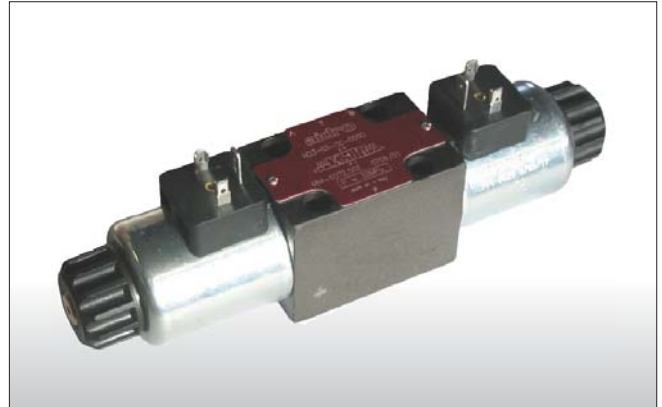
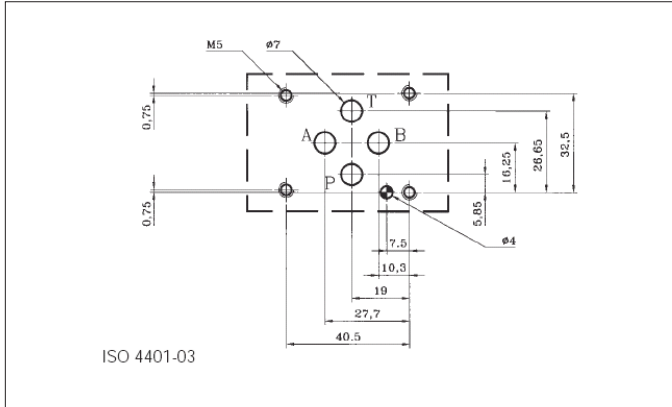


**DIRECTIONAL CONTROL VALVE SOLENOID OPERATED  
TYPE HD3-ES-\*/10  
CETOP 03 - 35 MPa**

**22mm Coil Stems**



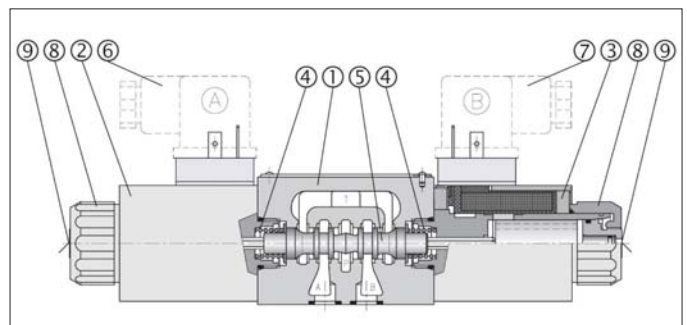
**1 HOW TO READ THE MODEL CODE FOR HD3-ES - Pressure 35 MPa (350 bar)**

**HD3 - ES - (1) (C) - \* - (024C) (-) / 10**  
 ① ② - ③ ④ - ⑤ - ⑥ ⑦ ⑧

- ① **HD3** : 4-way directional control valve CETOP 03
- ② **ES** : electrically controlled
- ③ **(1)** : spool type (see [5](#))
- ④ **(C)** : solenoid(s) and spring(s) arrangements (see [5](#))
  - 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 [16](#) (2 position)
- ⑤ **\*** : Code reserved for options and variants
  - S-\*\* : calibrated orifice on P port, see [14](#)
  - K : water proof caps on emergency pin, see [13](#)
  - T : soft shifting device, see [15](#)
  - Z\* : anti corrosion coating (variants), see [17](#)
  - Sa, Sb : proximity sensors [18](#)
- ⑥ **(024C)** : Electric voltage and solenoid coils
  - 0000 : no coil(s)
  - 012C : coil(s) for V12 DC
  - 024C : coil(s) for V24 DC
  - 048C : coil(s) for V48 DC
  - 024A : coil(s) for V24/50 AC
  - 115A : coil(s) for V110/50 – V 115/60 AC
  - 230A : coil(s) for V220/50 – V 230/60 AC
- ⑦ **-** : Coil connection
  - : DIN 43650-A ISO 4400
  - AMP : Amp Junior Timer – vertical configuration, see [19](#)
  - AMPX : Amp Junior Timer – axial configuration, see [19](#)
  - D : Deutsch, see [19](#)
- ⑧ **10** : Design number (progressive) of the valves.

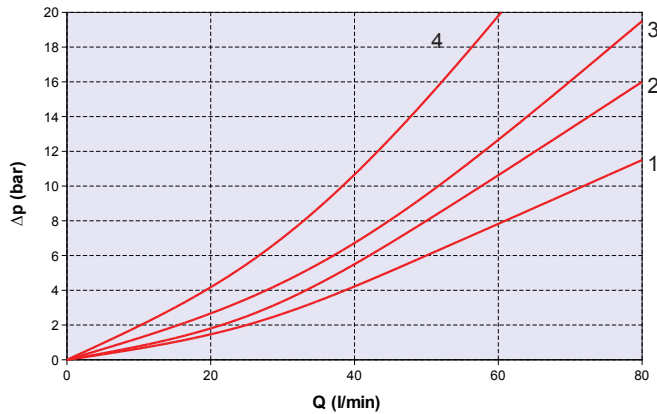
**2 DESCRIPTION**

The spool ⑤ shifts into the valve body ① subject to the action of springs ④ and solenoids ⑨. Spool ⑤, depending from its shape and its position in the valve body ①, opens and/or closes passages between P, A, B and T ports, thus controlling the direction of the hydraulic flow.



**3** TYPICAL DIAGRAMS

Typical P-Q curves for valves HD3-ES-\* in standard configuration, with mineral oil at  $v=32 \text{ mm}^2/\text{s}$  and at  $T=40^\circ\text{C}$ .



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		

**5** 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	

**4** TECHNICAL DATA

Nominal flow	60 l/min
Maximum rec. flow rate see <b>7</b>	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 <b>3</b>
Electric characteristics	see <b>6</b>
Protection to DIN 40050	IP 65
Duty cycle	100%
Dimensions	see <b>9</b>
Installation	see <b>8</b>
Mass	2,1/1,6 kg

**6** ELECTRIC CHARACTERISTICS

Valve type HD3-ES-\* are operated by solenoid that are energized :

- directly from a D.C. voltage supply  
V 12 DC = 012C  
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

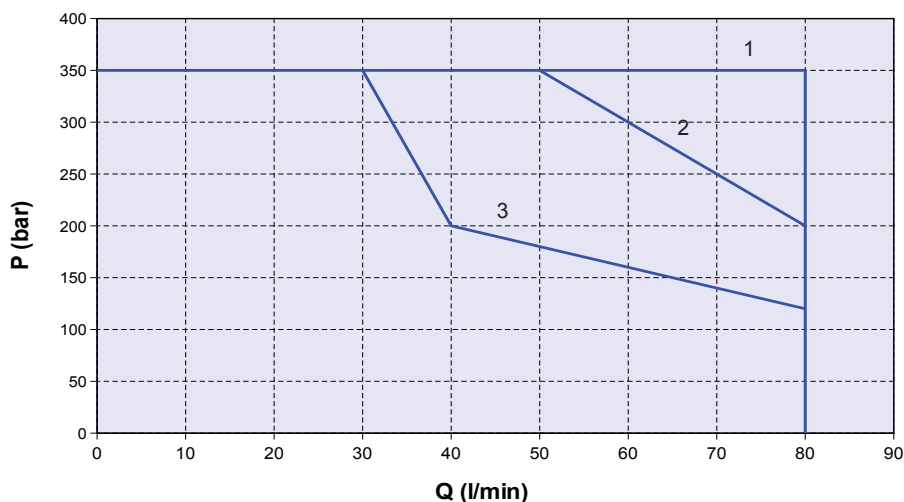
All connectors must conform to ISO 4400 (DIN 43650) and electric circuitry must be able to carry the following rated current values :  
V 12 DC = 2,4 A                      V 115/50 = 0,26 A  
V 24 DC = 1,2 A                      V 230/50 = 0,14 A

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 :  $\pm 10 \%$

## 7 HYDRAULIC LIMITS OF USE

P-Q characteristics limits for safe use 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 INSTALLATION

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.

## 10 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 21)

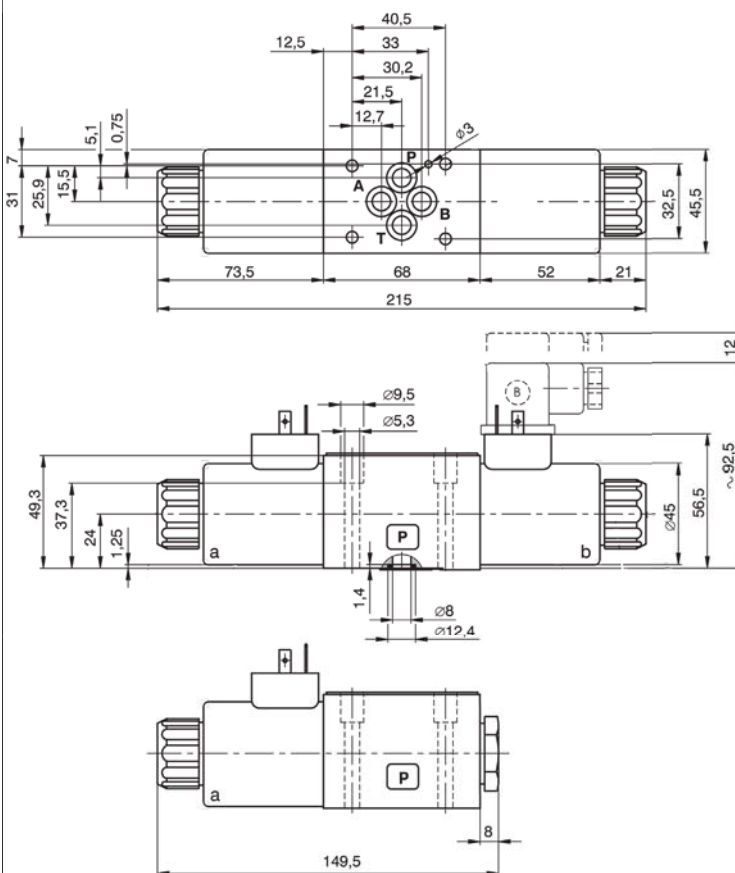
## 11 HYDRAULIC FLUID

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.

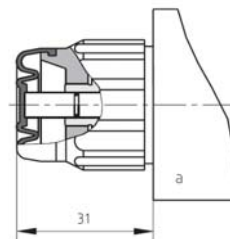
## 9 INSTALLATION DIMENSIONS

(dimensions are mm)



**13** VERSION "K": OVERRIDE PIN

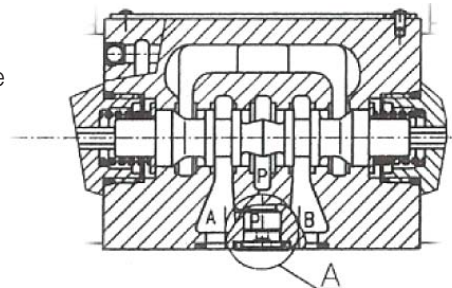
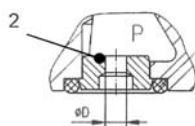
Solenoid valves according to "K" version have extended emergency actuator pins protruding from the solenoid shape, that permit a quick and easy "hand operation" of the valves, without the need of any tool. The actuator pin and the end of the solenoid are protected by a flexible rubber cap that makes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

**14** VERSION "S\*": CALIBRATED ORIFICE ON P PORT

Option "S\*" 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  $\Delta P$  value, the flow rate entering the solenoid valve.

Those elements have the following orifice diameters :

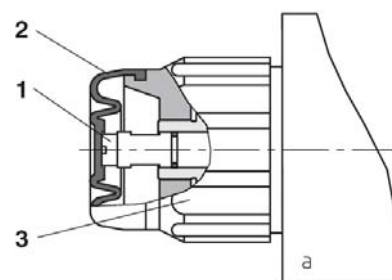
- 3S-00 → D = 0 mm
- 3S-10 → D = 1,0 mm
- 3S-15 → D = 1,5 mm
- 3S-20 → D = 2,0 mm
- 3S-25 → D = 2,5 mm



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

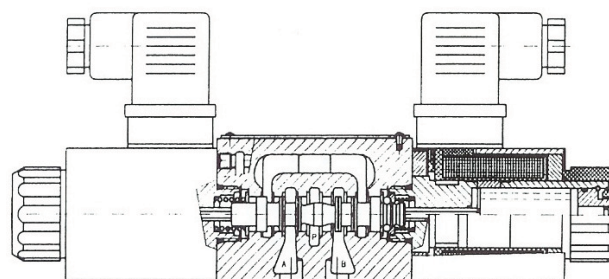
**15** VERSION "T": SOFT SHIFTING

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.

**16** 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).

**17** 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

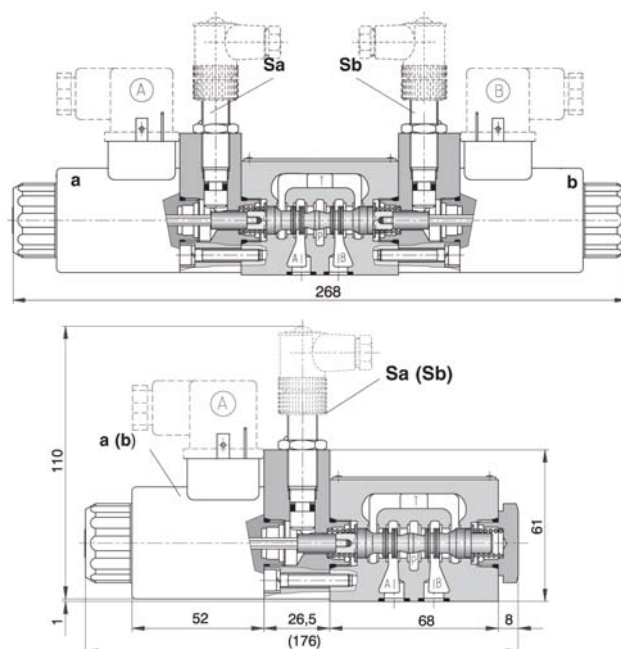
- ZT** : • Body, solenoid tubes and coils irons are zinc trivalent plated
- ZL** : • Body is coated with special TEMADUR 20 zinc painting  
• Solenoids have 8-12  $\mu\text{m}$  zinc plating
- ZK** : • Body is coated with special TEMADUR 20 zinc painting  
• Solenoids tube and coils irons are "zinc-nickel" plated



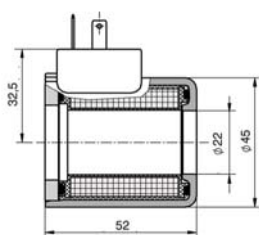
## 18 POSITION SENSOR "Sa,Sb"

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.

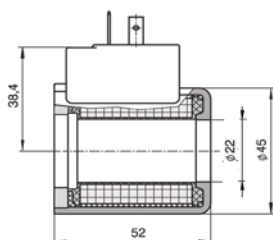
Technical Data of the Sensor	
Supply Voltage	24 V DC
Supply voltage range	10..30 V DC
Rated current	200 mA
Protection	IP67
Max. operating Pressure	50 bar (standard) - 210 bar (optional)
Indication	yellow led



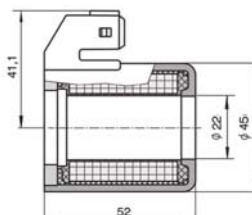
## 19 SOLENOID COILS types B03-xxxx



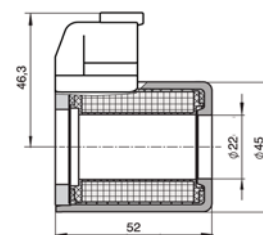
ISO 4400 (DIN 43650)  
(standard configuration)  
B03-0xxC



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

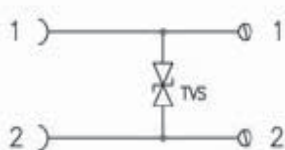


AMPX = Amp Junior Timer  
axial configuration  
B03-0xxCAMPX



D = Deutsch  
B03-0xxD

## 20 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.

## 21 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

