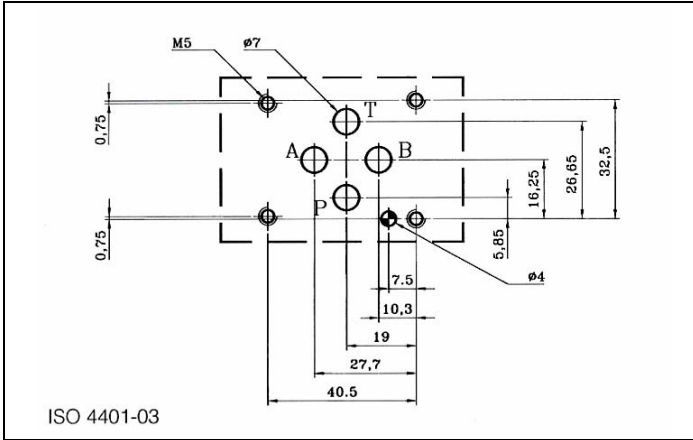


**DIRECTIONAL CONTROL VALVES SOLENOID OPERATED – CETOP 03**

**Ex** | - proof II 2 G EEx d IIC T5

**TYPE HD3 – EX - \***  
**ATEX**



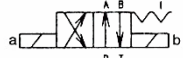
**2 FUNCTIONAL SYMBOLS**

Spring/Stroke combination for spool type "1"

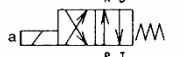
1C



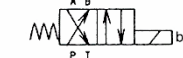
1N



1LL



1LLb



1ML



1MLb



1LM



1LMb



**3 HOW TO READ THE MODEL CODE FOR VALVES HD3 – EX - \***

**HD3 - EX - (1) (C) - \* (024C) / 20**

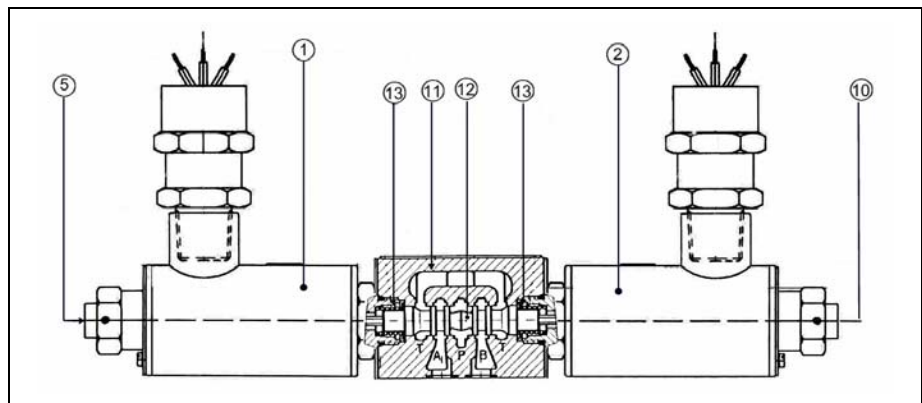
① ② ③ ④ ⑤ ⑥ ⑦

- ① HD3 : 4-way directional valve Cetop 03 – Pressure 25 Mpa (250 bar)
- ② EX : electrically controlled, Ex-proof solenoid
- ③ (1) : spool type (see 7)
- ④ © : solenoid(s) and spring(s) arrangement, see also functional symbols 2
  - C : 2 sol., spool is spring centered (3 position)
  - N : 2 sol., spool is detented (2 position) see 13
  - LL : 1 sol. (a), spool is spring offset (2 position, end to end)
  - ML : 1 sol. (a), spool is spring offset (2 position, middle to end)
  - LM : 1 sol. (a), spool is spring offset (2 position, end to middle)
- ⑤ \* : code reserved for option and variants
  - b : only for LL, ML, LM sol. B installed (instead of sol. A)
  - S-\*\* : calibrated orifice on P port, see 14
  - ZC : zinc plated valve, see 15
- ⑥ (024C) : electric voltage and solenoid coils
  - 012C : coil(s) for V12DC
  - 024C : coil(s) for V24DC
  - 115A : coil(s) for V110/50 – V115/60 AC
  - 230A : coil(s) for V220/50 – V230/60 AC
 see also electric characteristics 6
- ⑦ : design number (progressive) of the valves

**3 DESCRIPTION**

The spool 12 shifts in to the valves body 11 subject to the action of springs 13 and solenoids 1 2.

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 of the hydraulic flow. Solenoids 1 and 2 are 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.

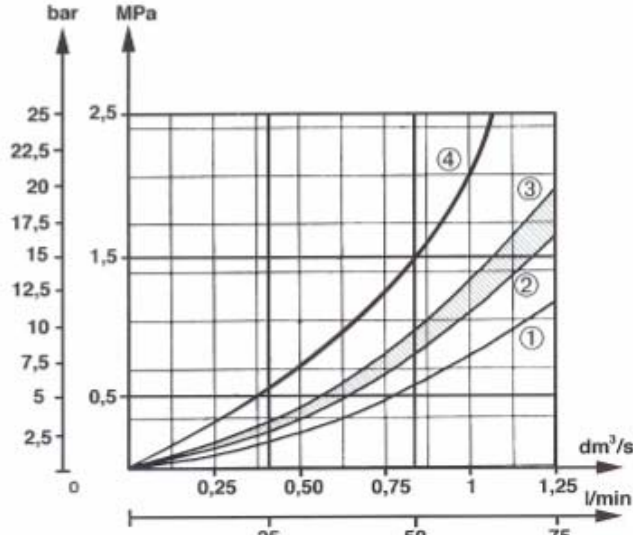


# Explosion Proof Directional Control Valve DO3

## ATEX Standard

### 4 TYPICAL DIAGRAMS

Typical  $\Delta p$ -Q curves for valves HD3 – EX - \* in standard configuration, with mineral oil at 36 cSt and at 50°C for flow P → A/B, A/B → T



① = spool 0, 8      ② ↔ ③ = spool 1, 2, 3, 4, 42, 55, 56, 7, 38, 19  
 ④ = P → A spool 4      = P → T spool 4

### 5 TECHNICAL DATA

Nominal flow	32 l/min
Maximum rec. flow rate	40 l/min
Maximum nominal pressure (P,A,B)	25 Mpa (250 bar)
Maximum pressure at T port	25 Mpa (250 bar)
Pressure drops	See 4
Electric characteristics	See 6 and 9
Protection to DIN 40050	IP 67
Duty cycle	100%
Service life	≥ 10 <sup>7</sup> cycles
Dimensions	See 10
Installation	See 11 and 9
Mass	Approx 2,6 / 3,7 kg

### 7 SPOOL IDENTIFICATION AND INTERMEDIATE POSITION TRANSITORIES

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

### 6 ELECTRIC CHARACTERISTICS

Valves type HD3-EX-\* are operated by solenoid that are energized:

- directly from a D.C. voltage supply:  
 V 12 DC = 012 C  
 V 24 DC = 024 C
- 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

Other voltages are available.

Permissible supply voltage variation: ± 5%.

Ex-proof solenoid according to ATEX 94/9/CE, CE 0722 Ex II 2G, class EExd IIC T5 – see 9.

Power consumption: max 11 w.

Currents are, at nominal voltage and at 25°C:

V12DC = 0,92A    V115AC = approx 0,1A  
 V24DC = 0,46A    V230AC = approx 0,05A

### 8 FUNCTIONAL SYMBOLS.

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 fo spools (with the few exceptions of spool 2, 4, 42 and \*38\*), 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

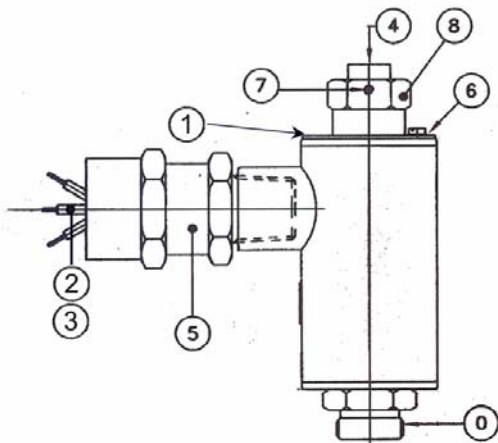
1 = P, A, B, T closed

3 = P closed, A, B, T, connected

for other types see 7.

Explosion Proof Directional Control Valve DO3  
ATEX Standard

9 EXPLOSION PROOF SOLENOID TYPE GMA-6/HD SERIES 271



- ① Ex proof solenoid according to ATEX 94/9/CE.  
Class CE0722 EX II 2G EExd IIC T5.  
Solenoid outside surfaces are nickel plated, with 7 μ minimum thickness
- ① Solenoid label indicates supply voltage, protection class EExd, certification number by CESI and maximum absorbed power.
- ② 3-wires cable, according to CEI 20-22, of standard length of 1,5 m, is fastened to the coil and locked by cable gland ⑤.
- ③ Wires have 1,5 mm<sup>2</sup> section; earth connection wire is green-yellow.

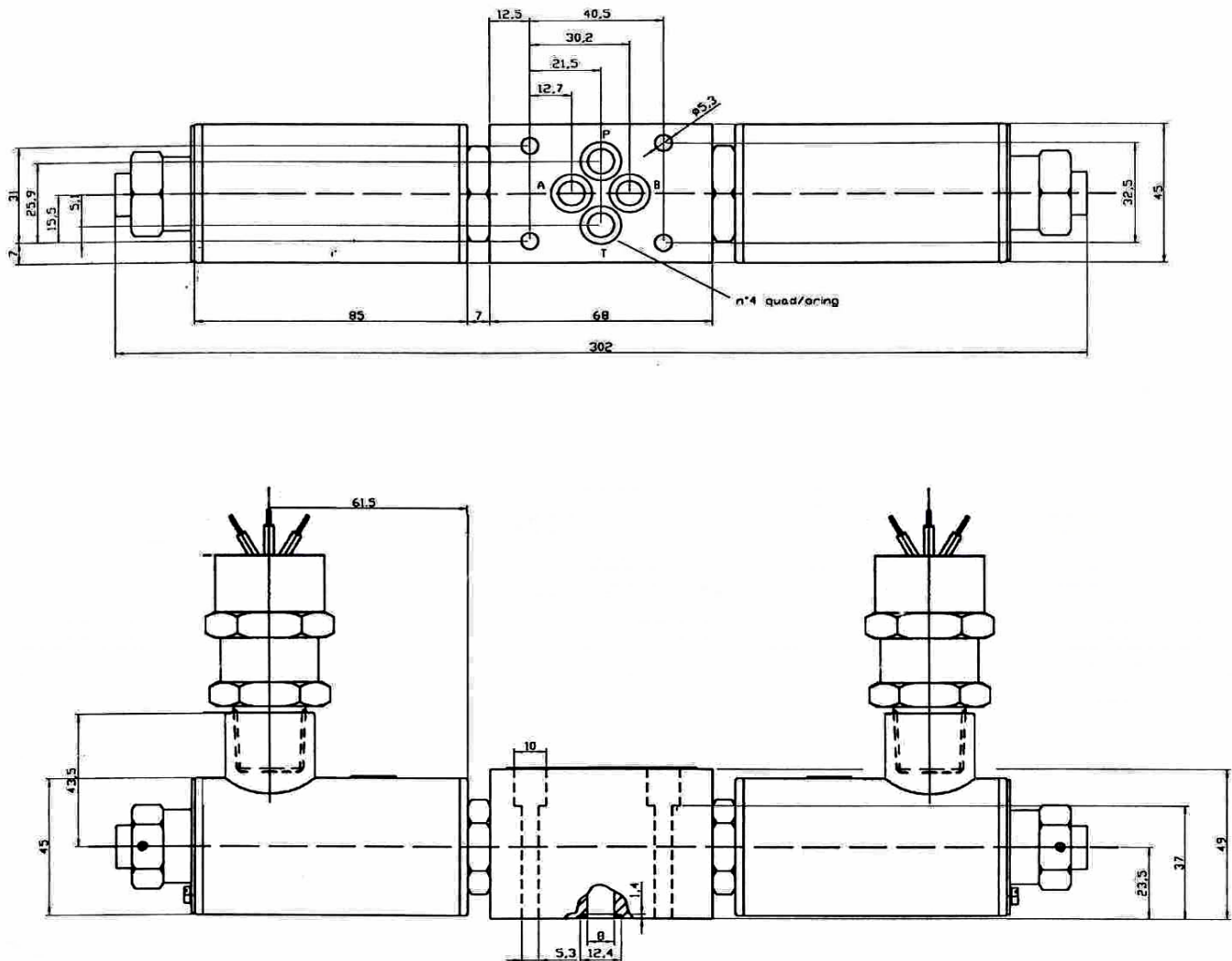
**Electric connection must be in accordance with Ex-proof norm ATEX.**

- ④ Manual override operation is by pushing the extended pin.
- ⑤ Normalised cable gland –torque 8 Nm ± 1 – device has threaded attachment ½" conical – ISO 7/1
- ⑥ Earth connection screw
- ⑦ Threaded plug (socket hexagon 1,5 mm)to lock the retaining coil nut ⑧
- ⑧ Nut for retaining the coil –torque 6 Nm ± 1 – hexagon 24 mm.

**Conformity of unit to the norms is not granted if coil is used separately from its electromagnetic tube.**

**Copy of ATEX certificate-CESI 03 ATEX 212 - is available on request.**

10 INSTALLATION DIMENSIONS



All dimension are mm.

## Explosion Proof Directional Control Valve DO3

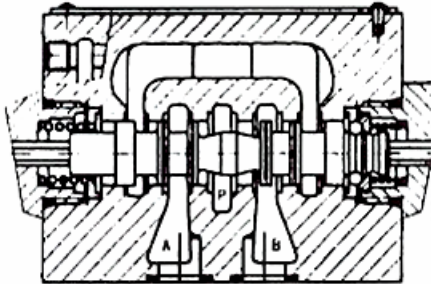
### ATEX Standard

#### 11 INSTALLATION

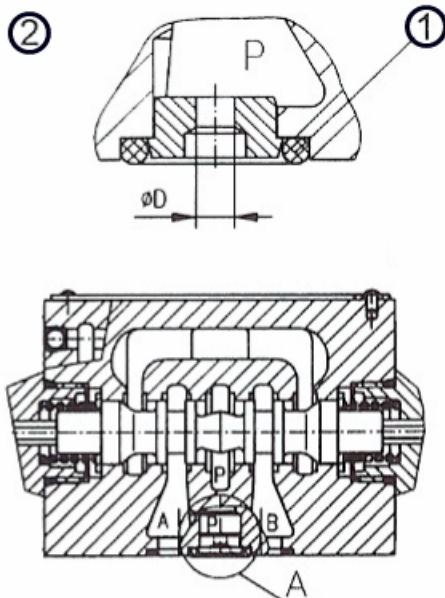
All valves HD3 - \* conform with ISO and CETOP specifications for mounting surface dimensions (see also front page) and for valves height. When assembled to its mounting plate valve HD3 - \* must be fastened with 4 bolts M5 X 45 mm (or M5 x \*\* according to the number of modules) tightened at 8 Nm torque.

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.

13



14



#### 12 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.

#### 13 VERSION "N":

##### MECHANICAL DETENT ON SPOOL.

Solenoid valves with detent typically are 2 position, 2 solenoid, no-spring valve 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 that the spool remains at its position regardless of forces due to hydrodynamics or gravitational/inertial effects (vibrations).

#### 14 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 sizes) able to restrict, at the requested  $\Delta P$  value, the flow rate entering the solenoid valve.

Those elements have the following orifice diameter:

3S - 10  $\rightarrow$   $\varnothing D = 1$  mm

3S - 20  $\rightarrow$   $\varnothing D = 2$  mm

3S - 25  $\rightarrow$   $\varnothing D = 2,5$  mm

and are kept sealed on the P port of the valve by an OR ① of 9,25x1,78 mm sizes (example OR 110 - 2037).

#### 15 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 ambiance or other aggressive chemicals. Zinc thickness are on the valve body: 10-15  $\mu\text{m}$ .

Electromagnets GMA-6/\*  
Ex-proof solenoids according to EExd  
Type 271 OXOOOX

## SAFETY INSTRUCTIONS

### 1. FOREWORD

These safety instructions refer to installation, use & maintenance of ex-proof solenoids coded 27100(.) for operation of solenoid valves to be used in areas with potentially explosive atmospheres.

Solenoids that are matter of these instructions are classified by following protection mode: **EExd II 2G**.

### 2. INSTALLATION

#### 2.1 Suitability of installation ambient

For use in areas potentially explosive, it is necessary to verify that solenoids are conforming to classification of area & characteristics of flame-proof of all media that can be present in the area.

Essential requisites of safety against the risk of explosion in any classified area, are stated by the European norms 94/9/CE of 23rd March 1994 (related to components) and 1999/92/CE of 16th December 1999 (related to plants).

Criteria for classification of areas with risk of explosion are regulated by the European norm EN 60079-10.

Technical requisites of electric plants of any classified area are regulated by the European norm EN 60079-14.

Following to these technical and legal prescription, following items are topic :

- *Type of plant* : Group I - mines; Group II - surface plant
- *Classification of area*: 0,1,2 (to which characteristics of components & apparatuses of class 1,2 & 3 are corresponding to)
- *Characteristics of flammable media that are present in the area as gas, steams, mist* :groups IIA, IIB, IIC
- *Temperature class* : T1, T2, T3, T4, T5, T6 (they refer to ignition temperature of gas)

Data that are quoted on label, besides the nominal operation data, include:

- Necessary information far a correct installation and start-up
- References of National Organisms charged for the certification of conformity of product

#### 2.2 Limits for utilization


Solenoids type 27100(.) for operation of solenoid valves can be used with ambient temperature from -20°C to +40°C

Protection according to EN60529 : IP67

Nominal data for solenoids type 27100(.)

- Max electric power : 11 W ac for temperature class T5
- Max nominal voltage : 230 Vac

## 2.3 Data quoted on the label that refer to safety :

- a)- II 2G ex-proof solenoid for surface plants with presence of gas or steams of classification 2, suitable far area 1 and (redundant) for area 2
- b)- EExd ex-proof solenoid
- c)- II C solenoid of group II C for application with media of group II C
- d)-  mark of conformity to European Directive 94/9/CE and concerned technical norms
- e)- CE mark CE in conformity to European Directive 94/9/CE and concerned technical norms
- e)- CESI name of Organism that has certified the product according to CE norm
- f)- xx year of issue of certificate
- g)- xxx number of certificate CE
- h) - 0722 number of Organism that has effected the certification of quality of the production system

### Important Notes

- I) Ex-proof units of group II C are suitable as well for ambient with presence of gas and steams of group II A & II B
- II) Ex-proof units of class T5 are suitable as well for class of temperatures from T1 to T4.
- III) Screws and bolts associated to the units must be of minimum quality class 8.8 according to UNI EN 20898
- IV) To grant the protection degree IP67, after any possible disassembling of unit, it is requested to verify the integrity of OR seals seated within the solenoid body and closing flanges and between these latter and the tube of solenoid.

## 2.4 Connections to control and supply apparatus

Connections to control and supply apparatus are executed by means of tripolar cable, hold by a cable gland conforming to European Norms EN50014 & EN50018 related to E or to ATEX.

## 2.5 Earth connection

Bodies of ex-proof solenoids type 27100(.) are provided by an external earth connection terminal located onto the body in conformity to prescriptions of norm EN50014 par. 15. Such a terminal must be connected to the earth line of system by a cable of minimum section of 4 mm<sup>2</sup>

An additional earth wire, connected internally to the body of solenoids, is incorporated in the cable of solenoids. It is a green-yellow wire with section of 1,5 mm<sup>2</sup>

## 3. CONTROLS AND MAINTENANCE

All interventions for controls and maintenance of ex-proof solenoids must be conducted according to European norm EN 60079-17.

In particular specific care must be paid to :

- Screws must be tightened to required torque value
- Substitution of parts that are subjected to wear (as for instance the OR seals) must be executed with parts having identical characteristics of original parts to grant the conformity with ex-proof and protection degrees requests of the unit
- Surfaces and mechanical coupling between the different elements of solenoid cannot be machined nor altered in the dimensions originally stated.

## 4. REPAIRS OF EX-PROOF SOLENOIDS

Any repair activity can be conducted only by the producer or by workshops authorised by the producer. Any intervention on body of ex-proof solenoid must be effected in strict accordance with all requirements and parameters of ex-proof construction. In the case, after the repair work, the expected ex-proof requirements are not achieved, solenoid will have its identification label removed and unit will not be considered any more as ex-proof.