

## DIRECTIONAL CONTROL VALVES SOLENOID OPERATED

### HD3-EL-\*/10

80 l/min - 35 MPa (350 bar)

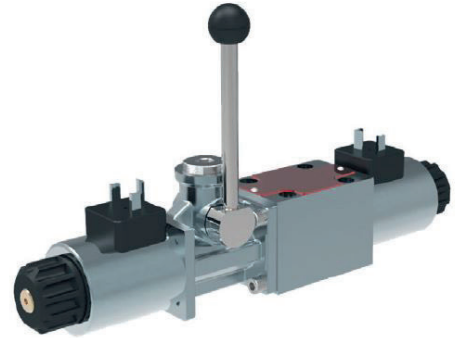
#### 1 DESCRIPTION

Valves HD3-EL 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.

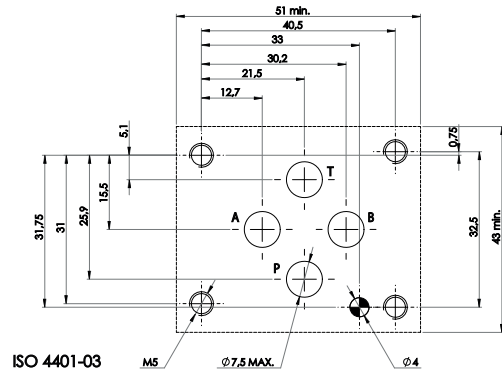
In the standard version, the valve housing is phosphated for 240 h salt spray protection acc. to ISO 9227. Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray). HD3-EL are equipped with an additional lever for manual operations.

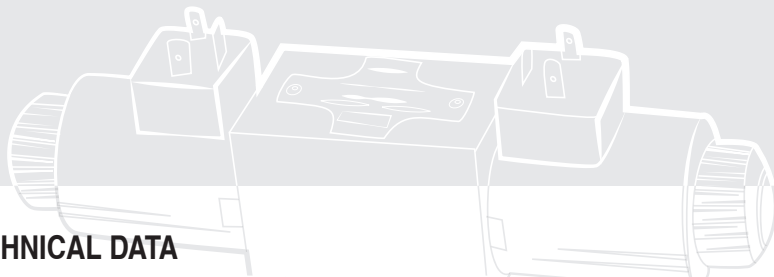


#### 2 ORDERING CODE

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

- (1) HD3: 4-way directional control valve CETOP 03
- (2) EL: Electrically controlled with additional manual control
  - no designation: lever mounted on A side (standard)
  - b: lever mounted on B side
- (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)
- (4) Code reserved for option and variants:
  - S-\*\*: calibrated orifice on P port, see [10](#)
  - T : soft shifting device, see [11](#)
  - Z\* : anti corrosion coating (variants), see [13](#)
- (5) 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
- (6) 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
- (7) Design number (progressive) of the valves





### 3 TECHNICAL DATA

Nominal flow	60 l/min
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

#### Lever characteristics

Total stroke angle	deg	±20
Working stroke angle		±12 to 20
Operating force		40 N
Lever device mass		0.59 kg

#### Electric characteristics:

Valve type HD3-EL-\* 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).

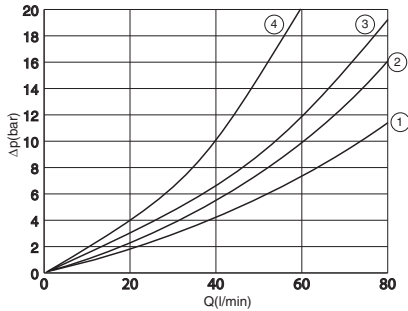
Permissible supply voltage variation : ± 10 %

### 4 SPOOL IDENTIFICATION AND INTERMEDIATE POSITION TRANSITORIES

1C			1LL		
4C			OML		
0C					
3C					

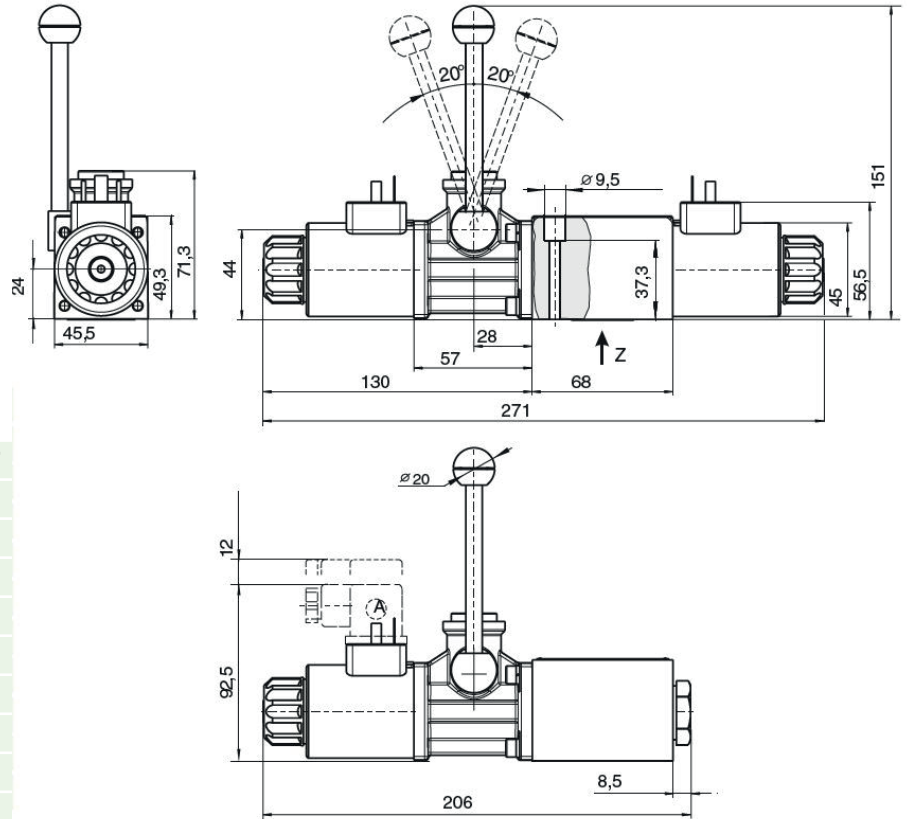
## 5 TYPICAL DIAGRAMS

Typical  $\Delta p$ -Q curves for valves HD3-EL-\* in standard configuration, with mineral oil at 32 mm<sup>2</sup>/s and T=40°C



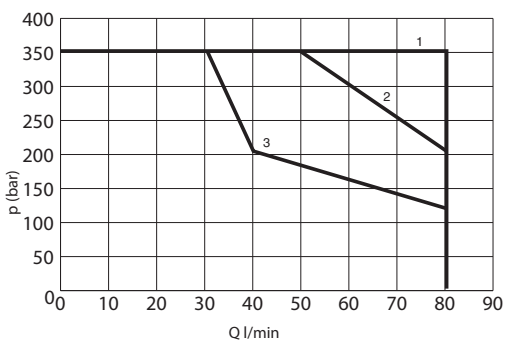
Spool	P-A	P-B	A-T	B-T	P-T
1C	1	1	2	2	
4C	3	3	4	4	1
0C	1	1	2	2	1
3C	1	1	2	2	
1LL	1	1	2	2	
1LLb	1	1	2	2	
1ML		1	2		
4ML	4		4		2
0ML		1	2		1
3ML	1		2		

## 6 INSTALLATION DIMENSIONS (mm)



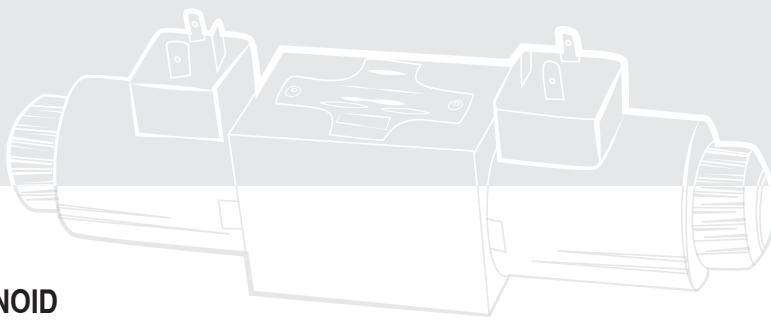
## 7 HYDRAULIC LIMIT OF USE

$\Delta p$ -Q characteristics limits for safe of HD3-EL-\* 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

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 8,9 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.



## 8 SOLENOID

Solenoid valves can be supplied without electric coils, as HD3-EL-\*\*\*\*-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 17)

## 9 HYDRAULIC FLUID

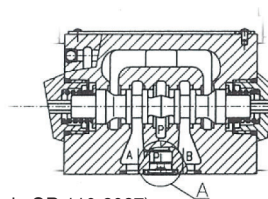
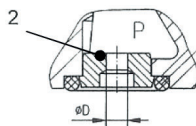
Seals and materials used on standard valves HD3-\* are fully coMPatible with hydraulics fluids of mineral base, upgraded with antifoaming and anti oxidizing agents. The hydraulic fluid must be kept clean and filtered to ISO 4406 class 19/17/14, or better, and used in a recommended viscosity range from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

## 10 VERSION "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 :

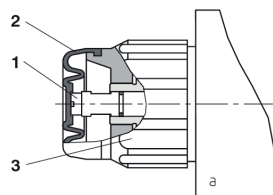
- 3S-00 -> D = 0 mm
- 3S-10 -> D = 1,0 mm
- 3S-15 -> D = 1,5 mm
- 3S-20 -> D = 2,0 mm
- 3S-25 -> D = 2,5 mm



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

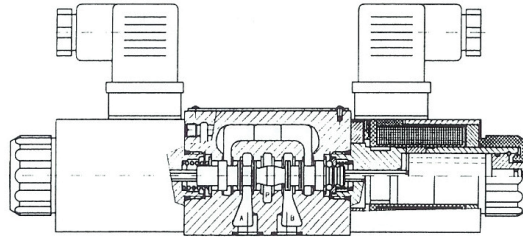
## 11 VERSION "T": SOFT SHIFTING

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.



## 12 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).



## 13 VERSION "Z": ANTICORROSION OPTION

On HD3-EL-\* 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-EL-3C-ZK-024C/10

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

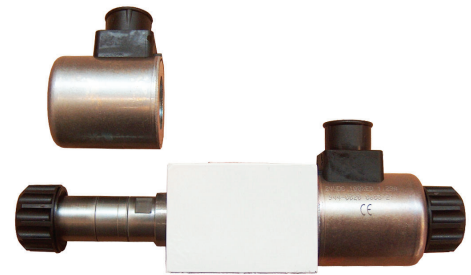
ZL: Body is coated with special TEMADUR 20 zinc painting

Solenoids have 8-12 µm zinc plating

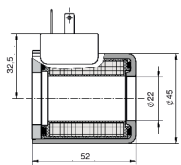
ZK: Body is coated with special TEMADUR 20 zinc painting

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

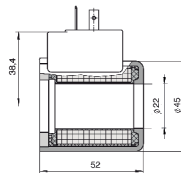
ZN: Zinc-nickel plating (720 h)



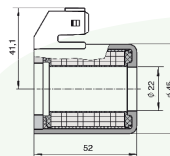
## 14 SOLENOID COILS types B03 (see BO\* coils datasheet)



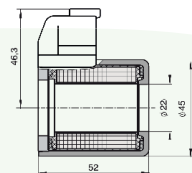
ISO 4400 (DIN 43650)  
(standard configuration)  
B03-0xxC



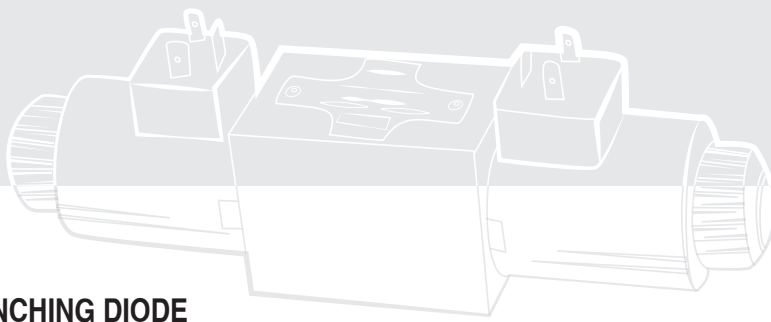
115A/230A = ISO 4400 (DIN 43650)  
with integrated rectifier  
B03-xxxA



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

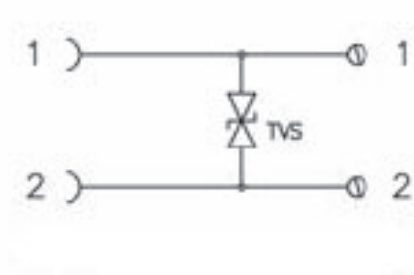


D = Deutsch  
B03-0xxD



## 15 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



## 16 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

