

DIRECTIONAL CONTROL VALVES SOLENOID OPERATED

HD3-ES-*/10

80 l/min - 35 MPa (350 bar)

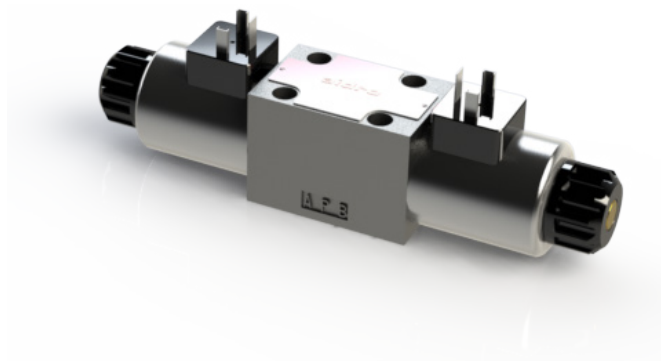
1 DESCRIPTION

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

The design of the body is a quality five chamber casting.

The valve is available with interchangeable metallic DC solenoids, also for AC power supply using a built-in rectifier bridge inside the coil.

In the standard version, the valve housing is phosphated for 240 h salt spray protection acc. to ISO 9227. Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray).



2 ORDERING CODE

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
HD3	-	ES	-	-	-	-	/ 10

(1) HD3: 4-way directional control valve CETOP 03

(2) ES: Electrically controlled

(3) Spool type (see 4):

-number is the main spool type

-letter is the solenoid or spring arrangement:

C : 2 solenoids, spool is spring centered (3 position)

LL : 1 solenoid, spool is spring offset (2 position)

ML : 1 solenoid, spool is spring centered (2 position)

N : 2 solenoids, spool is detented see 13 (2 position)

(4) b: only for LL, ML, LM sol. b installed (instead of sol. a)

(5) Code reserved for option and variants:

S-**: calibrated orifice on P port, see 11

K : water proof caps on emergency pin, see 10

T : soft shifting device, see 12

Z* : anti corrosion coating (variants), see 14

S1, S4: proximity sensors, see 15

(6) Electric voltage and solenoid coils: see 8

0000: no coils

012C: coils for V12DC

024C: coils for V24DC

048C: coils for V48DC

024A: coils for V24/50AC

115A: coils for V110/50- V 115/60AC

230A: coils for V220/50- V 230/60AC

(7) Coil connection (see 16):

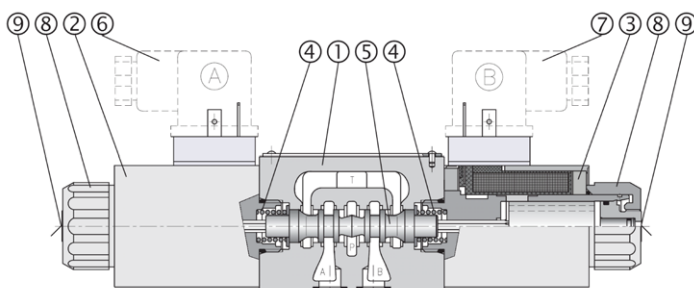
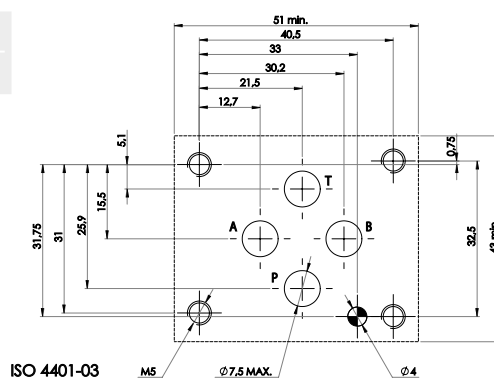
no designation: DIN 43650-A ISO 4400

AMP: Amp Junior Timer- vertical configuration

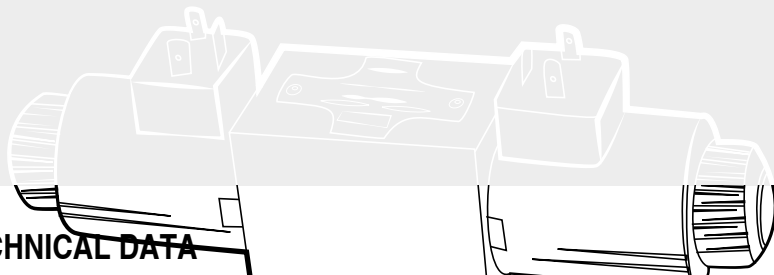
AMPX: Amp Junior Timer- axial configuration

D: Deutsch

(8) Design number (progressive) of the valves



The spool 5 shifts into the valve body 1 subject to the action of springs 4 and solenoids 2. Spool 5, depending from its shape and its position in the valve body, opens and/ or closes passages between P, A, B and T ports, thus controlling the direction of the hydraulic flow.



3 TECHNICAL DATA

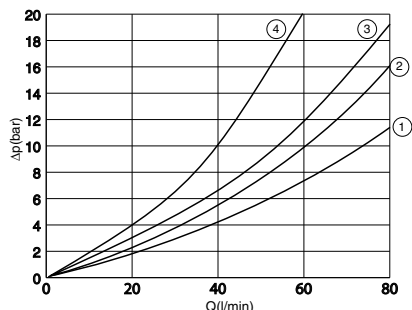
Nominal flow	60 l/min	Electric characteristics: Valve type HD3-ES-* are operated by solenoid that are energized : Directly from a D.C. voltage supply: V 12 DC = 012 C V 24 DC = 024C By the use of coils that incorporate a full wave bridge rectifier, from A.C. voltage supply: V 110/50 - V 115/60 = 115A V 220/50 - V 230/60 = 230A Other available voltages are : 014C ; 048C ; 060C ; 102C ; 205C ; and V24/50 = 024A All connectors must conform to ISO 4400 (DIN 43650) and electric circuitry must be able to carry the following rated current values : V 12 DC = 2,4A V 115/50 = 0,26A V 24 DC = 1,2A V 230/50 = 0,14A Coils with 2 electric pins, conforming with AMP connectors or Deutsch connectors, are only available for DC supply (example of code: B03.012C AMPX or B03.012C D). Permissible supply voltage variation : $\pm 10\%$
Maximum rec. flow rate	80 l/min	
Maximum nominal pressure (P, A, B)	35 MPa (350 bar)	
Maximum pressure at T port	21 MPa (210 bar)	
Pressure drops	see [5]	
Protection to DIN 40050	IP 65	
Duty cycle	100%	
Installation and dimensions	see [6]	
Mass	2,1/1,6 kg	

4 SPOOL IDENTIFICATION AND INTERMEDIATE POSITION TRANSITORIES

0C		0LL	
1C		1LL	
3C		1LLb	
4C		2LL	
55C		0ML	
7C		1ML	
8C		3ML	
1N		4ML	
2N		8ML	
19C		18ML	
42C		13ML	
56C		56ML	
38C		56MLb	

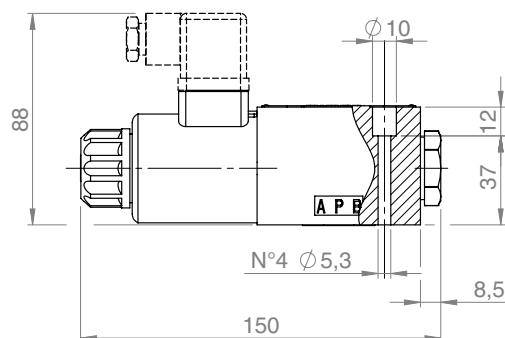
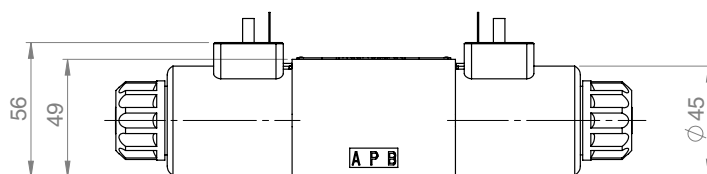
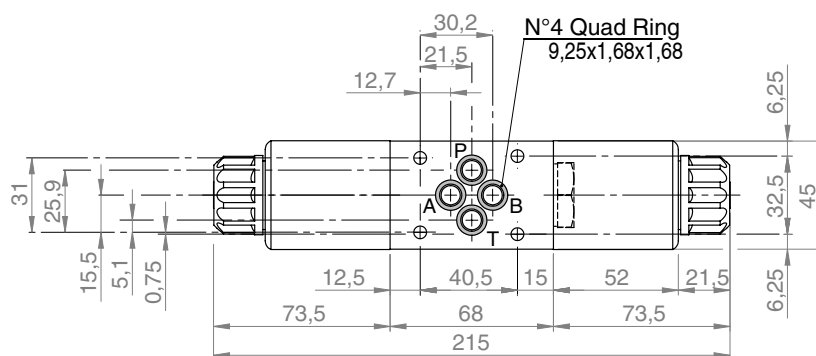
5 TYPICAL DIAGRAMS

Typical Δp -Q curves for valves HD3-ES-* in standard configuration, with mineral oil at 32 mm²/s and T=40°C



Spool	P-A	P-B	A-T	B-T	P-T
1C	1	1	2	2	
4C	3	3	4	4	1
0C	1	1	2	2	1
3C	1	1	2	2	
1LL	1	1	2	2	
1LLb	1	1	2	2	
1ML		1	2		
4ML	4		4		2
0ML		1	2		1
3ML	1		2		

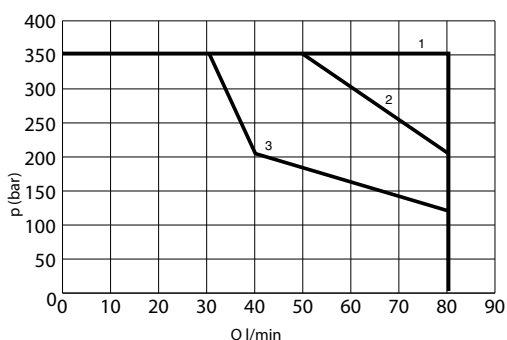
6 INSTALLATION DIMENSIONS (mm)



All valves HD3-* conform with ISO and CETOP specifications for mounting surface dimensions (see 9) and for valves height. When assembled to its mounting plate valve HD3-* must be fastened with 4 bolts M5x45 (or M5x** according to the number of modules) tightened at 8 Nm torque. Leakage between valve and mounting surface is prevented by the positive compression on their seats of 4 seals of Quad Ring type 9,25x1,68x1,68.

7 HYDRAULIC LIMIT OF USE

Δp -Q characteristics limits for safe of HD3-ES-* solenoid operated valves. Measured at $v = 32 \text{ mm}^2/\text{s}$ and $T = 40^\circ\text{C}$



1C	1
4C	3
0C	2
3C	2
1LL	1
3ML	2
4ML	3
1ML	1
0ML	2
1MLb	1
1LLb	1
4MLb	3
0MLb	2
3MLb	2

8 SOLENOID

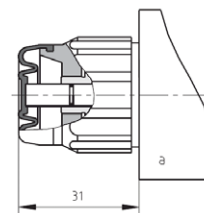
Solenoid valves can be supplied without electric coils, as HD3-ES-****-0000. Coils are supplied separately; standard, 3 electric pins, coils are : - B03.012C ; B03.024C ; B03.115A ; B03.230A Connections to the electric supply is made by standard 3-PIN connectors, according to ISO 4400 (DIN 43650). Connectors can be with different cable exit size (PG9, PG11) and beside of the plain connecting function they may incorporate various features like: Signal led, Voltage surge suppressor, etc. (see 18)

9 HYDRAULIC FLUID

Seals and materials used on standard valves HD3-* are fully compatible with hydraulics fluids of mineral 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.

10 VERSION "K": OVERRIDE 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



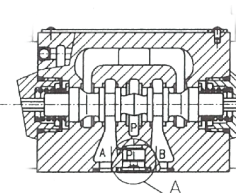
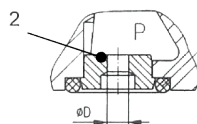
11 VERSION "3S*"; CALIBRATED ORIFICE ON P PORT

Option "3S*" is represented by an element suitably shaped to be inserted on P port of the solenoid valve, having a calibrated orifice (of various sizes) able to restrict, depending on the ΔP value, the flow rate entering the solenoid valve.

Those elements have the following orifice diameters :

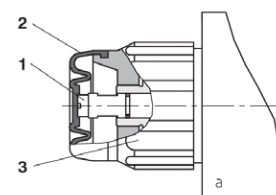
- 3S-00 -> $D = 0$ mm
- 3S-10 -> $D = 1,0$ mm
- 3S-15 -> $D = 1,5$ mm
- 3S-20 -> $D = 2,0$ mm
- 3S-25 -> $D = 2,5$ mm

and are kept sealed on the P port of the valve by an OR of 9,25x1,78 mm sizes (example OR 110-2037)



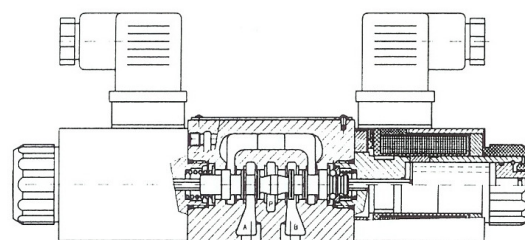
12 VERSION "T": SOFT SHIFTING

Solenoid valves with "soft shifting" devices are 2 or 3 positions valves controlled by solenoids which incorporate calibrated orifices in the armature plungers. The hydraulic controls on the shifting speed of the plunger, and therefore of the spool in the valve's body, permit progressive transitories, thus reducing or eliminating water hammer effects in the circuit. Typically the shifting time of a "T" version solenoid valve is, when energized, in the order of 300-500 ms (versus 30-50 ms of a standard valve) provided that the armature plunger properly works in the hydraulic fluid. The appropriate conditions are given by assuring a minimum counter pressure on T line and by bleeding the air from the solenoid acting on purge's valve 1, which is accessible after removing the rubber boot 2 from the solenoid retaining nut 3.



13 VERSION "N": MECHANICAL DETENT ON SPOOL

Solenoids valves with detent typically are 2 position, 2 solenoid, no-spring valves where the spool is kept at the extreme ends of its stroke by a mechanical device. This permits that solenoids are energized by short time current pulses and the spool remains at its position regardless of forces due to hydrodynamics or gravitational/ inertial effects (vibrations).



14 VERSION "Z": ANTICORROSION OPTION

On HD3-ES-* standard valves the body is phosphate coated, the solenoid tubes are not treated and coils mantel and irons are zinc trivalent plated. To increase the resistance to corrosive agents different variants are available :

Example of ZK painted : HD3-ES-3C-ZK-024C/10

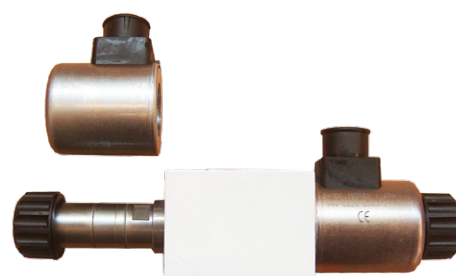
ZT: Body, solenoid tubes and coils irons are zinc trivalent plated

ZL: Body is coated with special TEMADUR 20 zinc painting

Solenoids have 8-12 μ m zinc plating

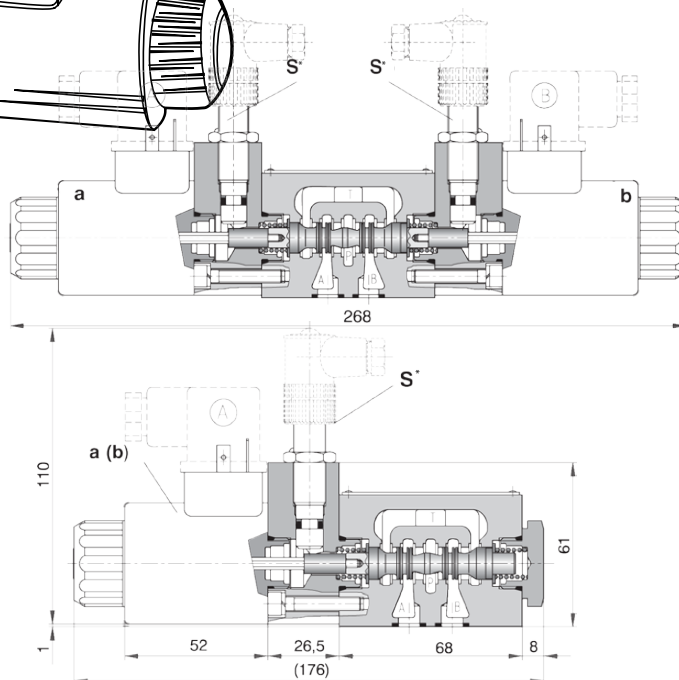
ZK: Body is coated with special TEMADUR 20 zinc painting

Solenoids tube and coils irons are "zinc-nickel" plated



15 VERSION "S1 and S4": POSITION SENSOR

Solenoid valves with spool position sensors are equipped with a proximity sensor able to transform the spool position into an electric signal. It can be used with directional control valves with one or two solenoids. It's possible to have the two different versions, normally open and normally closed sensor. This option is mandatory in "safe" application, where an electric signal of positive valves spool (displacement) position is needed. In both S1 and S4 version each coil has one sensor applied; this means that with bistable valves sensors are applied on both sides. For different versions ask our sales department.



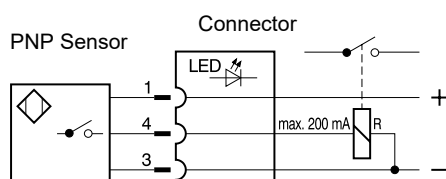
Technical data of the Sensor

Supply Voltage	24 V DC
Supply voltage range	10..30 V DC
Rated current	200 mA
Protection	IP67
Max. operating Pressure	210 bar (standard)
Indication	yellow led

16 POSITION SENSOR TYPE

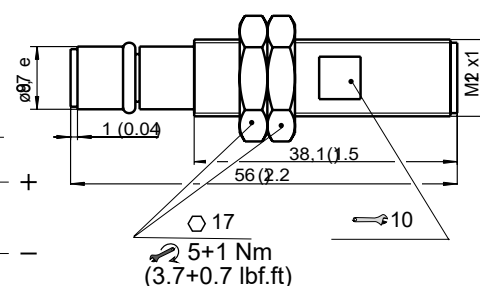
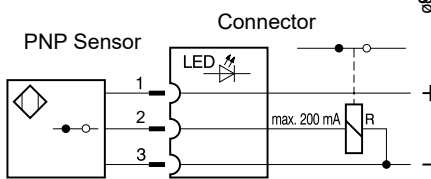
S1

Circuit diagram of the normally - OPEN sensor

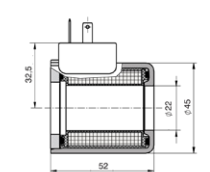


S4

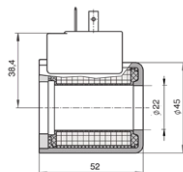
Circuit diagram of the normally - CLOSED sensor



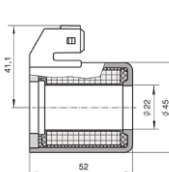
17 SOLENOID COILS types B03 see CAP 12 pag 0011



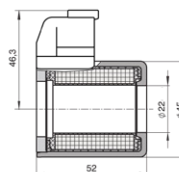
ISO 4400 (DIN 43650)
(standard configuration)
B03-0xxC



115A/230A = ISO 4400 (DIN 43650)
with integrated rectifier
B03-xxxA



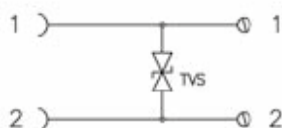
AMPX = Amp Junior Timer with
axial configuration
B03-0xxCAMPX



D = Deutsch
B03-0xxD

18 QUENCHING DIODE

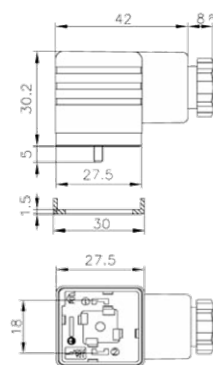
On request, DC coils can be supplied with an integrated bidirectional quenching diode (transil type BZW06-19B) able to provide high overvoltage protection. Their instantaneous response to transient overvoltages makes them particularly suited to protect voltage sensitive devices



19 CONNECTORS FOR ISO 4400 (DIN 43650) series KA132

Connectors are available for coils with ISO 4400 (DIN 43650) connection. Most common configuration are: Standard, simple, 3 pin connectors:

KA132000B9 = black with PG9
KA132000B1 = black with PG11
KA132000A1 = grey with PG11
KA132L34T9 = transparent with led indication
KA132T54T9 = transparent with led indication and diode transil for protection against overvoltages



For more details and models see aidro table KA-132