

PROPORTIONAL 4-WAY CONTROL VALVES SOLENOID OPERATED

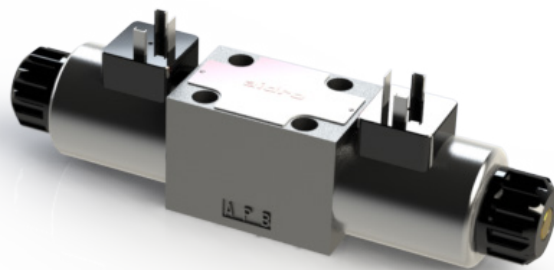
HD3-PS-*

32 l/min 32 MPa (320 bar)

1 DESCRIPTION

Valves HD3-PS are proportional directional control valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03).

The design of the body is an high quality five chamber casting. The valve is available with different spools able to control different flow ranges. In the standard version, the valve housing is phosphated for 240 h salt spray protection acc. to ISO 9227.



2 ORDERING CODE

(1)	(2)	(3)	(4)	(5)	(6)
HD3	-	PS	-	-	/ 10

(1) 4-way directional valve CETOP 03 – Pressure 32 MPa (320 bar)

(2) PS : Proportional electric control

(3) Functional spool type (see 4):

-number is the main spool type

1: closed center (P, A, B, T blocked)

3: P blocked, A, B, T connected

-spool nominal flow

P : 32 l/min with P = 1 MPa (10 bar) (PA+BT or PB+AT)

R : 16 l/min with P = 1 MPa (10 bar) (PA+BT or PB+AT)

05 : 05 l/min with P = 1 MPa (10 bar) (PA+BT or PB+AT)

D : differential $Q_b = 2Q_a$: 32/16 l/min with P = 1 MPa (10 bar)

-letter is the solenoid or spring arrangement:

C : 2 solenoids, spool is springs centred

ML : 1 solenoid ("a") spool is centred + 1 end position

MLb : 1 solenoid ("b") spool is centred + 1 end position

(4) Options and variants:

K : extended manual overrides (see 7)

AK : extended manual overrides with air bleeding valves (see 8)

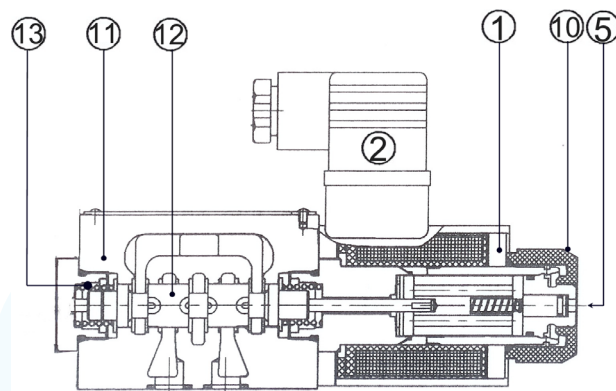
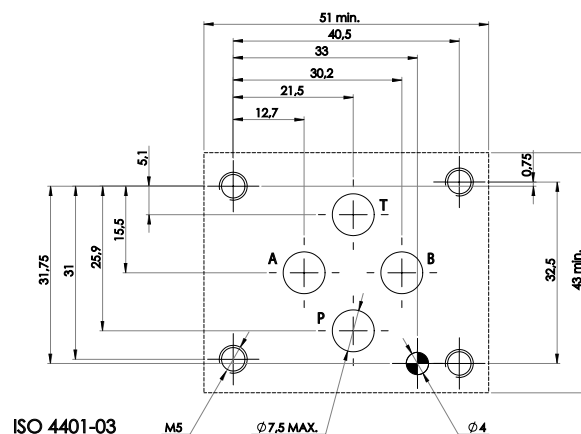
ZC : zinc plated valves (see 9)

(5) Type of coil and supply voltages

R2 : R= 2,3 standard for V12DC; R3 : R= 4,5

R4 : R=13,4 standard for V24DC; R5 : R=18,6

(6) Design number (progressive) of the valve.























The spool 12 shifts in to the valves body 11 subject to the action of springs 13 and proportional solenoid 1. Spool 12, depending from its shape and its position in the valves body 11, opens and/or closes passages between P, A, B, T ports, thus controlling the direction and the rate of the hydraulic flow. Solenoid 1 is energized by electric current flowing-in through cables; in case of electric cut-offs, the spool can be manually shifted by acting on the emergency pins 5, located at the end of the solenoids and accessible through the retaining nuts 10.

3 TECHNICAL DATA

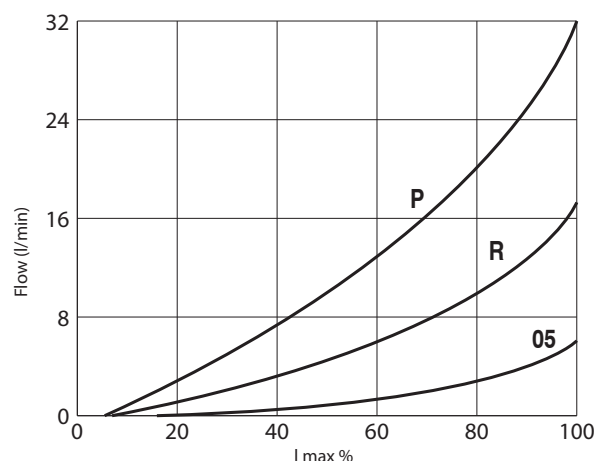
Nominal flow rates	5, 16, 32 l/min	Electric Characteristics: Valves type HD3-PS-* are operated by proportional solenoids that are rated for an average max power of 13,5 w. The values of nominal max. current are: for coils type R2 (2,3 Ω): I max = 2,4 A R3 (4,5 Ω): I max = 1,7 A R4 (13,4 Ω): I max = 1,0 A R5 (18,6 Ω): I max = 0,85 A Currents to hydraulic proportional valves are normally supplied by an electronic driver based on PWM mode of operation, capable of full control of min and max values of current for drivers type UED-*
Maximum nominal pressure (P,A,B)	32 MPa (320 bar)	
Maximum pressure at T port	16 MPa (160 bar)	
Maximum rec. Pressure drops	10 MPa (100 bar) see [8]	
Protection DIN 40050	IP 67	
Duty cycle	100%	
Service life	$\geq 10^7$ cycles	
Installation and Dimensions	(see [10])	
Mass	Approx 1,6 / 2,1 kg.	

4 SPOOL IDENTIFICATION AND NOMINAL FLOW RATE

Nominal Flow rate 5 l/min	
 HD3-PS-105ML-R*	 HD3-PS-305ML-R*
 HD3-PS-105MLb-R*	 HD3-PS-305MLb-R*
 HD3-PS-105C-R*	 HD3-PS-305C-R*
Nominal Flow rate 16 l/min	
 HD3-PS-1RML-R*	 HD3-PS-3RML-R*
 HD3-PS-1RMLb-R*	 HD3-PS-3RMLb-R*
 HD3-PS-1RC-R*	 HD3-PS-3RC-R*
Nominal Flow rate 32 l/min	
 HD3-PS-1PML-R*	 HD3-PS-3PML-R*
 HD3-PS-1PMLb-R*	 HD3-PS-3PMLb-R*
 HD3-PS-1PC-R*	 HD3-PS-3PC-R*
Differential flow: Q _b =2Q _a (example P→B=32 l/min and A→T= 16 l/min)	
 HD3-PS-1DC-R*	 HD3-PS-3DC-R*

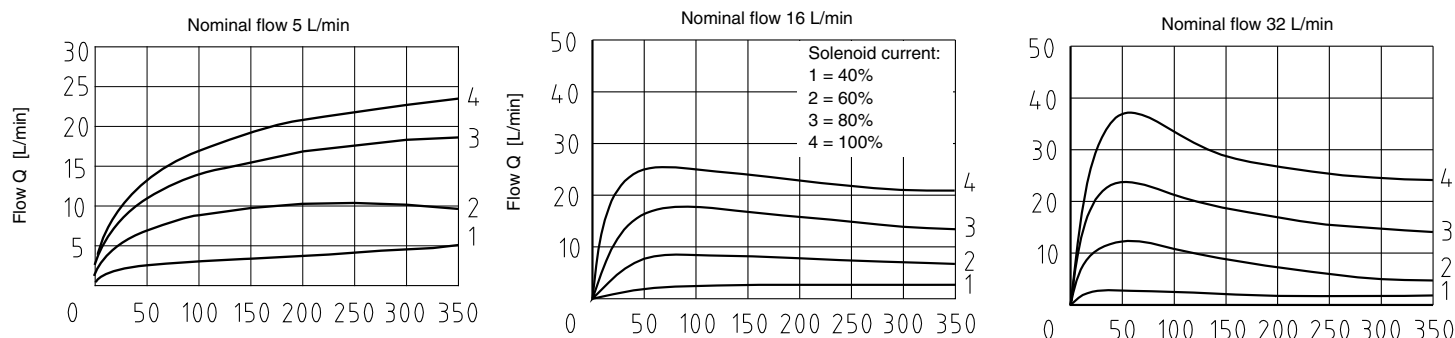
5 TYPICAL DIAGRAMS

Typical flow curves of valves HD3-PS-*, with spools type P, R, 05, in standard configuration measured with mineral oil at 36 cSt and at 50°C at $\Delta P=01$ MPa (10 bar) for flow P→B A→T



6 FLOW RATES AND PRESSURE DIFFERENTIAL

For a given ΔP on a given valve the flow rates are proportional to the driving current; for a given driving current on a given valve, the flow rates increase with the increasing of the ΔP up to certain limits. Typical limit curves are:



7 VERSION "K": EXTENDED EMERGENCY PIN

Solenoid valves according to "K" version have extended emergency actuator pins protruding from the solenoid shape, that permit a quick and easy "Hand operation" of the valves, without the need of any tool. The actuator pin and the end of the solenoid are protected by a flexible rubber cap that makes easy operation and protects from moisture and water splashes.

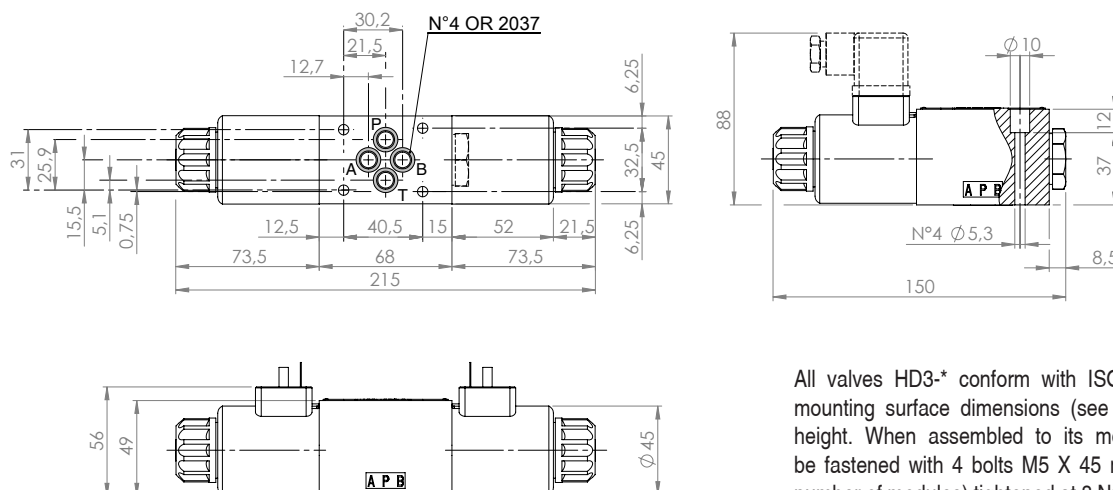
8 VERSION "AK": EXTENDED PIN AND AIR VALVES

Proportional valves according to "AK" version have extended emergency actuator pins that incorporate air bleeding valves, to purge air from the solenoid tube for a simplified start-up of the system. The actuator pin and the end of the solenoid are protected by a flexible rubber cap that makes easy operation and protects from moisture and water splashes.

9 VERSION "ZC": ZINC PLATED VALVES

Solenoid valves according to "ZC" version have central body zinc plated and protected against every type of corrosion due to saline ambience or other aggressive chemicals. Zinc thickness are on the valve body: 10-15 μ m; and 8/12 μ m on solenoids.

10 INSTALLATION DIMENSIONS (mm)



All valves HD3-* conform with ISO and CETOP specifications for mounting surface dimensions (see also front page) and for valves height. When assembled to its mounting plate valve HD3-* must be fastened with 4 bolts M5 X 45 mm (or M5 x ** according to the number of modules) tightened at 8 Nm torque. Of special interest is the mounting of pressure compensator modules with HD3-P proportional valves. Leakage between valve and mounting surface is prevented by the positive compression on their seats of 4 seals of QUAD/O Ring type 9,25x1,68x1,68.

11 HYDRAULIC FLUIDS

Seals and materials used on standard valves HD3-* are fully compatible with hydraulic fluids of mineral oil base, upgraded with antifoaming and anti-oxidizing agents. The hydraulic fluid must be kept clean and filtered to ISO 4406 class 19/17/14, or better, and used in a recommended viscosity range from 10 cSt to 60 cSt.

12 PRESSURE COMPENSATOR MODULES.

2-way pressure compensator for meter-in application type AM3-PCP – see table AM-391. When using the 2-way pressure compensators in meter-in application, shown in the circuit diagram, a constant pressure difference across the metering edge of the proportional directional valve is held. In this case, the pressure variations due to loading changes, as well as pump pressure changes, are compensated. That means that a pressure change cannot result in flow increase. 3-way pressure compensator type AM3-LS-P is able to operate as "load sensing" device, by ischarging at T port, at the same pressure of the user, the flow that exceeds the flow rates required by the controlled opening of the proportional 4-way valve.

