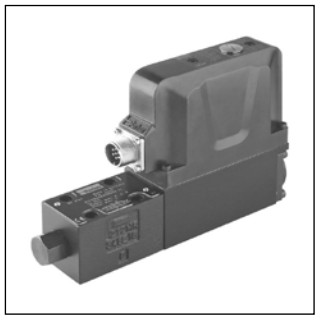
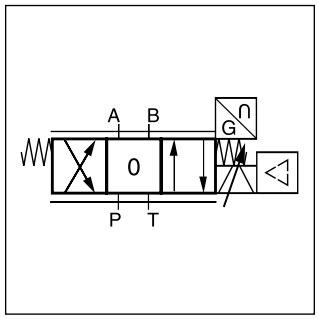
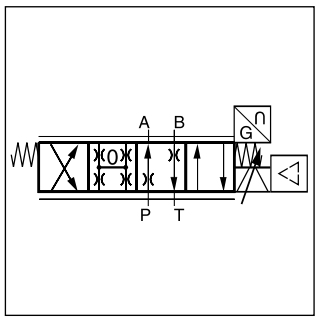
The direct operated control valve D1FP of the nominal size NG06 (CETOP 03) shows extremly high dynamics combined with maximum flow. It is the preferred choice for highest accuracy in positioning of hydraulic axis and controlling of pressure and velocity.

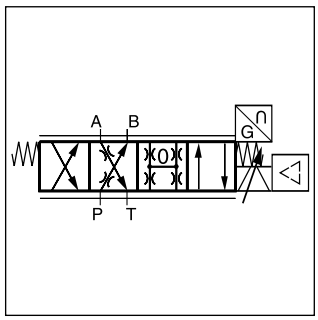
Driven by the patented VCD® actuator the D1FP reaches the frequency response of real servovalves. Compared with solenoid driven valves the D1FP can also be used in applications with pressure drops up to 350 bar across the valve. Because of the high flow capability the D1FP can be a substitute for NG10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

At power-down the spool moves in a defined position. All common input signals are available.





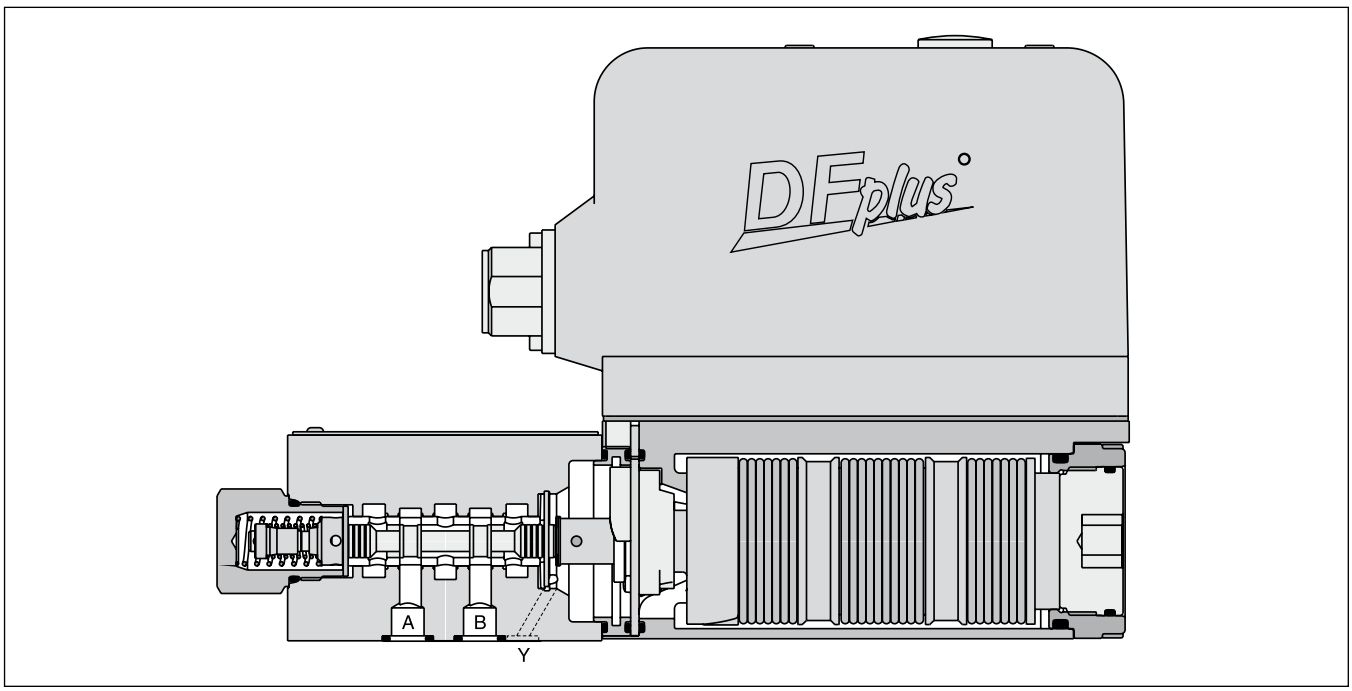




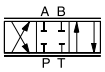
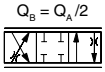
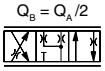
Technical features

- Real servovalve dynamics
  (-3 dB / 350 Hz 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 at power-down - optional
  P-A/B-T or P-B/A-T or center position
  (for overlapped spools)
- Onboard electronics

CE



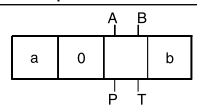
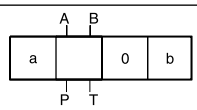
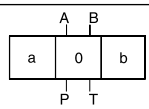
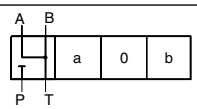
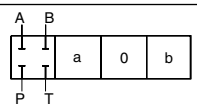
D	1	F	P			9				0	
Directional control valve	**Size DIN NG06 CETOP 03 NFPA D03**	**Proportional control**	**VCD**	**Spool type**	**Spool position on power down [1]**	**Y-port (plugged) [5]**	**Seals**	**Command signal**	**Acces-sories**	**Spool/ sleeve design**	**Design series** (not required for ordering)

Code	Spool type	Flow [l/min] at Δp 35 bar per metering edge
Zerolap		
E50M		**40**
E50H		**25**
E50G		**16**
E50F		**12**
E50C		**6**
E50B		**3**
B60M	$Q_B = Q_A/2$ 	**40 / 20**
B60H		**25 / 12.5**
B60G		**16 / 8**
B60F		**12 / 6**
B60C		**6 / 3**
Underlap approx. -0.5 %		
E55M		**40**
E55H		**25**
E55G		**16**
E55F		**12**
E55C		**6**
E55B		**3**
Overlap 25 %		
E01M		**40**
E01H		**25**
E01G		**16**
E01F		**12**
E01C		**6**
E01B		**3**
B31M	$Q_B = Q_A/2$ 	**40 / 20**
B31H		**25 / 12.5**
B31G		**16 / 8**
B31F		**12 / 6**
B31C		**6 / 3**
E02M		**40**
E02H		**25**
E02G		**16**
E02F		**12**
E02C		**6**
E02B		**3**
B32M	$Q_B = Q_A/2$ 	**40 / 20**
B32H		**25 / 12.5**
B32G		**16 / 8**
B32F		**12 / 6**
B32C		**6 / 3**

Code	Connection type
0	**6 + PE acc. EN175201-804**
5	**11 + PE acc. EN175201-804**
7	**6 + PE + Enable**

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

Code	Seals
N	**NBR**
V	**FPM**
H	**for HFC fluid**

Code	Spool position at power down
A [2]	
B [2]	
C [3]	
H [4]	
J [4]	

Note:

Adapter plate for ISO 4401 to ISO 10372 size 04
Ordering code HAP04WV06-1661
Please order connector separately, see chapter 3 accessories.

Short delivery time for all variations

[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 and underlap spools.

[3] Only for overlapped spools.

[4] Not for flow code M (40 l/min).

[5] Needs to be removed at tank pressure >35 bar.

General			
Design			Direct operated proportional DC valve
Actuation			VCD® actuator
Size			NG06 / CETOP 03 / NFPA D03
Mounting interface			DIN 24340 / ISO 4401 / CETOP RP121 / NFPA
Mounting position			unrestricted
Ambient temperature		[°C]	-20...+50
$MTTF_D$ value		[years]	75
Weight		[kg]	5.0
Vibration resistance		[g]	10 Sinus 5...2000 Hz acc. IEC 68-2-6 30 Random noise 20...2000 Hz acc. IEC 68-2-36 15 Shock acc. IEC 68-2-27
Hydraulic			
Max. operating pressure		[bar]	Ports P, A, B 350, port T 35 for internal drain, 350 for external drain, port Y 35 [1]
Fluid			Hydraulic oil as per DIN 51524 ... 51535, other on request
Fluid temperature		[°C]	-20...+60
Viscosity	permitted	[cSt] / [mm^2/s]	20...380
	recommended	[cSt] / [mm^2/s]	30...80
Filtration			ISO 4406 (1999) 18/16/13
Nominal flow at Δp=35 bar per control edge [2]		[l/min]	3 / 6 / 12 / 16 / 25 / 40
Flow maximum		[l/min]	90 (at Δp=350 bar over two control edges)
Leakage at 100 bar		[ml/min]	<400 (zerolap spool); <50 (overlap spool)
Static / Dynamic			
Step response at 100 % step [3]		[ms]	<3.5
Frequency response (±5 % signal) [3]		[Hz]	350 (amplitude ratio -3 dB), 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 (with correctly mounted plug-in connector)
Supply voltage/ripple		[V]	DC 22 ... 30, ripple <5 % eff., surge free
Current consumption max.		[A]	3.5
Pre-fusing		[A]	4.0 medium lag
Input signal			
	Voltage	[V]	10...0...-10, ripple <0.01 % eff., surge free, 0...+10 V P->A
	Impedance	[kOhm]	100
	Current	[mA]	20...0...-20, ripple <0.01 % eff., surge free, 0...+20 mA P->A
	Impedance	[Ohm]	250
	Current	[mA]	4...12...20, ripple <0.01 % eff., surge free, 12...20 mA 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 ⏚)
	Code 7	[V]	30 for terminal D and E against PE (terminal G)
Enable signal (only code 5/7)		[V]	5...30, Ri = 9 kOhm
Diagnostic signal		[V]	+10...0...-10 / +Ub, rated max. 5 mA
EMC			EN 61000-6-2, EN 61000-6-4
Electrical connection		Code 0/7	6 + PE acc. EN 175201-804
		Code 5	11 + PE acc. EN 175201-804
Wiring min.	Code 0/7	[mm^2]	7x1.0 (AWG 18) overall braid shield
	Code 5	[mm^2]	8x1.0 (AWG 18) overall braid shield
Wiring lenght max.		[m]	50

[1] For applications with p_T>35 bar (max. 350 bar) the Y-port has to be connected and the plug in the Y-port has to be removed.

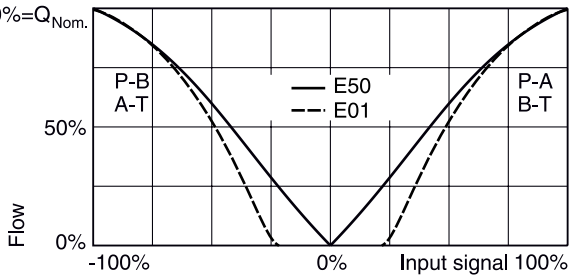
[2] Flow rate for different Δp per control edge: $Q_x = Q_{Nom.} \cdot \sqrt{\frac{\Delta p_x}{\Delta p_{Nom.}}}$

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

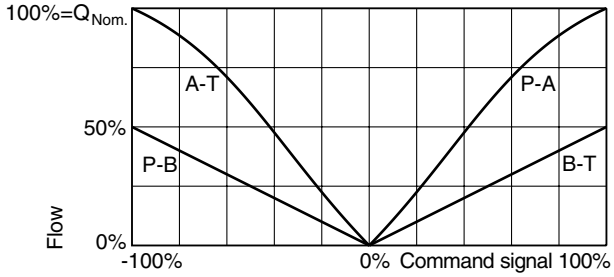
3

Flow curves
at Δp = 35 bar per metering edge

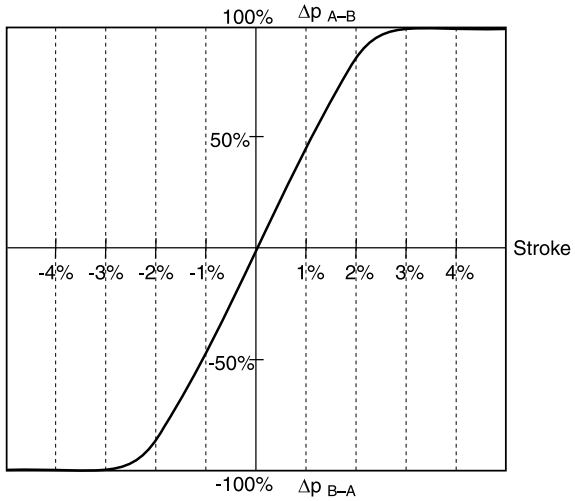
Spool type **E01/E50**



Spool type **B60**

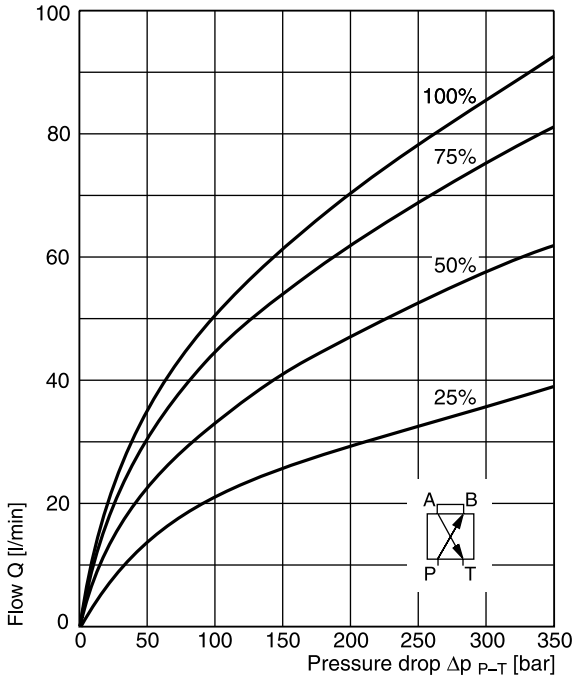


Pressure gain

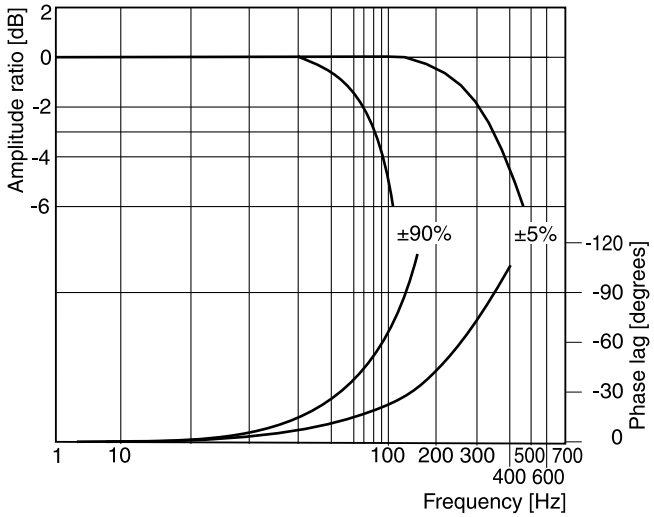


Functional limits
at 25 %, 50 %, 75 % and 100 % command signal

Spool type **E50M**

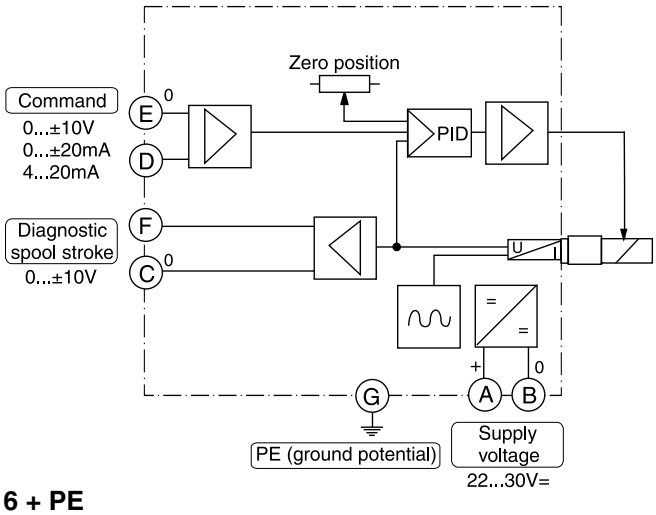


Frequency response
±5 % command signal
±90 % command signal

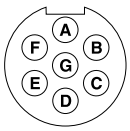


All characteristic curves measured with HLP46 at 50 °C.

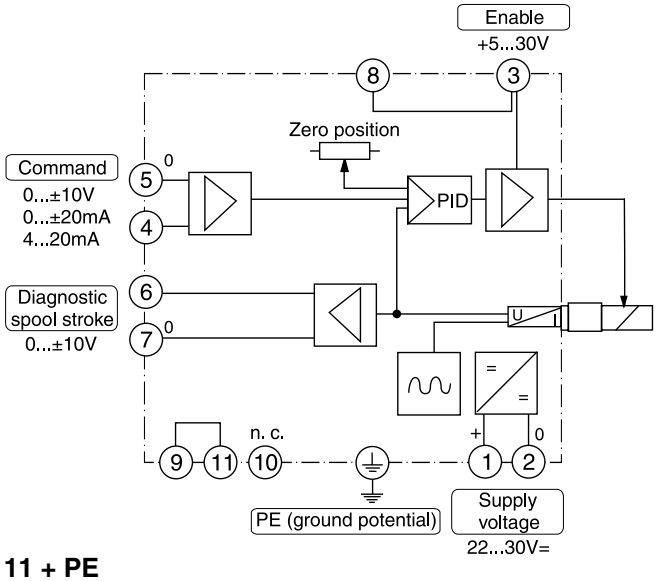
Code 0



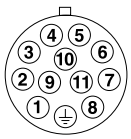
6 + PE



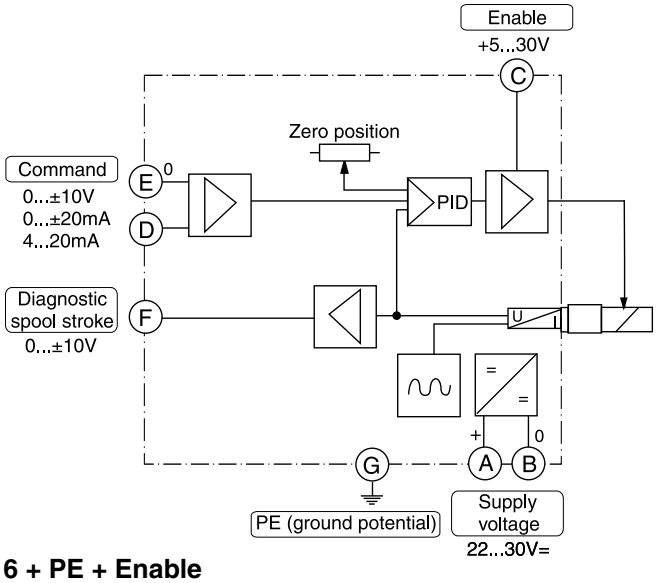
Code 5



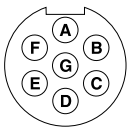
11 + PE



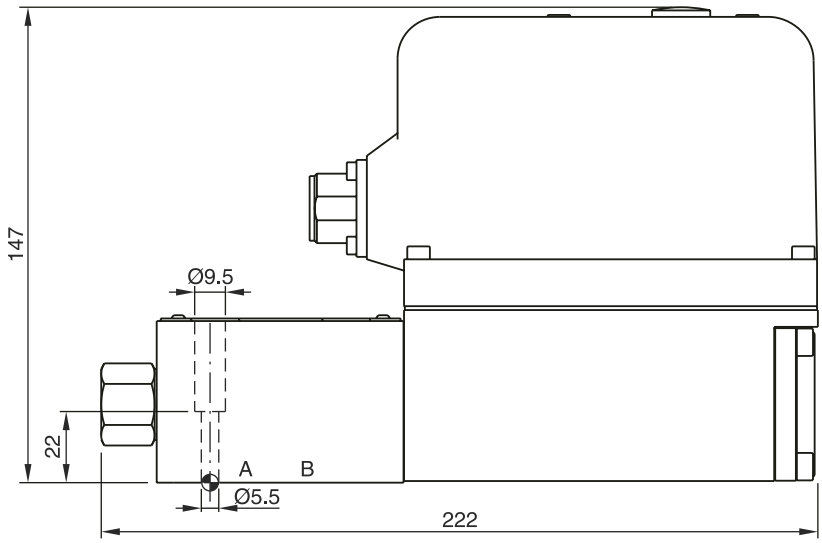
Code 7

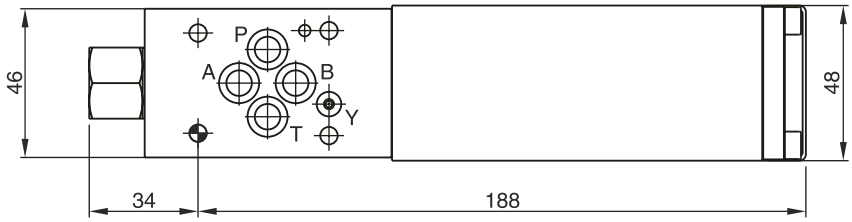


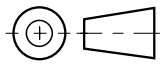
6 + PE + Enable



3







Surface finish	Kit			Kit
$\sqrt{R_{max}6.3}$ 0.01/100	BK375	4x M5x30 ISO 4762-12.9	7.6 Nm ±15 %	NBR: SK-D1FP FPM: SK-D1FP-V HFC: SK-D1FP-H