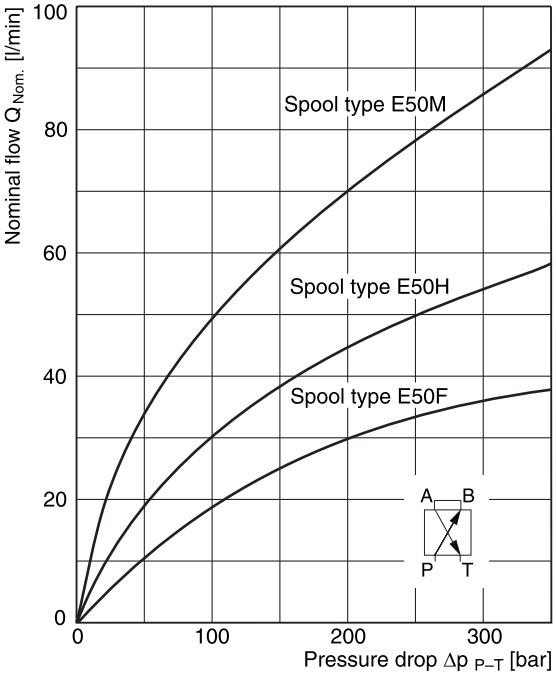
[1] For applications with p_T>35 bar the Y-port has to be connected and the plug in the Y-port has to be removed.

[2] Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

[3] Measured with load (100 bar pressure drop/two control edges)

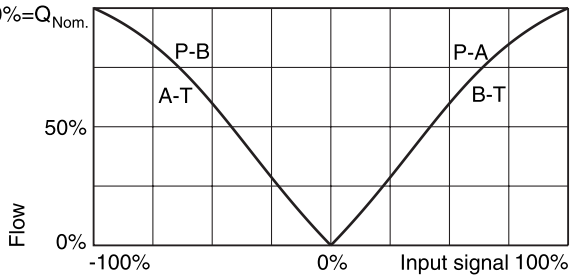
3

Functional limit (at 100% command signal)

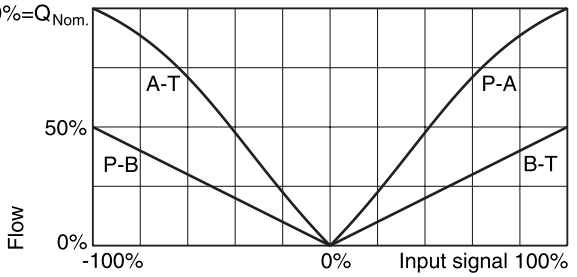


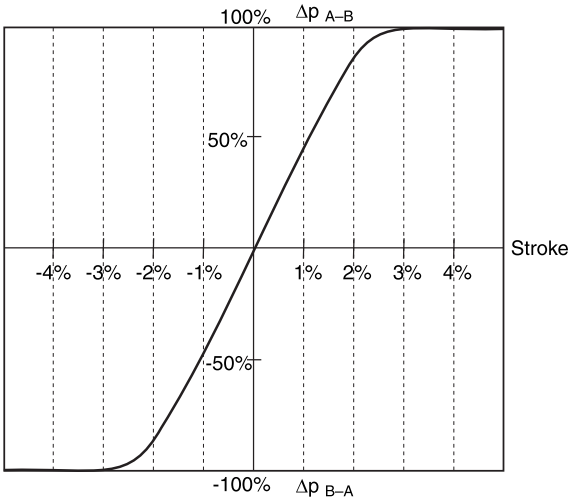
Flow curves

Spool type **E50**



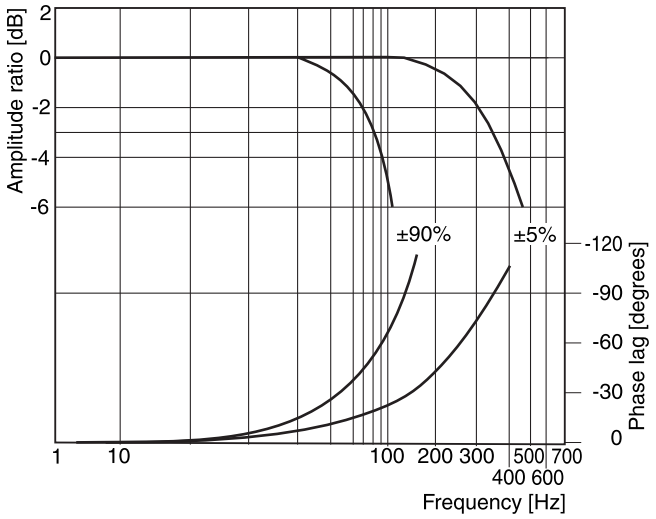
Spool type **B60**





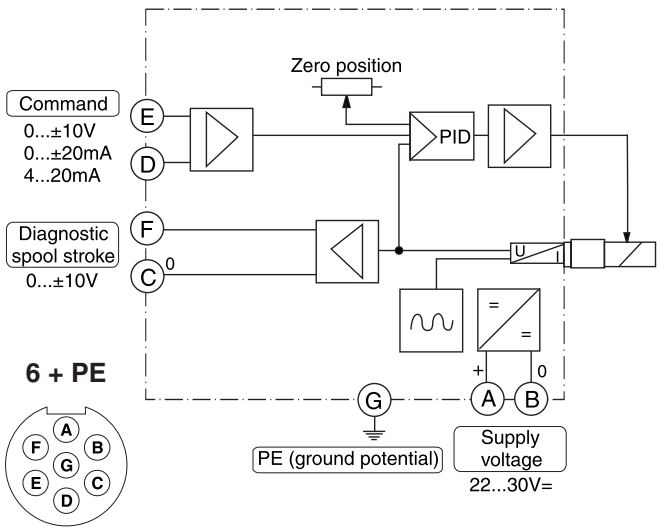
Frequency response

±5% input signal
±90% input signal

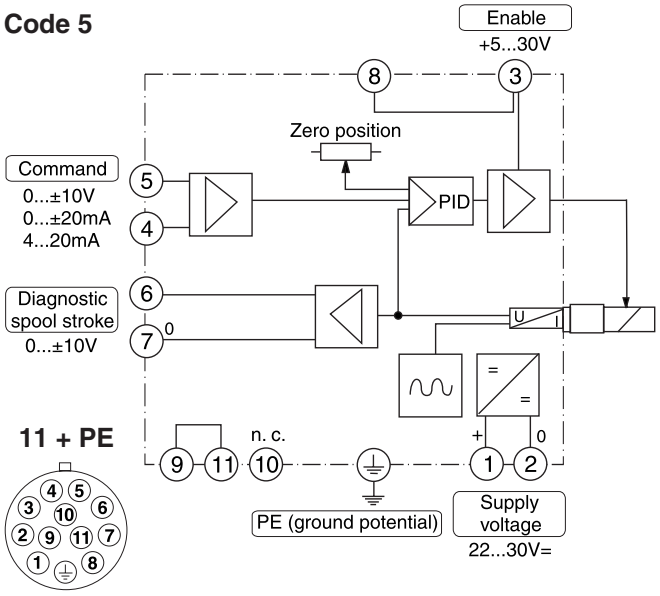


Block diagrams

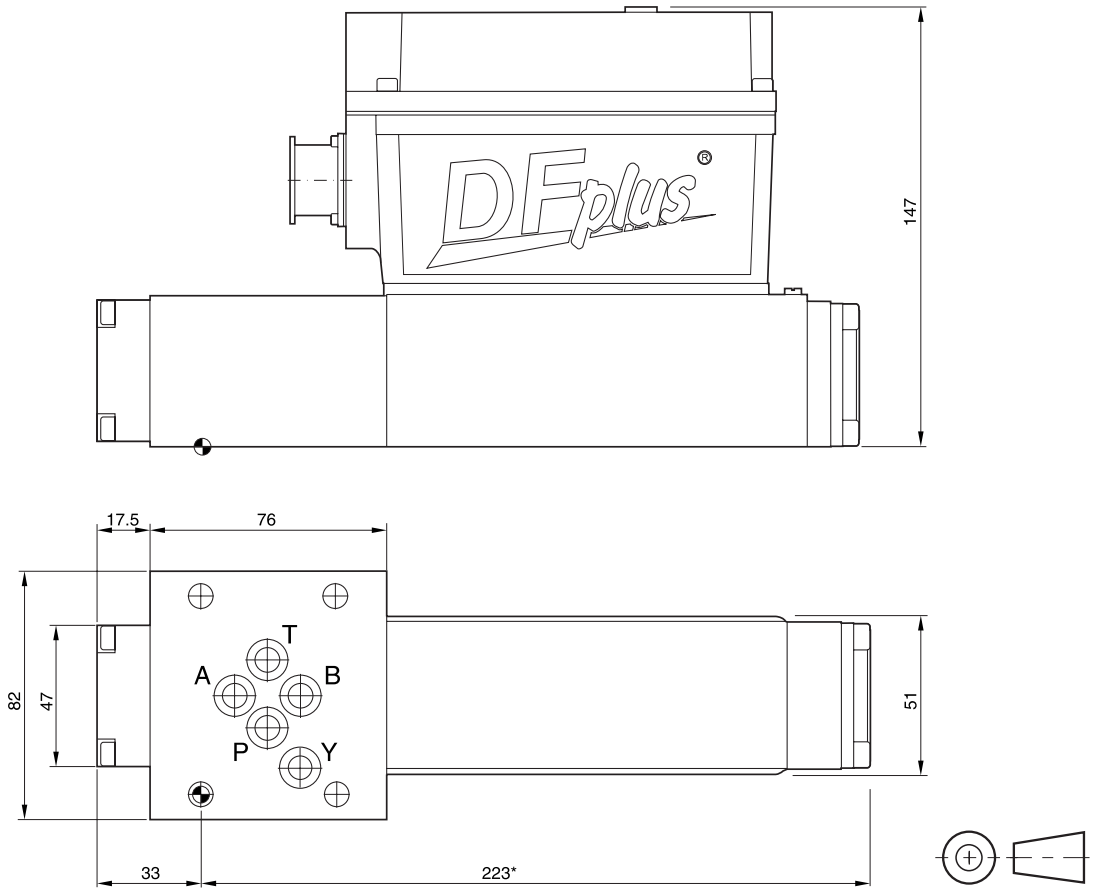
Code 0



Code 5



Dimensions



* valve drive on opposite side on request

Surface finish	Kit		
$\sqrt{R_{max}6.3}$ 0.01/100	BK414	4x M8x40 DIN 912 12.9	31.8 Nm ±15%

D1FPS_UK.INDD CM

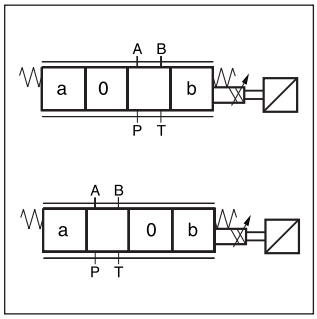
Parker Hannifin GmbH & Co. KG
Hydraulic Controls Division
Kaarst, Germany

Notes

The direct operated control valve D3FP of the nominal size NG10 (CETOP05) shows extremly high dynamics combined with high flow. First of all it is used for highest accuracy in positioning of hydraulic axis and controlling of pressure and velocity.

Driven by the new patented VCD® actuator the D3FP reaches the frequency response of real servovalves.

A loss of power supply lets the spool move in a defined position. All common input signals are available.

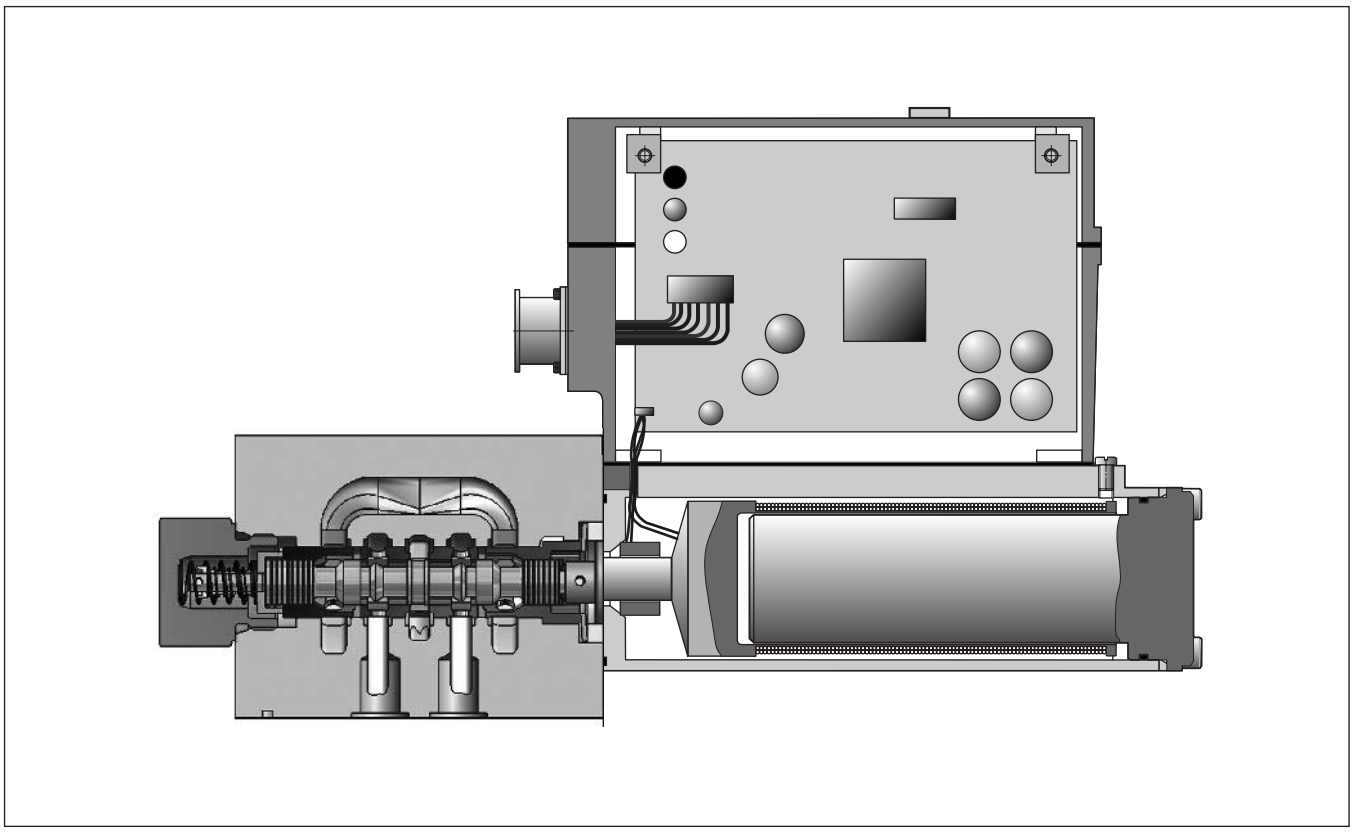


Technical features

- Extremely high dynamics
- Max. tank pressure 350 bar (with external drain port Y)
- Defined spool positioning in case of power supply breakdown
- Onboard electronics
- Spool / sleeve design

CE

D3FP



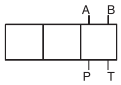
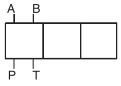
D	3	F	P			9	N			0	
Direct. control valve	Size DIN NG10 CETOP05 NFPA D05	Proportional control	VCD	Spool type	Spool position on power down [1]	Y-port (plugged) [3]	Seal NBR (other seal compound on request)	Command-signal	Acces-sories	Spool in sleeve design	Design series

3

Code	Spool type	Flow [l/min] at Δp 35bar per metering edge
Zerolap		
E50Y		**100**
E50P		**50**

Code	Connection type
0	**6 + PE acc. EN175201-804**
5	**11 + PE acc. EN175201-804**

Code	Signal	Flow direction
B	**+/- 10V**	**0...+10V -> P-A**
E	**+/- 20mA**	**0...+20mA -> P-A**
S	**4...20mA**	**12...20mA -> P-B**

Code	Spool pos. on power down
A[2]	
B[2]	

Bold letters =
Short-term availability

[1] On power down the spool moves in the middle position. This cannot be guaranteed in case of contamination in the hydraulic fluid.

[2] approx. 10% opening

[3] needs to be removed at tank pressure >35 bar

Please order plugs separately.
See chapter 3 accessories.

General			
Design			Direct operated proportional DC valve
Actuation			VCD® actuator
Size			NG10/CETOP05/NFPA D05
Mounting interface			DIN 24340 / ISO 4401 / CETOP RP121 / NFPA
Mounting position			unrestricted
Ambient temperature		[°C]	-20...+50
Weight		[kg]	6.5
Vibration resistance		[g]	25 acc. DIN IEC68, part 2-6
Hydraulic			
Max. operating pressure		[bar]	Ports P, A, B 350
		[bar]	Port T max. 35, port Y max. 35 [1]
Fluid			Hydraulic oil as per DIN 51524...535, other on request
Fluid temperature		[°C]	-20...+60
Viscosity	permitted	[cSt] / [mm²/s]	20...380
	recommended	[cSt] / [mm²/s]	30...80
Filtration			ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)
Flow nominal at Δp=35bar per control edge [2]		[l/min]	50 / 100
Flow maximum		[l/min]	150
Leakage at 100 bar		[ml/min]	<400
Static / Dynamic			
Hysteresis		[%]	<0.05
Temperature drift		[%/°K]	<0.025
Sensitivity		[%]	<0.03
Step response at 100% step [3]		[ms]	<6
Frequency response (±5% signal) [3]		[Hz]	200 (amplitude ratio -3dB), 200 (phase lag -90°)
Electrical characteristics			
Duty ratio		[%]	100
Protection class			IP65 in accordance with EN 60529 (plugged and mounted)
Supply voltage/ripple		[V]	22 ... 30, ripple <5% eff.
Current consumption max.		[A]	3.5
Switch-on current typical		[A]	22 for 0.2 ms
Input signal			
	Voltage	[V]	10...0...-10, ripple <0.01% eff., surge free, 0...+10V P->A
	Impedance	[kOhm]	100
	Current	[mA]	20...0...-20, ripple <0.01% eff., surge free, 0...+20mA P->A
	Impedance	[Ohm]	250
	Current	[mA]	4...12...20, ripple <0.01% eff., surge free, 12...20mA P->B <3.6 mA = disable, <3.8 mA = according to NAMUR NE43
	Impedance	[Ohm]	250
Differential input max.		[V]	30 for terminal D and E against PE (terminal G) 30 for terminal 4 and 5 against PE (terminal ⏚)
Enable signal (only code 5)		[V]	5...30, Ri = 9 kOhm
Diagnostic signal		[V]	+10...0...-10 / +Ub, rated max. 5mA
Pre-fusing		[A]	4.0 medium lag
EMC			EN 50081-2 / EN50082-2
Electrical connection		Code 0	6 + PE acc. EN 175201-804
		Code 5	11 + PE acc. EN 175201-804
Wiring min.			
Code 0		[mm²]	7 x 1.0 (AWG 18) overall braid shield
Code 5		[mm²]	12 x 1.0 (AWG 18) overall braid shield
Wiring lenght max.		[m]	50

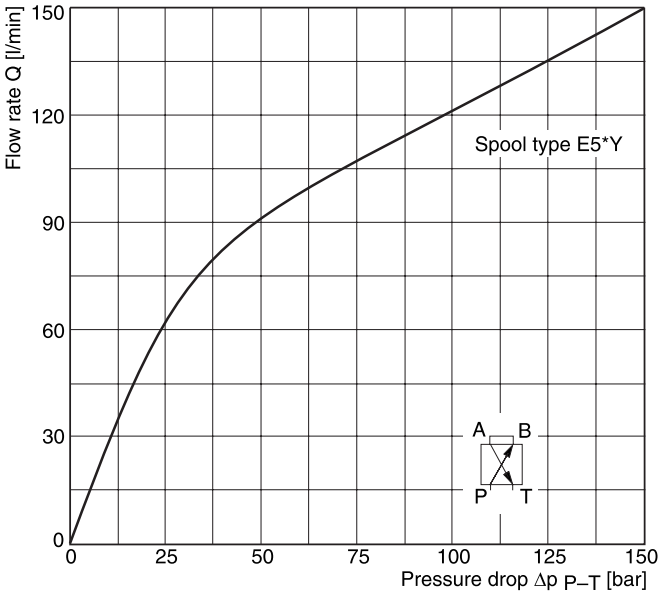
[1] For applications with p_T>35 bar the Y-port has to be connected and the plug in the Y-port has to be removed.

[2] Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

[3] Measured with load (100 bar pressure drop/two control edges)

3

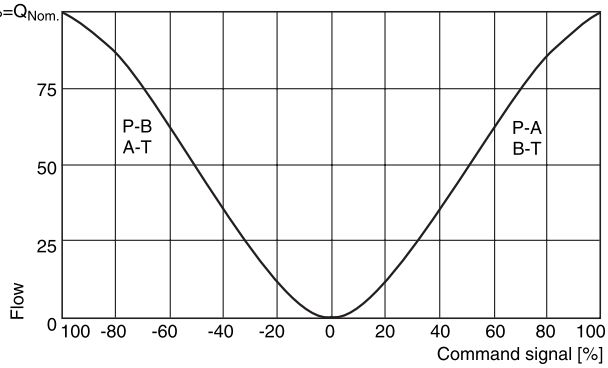
Functional limit* (at 100% command signal)



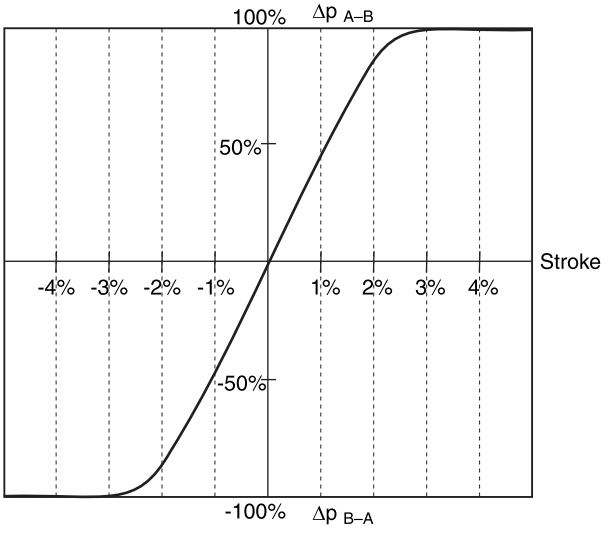
*** When exceeding the functional limits, for a period of time the valve will go into fail safe and power supply needs to be switched off/on to re-enable the valve.**

Flow curve

Spool type **E50/E55**



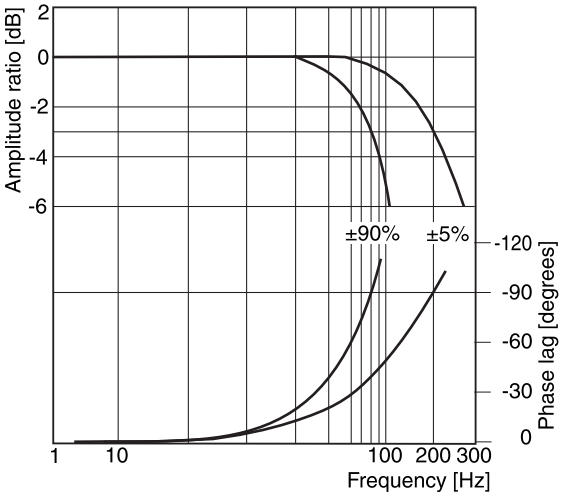
Pressure gain



Frequency response

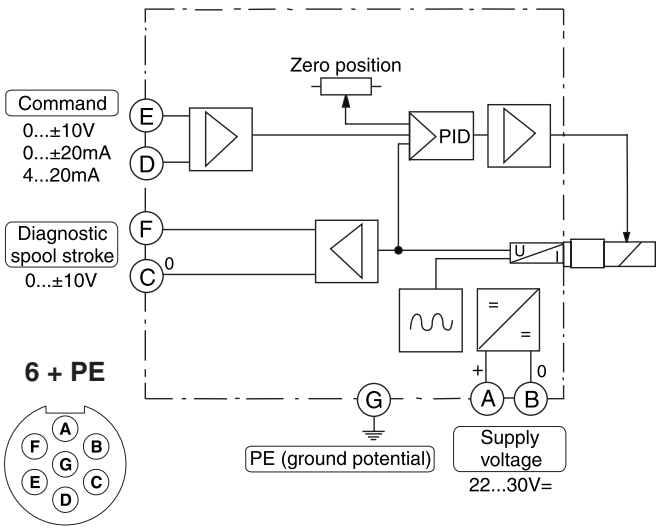
±5% input signal

±90% input signal

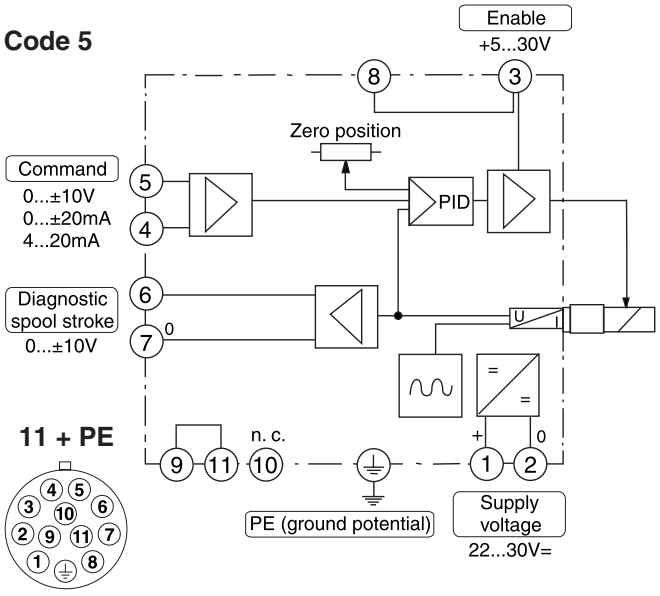


Block diagrams

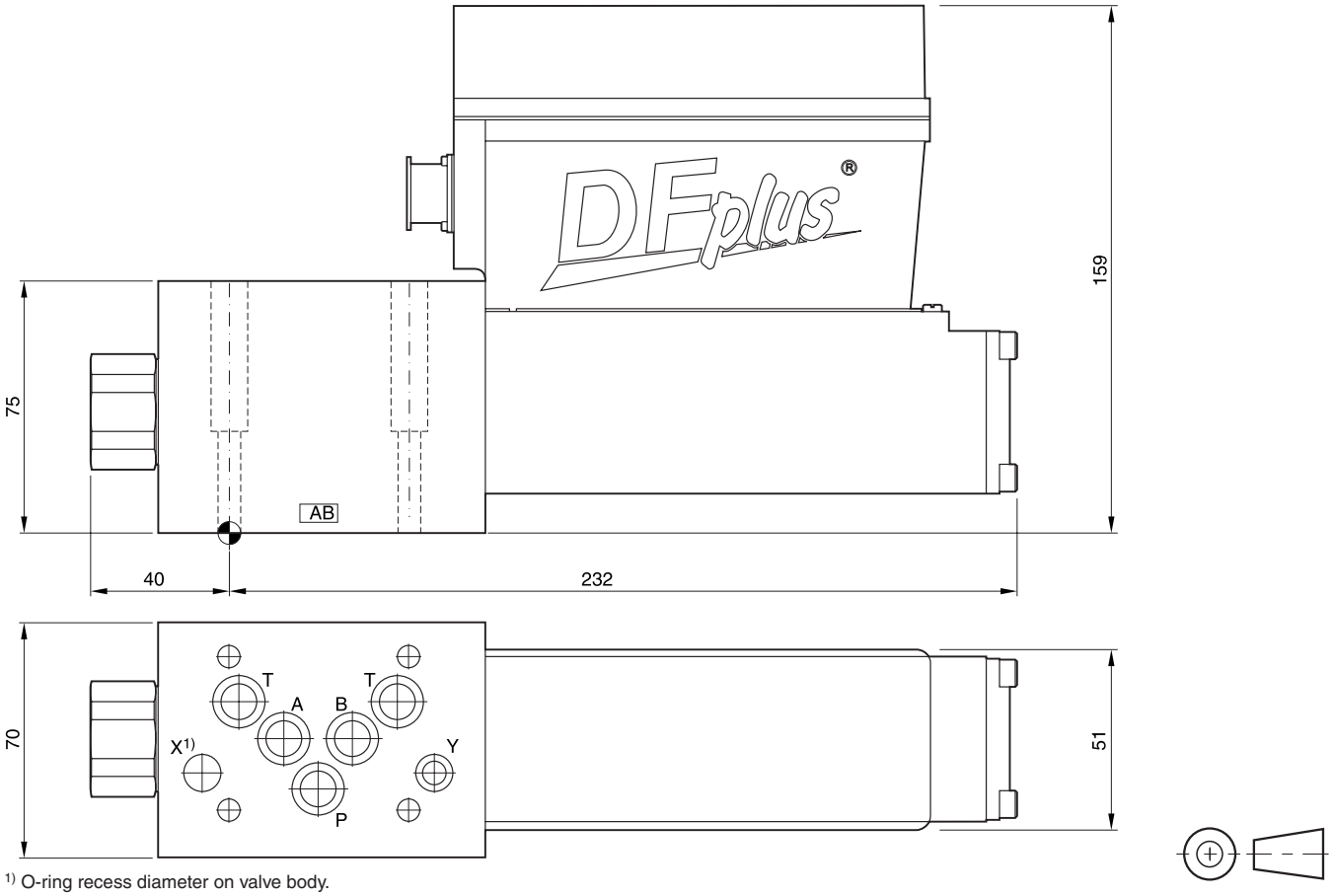
Code 0



Code 5



Dimensions



1) O-ring recess diameter on valve body.

Surface finish	Kit		
R_{max}6.3 ▱ 0.01/100	BK360	4xM6x40 DIN 912 12.9	13.2 Nm ±15%

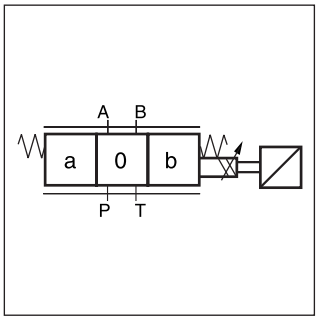
D3FP0_UK.INDD CM

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

Notes

The direct operated control valve D3FP of the nominal size NG10 (CETOP05) shows extremly high dynamics combined with high flow. First of all it is used for highest accuracy in positioning of hydraulic axis and controlling of pressure and velocity. Driven by the new patented VCD® actuator the D3FP reaches the frequency response of real servovalves.

A loss of power supply lets the spool move in a defined position. All common input signals are available.

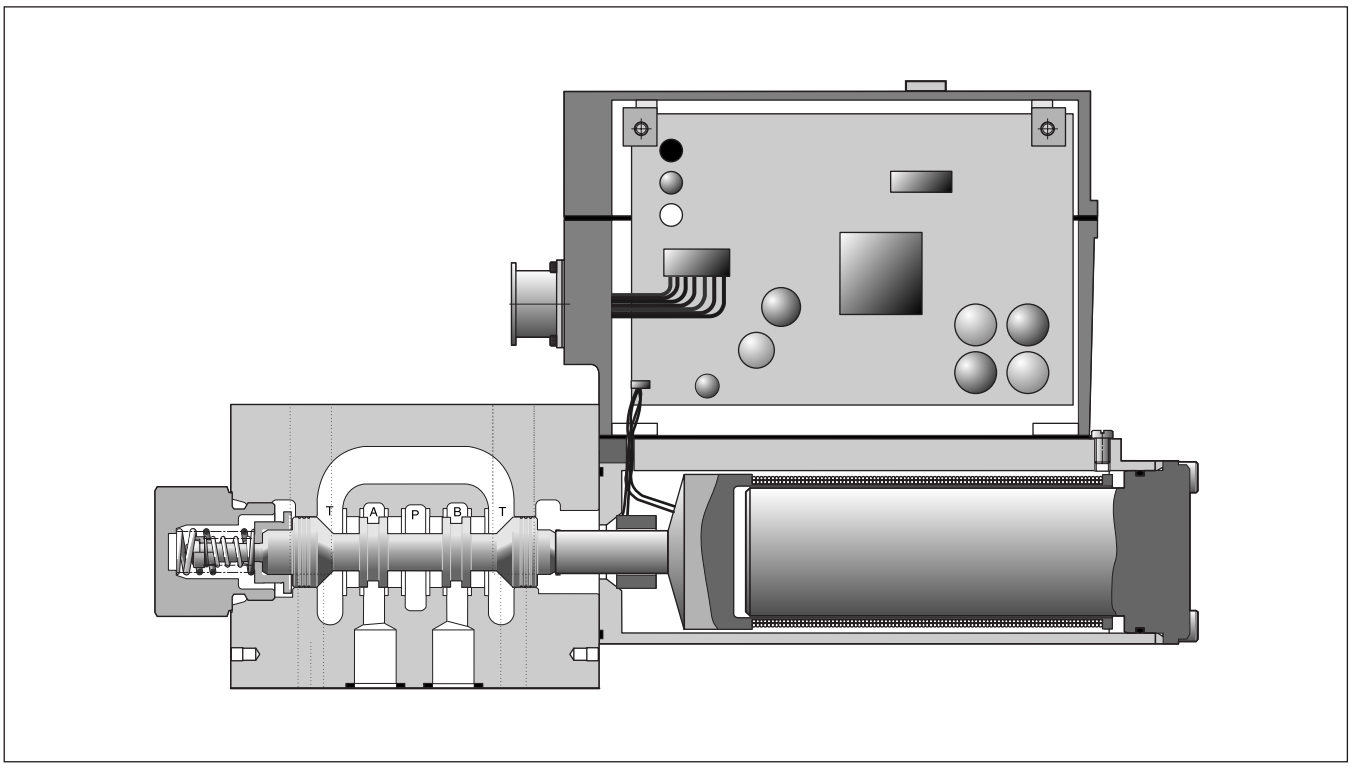


Technical features

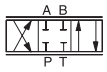
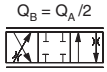
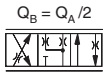
- Extremly high dynamics
- Max. tank pressure 350 bar (with external drain port Y)
- Defined spool positioning
- Onboard electronics
- Spool / body design

CE

D3FP



D	3	F	P		C	9	N			3	
Directional control valve	**Size DIN NG06 CETOP03 NFPA D03**	**Proportional control**	**VCD**	**Spool type**	**Spool position on power down [1]**	**Y-port (plugged) [2]**	**Seal NBR** (other seal compound on request)	**Command signal**	**Acces-sories**	**Spool in body design**	**Design series**

Code	Spool type	Flow [l/min] at Δp 35bar per metering edge
Overlap 20%		
E01Y **E01P**		**100** **50**
E02Y **E02P**		**100** **50**
B31Y **B31P**	$Q_B = Q_A/2$ 	**100 / 50** **50 / 25**
B32Y **B32P**	$Q_B = Q_A/2$ 	**100 / 50** **50 / 25**

Code	Connection type
0	**6 + PE acc. EN175201-804**
5	**11 + PE acc. EN175201-804**

Code	Signal	Flow direction
B	**+/- 10V**	**0...+10V -> P-A**
E	**+/- 20mA**	**0...+20mA -> P-A**
S	**4...20mA**	**12...+20mA -> P-A**

[1] On power down the spool moves in the middle position. This cannot be guaranteed in case of contamination in the hydraulic fluid.

[2] needs to be removed at tank pressure >35 bar

Please order plugs separately.

See chapter 3 accessories.

General			
Design			Direct operated proportional DC valve
Actuation			VCD® actuator
Size			NG10/CETOP05/NFPA D05
Mounting interface			DIN 24340 / ISO 4401 / CETOP RP121 / NFPA
Mounting position			unrestricted
Ambient temperature		[°C]	-20...+50
Weight		[kg]	6.5
Vibration resistance		[g]	25 acc. DIN IEC68, part 2-6
Hydraulic			
Max. operating pressure		[bar]	Ports P, A, B 350
		[bar]	Port T max. 35, port Y max. 35 [1]
Fluid			Hydraulic oil as per DIN 51524...535, other on request
Fluid temperature		[°C]	-20...+60
Viscosity	permitted	[cSt] / [mm²/s]	20...380
	recommended	[cSt] / [mm²/s]	30...80
Filtration			ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)
Flow nominal at Δp=35bar per control edge [2]		[l/min]	50 / 100
Flow maximum		[l/min]	150
Leakage at 100 bar		[ml/min]	<150
Static / Dynamic			
Hysteresis		[%]	<0.05
Temperature drift		[%/°K]	<0.025
Sensitivity		[%]	<0.03
Step response at 100% step [3]		[ms]	<6
Frequency response (±5% signal) [3]		[Hz]	200 at -3dB, 200 at -90° / 80 at -3dB, 80 at -90°
Electrical characteristics			
Duty ratio		[%]	100
Protection class			IP65 in accordance with EN 60529 (plugged and mounted)
Supply voltage/ripple		[V]	22 ... 30, ripple <5% eff.
Current consumption max.		[A]	3.5
Switch-on current typical		[A]	22 for 0.2 ms
Input signal			
	Voltage	[V]	10...0...-10, ripple <0.01% eff., surge free, 0...+10V P->A
	Impedance	[kOhm]	100
	Current	[mA]	20...0...-20, ripple <0.01% eff., surge free, 0...+20mA P->A
	Impedance	[Ohm]	250
	Current	[mA]	4...12...20, ripple <0.01% eff., surge free, 12...20mA P->B <3.6 mA = disable, <3.8 mA = according to NAMUR NE43
	Impedance	[Ohm]	250
Differential input max.		[V]	30 for terminal D and E against PE (terminal G) 30 for terminal 4 and 5 against PE (terminal ⏚)
Enable signal (only code 5)		[V]	5...30, Ri = 9 kOhm
Diagnostic signal		[V]	+10...0...-10 / +Ub, rated max. 5mA
Pre-fusing		[A]	4.0 medium lag
EMC			EN 50081-2 / EN50082-2
Electrical connection		Code 0 Code 5	6 + PE acc. EN 175201-804 11 + PE acc. EN 175201-804
Wiring min.			
Code 0		[mm²]	7 x 1.0 (AWG 18) overall braid shield
Code 5		[mm²]	12 x 1.0 (AWG 18) overall braid shield
Wiring lenght max.		[m]	50

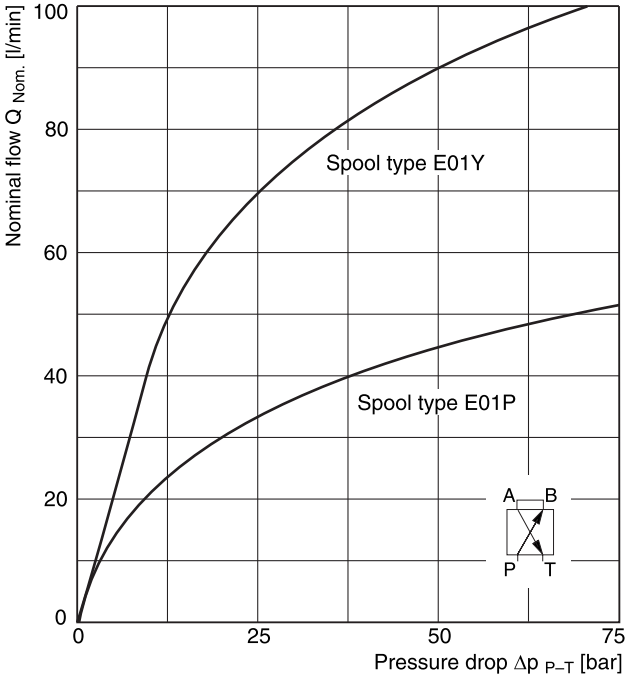
[1] For applications with p_T>35 bar the Y-port has to be connected and the plug in the Y-port has to be removed.

[2] Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

[3] Measured with load (100 bar pressure drop/two control edges)

3

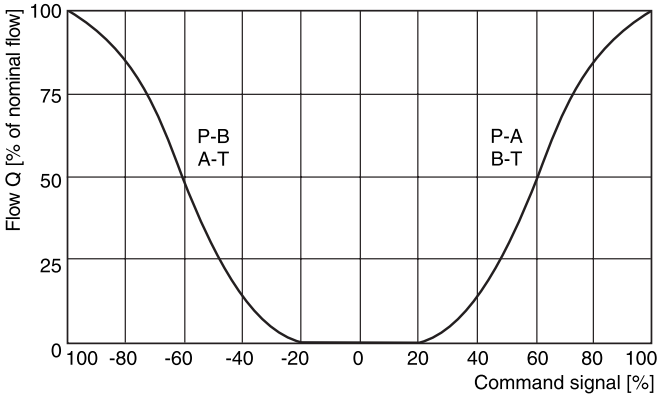
Functional limit* (at 100% command signal)



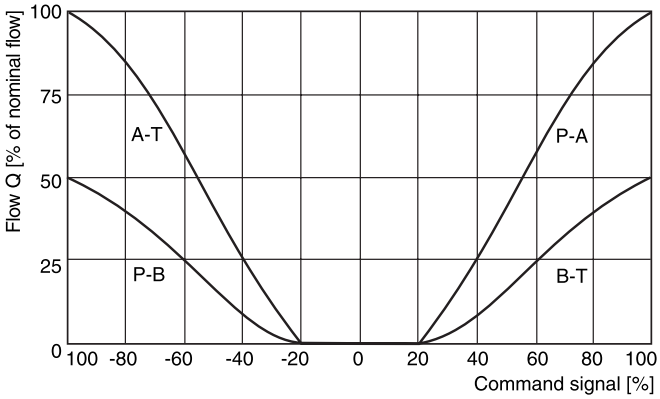
*** When exceeding the functional limits, for a period of time the valve will go into fail safe and power supply needs to be switched off/on to re-enable the valve.**

Flow curves

Spool type **E01**

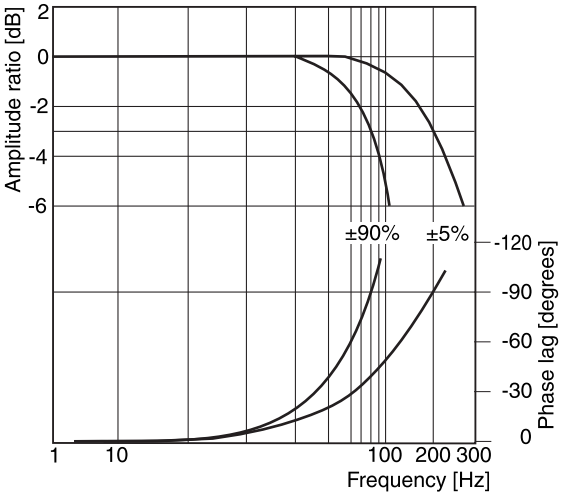


Spool type **B31**



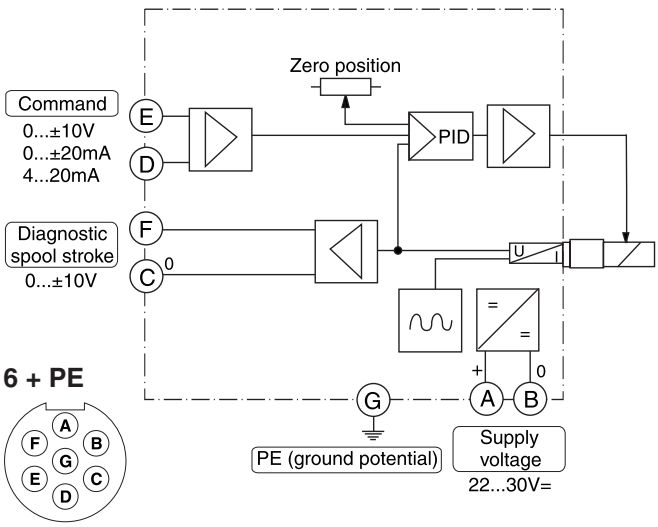
Frequency response

±5% input signal
±90% input signal



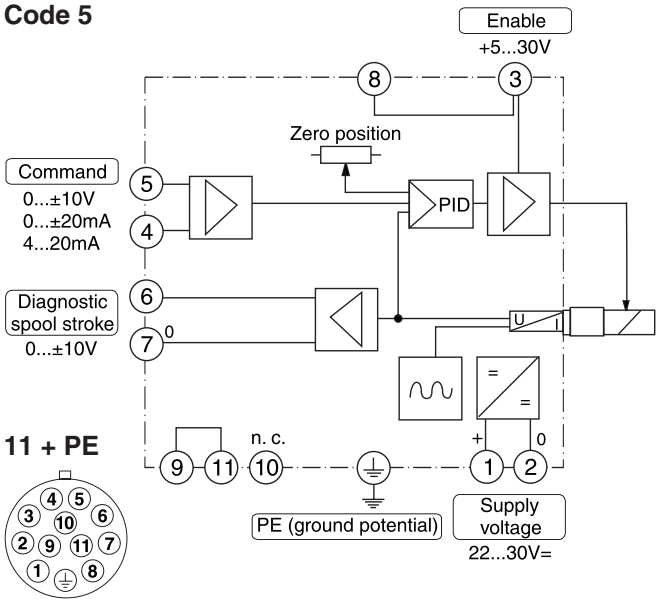
Block diagrams

Code 0



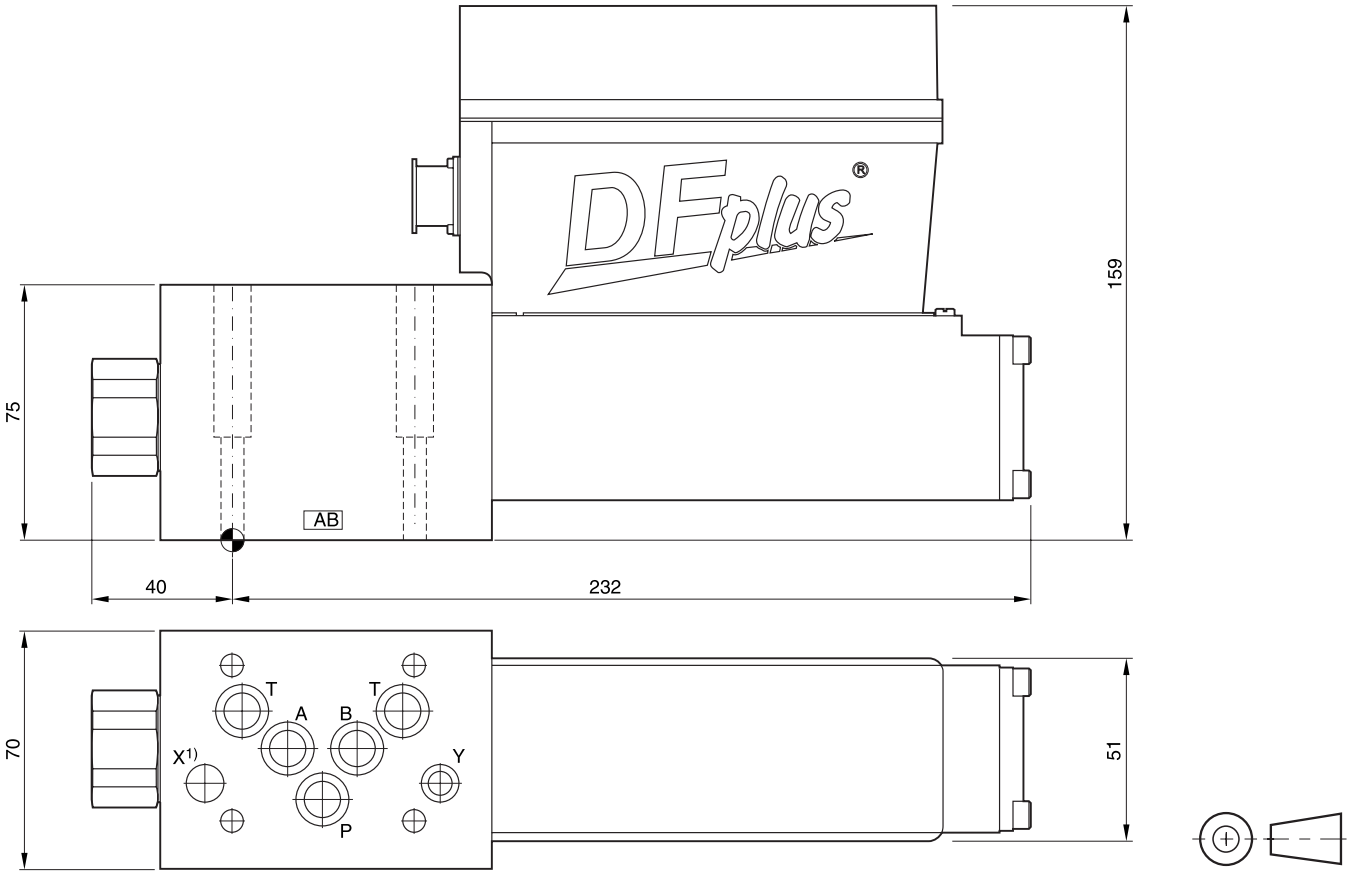
6 + PE

Code 5



11 + PE

Dimensions



1) O-ring recess diameter on valve body.

Surface finish	Kit		
$R_{max}6.3$ 0.01/100	BK330	4x M6x40 DIN 912 12.9	13.2 Nm ±15%

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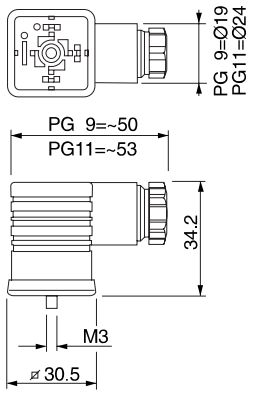
Hydraulic Controls Division
Kaarst, Germany

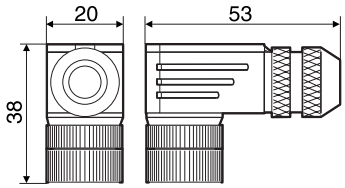
Notes

Solenoid connector
D*FB, D*FC, D*1FW, D*1FS



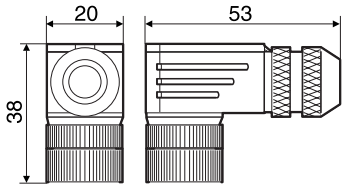
Description	Variation	Order No.
EN 175301-803 2+PE	PG 9 black B	5001710
EN 175301-803 2+PE	PG 9 grey A	5001711
EN 175301-803 2+PE	PG 11 black B	5001716
EN 175301-803 2+PE	PG 11 grey A	5001717

Feedback connector
D*FC, D*1FS



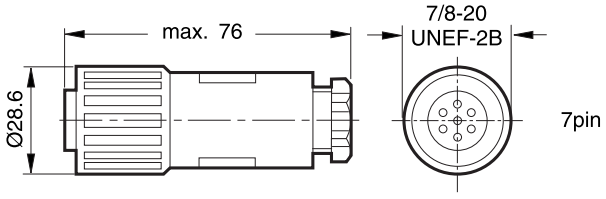
Description	Order No.
IEC 61076-2-101 M12 / 4 + PE	5004109

Monitor switch connector
D*1FW / D*1FT / D*1FS / D*1FH



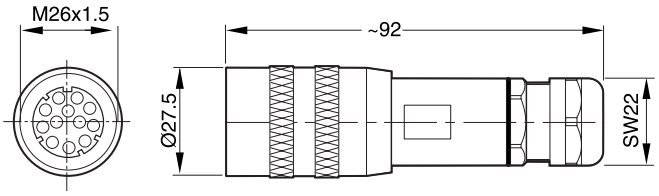
Description	Order No.
IEC 61076-2-101 M12 / 4 + PE	5004109

Central connector
D1FT / D*1FT / D*1FH / D*FP*0



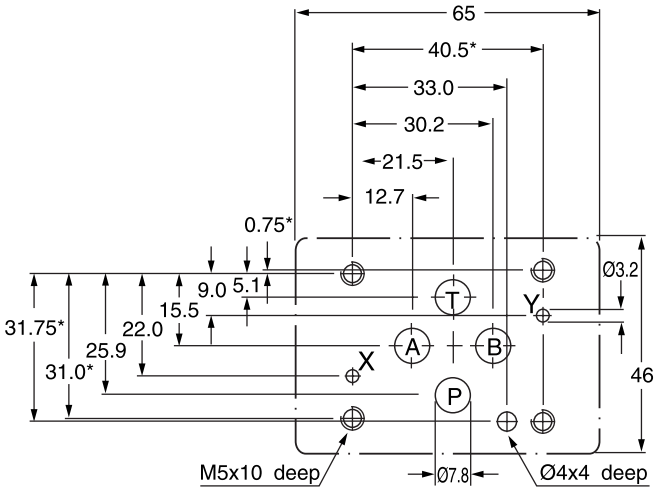
Description	Order No.
EN 175201-804 6 + PE	5004072

Central connector
D*FP*5

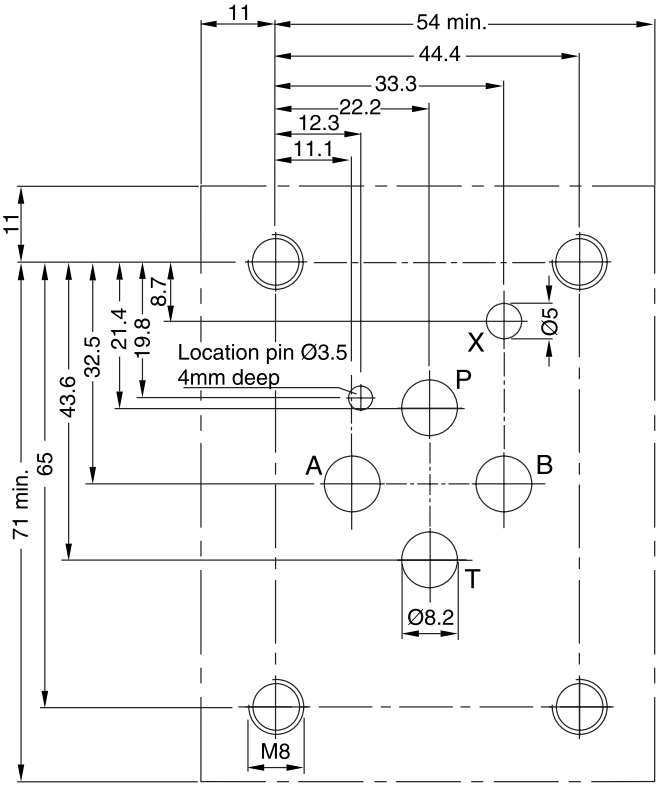


Description	Order No.
EN 175201-804 11 + PE	5004711

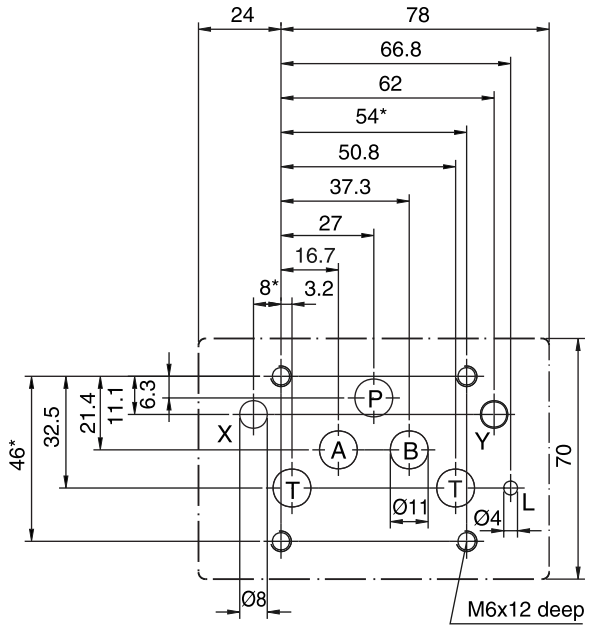
to DIN 24340-A6, size NG06/CETOP03



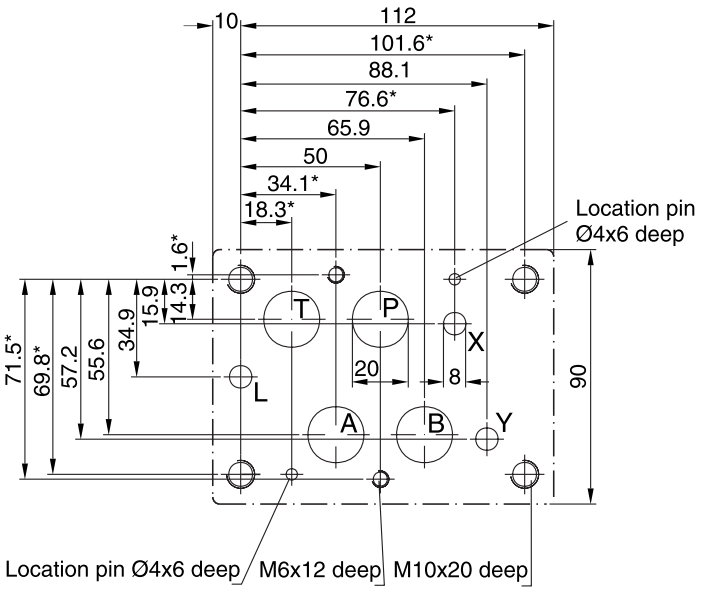
to ISO 10372-04-04-0-92, size 04



to DIN 24340-A10, size NG10/CETOP05



to DIN 24340-A16, size NG16/CETOP07



With * marked dimensions ± 0.1mm.
All other dimensions ± 0.2mm.

Subplates and manifolds see chapter 12.

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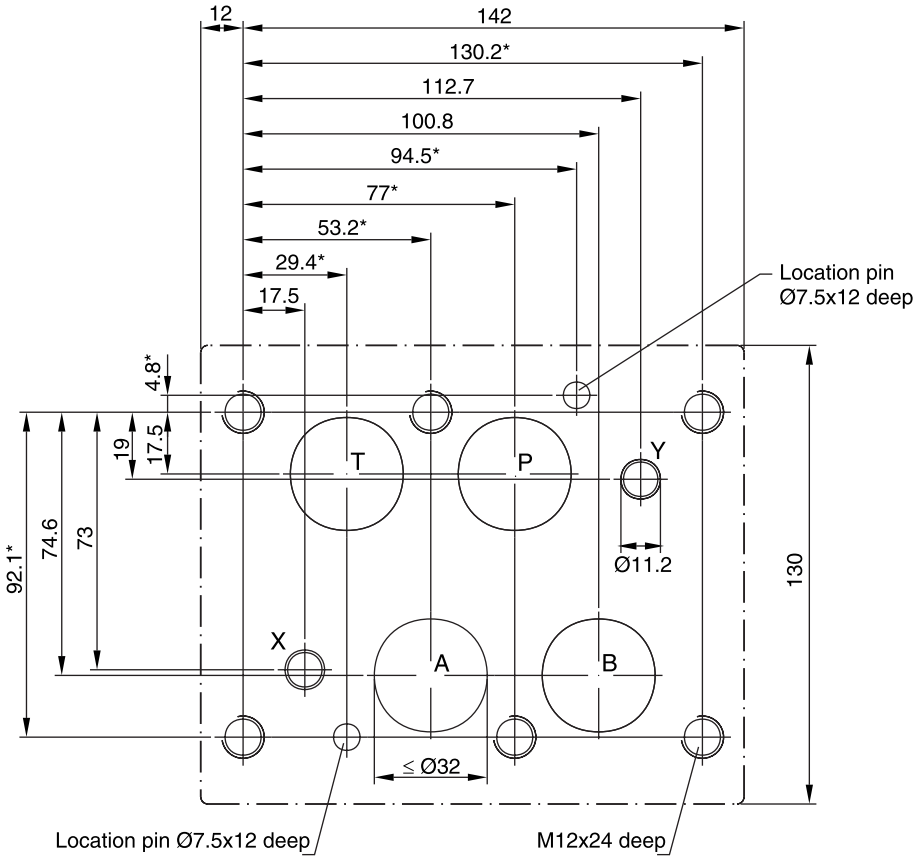
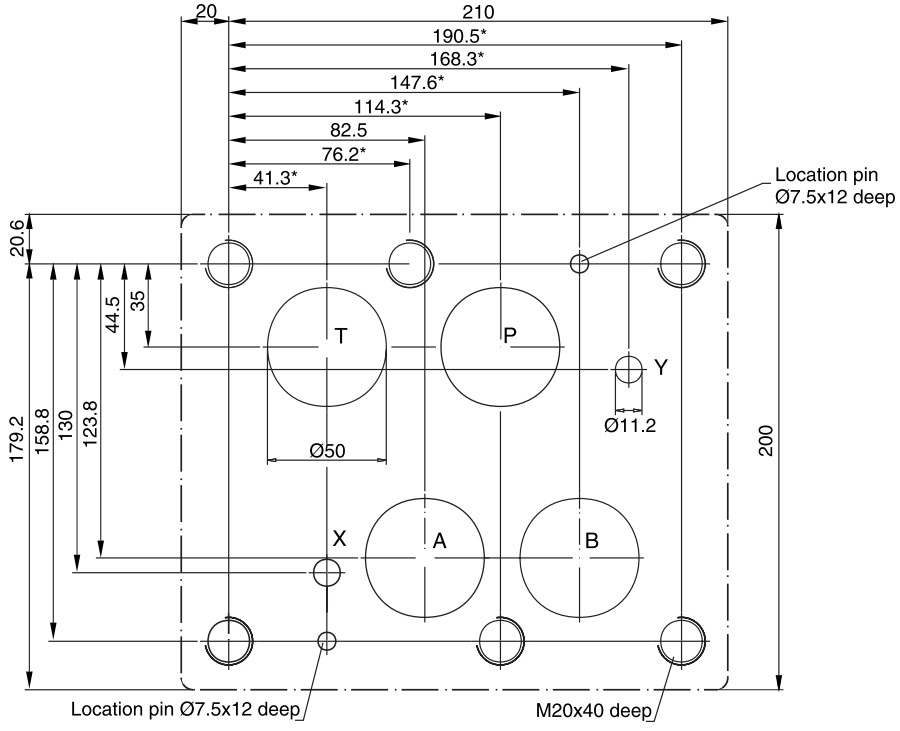
to DIN 24340-A25, size NG25/CETOP08



to DIN 24340-A32, size NG32/CETOP10



With * marked dimensions ± 0.1mm.
All other dimensions ± 0.2mm.

Subplates and manifolds see chapter 12.

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Notes