

DIRECTIONAL CONTROL VALVES SOLENOID OPERATED

HD2-ES-*

30 l/min - 32 MPa (320 bar)

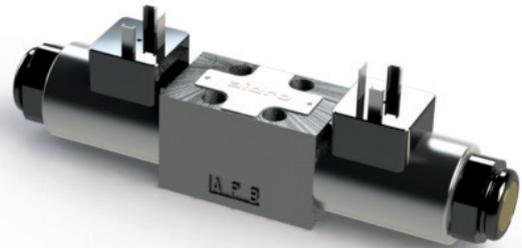
1 DESCRIPTION

Valves HD2-ES are directional control valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02).

The design of the body is a three chamber casting for production cost saving and low pressure drops.

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

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)
HD2	-	ES	-	-	/ 11

(1) HD2: 4-way directional control valve CETOP 02- Pressure 32 MPa (320 bar)

(2) ES: electrically controlled standard

(3) Spool type (see 4)

-number is the main spool type

-letter is solenoid and spring arrangement:

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

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

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

ML: 1 solenoid (a), spool is spring offset (2 position, middle to end)

LM: 1 solenoid (a), spool is spring offset (2 position, end to middle)

(4) Code reserved for option and variants:

b: only for version LL, ML, LM solenoid b installed (instead of solenoid a)

K: protruding emergency pins, protected by rubber caps (see 9)

S*: calibrated orifice on P port (see 10)

ZC: zinc plated valve (see 12)

ZN: Zinc nichel plated body (see 12)

(5) Electric voltage and solenoid coils:

0000: no coils

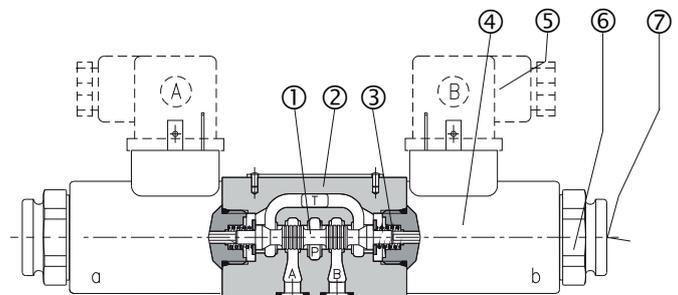
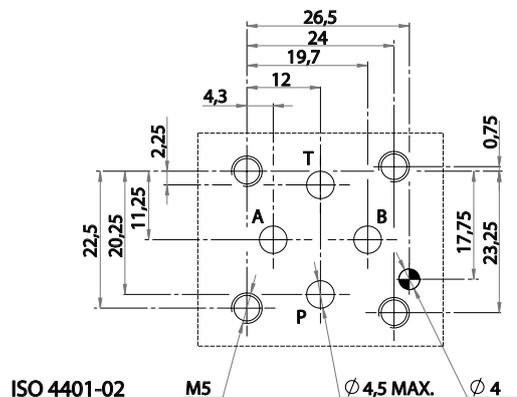
012C: coils for V12DC

024C: coils for V24DC

115A: coils for V110/50 – V115/60 AC

230A: coils for V220/50 – V230/60 AC

(6) Design number (progressive) of the valves

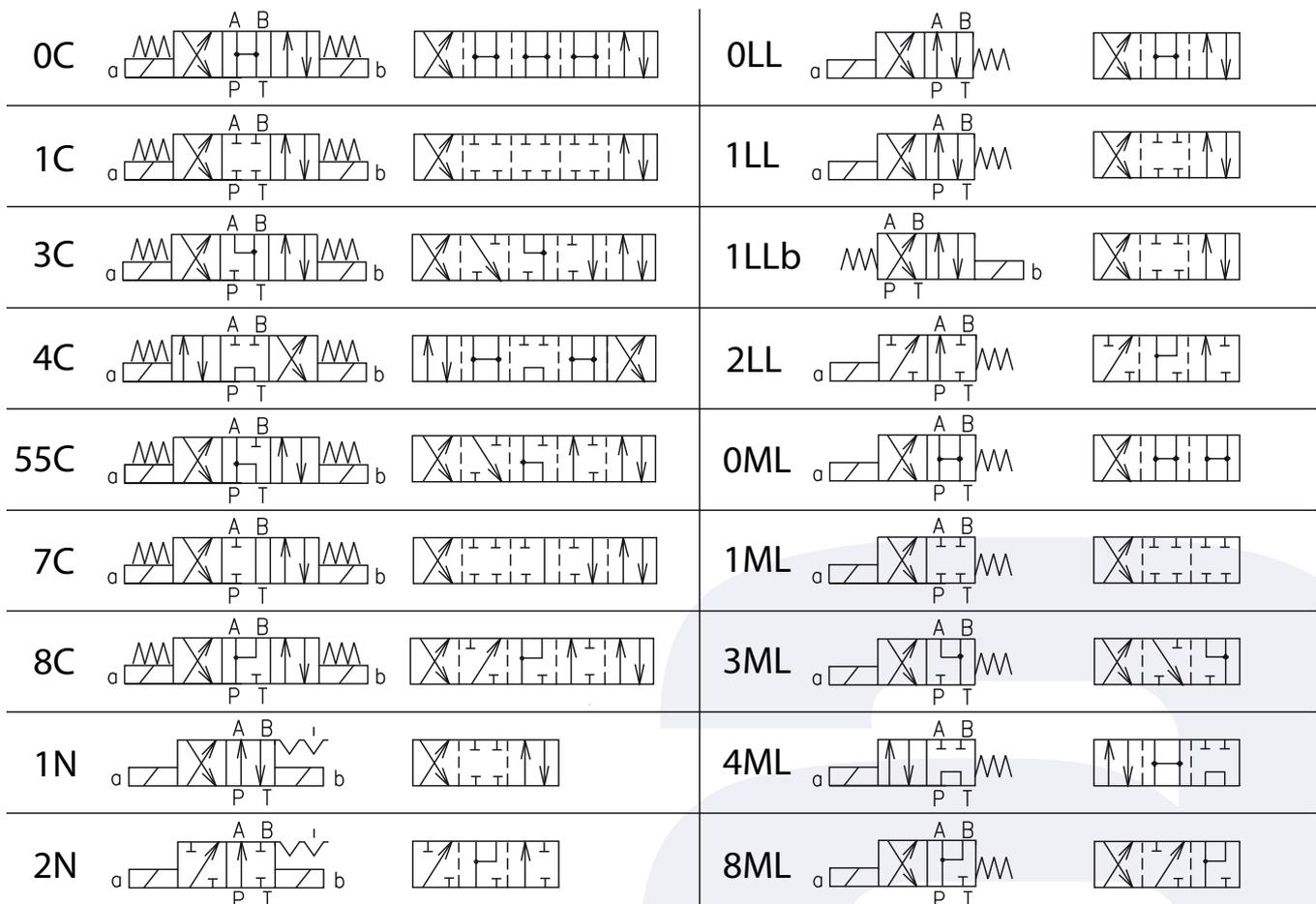


Spools, springs and solenoids combination permit to obtain almost every type of ports (P, A, B, T) connection and sequence. For almost all types of solenoids/springs combination and for all type of spools (with the exception of spool 4), when solenoid "a" is energized, hydraulic connections are P-->B and A-->T; to obtain P-->A and B-->T solenoid "b" must be energized. The hydraulic connections that are obtained in the "central" (neutral) position when solenoids are not energized is the characteristic mark of the spool shape and from it derives its identification number: 0 = P, A, B, T connected 1 = P, A, B, T closed 3 = P closed, A, B, T, connected for other types see 4

3 TECHNICAL DATA

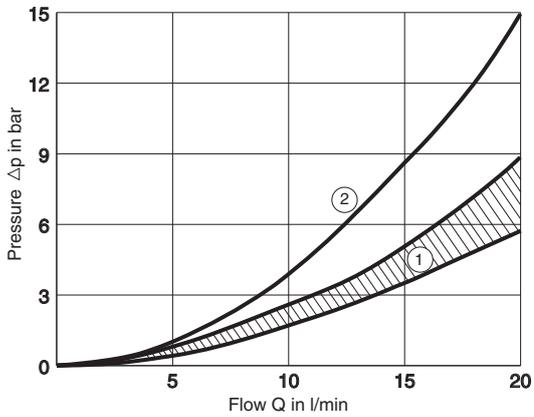
Maximum nominal flow	0,5 dm ³ /s (30 l/min)	Electric characteristics: Valves HD2 -ES-* are operated by solenoid that are energized: - directly from a D.C. voltage supply: V 12 DC (012C) V 24 DC (024C) - by the use of coils that incorporate a full wave bridge rectifier, from A.C. voltage supply: V 110/50 (V 115/60) =115 A V 220/50 (V 230/60) =230 A All standard valves are to be fitted with connectors 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 24 DC = 1,2 A V 110/50 = 0,30 A V 220/50 = 0,15 A Permissible supply voltage variation: +5% -10%
Maximum rec. flow rate	see [6]	
Maximum nominal pressure (P, A, B)	32 MPa (320 bar)	
Maximum pressure at T port	21 MPa (210 bar)	
Pressure drops	see [5]	
Protection to DIN 40050	IP 65	
Duty cycle	100%	
Service life	≥ 10 ⁷ cycles	
Installation and dimensions	see [7]	
Mass	approx 1,0/1,4 kg	

4 SPOOL IDENTIFICATION AND INTERMEDIATE POSITION TRANSITORIES



5 TYPICAL DIAGRAMS

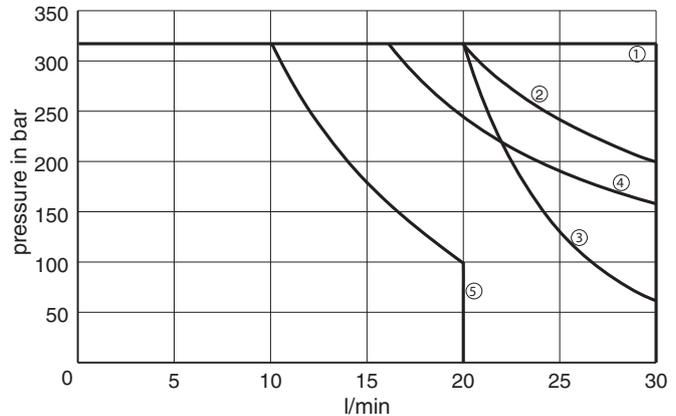
Typical Δp -Q curves for valves HD2-ES-* in standard configuration, with mineral oil at 36 cSt and at 50°C for flow P -> A/B, A/B -> T



- ①=all spool P -> A/B and A/B -> T ; P -> T spool 4 and 0
 ②= P -> A/B spool 4 ; A/B -> T spool 4

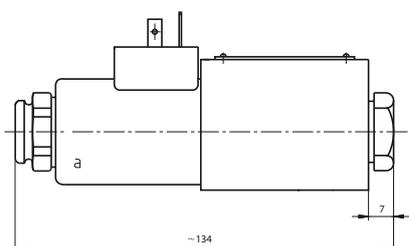
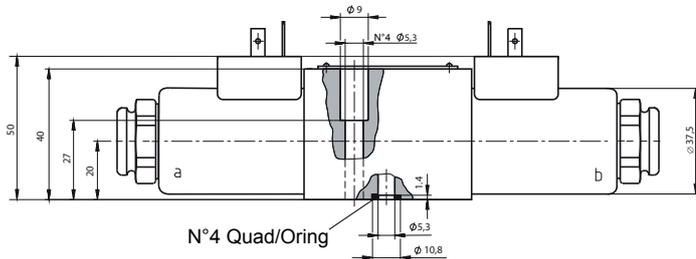
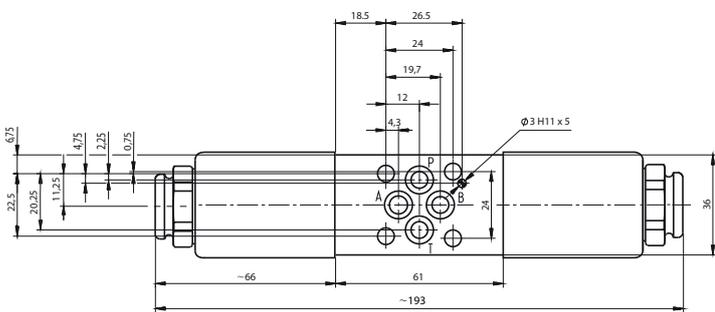
6 HYDRAULIC LIMITS OF USE

P/Q characteristic limits for safe use of HD2-ES-* solenoid operated valves. Limit curves apply to solenoid valves energized with rated voltage - 5% and flushed with hydraulic fluid with properties according to 8.



- ①= HD2 - ES - 0C; - 1C; - 1N; - 3C; - 8C; - 0ML; - 1LL; - 1ML; - 3ML; - 8ML
 ②= HD2 - ES - 2N; - 7C
 ③= HD2 - ES - 0LL
 ④ = HD2 - ES - 4C; - 4ML
 ⑤ = HD2 - ES - 55C; - 2LL

7 INSTALLATION DIMENSIONS (mm)



All valves HD2-* conform with ISO and CETOP specifications for mounting surface dimensions (see 6) and for valves height. When assembled to its mounting plate valve HD2 - * must be fastened with 4 bolts M5x35 (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/ O Ring type 7,65x1,68x1,68. Solenoid valves can be supplied without electric coils, as HD2 - ES -**-0000 - .

Coils are supplied separately: standard, 3 electric pins coils are BO2-012C, BO2-024C, BO2-115A and BO2-230A.

Connectors to the electric supply is made:

a) On standard solenoid coils 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.

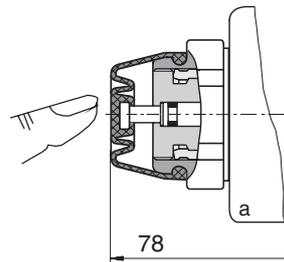
b) On type "AMP" solenoid coils, by connectors conforming to AMP-Timer (see 11)

8 HYDRAULIC FLUIDS

Seals and materials used on standard valves HD2-* are fully compatible with hydraulic fluids of mineral oil base, upgraded with antifoaming 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 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.



10 VERSION "S*": CALIBRATED ORIFICE ON P PORT

Option "S" is represented by elements ②, suitably shaped to be inserted on P port of the solenoid valve, having a calibrated orifice (of various size) able to restrict, at the requested Δp value, the flow rate entering the solenoid valve. Those elements have the following orifice diameter:

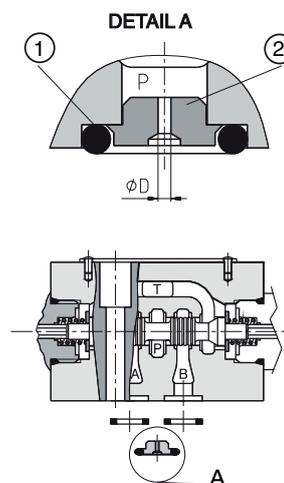
2S - 08 D = 0,8 mm

2S - 10 D = 1

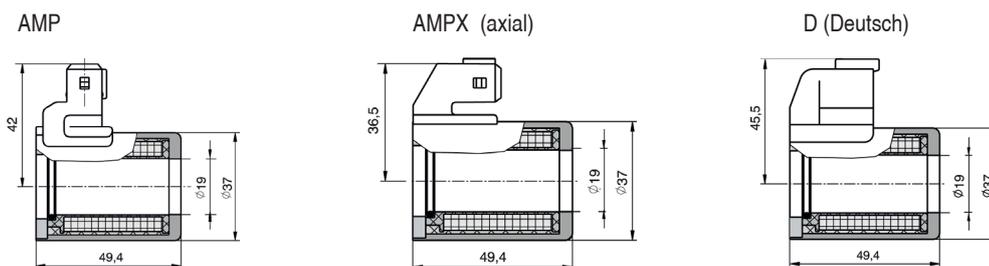
2S - 12 D = 1,2 mm

2S - 15 D = 1,5 mm

and are kept sealed on the P port of the valve by an OR ① of 7,65x1,78 mm sizes (example OR 107-2031)



11 VERSION "AMP" and VERSION "Deutsch":



They are typically used on DC mobile application and they are available for many different coltages voltages:

12 VERSION "ZC" and VERSION "ZN" ZINC PLATED VALVES

Solenoid valves according to "ZC" version are completely 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 μm

on the solenoid tubes 8-12 μm

on the solenoid coils 8-12 μm

Version ZN (Zinc Nichel) has an higher protection degree which achieve the ISO 9227, 720 h salt spray test requirements