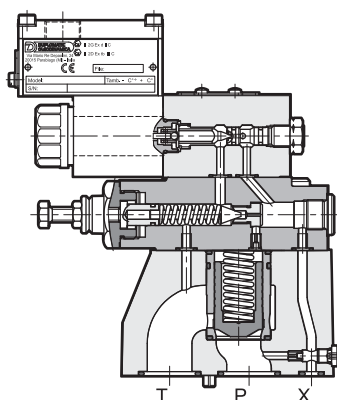


PRE(D)*K*

EXPLOSION-PROOF PROPORTIONAL PRESSURE RELIEF VALVE, PILOT OPERATED in compliance with ATEX 94/9/EC SERIES 10

PRED3K*	ISO 4401-03 (CETOP 03)
PRE3K*	ISO 4401-03 (CETOP 03)
PRE10K*	ISO 6264-06 (CETOP R06)
PRE25K*	ISO 6264-08 (CETOP R08)
PRE32K*	ISO 6264-10 (CETOP R10)

OPERATING PRINCIPLE



Type examination certificate No: CEC 13 ATEX 030-REV.2

- PRED3K* and PRE*K* are explosion-proof pressure relief valves with proportional control.
- They are compliant with ATEX 94/9/EC standards and are suitable for the use in potentially explosive atmospheres, that fall within the ATEX II 2GD (temperature class T4 or T5) or I M2, for mines. See par. 5 for ATEX classification,
- The statement of conformity to the up mentioned standard is always supplied with the valves.
- A low temperature version (up to -40 °C) is also available.
- The valves can be controlled directly by a current power supply or by means of an electronic control unit, to exploit valve performance to the full (see par. 20).
- Upon request, these valves can be supplied with a finishing surface treatment (zinc-nickel) suitable to ensure a salt spray resistance up to 600 hours.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)		PRED3K*	PRE3K*	PRE10K*	PRE25K*	PRE32K*
Maximum operating pressure	- P port - T port	350 2				
Minimum flow	l/min	-	2	-	-	-
Nominal flow		1	10	-	-	-
Maximum flow		3	40	200	400	500
Step response		see paragraph 10				
Hysteresis	% of p nom	< 5%				
Repeatability	% of p nom	< ±1,5%				
Electrical characteristic		see paragraph 5.6				
Operating temperatures (ambient and fluid)		see paragraph 5.5				
Fluid viscosity range	cSt	10 + 400				
Fluid contamination degree		According to ISO 4406:1999 class 18/16/13				
Recommended viscosity	cSt	25				
Mass	kg	1,8	3,8	5,3	6,1	8,3



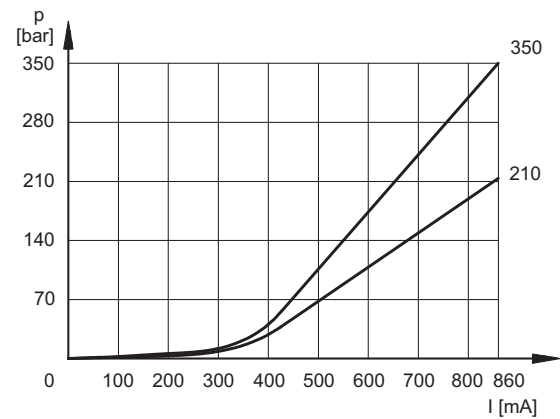
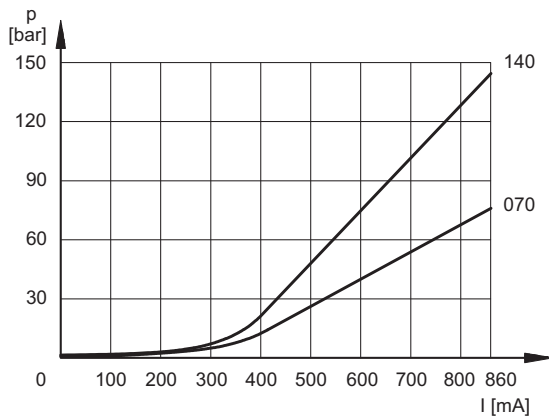
3 - CHARACTERISTIC CURVES FOR DIRECT OPERATED PROPORTIONAL VALVE PRED3K*

(measured with viscosity of 36 cSt at 50°C)

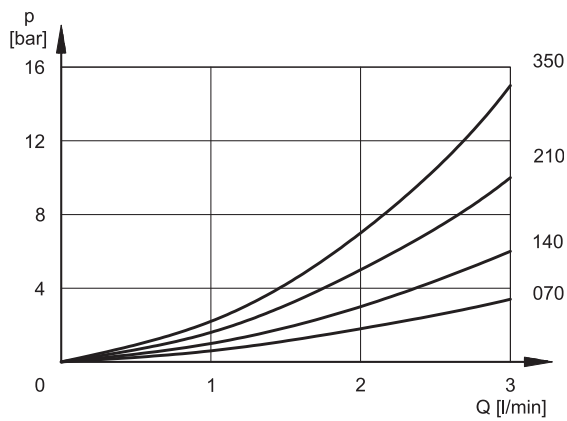
Typical control curves according to the current supplied to the solenoid for pressure control ranges: 070, 140, 210, 350, measured with input flow rate $Q = 1$ l/min.

The curves are obtained without any hysteresis and linearity compensation and they are measured without any backpressure in T. The full scale pressure is set in factory with a flow rate of 1 l/min. In case of higher flow rate, the full scale pressure will increase considerably (see diagram $p_{max} = f(Q)$).

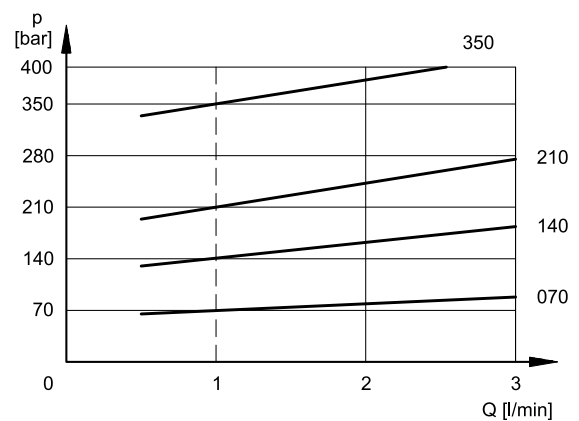
PRESSURE CONTROL $p = f(I)$



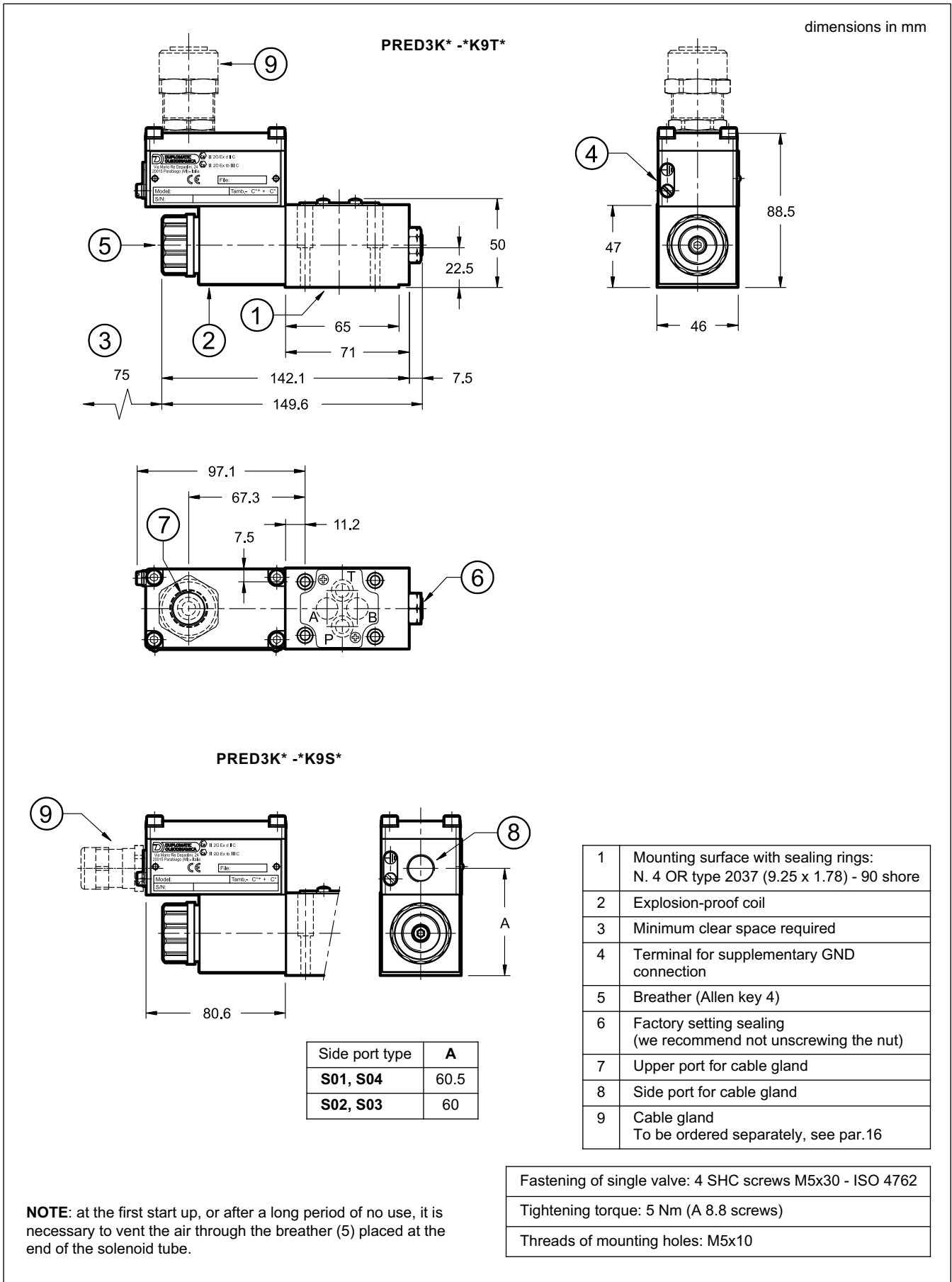
MINIMUM CONTROLLED PRESSURE $p_{min} = f(Q)$



PRESSURE VARIATION $p_{max} = f(Q)$



4 - PRED3K* OVERALL AND MOUNTING DIMENSIONS



4 - ATEX CLASSIFICATION, OPERATING TEMPERATURES AND ELECTRICAL CHARACTERISTICS

Diplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive prescriptions; **the supply always includes the declaration of conformity to the directive and the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environments.**

Coils assembled on these valves have been separately certified according to ATEX directive and so they are suitable for use in potentially explosive atmospheres.

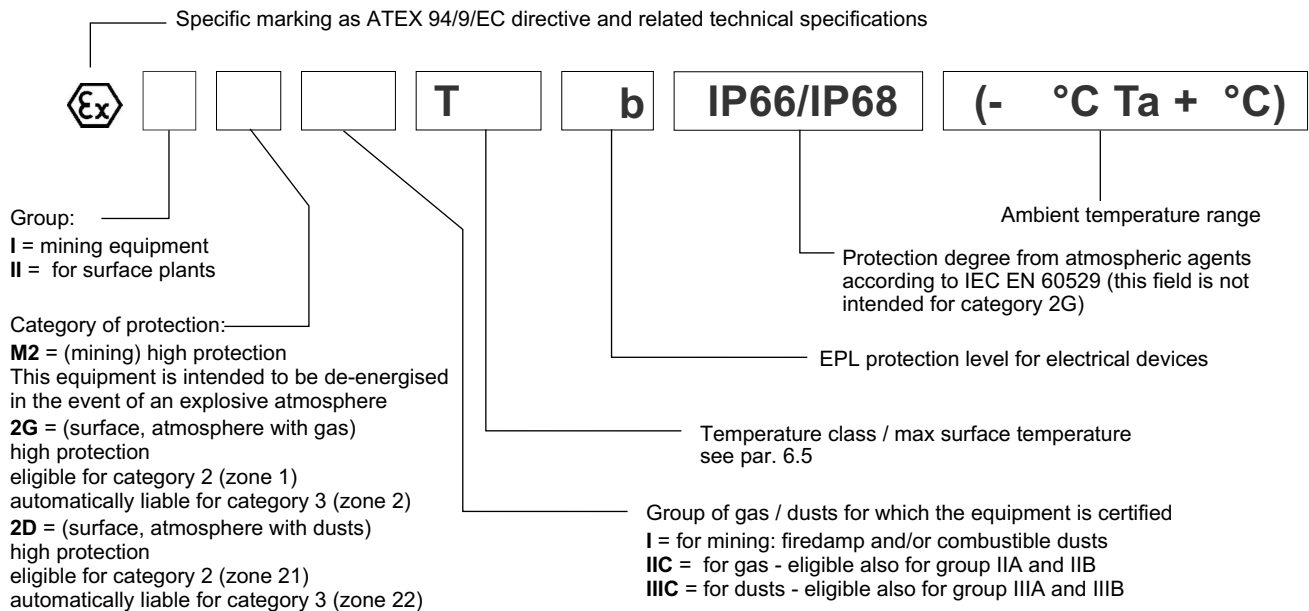
4.1 - ATEX classification for valves

The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	*KD2	intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
ATEX I M2	*KDM2	intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

4.2 - ATEX marking for valves

valve code		N and V seals	NL seals
*KD2	for gas	II 2G IIC T4 Gb (-20°C Ta +80°C)	II 2G IIC T4 Gb (-40°C Ta +80°C)
	for dusts	II 2D IIIC T154°C Db IP66/IP68 (-20°C Ta +80°C)	II 2D IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
*KD2 /T5	for gas	II 2G IIC T5 Gb (-20°C Ta +55°C)	II 2G IIC T5 Gb (-40°C Ta +55°C)
	for dusts	II 2D IIIC T129°C Db IP66/IP68 (-20°C Ta +55°C)	II 2D IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
*KDM2	mining	I M2 I T150°C Mb IP66/68 (-20°C Ta +75°C)	I M2 I T150°C Mb IP66/68 (-40°C Ta +75°C)



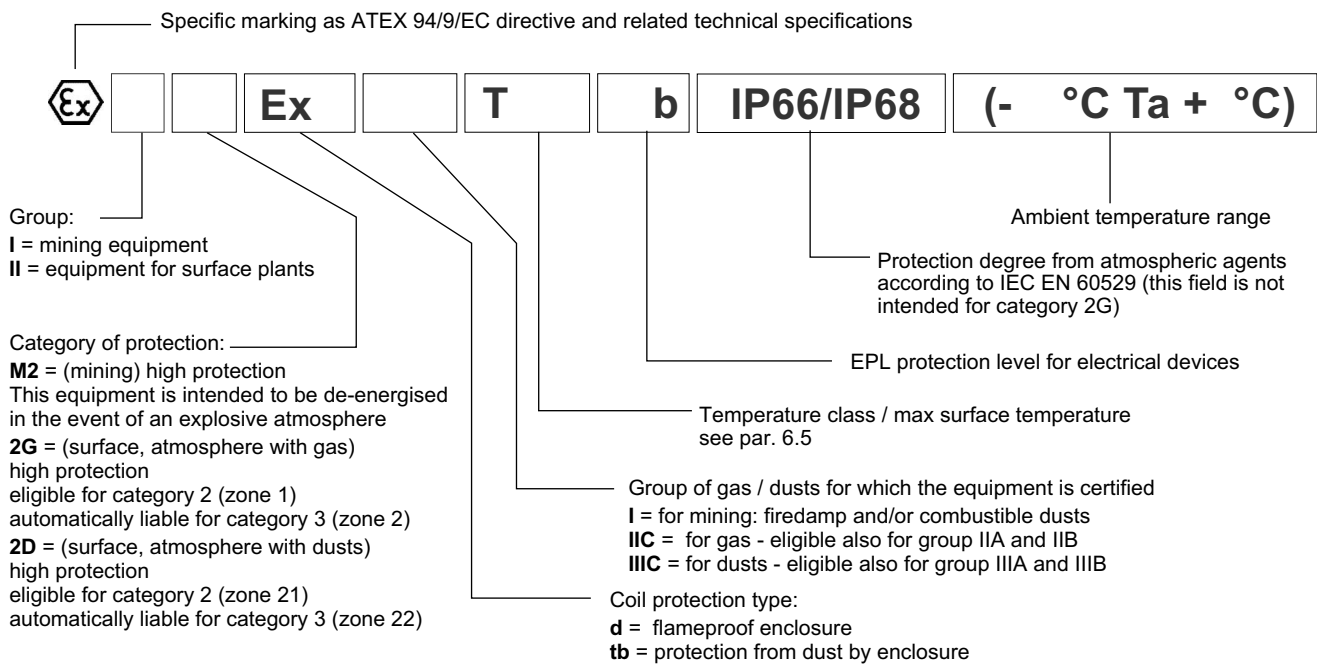
4.3 - ATEX classification of the coils

The coil of the explosion-proof valves is identified with its own tag, which carries the relative ATEX marking. **The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex d” type protection (explosion-proof coil).**

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

4.4 - ATEX marking on coils

for valve type *KD2	for gas for dusts	II 2G Ex d IIC T4 Gb (-40°C Ta +80°C) II 2D Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
for valve type *KD2 /T5	for gas for dusts	II 2G Ex d IIC T5 Gb (-40°C Ta +55°C) II 2D Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
for valve type *KDM2	mining	I M2 Ex d I T150°C Mb IP66/IP68 (-40°C Ta +75°C)



4.5 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

The valves in group II can also be used for less limiting temperature classes (surface temperature allowed higher).

		temperature range	N and V seals	NL seals	Temperature class	eligible also for
ATEX II 2G ATEX II 2D	*KD2	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas)	T3, T2, T1 T200°C and higher
		of fluid			T154°C (dusts)	
	*KD2 /T5	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C	T129°C (dusts)	
ATEX I M2	*KDM2	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
	of fluid					

5.6 - Electrical characteristics (values $\pm 5\%$)

NOMINAL VOLTAGE	V DC	12	24
RESISTANCE (AT 20°C)	Ω	3,4	15,6
NOMINAL CURRENT	A	1,88	0,86

DUTY CYCLE	100%
EXPLOSION-PROOF VERSION	According to ATEX 94/9/CE
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE
CLASS OF PROTECTION: Atmospheric agents Coil insulation (VDE 0580)	IP66 / IP68 class H

6 - ELECTRICAL CONNECTION

6.1 - Wiring

In order to realise the electrical connection of the coil, it is necessary to access the terminal block (1) unscrewing the 4 screws (2) that fasten the cover (3) with the box (4) that contains the terminal block.

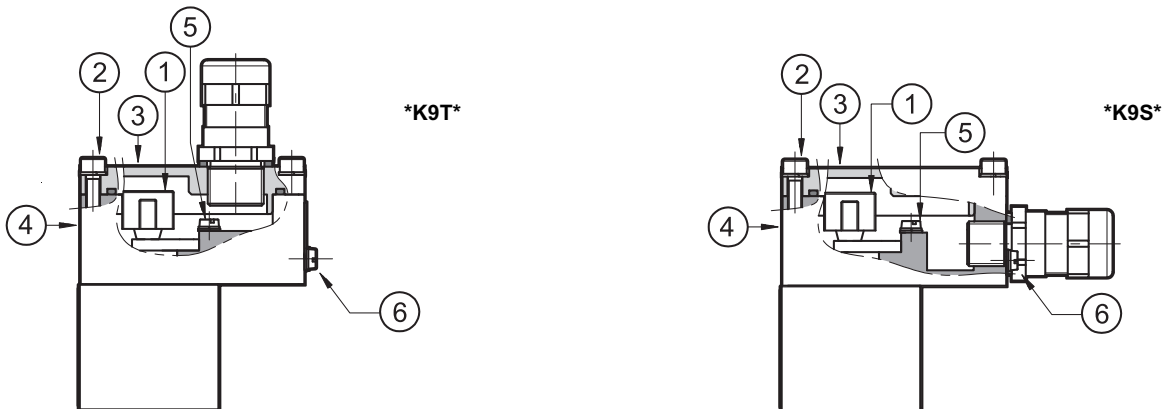
The electrical connection is polarity-independent.

By doing electrical connection it is important to connect also the grounding point (5) in the terminal block box (M4 screws), through suitable conductors with the general grounding line of the system.

On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω), is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9 ± 6 Nm.

Electrical wiring must be done following the instructions of the rules in compliance with ATEX standards.



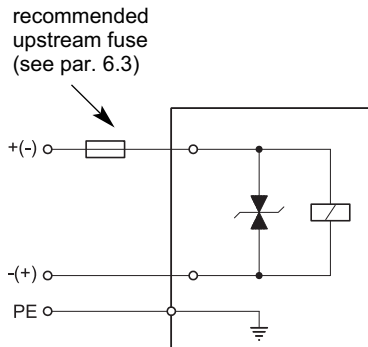
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	Cable section
Operating voltage cables connection	max 2.5 mm ²
Connection for internal grounding point	max 2.5 mm ²
Connection for external equipotential grounding point	max 6 mm ²

Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from - 20 °C to +110 °C (for valves either with N or V seals) or from - 40 °C to +110 °C (for valves with NL seals).

Cable glands (which must be ordered separately, see paragraph 16) allow to use cables with external diameter between 8 and 10 mm.

6.2 - Electrical diagrams



6.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x I_n according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source. The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil, that reduces voltage peaks, which can occur when inductances are switched off.

The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

Coil type	Nominal voltage [V]	Rated current [A]	Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1,88	2,5	- 49	Transient voltage suppressor bidirectional
D24	24	0,86	1,25	- 49	

7 - IDENTIFICATION CODE OF PILOT OPERATED PROPORTIONAL VALVES PRE*K*

P	R	E		-	/	10	-	K9			
----------	----------	----------	--	---	---	-----------	---	-----------	--	--	--

Pilot operated pressure relief valve

Electric proportional control

Size: **3** = ISO 4401-03 (CETOP 03)
 10 = ISO 6264-06 (CETOP R06)
 25 = ISO 6264-08 (CETOP R08)
 32 = ISO 6264-10 (CETOP R10)

Explosion-proof version: _____
 Protection type of the coil: "d"
KD2 = classified as ATEX II 2GD for gas or for dust
KDM2 = classified as ATEX I M2, for mines

Pressure control range: _____
 PRE3K*: PRE10K*, PRE25K* and
070 = 3.5 - 70 bar PRE32K*
140 = 4 - 140 bar **070** = up to 70 bar
210 = 4 - 210 bar **140** = up to 140 bar
350 = 5 - 350 bar **210** = up to 210 bar
 350 = up to 350 bar

Series No. _____
 (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals: _____
 For temperature range -20 / +80 °C
N = NBR seals for mineral oil (standard)
V = FPM seals for special fluids
 For temperature range -40 / +80 °C
NL = seal for low temperatures (for mineral oil)

NOTE: the valves are supplied with standard surface treatment of phosphating black.
 Upon request we can supply these valves with full zinc-nickel surface treatment, suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).
 For full zinc-nickel surface treatment add **/W7** at the end of the identification code.

Option:
surface treatment not standard.
Omit if not required (see **NOTE**)

Option: **/T5**
version in T5 temperature class.
See at par. 5.5
Omit if not required.

Connection type for cable gland upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
T03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)

side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
S03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Coil electrical connection: by terminal block

Nominal solenoid voltage:
D12 = 12V DC
D24 = 24V DC

8 - HYDRAULIC SYMBOLS



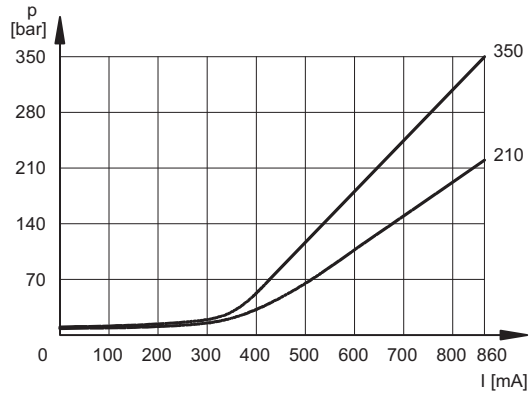
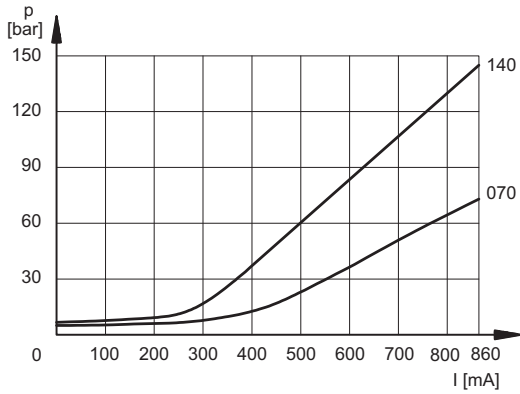


9 - CHARACTERISTIC CURVES OF PILOT OPERATED PROPORTIONAL VALVES

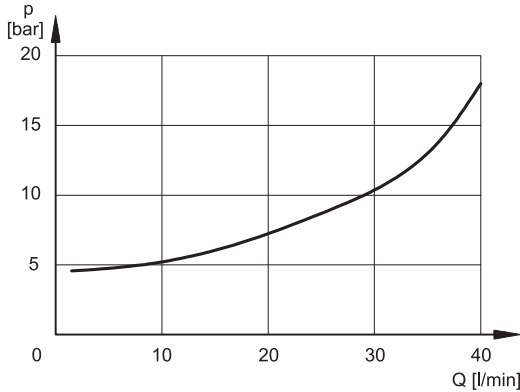
(measured with viscosity of 36 cSt at 50°C)

9.1 - PRE3K*

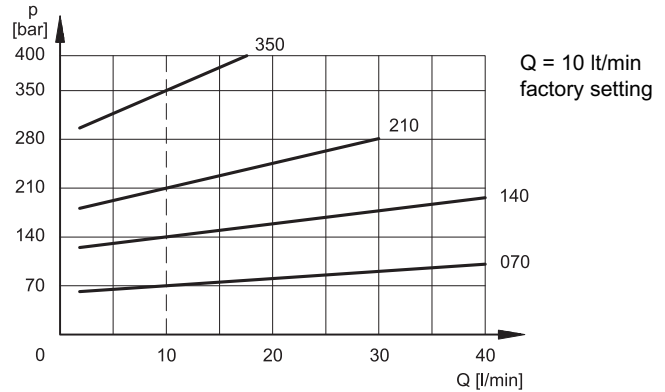
PRESSURE CONTROL $p=f(I)$



MINIMUM CONTROLLED PRESSURE $p_{min} = f(Q)$

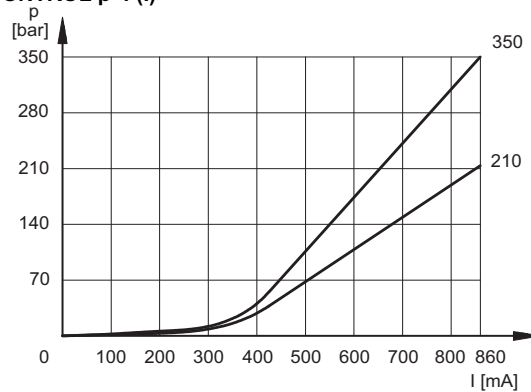
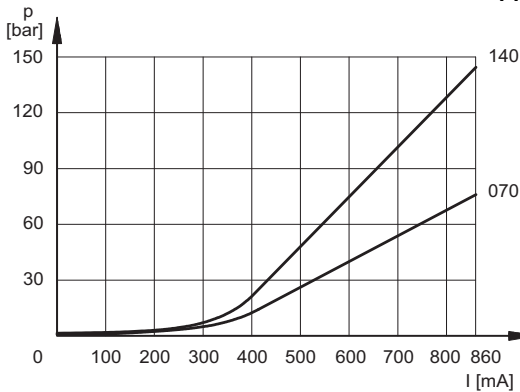


PRESSURE VARIATION $p_{max} = f(Q)$

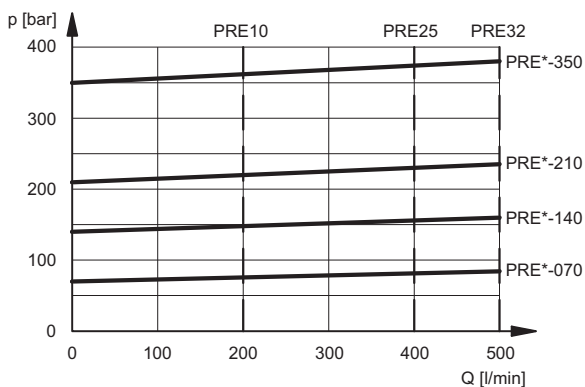


9.2 - PRE10K*, PRE25K* and PRE32K*

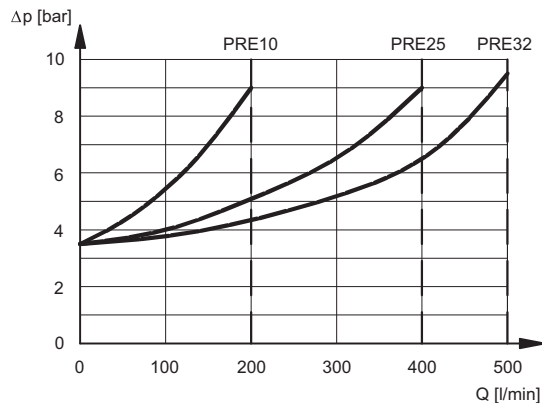
PRESSURE CONTROL $p=f(I)$



PRESSURE CONTROL $p=f(Q)$



PRESSURE DROP $\Delta p = f(Q)$



10 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with a valve of pressure range up to 140 bar and with input flow rate of Q = 2 l/min for PRED3K*, Q = 10 l/min for PRE3K* and Q = 50 l/min for PRE10K*, PRE25K* and PRE32K*.

REFERENCE SIGNAL	0 → 100%	100 → 0%
	Step response [ms]	
PRED3K*	80	40
PRE3K*	80	40
PRE10K*, PRE25K* and PRE32K*	120	90

11 - PRE3K* OVERALL AND MOUNTING DIMENSIONS

PRE3K*-/10*-*K9T*

dimensions in mm

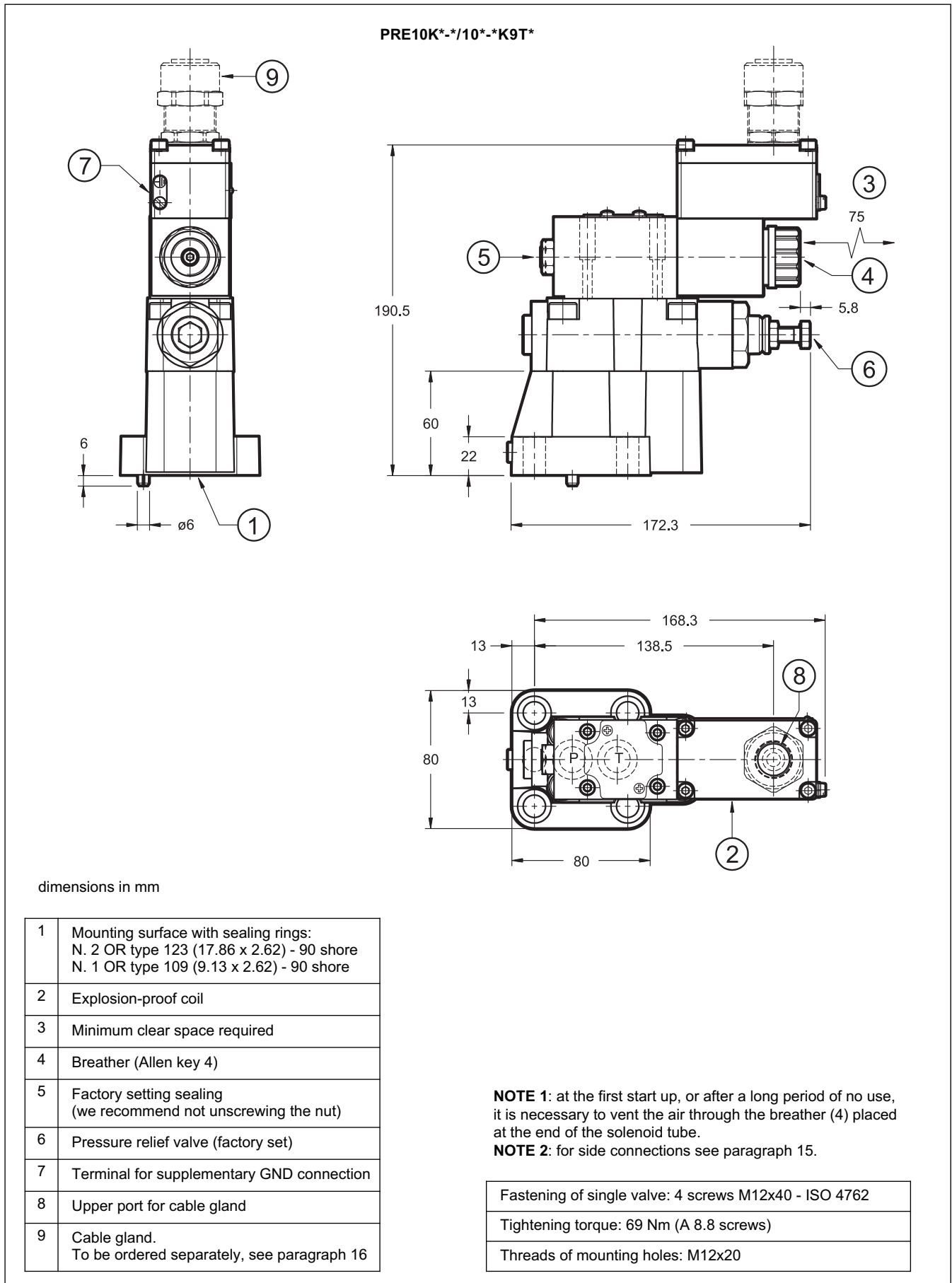
1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Terminal for supplementary GND connection
5	Breather (Allen key 4)
6	Factory setting sealing (we recommend not unscrewing the nut)
7	Upper port for cable gland
8	Cable gland. To be ordered separately, see paragraph 16

NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (5) placed at the end of the solenoid tube.

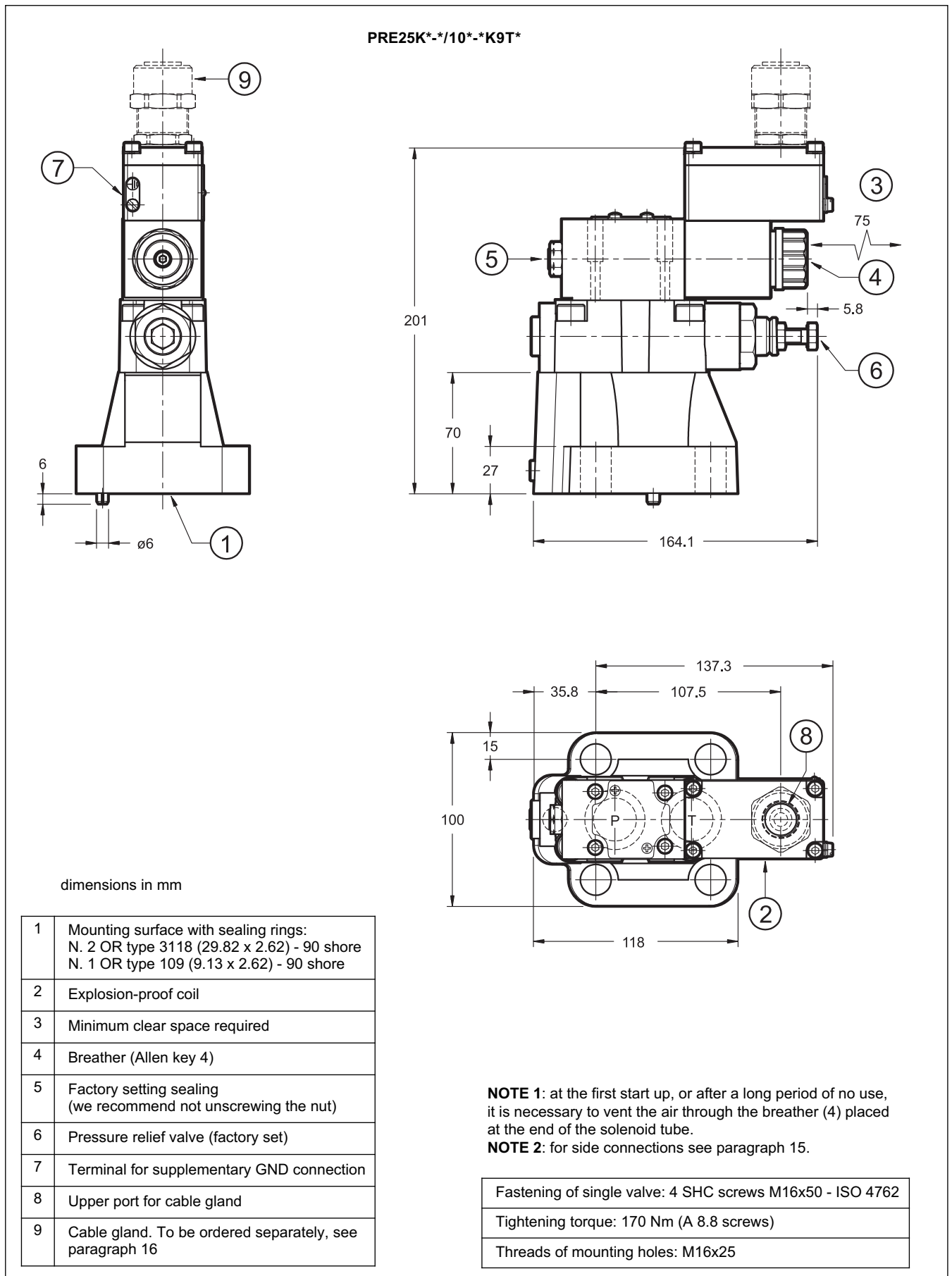
NOTE 2: for side connections see paragraph 15.

Fastening of single valve: 4 screws SHC M5x70 - ISO 4762
Tightening torque: 5 Nm (A 8.8 screws)
Threads of mounting holes: M5x10

12 - PRE10K* OVERALL AND MOUNTING DIMENSIONS

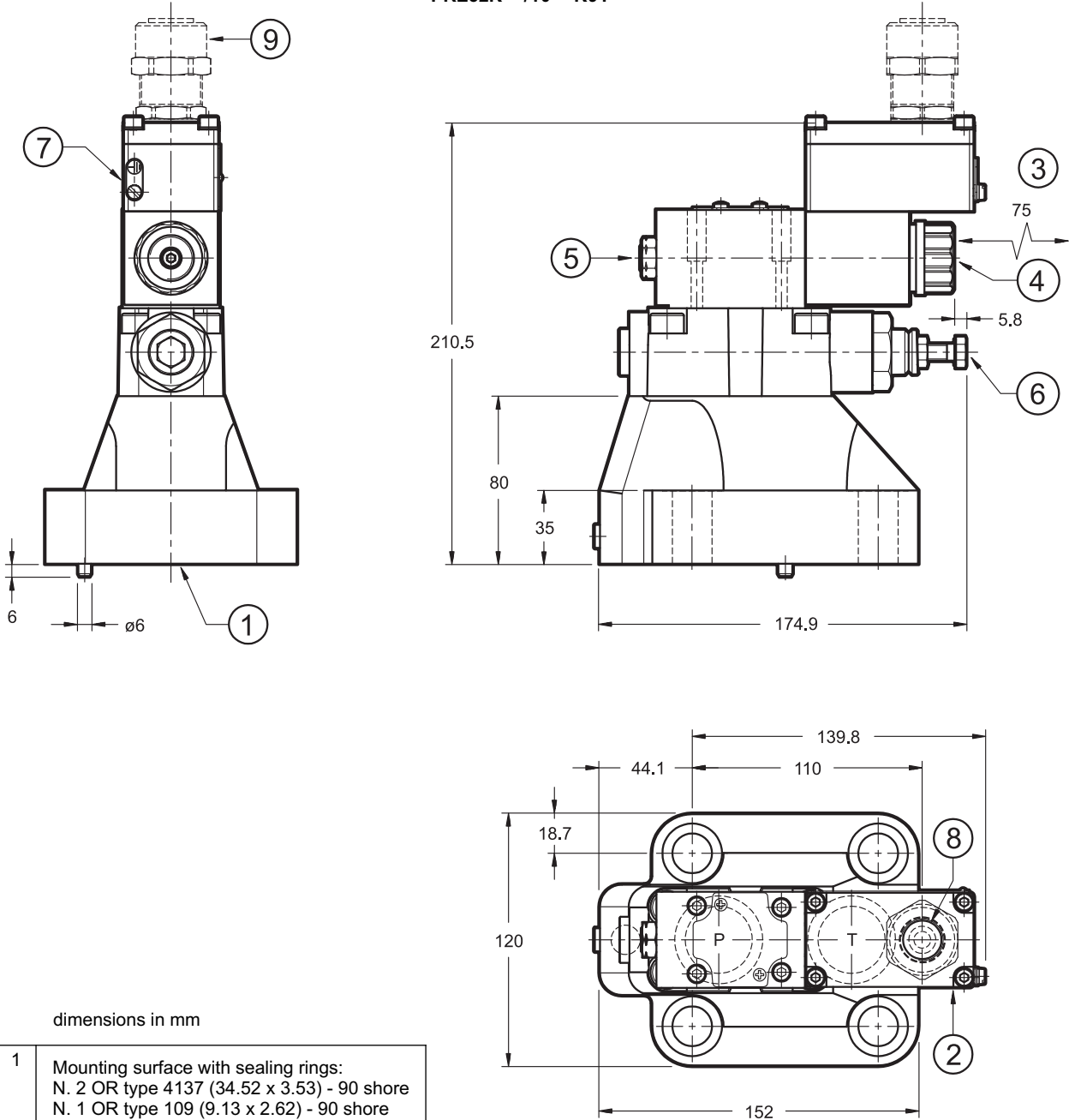


13 - PRE25K* OVERALL AND MOUNTING DIMENSIONS



14 - PRE32K* OVERALL AND MOUNTING DIMENSIONS

PRE32K*-/10*-*K9T*



dimensions in mm

1	Mounting surface with sealing rings: N. 2 OR type 4137 (34.52 x 3.53) - 90 shore N. 1 OR type 109 (9.13 x 2.62) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Factory setting sealing (we recommend not unscrewing the nut)
6	Pressure relief valve (factory set)
7	Terminal for supplementary GND connection
8	Upper port for cable gland
9	Cable gland. To be ordered separately, see paragraph 16

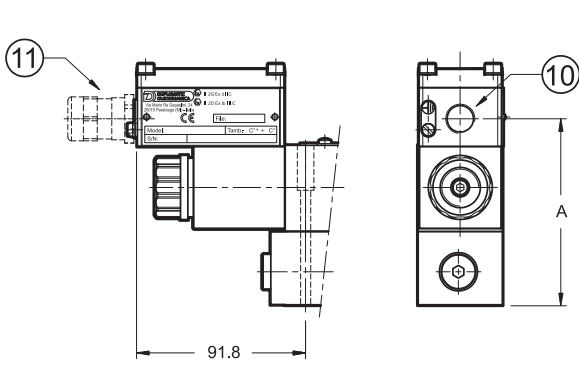
NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

NOTE 2: for side connections see paragraph 15.

Fastening of single valve: N. 4 SHC screws M18x60 - ISO 4762
Tightening torque: 235 Nm (A 8.8 screws)
Threads of mounting holes: M18x27

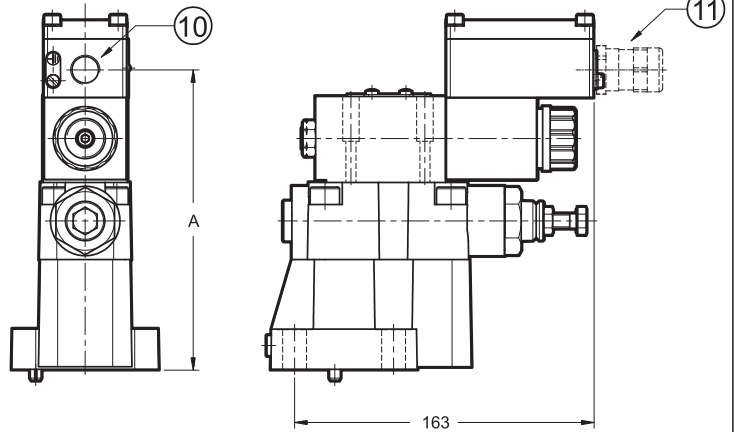
15 - PRE*K*-/10*-*K9S* (SIDE CONNECTION) OVERALL AND MOUNTING DIMENSIONS

PRE3K*-/10*-*K9S*



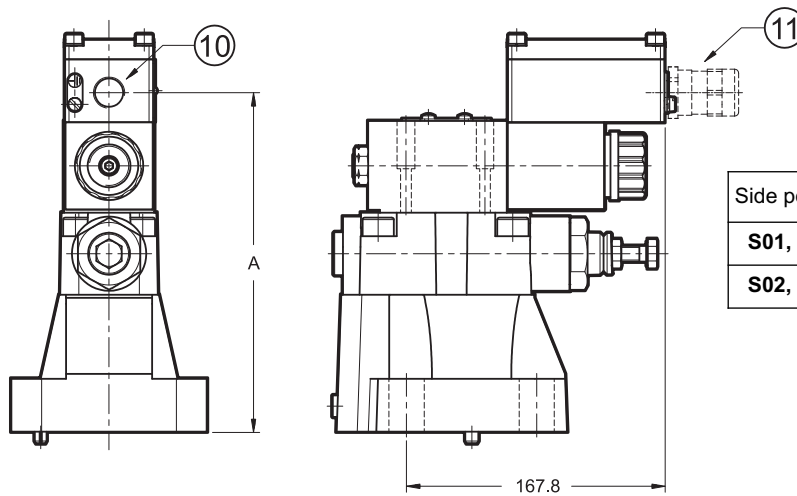
Side port type	A
S01, S04	100.5
S02, S03	100

PRE10K*-/10*-*K9S*



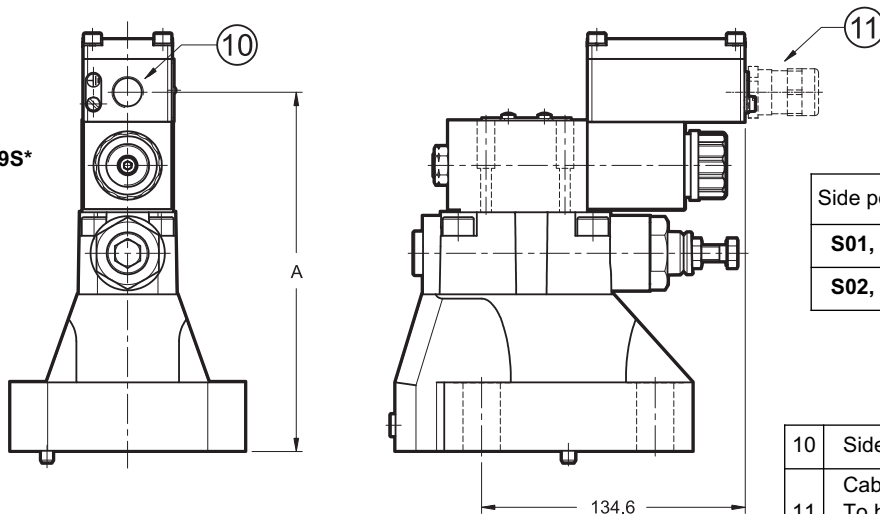
Side port type	A
S01, S04	162.5
S02, S03	162

PRE25K*-/10*-*K9S*



Side port type	A
S01, S04	172.5
S02, S03	172

PRE32K*-/10*-*K9S*



Side port type	A
S01, S04	182.5
S02, S03	182

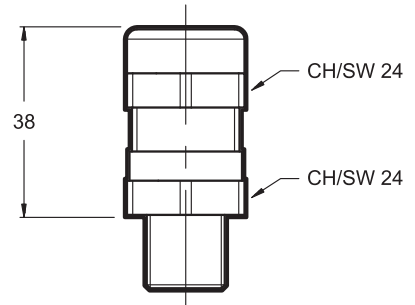
dimensions in mm

10	Side port for cable gland
11	Cable gland. To be ordered separately, see par. 16

16 - CABLE GLANDS

Cable glands must be ordered separately; Diplomatic offers some types of cable glands with the following features:

- version for non-armoured cable, external seal on the cable (suitable for $\varnothing 8+10$ mm cables);
- ATEX II 2GD and I M2 certified
- cable gland material: nickel brass
- rubber tip material: silicone
- ambient temperature range: $-70^{\circ}\text{C} + 220^{\circ}\text{C}$
- protection degree: IP66/IP68
- Tightening torque: 15 Nm



To order, list the description and the code of the version chosen from among those listed below:

Description: CGK2/NB-01/10

Code: 3908108001

M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connections. It is supplied equipped with silicone seal, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Description: CGK2/NB-02/10

Code: 3908108002

Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 and S02 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Description: CGK2/NB-03/10

Code: 3908108003

1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 and S03 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

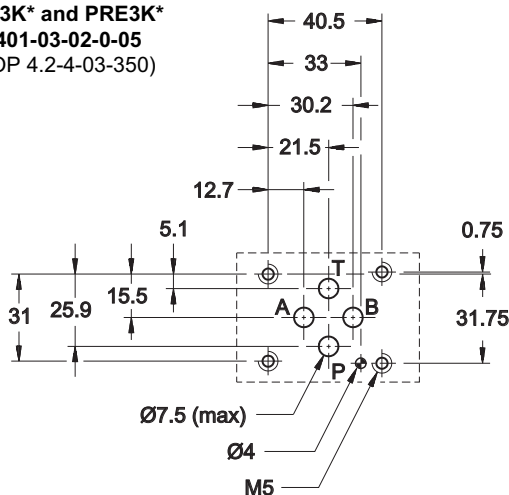
Description: CGK2/NB-04/10

Code: 3908108004

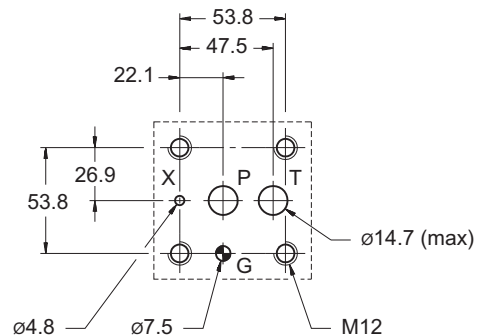
M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection. It is supplied equipped with silicone seal, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

17 - MOUNTING SURFACES

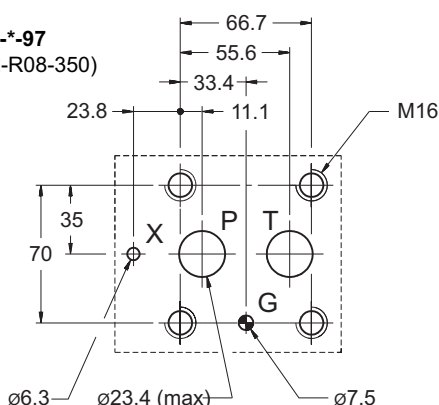
PRED3K* and PRE3K*
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



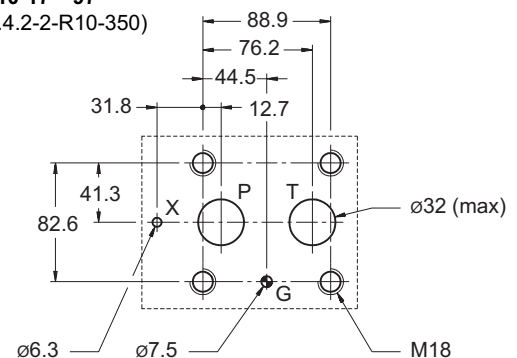
PRE10K*
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)



PRE25K*
ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)



PRE32K*
ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)





18 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

19 - INSTALLATION



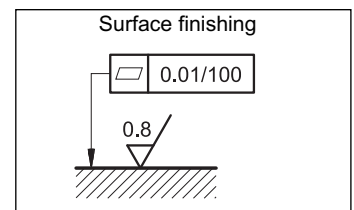
Installation must adhere to instructions reported in the *Use and Maintenance* manual, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in ATEX classified areas .

We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraphs 3 and 9.

Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air, by using the apposite drain screw in the solenoid tube. At the end of the operation, make sure of having correctly screwed the drain screw.

Connect the T port on the valve directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. **Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.**

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



20 - ELECTRONIC CONTROL UNITS

EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		

NOTE: electronic control units offered are not certified according to ATEX 94/9/EC Directive; therefore, they must be installed outside the classified area.

21 - SUBPLATES (see catalogue 51 000)

	PRED3K*	PRE3K*	PRE10K*	PRE25K*	PRE32K*
Type with rear ports	PMMD-AI3G	PMMD-AI3G	PMRQ3-AI4G	PMRQ5-AI5G	PMRQ7-AI7G
Type with side ports	PMMD-AL3G	PMMD-AL3G	-	-	-
P, T ports dimensions	3/8" BSP	3/8" BSP	P: 1/2" BSP T: 3/4" BSP	1" BSP	1" 1/4 BSP
X port dimensions	-	-	1/4" BSP	1/4" BSP	1/4" BSP

NOTE: Subplates (to be ordered separately) do not contain neither aluminium nor magnesium at a higher rate than the value allowed by norms according to ATEX directive for categories II 2GD and I M2 .

The user must take care and make a complete assessment of the ignition risk, that can occur from the relative use in potentially explosive environments.



PRE(D)*K

SERIES 10



DIPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.diplomatic.com • e-mail: sales.exp@diplomatic.com

