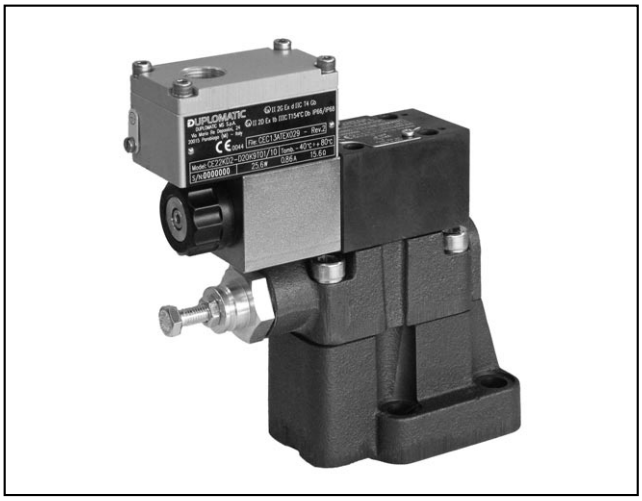
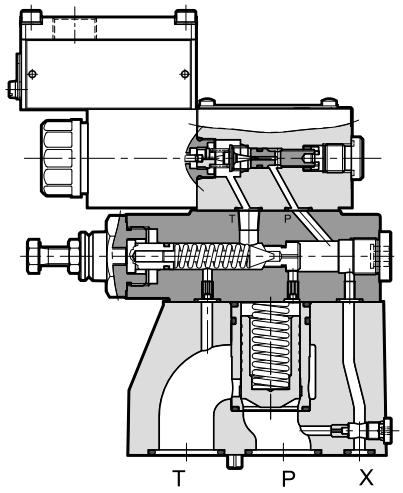


P*E*K*

EXPLOSION-PROOF PROPORTIONAL PRESSURE RELIEF VALVES, PILOT OPERATED ATEX, IECEX, INMETRO, PESO

PDE3K*	**ISO 4401-03**
PRE3K*	**ISO 4401-03**
PRE10K*	**ISO 6264-06**
PRE25K*	**ISO 6264-08**
PRE32K*	**ISO 6264-10**

OPERATING PRINCIPLE



— PDE3K* and PRE*K* are explosion-proof pressure relief valves with proportional control.

— They are compliant with ATEX, IECEx, INMETRO or PESO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.

— 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. 21).

— 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.

— **Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 'Explosion proof classification'.**

PERFORMANCES

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

		PDE3K*	PRE3K*	PRE10K*	PRE25K*	PRE32K*
Maximum operating pressure - P port - T port	bar	350 2	350 2	350 2		
Minimum flow Nominal flow Maximum flow	l/min	- 1 2	2 10 40	- - 200	- - 400	- - 500
Step response		see par. 11				
Hysteresis	% of p nom	< 5%				
Repeatability	% of p nom	< ±1,5%				
Electrical characteristic		see par. 5				
Operating temperatures (ambient and fluid)		see data sheet 02 500				
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

1 - IDENTIFICATION CODE OF DIRECT OPERATED PROPORTIONAL VALVE

P	D	E	3		-		/	10		-		K9			

Pressure control valve

Direct operated

Electrical proportional control

Size ISO 4401-03

Explosion-proof certification:
See table 1.1

Pressure control range
025 = 0,9 - 25 bar
070 = 1,6 - 70 bar
140 = 2,4 - 140 bar
210 = 3,2 - 210 bar
350 = 5 - 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)

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

Coil electrical connection:
junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
not available for INMETRO
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
not available for INMETRO
S03 = 1/2" NPT - ANSI B1.20.1
(ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Option: **/T5**
version in T5 temperature class.
Omit if not required.

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

NOTE: Valves are supplied with standard surface treatment of phosphating black.

The full zinc-nickel surface treatment is available upon request. It is 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 the suffix **/W7** at the end of the identification code.

Version with monobloc steel coil

Standard coils are made of zinc-nickel steel, with anodized aluminium junction box on it.

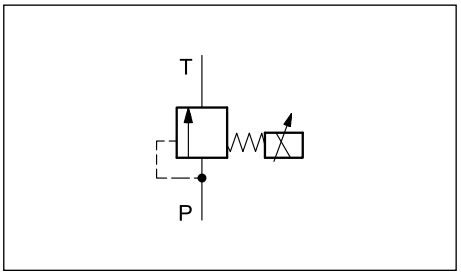
Monobloc coils **MD24K9S01** completely made of steel are available upon request. They have zinc-nickel treatment, power supply voltage D24 and cable gland connection type S01. Other variants for voltage and cable gland connection are available, always on request.

1.1 - Names of valves per certification

	ATEX		IECEx		INMETRO		PESO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KBD2**	INMETRO Gb INMETRO Db	**KPD2**	PESO Gb not applicable for dust
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	**KBDM2**	INMETRO Mb	not applicable for mines	

NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

2 - HYDRAULIC SYMBOL



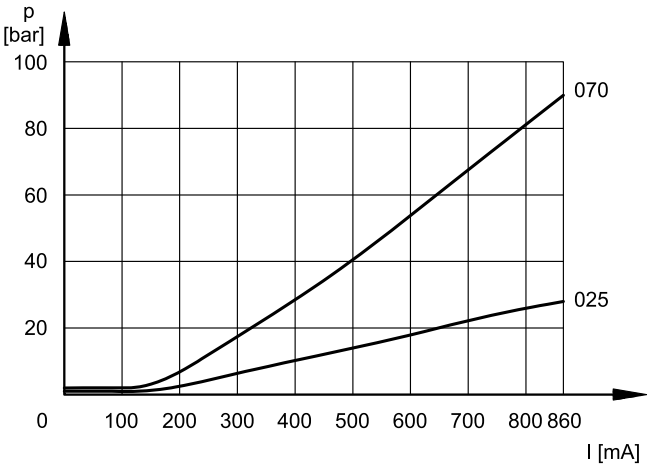
3 - CHARACTERISTIC CURVES FOR DIRECT OPERATED PROPORTIONAL VALVE

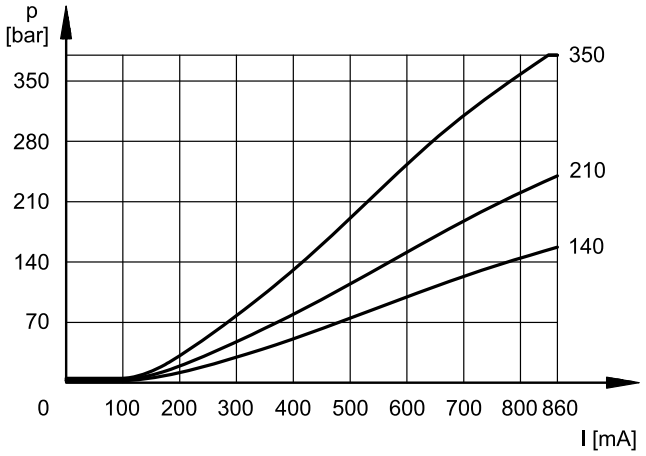
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Typical control curves according to the current supplied to the solenoid for available pressure control ranges measured with input flow rate Q = 1 l/min.

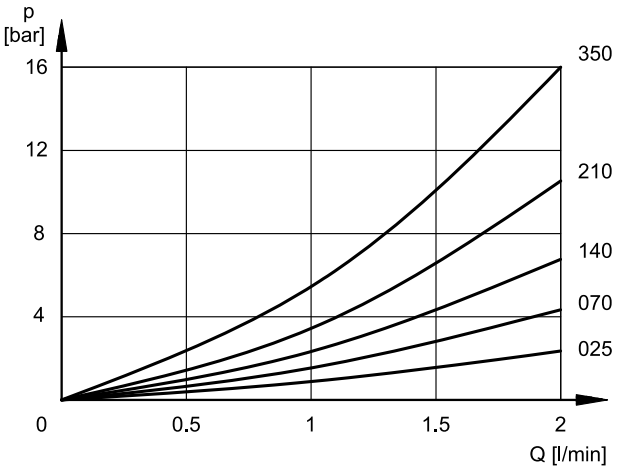
Curves have been obtained without any hysteresis and linearity compensation and they have been measured without any backpressure in T. The full scale pressure is set in factory with a flow rate of 1 l/min. In case of higher flow rate, the full scale pressure will increase considerably (see diagram pmax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

PRESSURE CONTROL p = f(I)

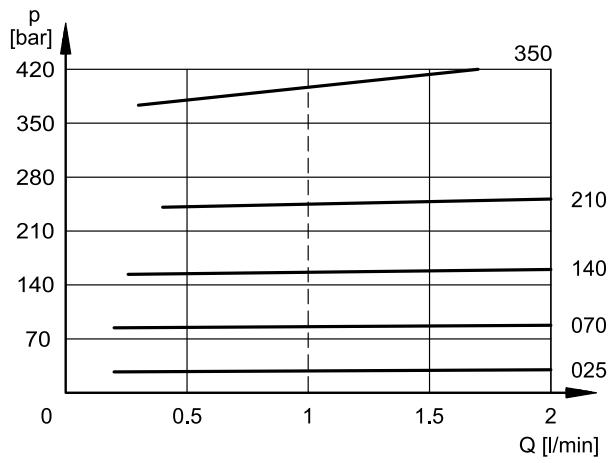




MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



4 - MAX PRESSURE VALUES FOR DIRECT OPERATED PROPORTIONAL VALVE

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 1 l/min

		PDE3K*-025	PDE3K*-070	PDE3K*-140	PDE3K*-210	PDE3K*-350
pressure value at 800 mA	bar	25	77	142	217	360
max pressure value when $I > I_{max}$	bar	33,5	90	161	252	390

5 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (AT 20°C)	Ω	3,8	15,6
NOMINAL CURRENT	A	1,88	0,86

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION Atmospheric agents Coil insulation (VDE 0580)	 IP66/IP68 class H

5.1 - 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.

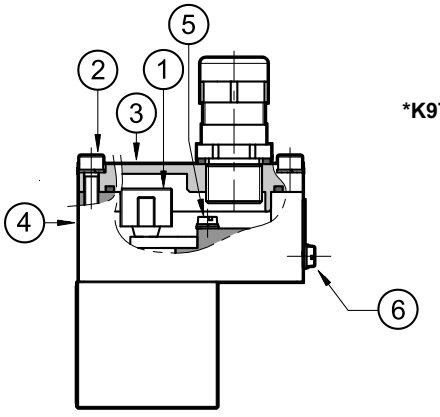
The electrical connection is polarity-independent.

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.

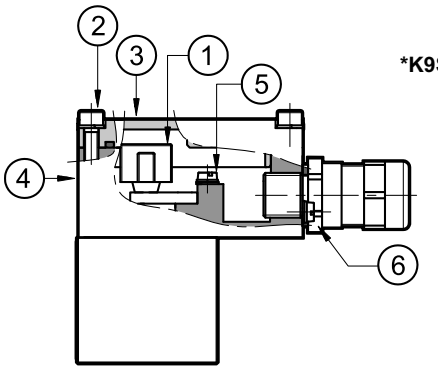
On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements 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 standard about protection against explosion hazards.



K9T



K9S

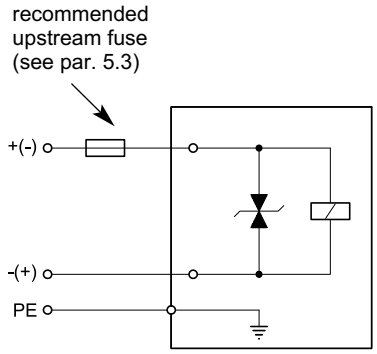
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

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 par. 18) allow to use cables with external diameter between 8 and 10 mm.

5.2 - Electrical diagrams



5.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In 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.

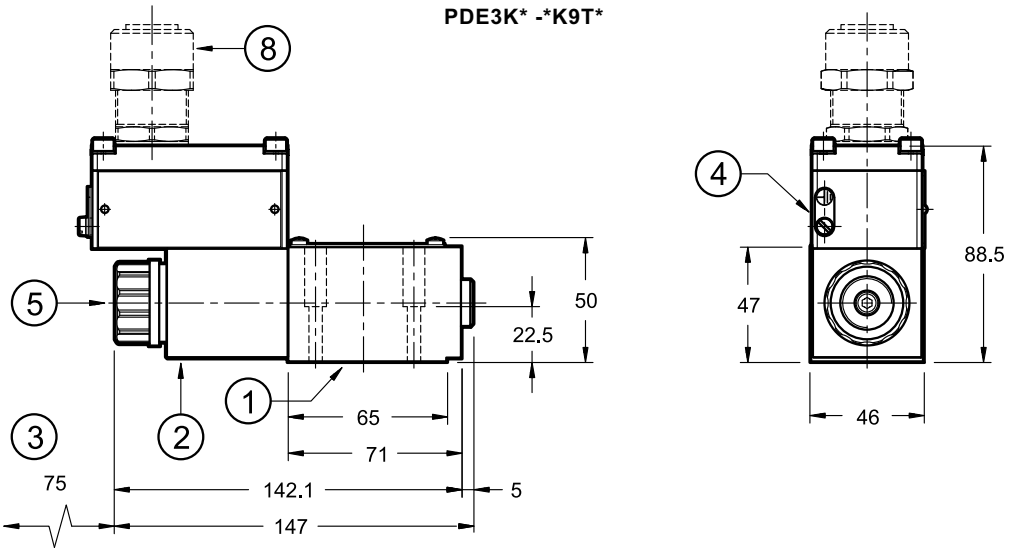
The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

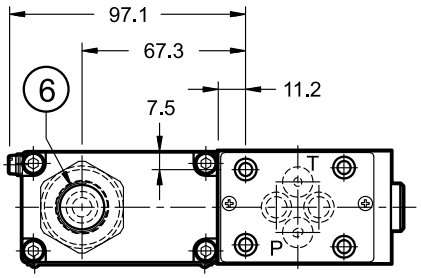
Coil type	Nominal voltage [V]	Rated current [A]	**Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]**	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1,88	2,5	- 49	Transient voltage suppressor bidirectional
D24	24	0,86	1,25	- 49	

6 - PDE3K* OVERALL AND MOUNTING DIMENSIONS

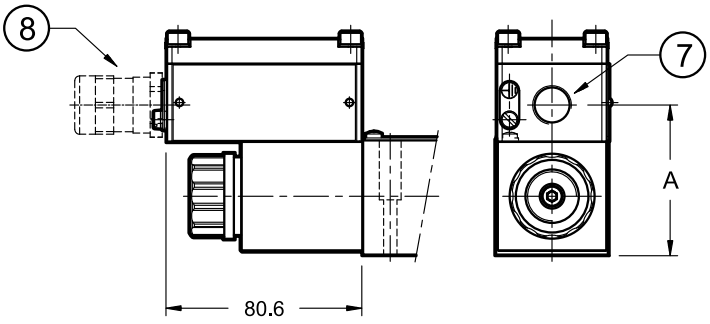
dimensions in mm

PDE3K* -*K9T*





PDE3K* -*K9S*



Side port type	A
S01, S04	60.5
S02, S03	60

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Terminal for supplementary GND connection
5	Breather (Allen key 4)
6	Upper port for cable gland
7	Side port for cable gland
8	Cable gland To be ordered separately, see par. 20

NOTE: 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.

Fastening of single valve: 4 SHC screws M5x30 - ISO 4762
Tightening torque: 5 Nm (A 8.8 screws)
Threads of mounting holes: M5x10

7 - IDENTIFICATION CODE OF PILOT OPERATED PROPORTIONAL VALVES

P	R	E			-		/	20		-		K9			

Pilot operated pressure relief valve

Electric proportional control

Size:
3 = ISO 4401-03
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Explosion-proof certification:
See table 1.1

Pressure control range:

PRE3K*:
025 = 4 - 25 bar
070 = 4 - 70 bar
140 = 4 - 140 bar
210 = 4 - 210 bar
350 = 5 - 350 bar

PRE10K*, PRE25K* and PRE32K*
025 = up to 25 bar
070 = up to 70 bar
140 = up to 140 bar
210 = up to 210 bar
350 = up to 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 20 to 29)

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)

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

Coil electrical connection:
junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
not available for INMETRO
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
not available for INMETRO
S03 = 1/2" NPT - ANSI B1.20.1
(ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Option: **/T5**
version in T5 temperature class.
Omit if not required.

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

NOTE: Valves are supplied with standard surface treatment of phosphating black.

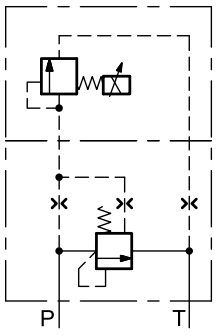
The full zinc-nickel surface treatment is available upon request. It is suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

For full zinc-nickel surface treatment add the suffix **/W7** at the end of the identification code.

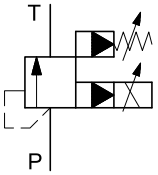
A version with monobloc coil made of steel is available. Please refer to details in page 2.

8 - HYDRAULIC SYMBOLS

PRE3K*



PRE10K*, PRE25K* and PRE32K*

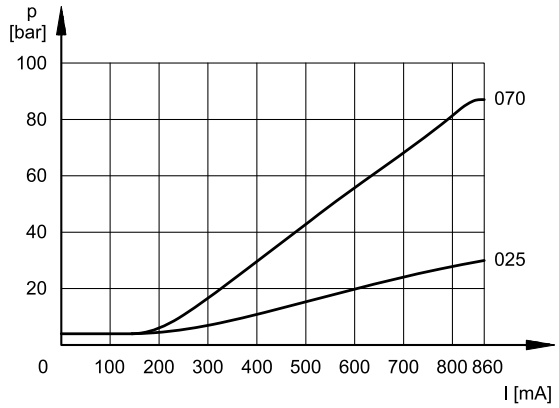


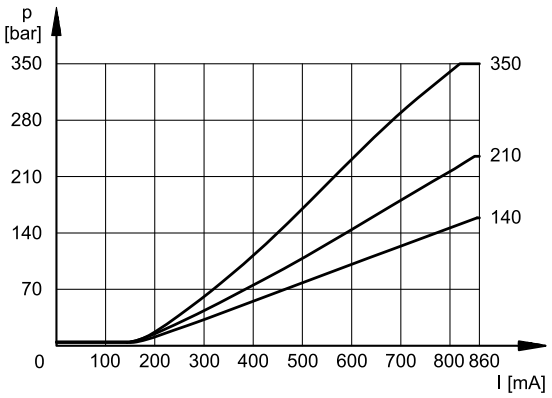
9 - CHARACTERISTIC CURVES OF PILOT OPERATED PROPORTIONAL VALVES

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

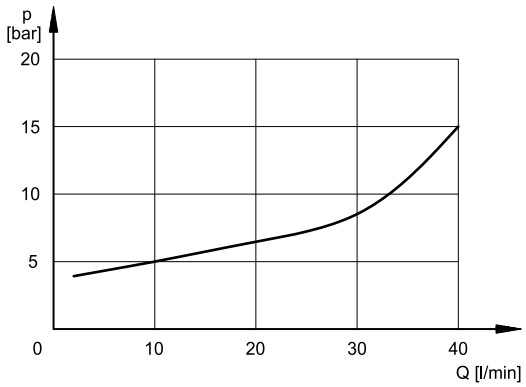
9.1 - PRE3K*

PRESSURE CONTROL p = f (I)

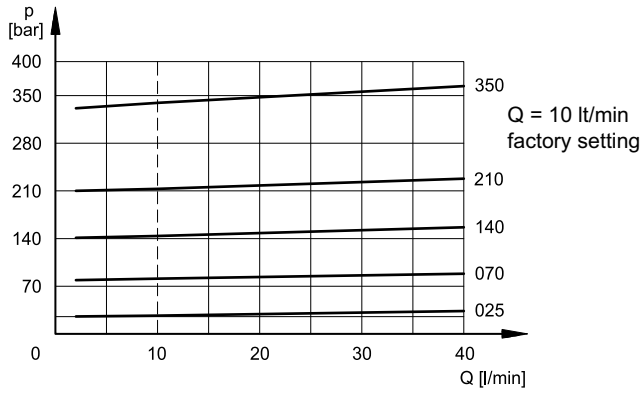




MINIMUM CONTROLLED PRESSURE p min = f (Q)

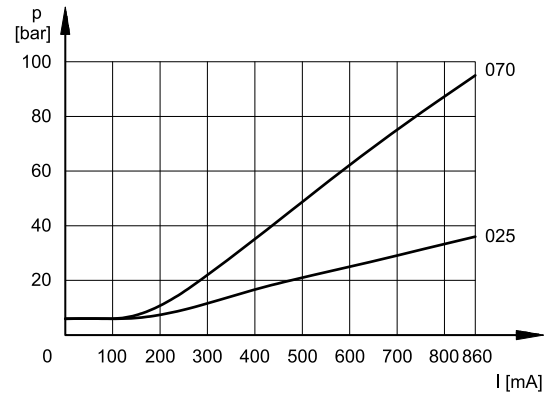


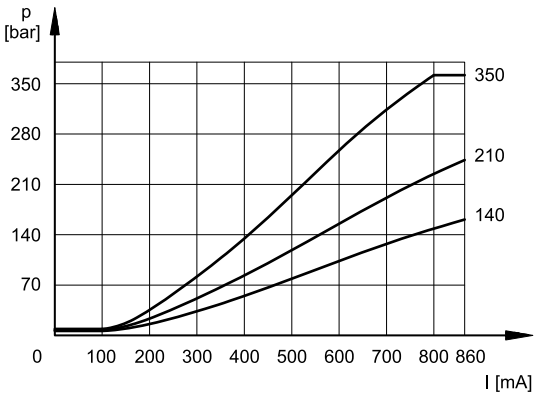
PRESSURE VARIATION p max = f (Q)



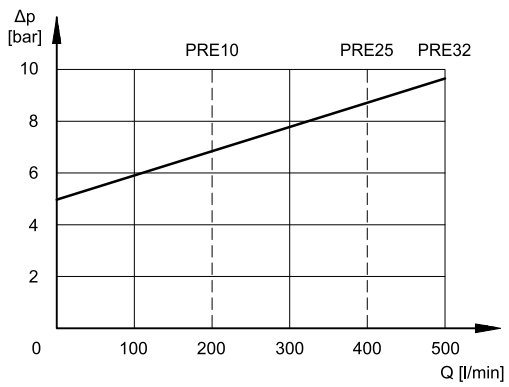
9.2 - PRE10K*, PRE25K* and PRE32K*

PRESSURE CONTROL p = f (I)

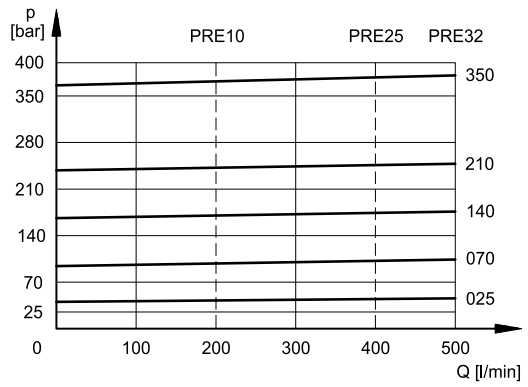




MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



10 - MAX PRESSURE VALUES FOR PILOT OPERATED VALVES

These valves incorporate a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures the pressure cannot rise over, even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 10 l/min

		PRE3-025	**PRE3-070**	**PRE3-140**	**PRE3-210**	**PRE3-350**
pressure value at 800 mA	bar	28	82	145	215	335
max pressure value when $I > I_{max}$	bar	30	86	155	230	350

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 50 l/min

		PRE*-025	**PRE*-070**	**PRE*-140**	**PRE*-210**	**PRE*-350**
pressure value at 800 mA	bar	27	85	147	220	365
max pressure value when $I > I_{max}$	bar	35	95	165	255	370

11 - STEP RESPONSE

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

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

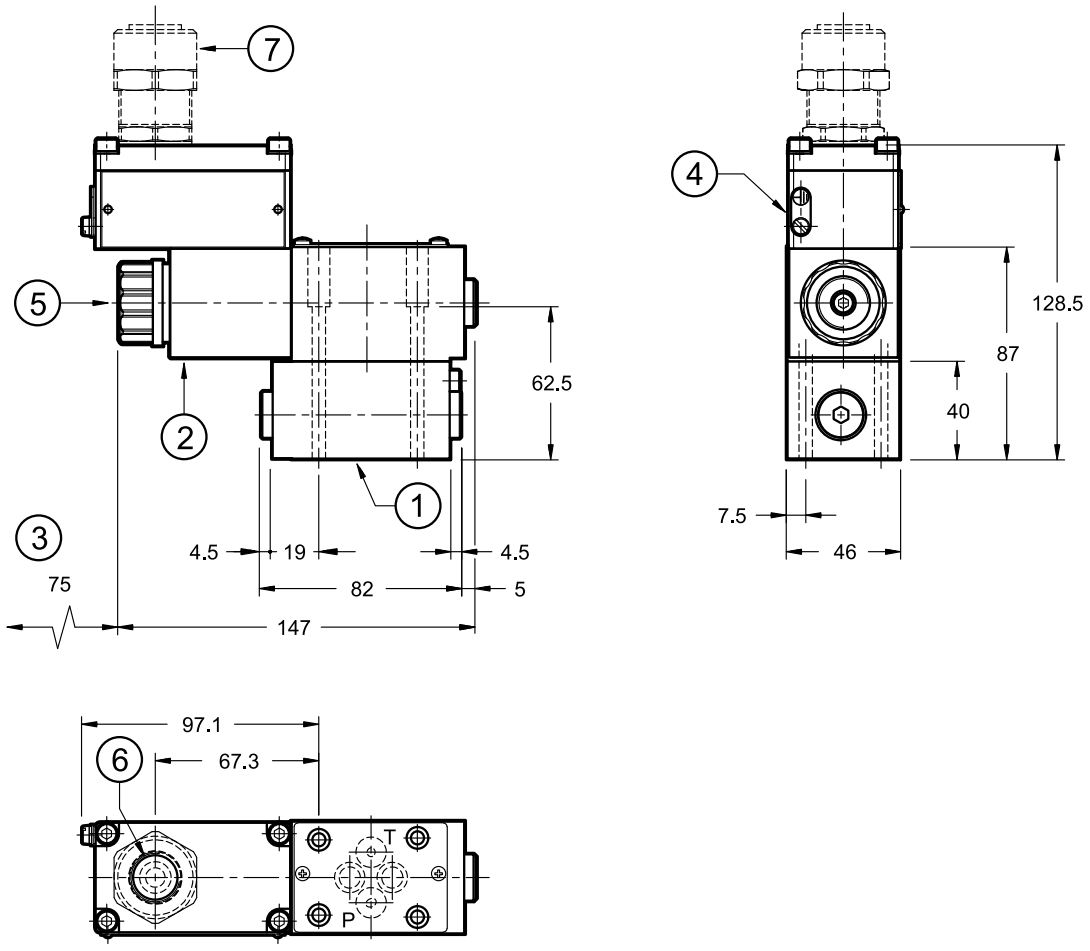
The table illustrates typical step response times measured with a valve of pressure range up to 210 bar and with input flow rate of Q = 1 l/min for PDE3K*, Q = 10 l/min for PRE3K* and Q = 50 l/min for PRE10K*, PRE25K* and PRE32K*.

REFERENCE SIGNAL	0 → 100%	100 → 0%
	Step response [ms]	
PDE3K*	60	70
PRE3K*	80	40
PRE10K*, PRE25K* and **PRE32K***	120	90

12 - PRE3K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRE3K*-*/20*-*K9T*



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 par. 16.

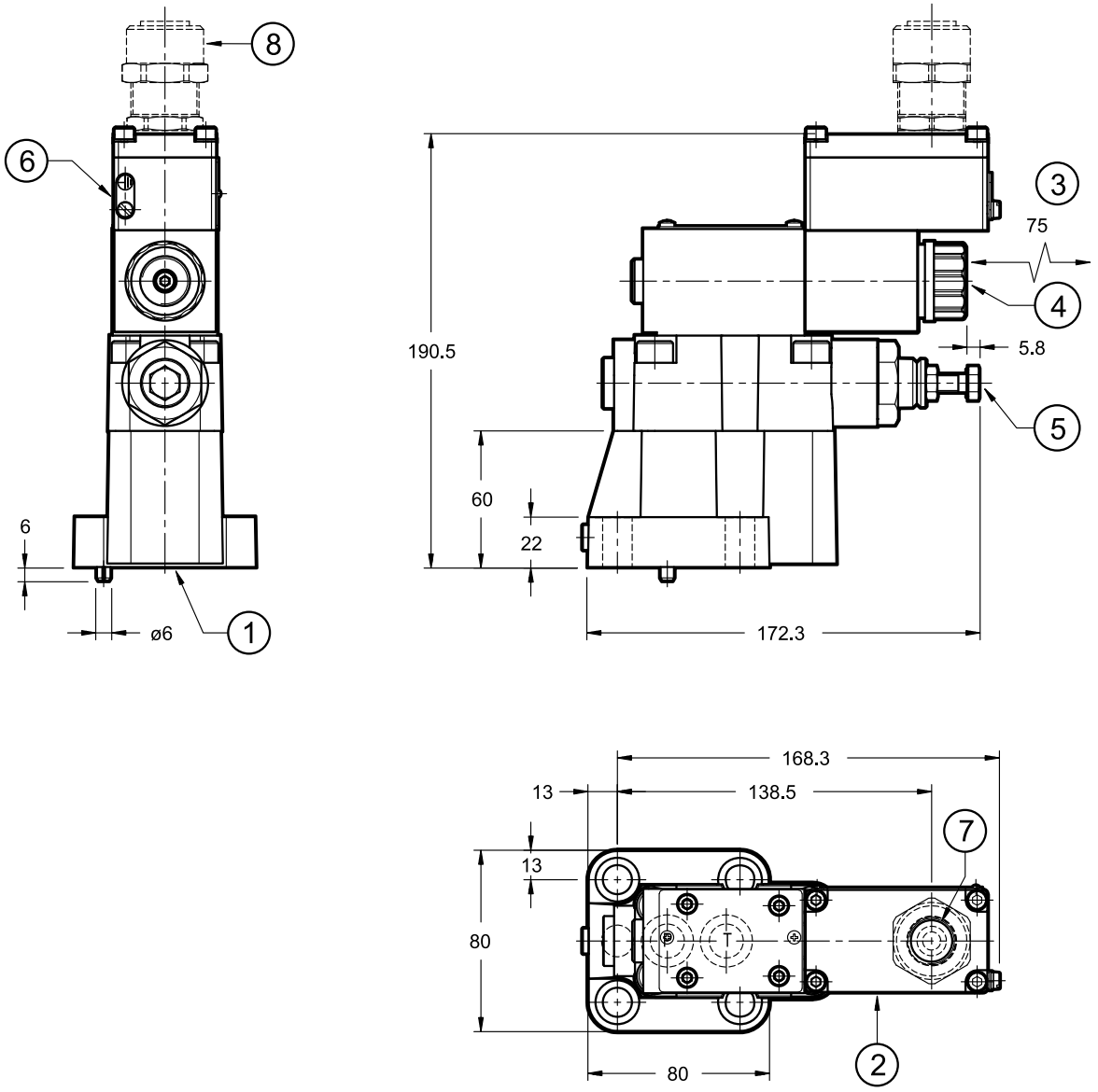
Fastening of single valve: 4 screws SHC M5x70 - ISO 4762	
Tightening torque: 5 Nm (A 8.8 screws)	
Threads of mounting holes: M5x10	

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	Upper port for cable gland
7	Cable gland. To be ordered separately, see par. 20

13 - PRE10K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRE10K*-*/20*-*K9T*



1	Mounting surface with sealing rings: N. 2 OR type 123 (17.86 x 2.62) - 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	Pressure relief valve (factory set)
6	Terminal for supplementary GND connection
7	Upper port for cable gland
8	Cable gland. To be ordered separately, see par. 20

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.

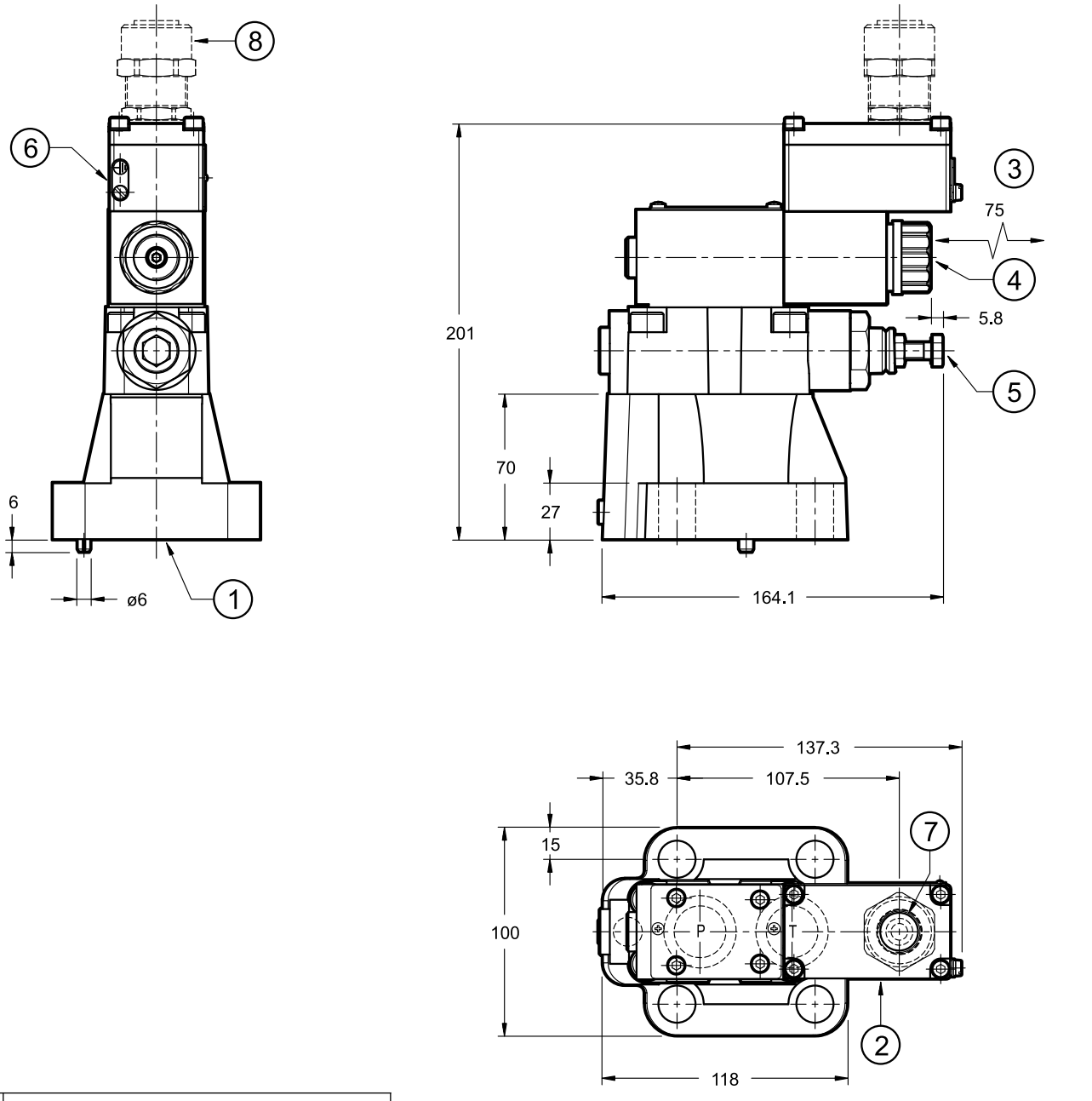
NOTE 2: for side connections see par. 16.

Fastening of single valve: 4 SHC screws M12x40 - ISO 4762
Tightening torque: 69 Nm (A 8.8 screws)
Threads of mounting holes: M12x20

14 - PRE25K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRE25K*-*/20*-*K9T*



1	Mounting surface with sealing rings: N. 2 OR type 3118 (29.82 x 2.62) - 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	Pressure relief valve (factory set)
6	Terminal for supplementary GND connection
7	Upper port for cable gland
8	Cable gland. To be ordered separately, see par. 20

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.

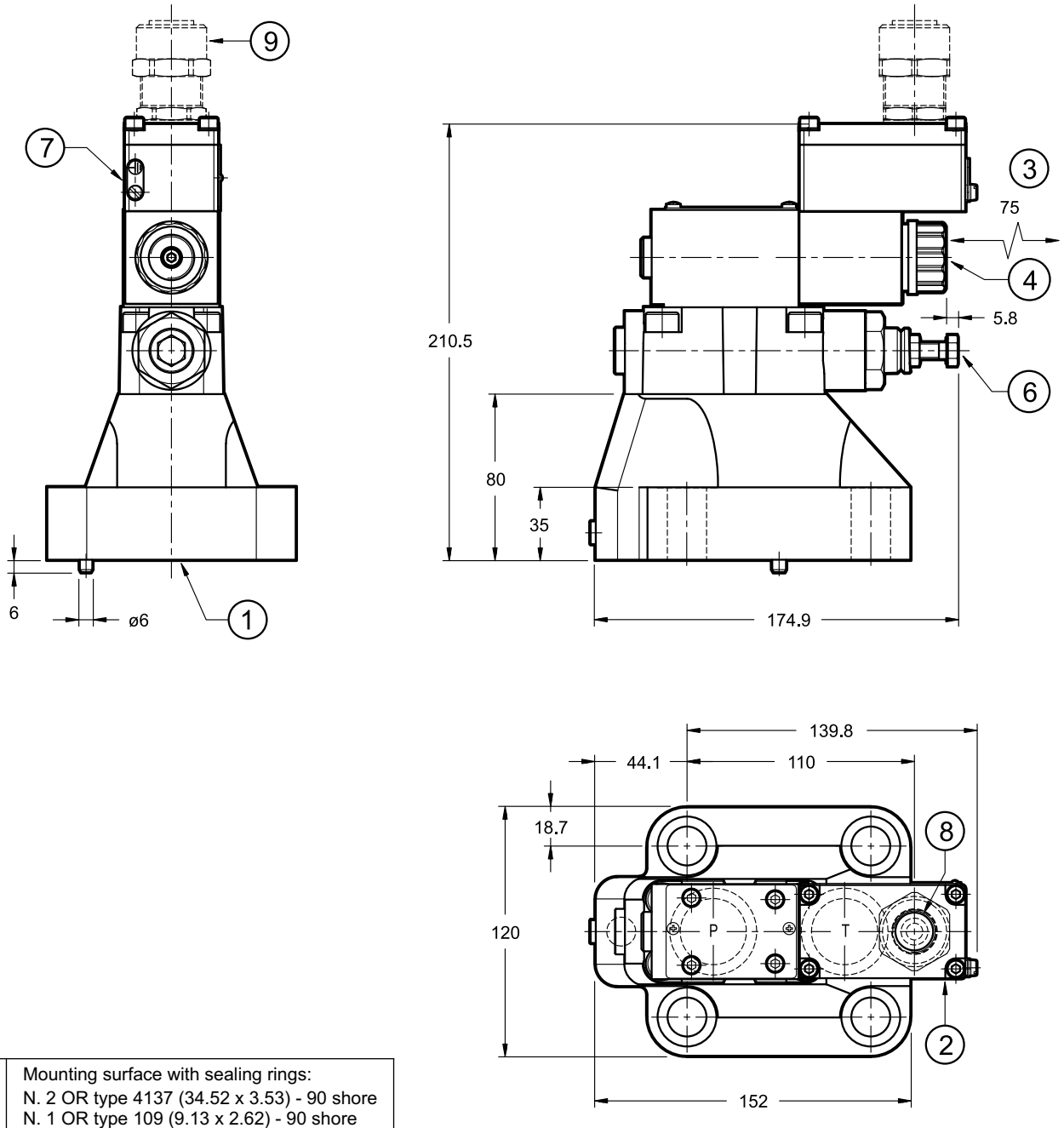
NOTE 2: for side connections see par. 16.

Fastening of single valve: 4 SHC screws M16x50 - ISO 4762
Tightening torque: 170 Nm (A 8.8 screws)
Threads of mounting holes: M16x25

15 - PRE32K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRE32K*-*/20*-*K9T*



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	Pressure relief valve (factory set)
6	Terminal for supplementary GND connection
7	Upper port for cable gland
8	Cable gland. To be ordered separately, see par. 20

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.

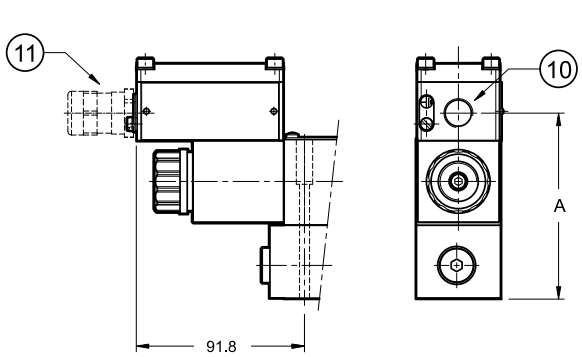
NOTE 2: for side connections see par. 16.

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

16 - PRE*K* WITH SIDE CONNECTION - OVERALL AND MOUNTING DIMENSIONS

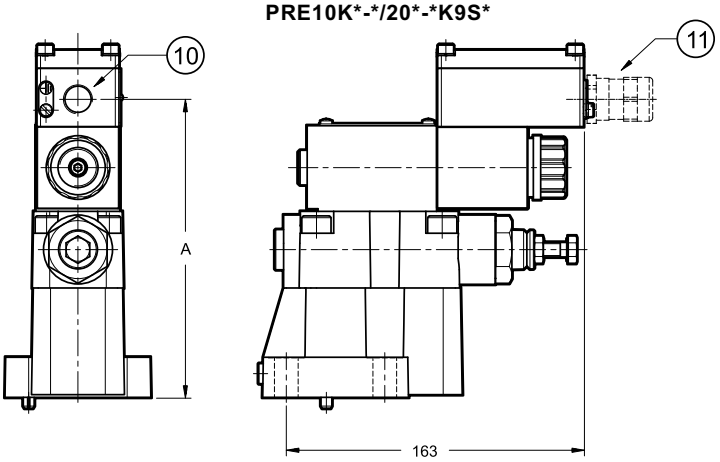
dimensions in mm

PRE3K*-*/20*-*K9S*



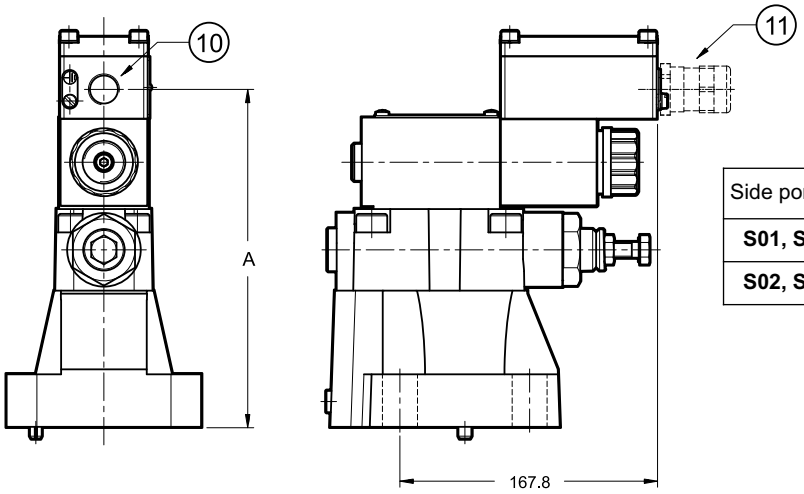
Side port type	A
S01, S04	100.5
S02, S03	100

PRE10K*-*/20*-*K9S*



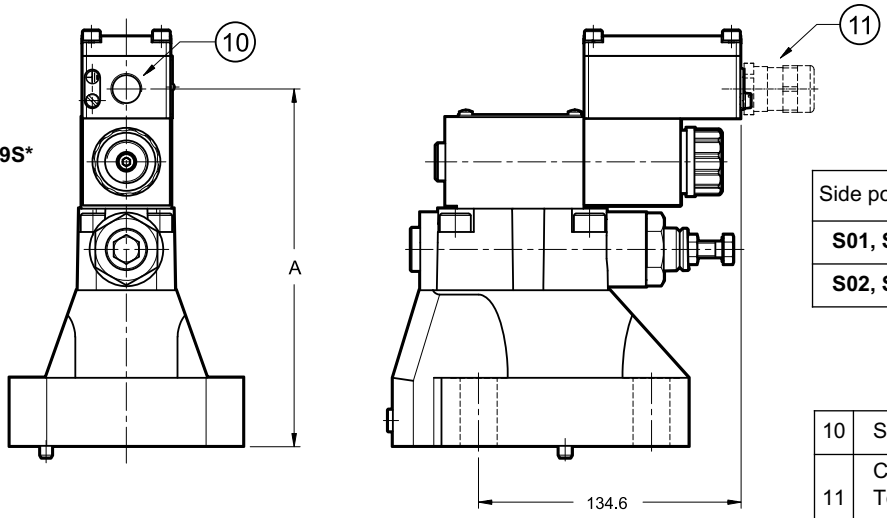
Side port type	A
S01, S04	162.5
S02, S03	162

PRE25K*-*/20*-*K9S*



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

PRE32K*-*/20*-*K9S*

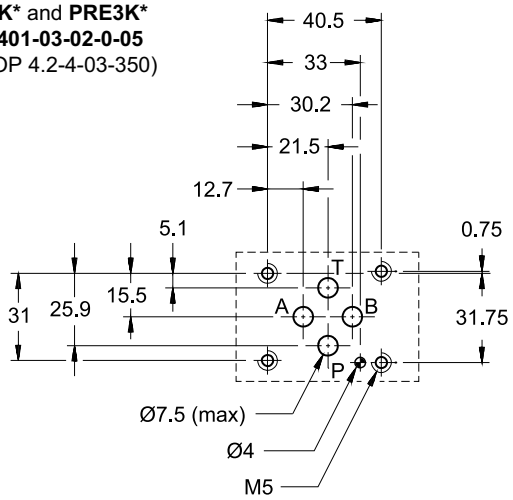


Side port type	A
S01, S04	182.5
S02, S03	182

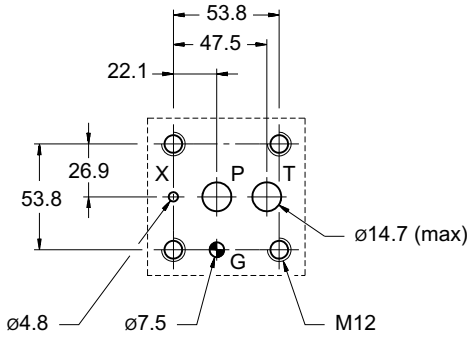
10	Side port for cable gland
11	Cable gland. To be ordered separately, see par. 20

17 - MOUNTING SURFACES

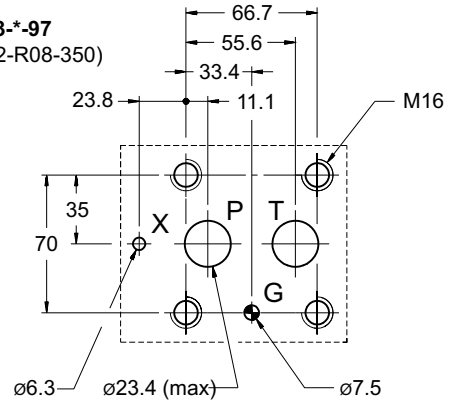
PDE3K* and **PRE3K***
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



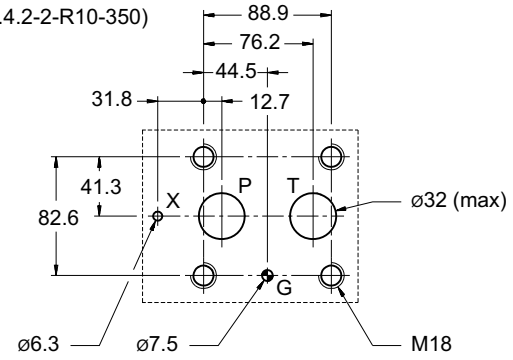
PRE10K*
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)



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

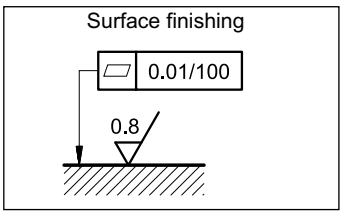
Installation must adheres to instructions reported in the *Use and Maintenance manual*, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.

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 par.s 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.**

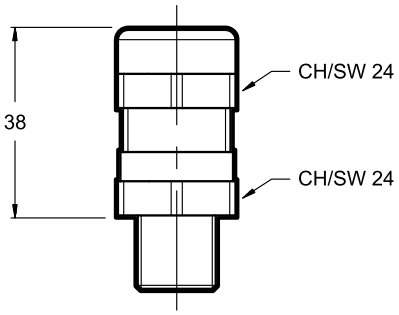
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



20 - CABLE GLANDS

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

- version for non-armoured cable, external seal on the cable (suitable for Ø 8 ÷ 10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb;
- cable gland material: nickel brass
- inner rubber tip material: silicone
- ambient temperature range: - 65 ºC ÷ +220 ºC
- protection degree: IP66/IP68



To order the desired cable glands, specify description, code and quantity.

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 copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

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.

Tightening torque: 20 ÷ 25 Nm

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.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-04/10

Code: 3908108004

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

Tightening torque: 45 ÷ 50 Nm

21 - ELECTRONIC CONTROL UNITS

EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see catalogue 89 251
EDM-M142	for solenoid 12V DC		

NOTE: electronic control units offered are not explosion-proof certified; therefore, they must be installed outside classified areas.

22 - SUBPLATES

(see catalogue 51 000)

	PDE3K*	**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" ¼ 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 rate higher than the value allowed by norms according to ATEX directive for category II 2GD and I M2.

The user will bear to do the complete assessment of the ignition risk that can occur from the relative use in potentially explosive environments.

EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure control valves	
RQM*K*-P	**21 515**
P*E*K*	**81 316**
ZDE3K*	**81 515**
DZCE*K*	**81 606**
flow control valves	
QDE3K*	**82 225**
directional valves	
D*K*	**41 515**
DT3K*	**42 215**
DS(P)E*K*	**83 510**

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic MS offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
INMETRO	**Gb**	**Db**	**Mb**
PESO	**Gb**		

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; 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.

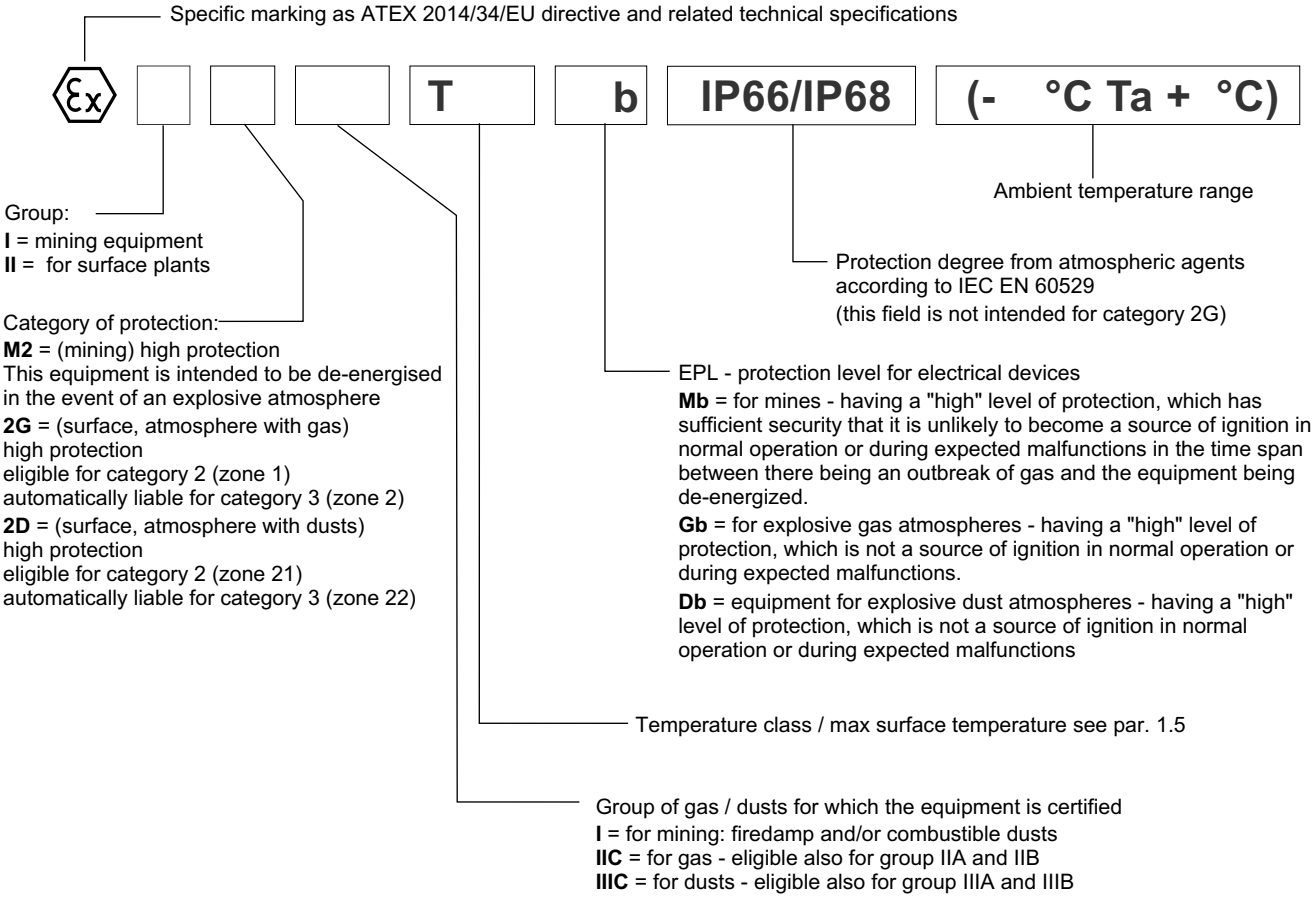
1.1 - ATEX classification for valves

Type examination certificate: AR18ATEX055
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
ATEX I M2	***KDM2**	equipment 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.

1.2 - ATEX marking for valves

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



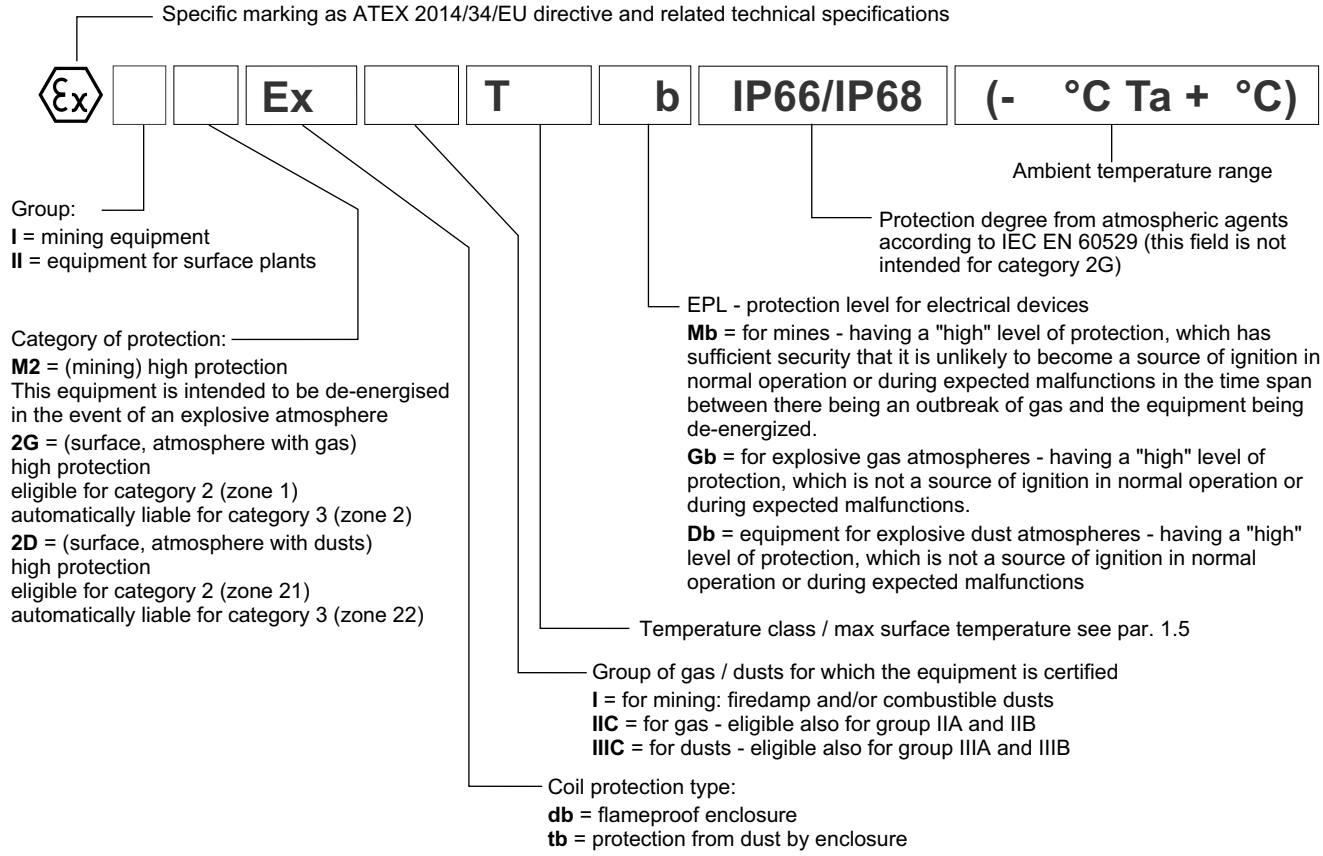
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself an as such is identified with its own tag, 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 db” type protection (explosion-proof coil).

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

1.4 - ATEX marking on coils

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



1.5 - 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) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

2 - IECEX CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. 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 db” type protection (explosion-proof coil).

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

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

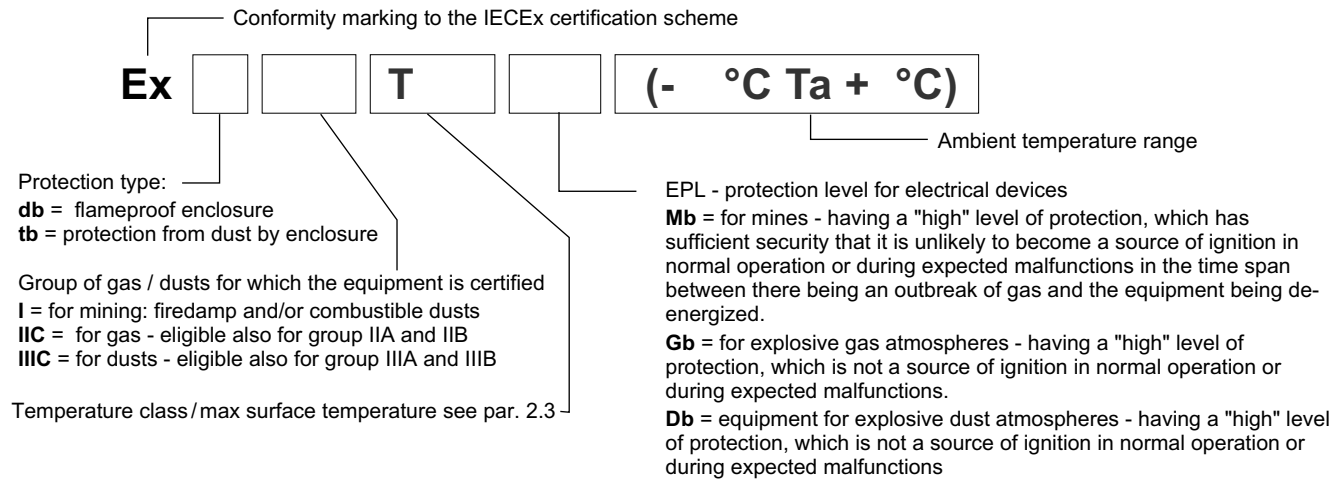
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
IECEx Mb	***KXDM2**	equipment 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.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas for dusts	Ex db IIC T4 Gb (-40°C Ta +80°C) Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas for dusts	Ex db IIC T5 Gb (-40°C Ta +55°C) Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



2.3 - 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.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

3 - INMETRO CLASSIFICATION AND TEMPERATURES

The INMETRO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with INMETRO certified coils, suitable for application and installation in potentially explosive atmospheres. 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 db” type protection (explosion-proof coil).

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

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - INMETRO classification

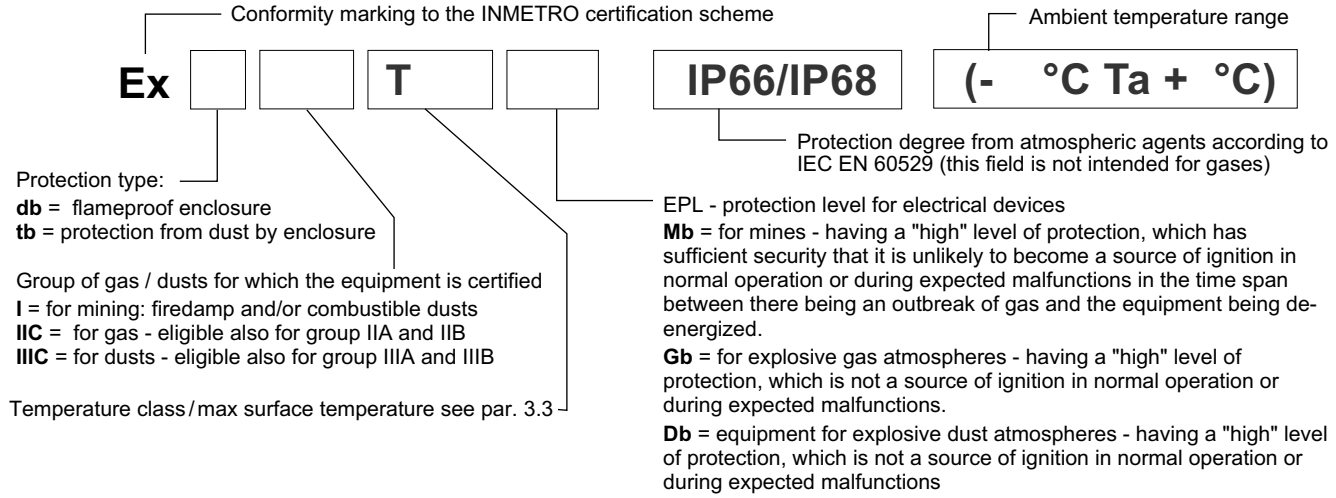
Certificate of conformity: DNV 15.0094 X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

INMETRO Gb INMETRO Db	***KBD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
INMETRO Mb	***KBDM2**	equipment 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.

3.2 - INMETRO marking

There is a plate with the INMETRO mark on each coil.

***KBD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KBD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KBDM2** valves	mining	Ex db I T150° Mb IP66/IP68 (-40°C Ta +75°C)



3.3 - 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.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
INMETRO Gb INMETRO Db	***KBD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KBD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
INMETRO Mb	***KBDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

4 - PESO CLASSIFICATION AND TEMPERATURES

The PESO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with PESO certified coils, suitable for application and installation in potentially explosive atmospheres. 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 db” type protection (explosion-proof coil).

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

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

4.1 - PESO classification

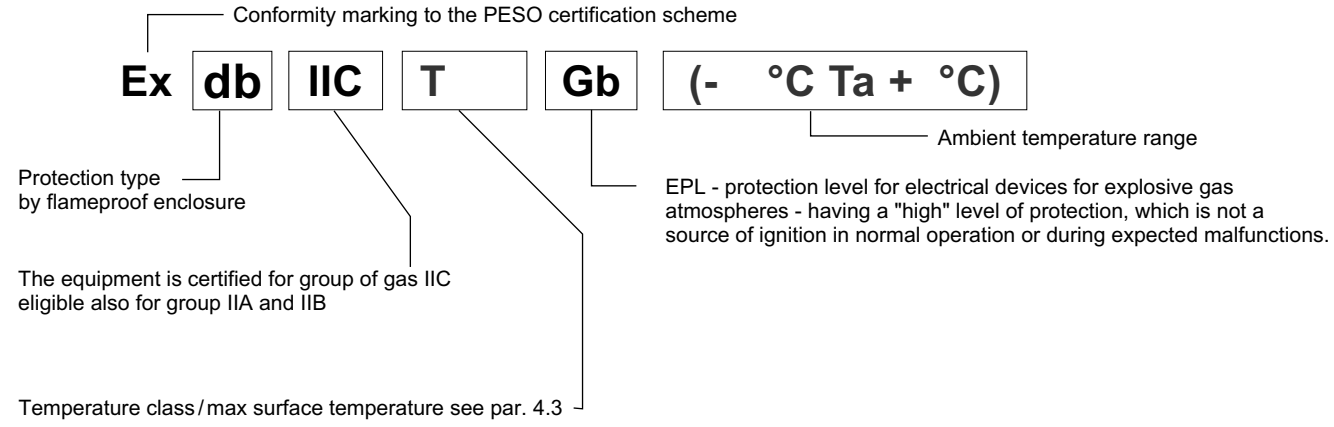
Certificate of conformity: P480801
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

PESO Gb	***KPD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.

4.2 - PESO marking

There is a plate with the PESO mark on each coil.

***KPD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
***KPD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)

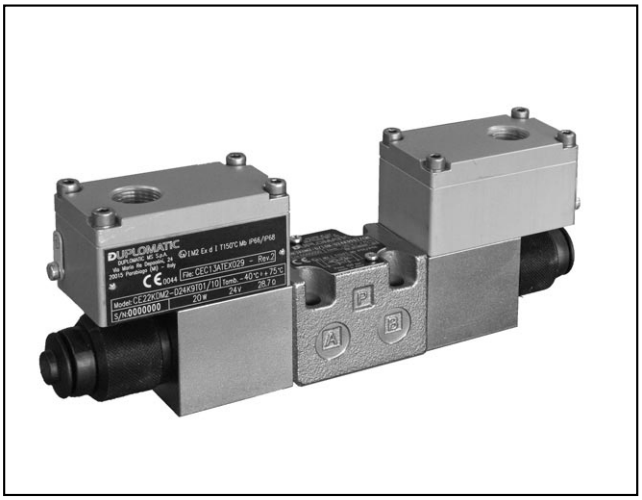


4.3 - Operating temperatures

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.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
PESO Gb	***KPD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas)	T3, T2, T1
		of fluid				
	***KPD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas)	T4, T3, T2, T1
		of fluid	-20 / +60 °C	-40 / +60 °C		



ZDE3K*

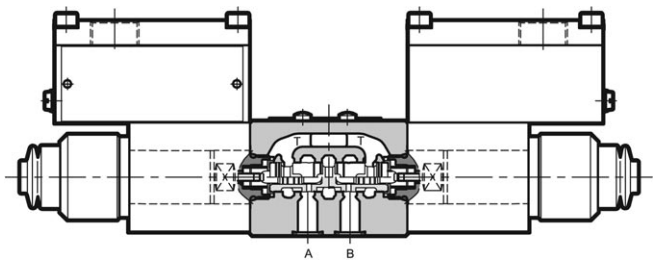
EXPLOSION-PROOF PRESSURE REDUCING VALVES ATEX, IECEx, INMETRO, PESO

SERIES 10

SUBPLATE MOUNTING ISO 4401-03

p max **100** bar
Q max **15** l/min

OPERATING PRINCIPLE



— ZDE3K* are direct operated pressure reducing valves, with electric proportional control, with ISO 4401-03 mounting surface.

— They are compliant with ATEX, IECEx, INMETRO or PESO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.

— A low temperature version (up to -40 °C) is also available.

— The valves are used to reduce pressure in the secondary circuit branches thus ensuring stability of controlled pressure in the event of variations of the flow rate through the valve.

— ZDE3K* valves are supplied with a finishing surface treatment (zinc-nickel) suitable to ensure a salt spray resistance up to 600 hours.

— Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 ‘Explosion proof classification’.

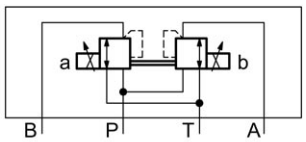
PERFORMANCES

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

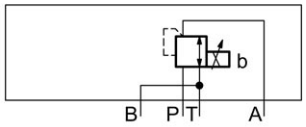
Pressure allowed in P port	bar	30 ÷ 100
Pressure allowed in T port (see par. 2)	bar	0 ÷ 30
Controlled pressure	bar	23
Maximum flow	l/min	15
Step response	ms	30
Hysteresis (with PWM 200 Hz)	% of p nom	< 4%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see paragraph 4	
Operating temperatures (ambient and fluid)	see data sheet 02 500	
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,9 2,8

HYDRAULIC SYMBOLS

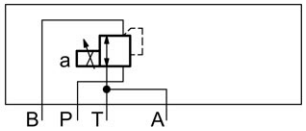
ZDE3K*-D



ZDE3K*-SA



ZDE3K*-SB



1 - IDENTIFICATION CODE

Pressure reducing valve

Electric proportional control

Size ISO 4401-03

Explosion-proof certification:
See table 1.1

Solenoids:
D = pressure reduction in A and B ports
SA = pressure reduction in A port (solenoid on side B)
SB = pressure reduction in B port (solenoid on side A)

Series No.
(from 30 to 39 sizes and mounting dimensions remain unchanged)

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)

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

Coil electrical connection: junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
not available for INMETRO
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
not available for INMETRO
S03 = 1/2" NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Manual override:
CM = boot protected
standard for both N and V seals
not available for NL seals
CB = blind ring nut
standard for NL seals
available upon request for both N and V seals
see paragraph 8

Option: **/T5**
version in T5 temperature class.
Omit if not required.

NOTE: Valves are supplied with zinc-nickel surface treatment, that is 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).

Version with monobloc steel coil

Standard coils are made of zinc-nickel steel, with anodized aluminium junction box on it.

Monobloc coils **MD24K9S01** completely made of steel are available upon request. They have zinc-nickel treatment, power supply voltage D24 and cable gland connection type S01. Other variants for voltage and cable gland connection are available, always on request.

1.1 - Names of valves per certification

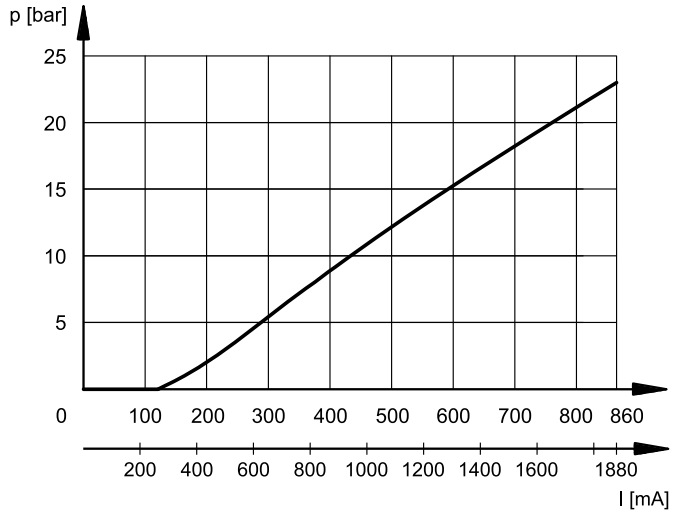
	ATEX		IECEx		INMETRO		PESO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KBD2**	INMETRO Gb INMETRO Db	**KPD2**	PESO Gb not applicable for dust
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	**KBDM2**	INMETRO Mb	not applicable for mines	

NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

2 - CHARACTERISTIC CURVES

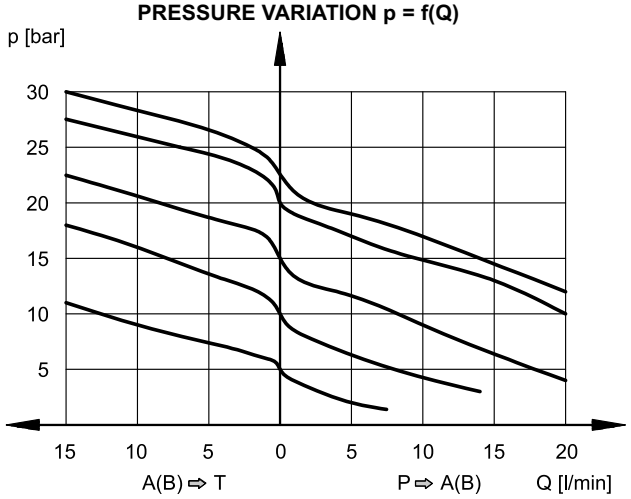
(obtained with ZDE3K*-D/10N-D24K9T01/CM with PWM 100Hz and oil with viscosity 36 cSt at 50°C)

PRESSURE CONTROL p=f (I)



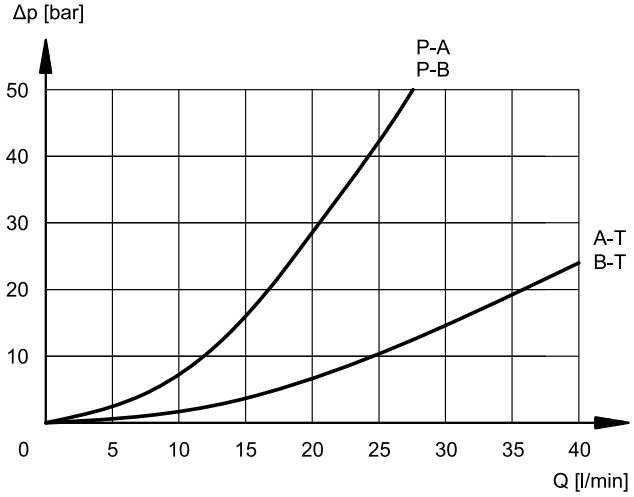
SA and SB versions pressure regulation is less than 0.5 bar.

PRESSURE VARIATION p = f(Q)



The curves have been obtained with inlet pressure 100 bar.

PRESSURE DROP Δp = f(Q)



3 - STEP RESPONSE

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

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 input flow rate of Q = 5 l/min and p = 50 bar.

REFERENCE SIGNAL STEP	0 → 100%	100% → 0
response time [ms]	30	30

4 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.8	15.6
NOMINAL CURRENT	A	1.88	0.86
PWM FREQUENCY	Hz	200	100

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION Atmospheric agents Coil insulation (VDE 0580)	 IP66/IP68 class H

4.1 - 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.

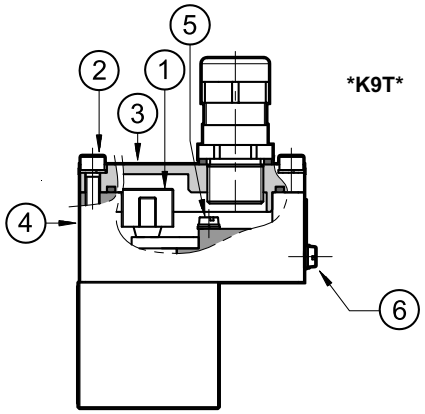
The electrical connection is polarity-independent.

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.

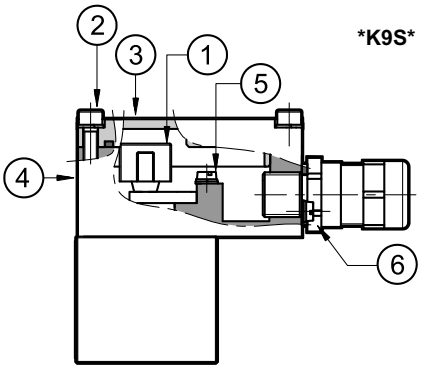
On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements 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 in compliance with standards about protection against explosion hazards.



K9T



K9S

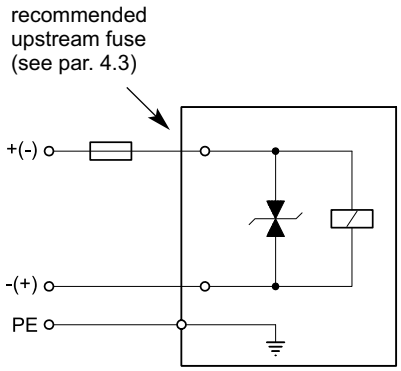
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

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 9) allow to use cables with external diameter between 8 and 10 mm.

4.2 - Electrical diagram



4.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In 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.

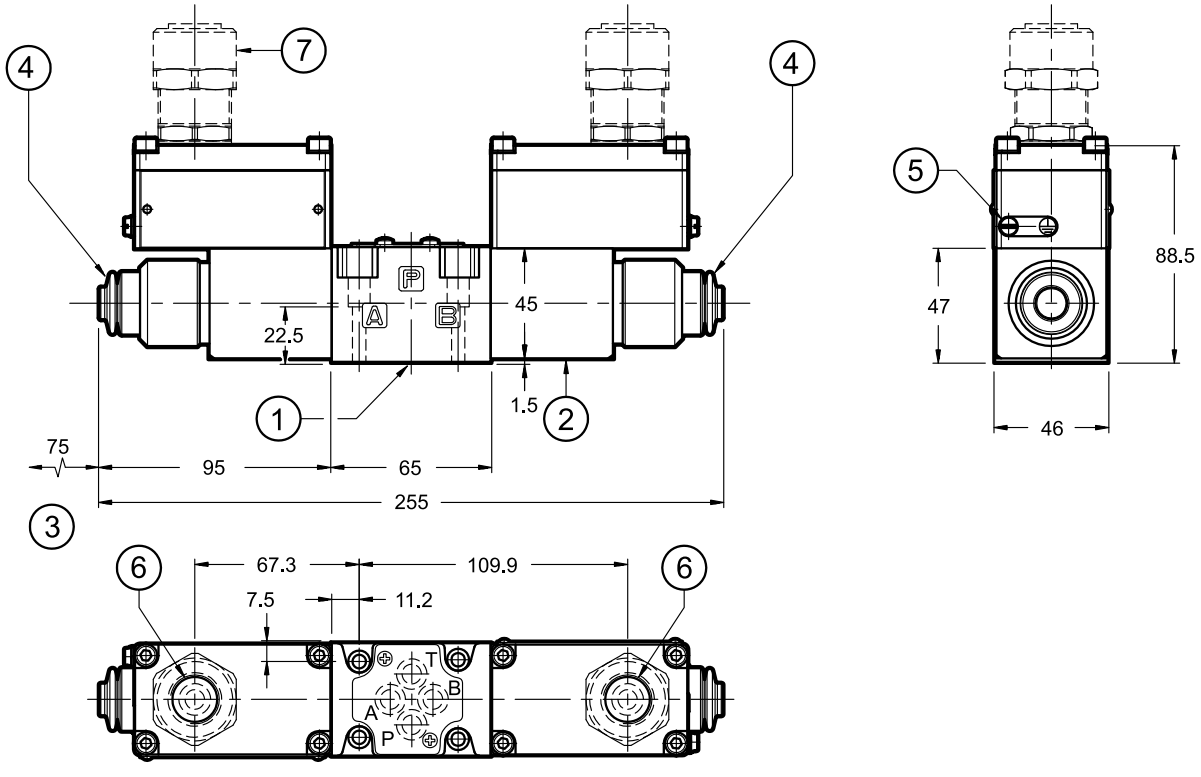
The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

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	

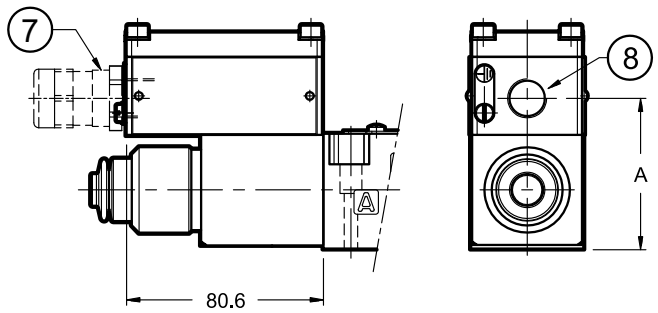
5 - OVERALL AND MOUNTING DIMENSIONS

ZDE3K*-D/10*-*K9T*/CM

dimensions in mm

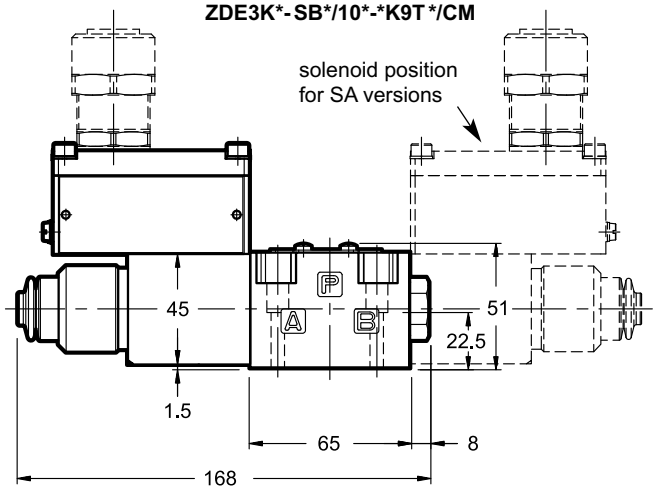


ZDE3K*-*/10*-*K9S*/CM



Side port type	A
S01, S04	60.5
S02, S03	60

ZDE3K*-SB*/10*-*K9T*/CM



Fastening of single valve: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm (A8.8 screws)
Threads of mounting holes: M5x10

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	Manual override, boot protected (**standard for both N and V seals**) for blind ring nut dimensions (standard with NL seals) see par. 8
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland To be ordered separately, see par. 9
8	Side port for cable gland

6 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types 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.

7 - INSTALLATION

Installation must adheres to instruction 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 potentially explosive atmospheres.

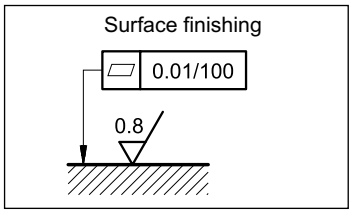
The valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the reduced pressure value.

In the T line the maximum admissible backpressure is 30 bar, under operational conditions.

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 leaks between the valve and support surface.



8 - MANUAL OVERRIDE CB

CB - Blind ring nut

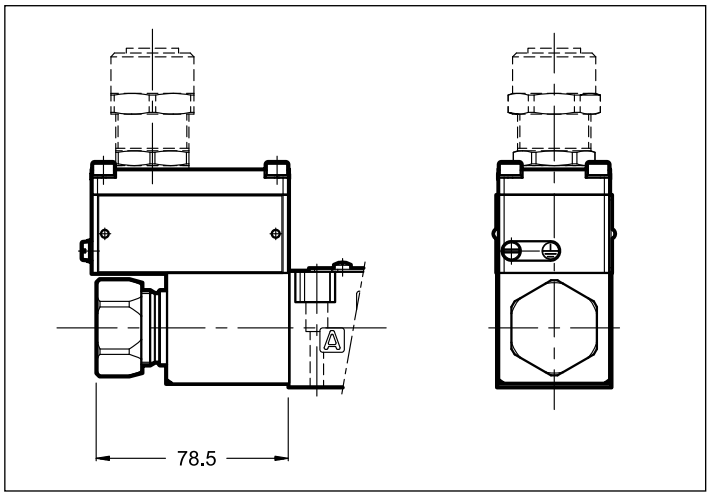
The metal ring nut protects the solenoid tube from atmospheric agents and isolates the manual override from accidental operations. The ring nut is tightened on a threaded fastener that keeps the coil in its position even without the ring nut.

To access the manual override loose the ring nut and remove it; then reassemble hand tightening, until it stops.

Activate the manual override always and only with non-sparking tools suitable for use in potentially explosive atmospheres.

More information on safe use of explosion-proof components are provided in the instruction manual, always supplied with the valve.

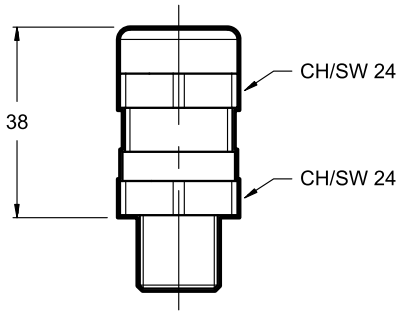
CAUTION!: The manual override doesn't allow any proportional regulation; indeed using this kind of override, the spool opens the path completely and the whole inlet pressure will pass through A or B line.



9 - CABLE GLANDS

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

- version for non-armoured cable, external seal on the cable (suitable for Ø 8÷10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb
- cable gland material: nickel brass
- inner rubber tip material: silicone
- ambient temperature range: -65 ºC ÷ +220 ºC
- protection degree: IP66/IP68



To order the desired cable glands, specify description, code and quantity.

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 copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

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.

Tightening torque: 20 ÷ 25 Nm

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.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-04/10

Code: 3908108004

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

Tightening torque: 45 ÷ 50 Nm

10 - ELECTRONIC CONTROL UNITS

ZDE3K*-SA* ZDE3K*-SB*

EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251
EDM-M142	for solenoid 12V DC		

ZDE3K*-D*

EDM-M211	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251
EDM-M242	for solenoid 12V DC		

NOTE: electronic control units offered are not explosion proof certified; therefore, they must be installed outside the classified area.

11 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G with rear ports
Type PMMD-AL3G with side ports
P, T, A, B port threading: 3/8” BSP

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

The user will bear to do the complete assessment of the ignition risk that can occur from the relative use in potentially explosive environments.

EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure control valves	
RQM*K*-P	**21 515**
P*E*K*	**81 316**
ZDE3K*	**81 515**
DZCE*K*	**81 606**
flow control valves	
QDE3K*	**82 225**
directional valves	
D*K*	**41 515**
DT3K*	**42 215**
DS(P)E*K*	**83 510**

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic MS offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
INMETRO	**Gb**	**Db**	**Mb**
PESO	**Gb**		

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; 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.

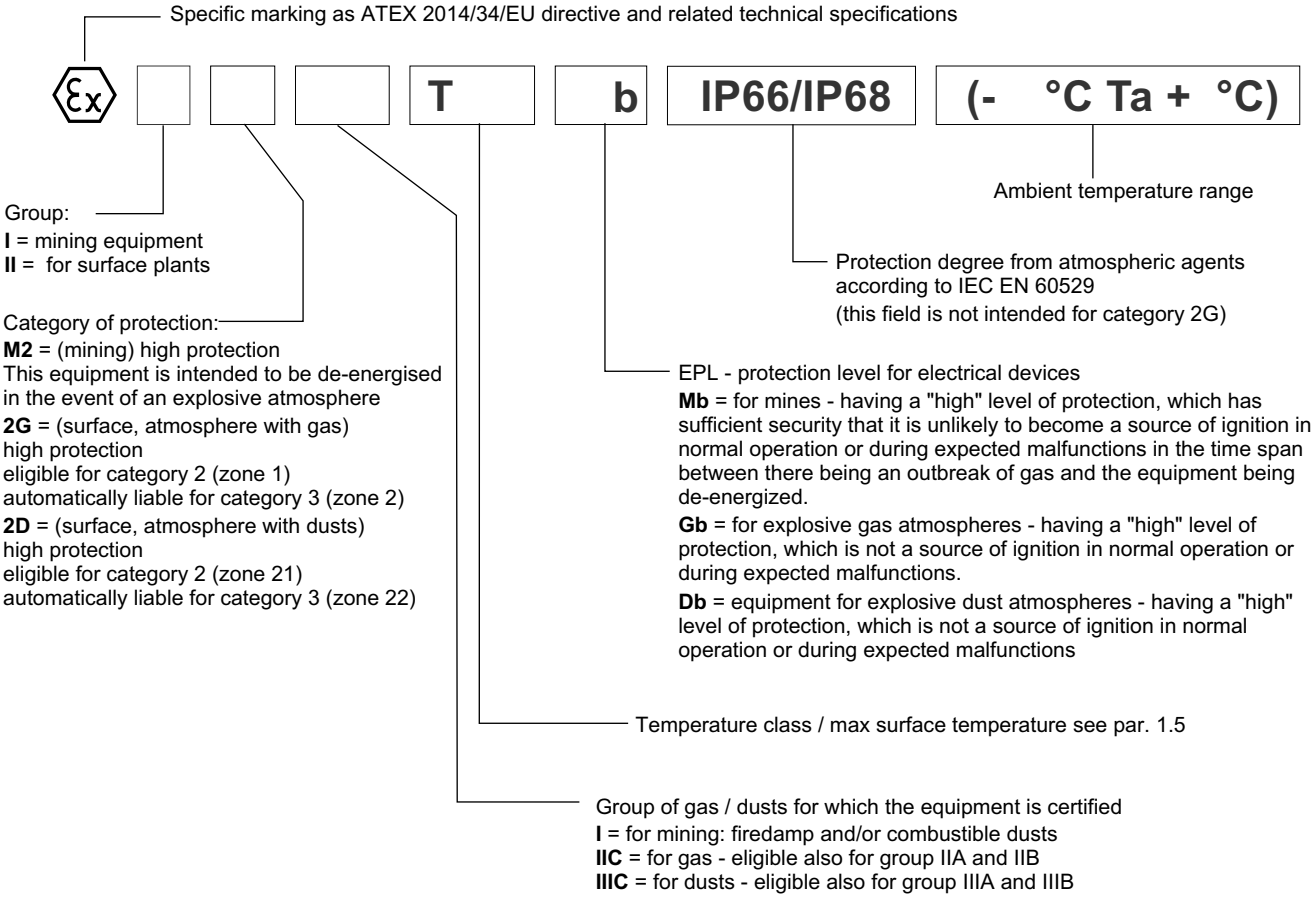
1.1 - ATEX classification for valves

Type examination certificate: AR18ATEX055
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
ATEX I M2	***KDM2**	equipment 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.

1.2 - ATEX marking for valves

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



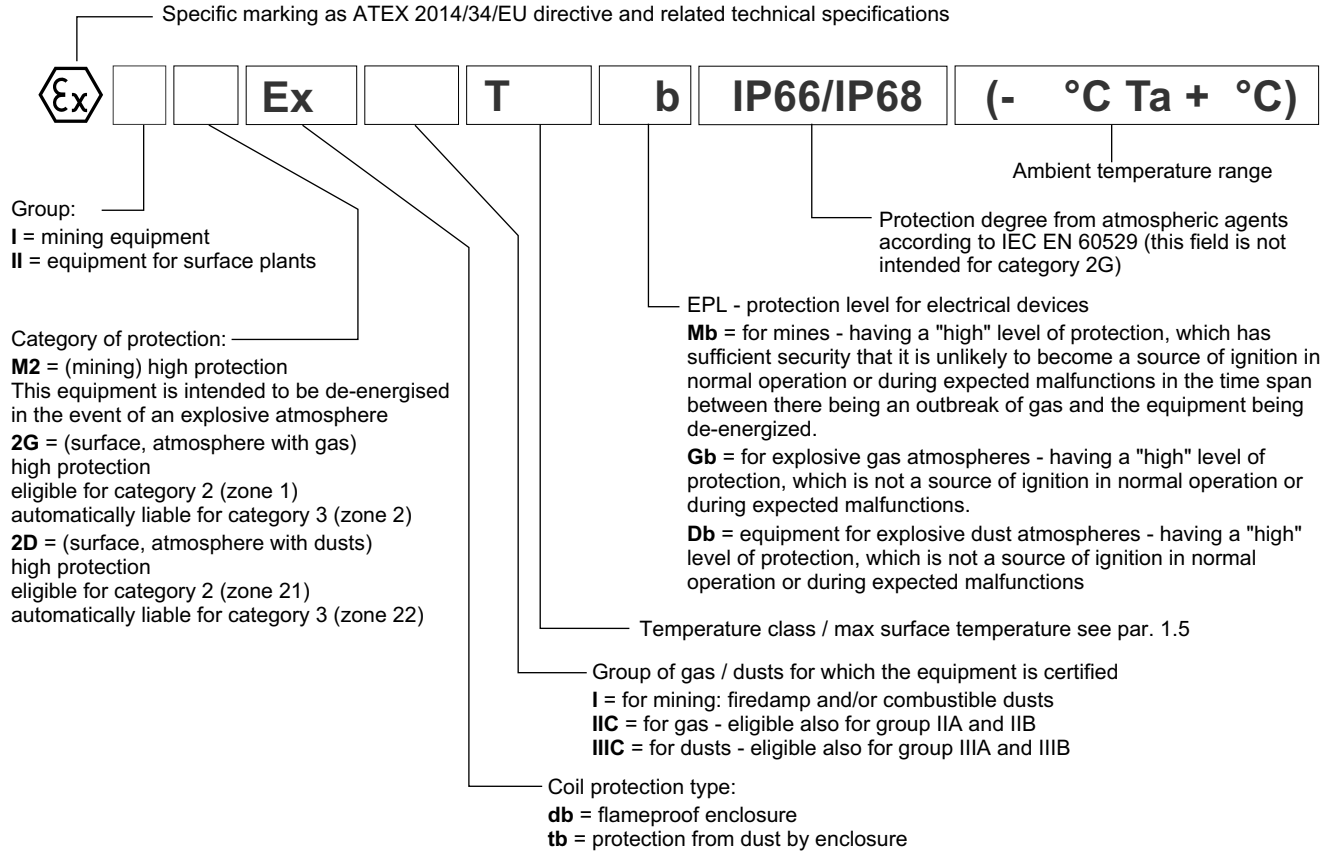
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself an as such is identified with its own tag, 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 db” type protection (explosion-proof coil).

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

1.4 - ATEX marking on coils

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



1.5 - 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) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

2 - IECEX CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. 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 db” type protection (explosion-proof coil).

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

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

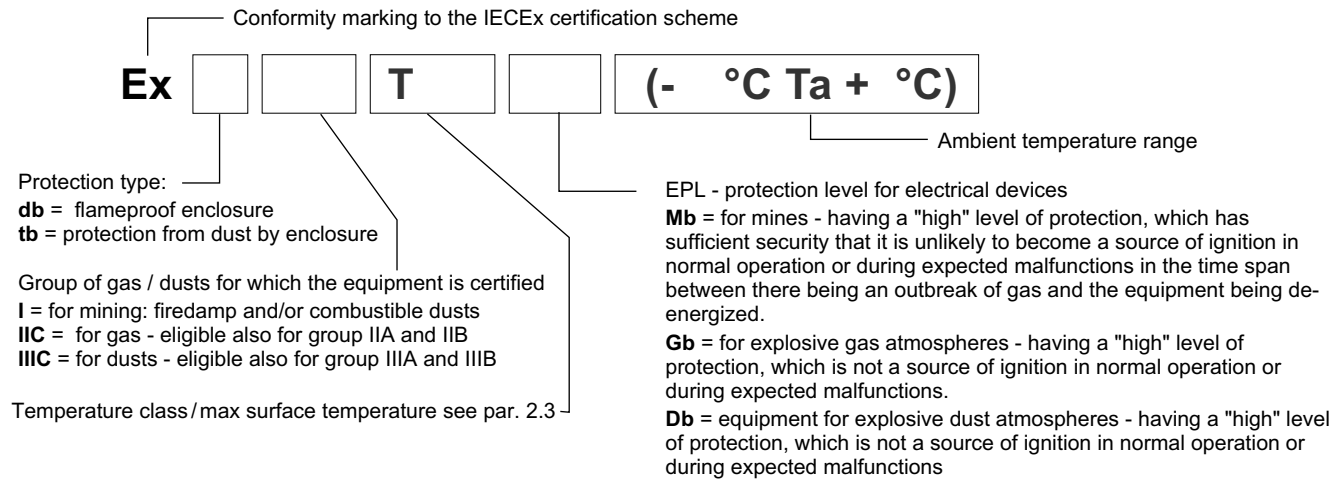
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
IECEx Mb	***KXDM2**	equipment 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.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas for dusts	Ex db IIC T4 Gb (-40°C Ta +80°C) Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas for dusts	Ex db IIC T5 Gb (-40°C Ta +55°C) Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



2.3 - 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.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

3 - INMETRO CLASSIFICATION AND TEMPERATURES

The INMETRO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with INMETRO certified coils, suitable for application and installation in potentially explosive atmospheres. 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 db” type protection (explosion-proof coil).

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

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - INMETRO classification

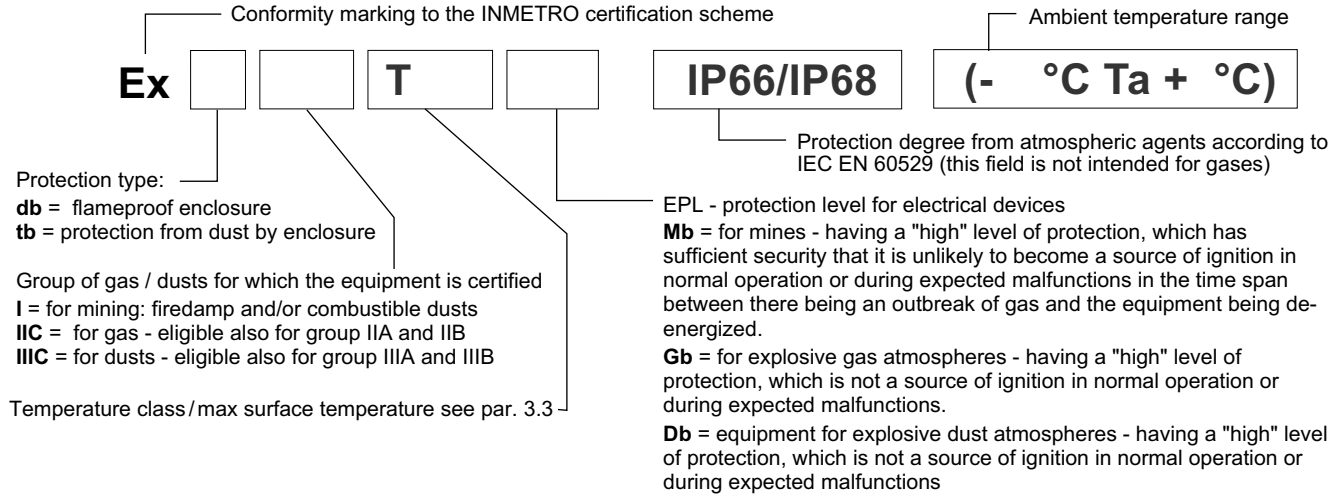
Certificate of conformity: DNV 15.0094 X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

INMETRO Gb INMETRO Db	***KBD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.
INMETRO Mb	***KBDM2**	equipment 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.

3.2 - INMETRO marking

There is a plate with the INMETRO mark on each coil.

***KBD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KBD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KBDM2** valves	mining	Ex db I T150° Mb IP66/IP68 (-40°C Ta +75°C)



3.3 - 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.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
INMETRO Gb INMETRO Db	***KBD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KBD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
INMETRO Mb	***KBDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

4 - PESO CLASSIFICATION AND TEMPERATURES

The PESO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with PESO certified coils, suitable for application and installation in potentially explosive atmospheres. 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 db” type protection (explosion-proof coil).

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

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

4.1 - PESO classification

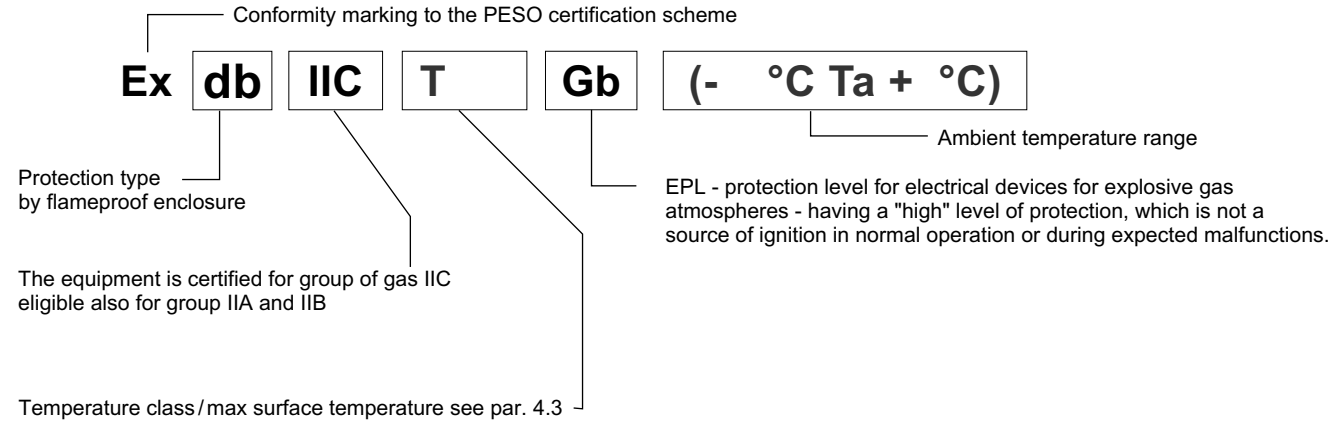
Certificate of conformity: P480801
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

PESO Gb	***KPD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.

4.2 - PESO marking

There is a plate with the PESO mark on each coil.

***KPD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
***KPD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)



4.3 - 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.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
PESO Gb	***KPD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas)	T3, T2, T1
		of fluid				
	***KPD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas)	T4, T3, T2, T1
		of fluid	-20 / +60 °C	-40 / +60 °C		

PLKE08

PROPORTIONAL PRESSURE CONTROL VALVE DIRECT OPERATED

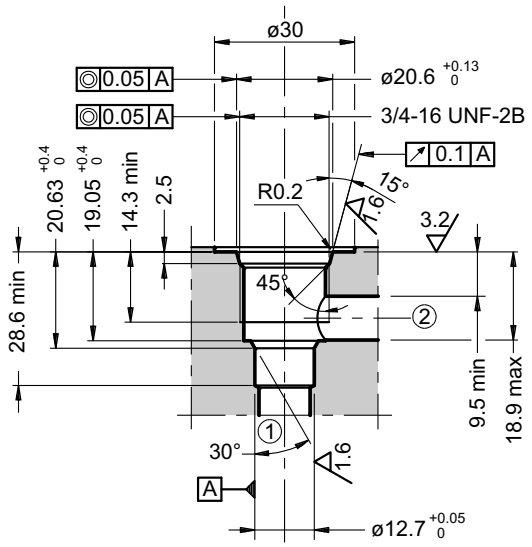
SERIES 10

CARTRIDGE TYPE

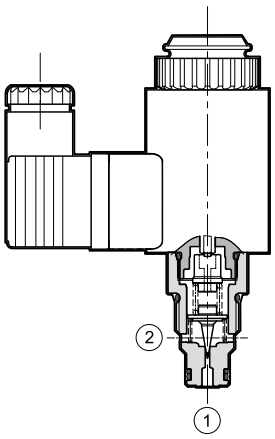
seat 3/4-16 UNF-2B (SAE-08)

p max **400** bar
Q max **2** l/min

SEAT DIMENSIONS: 3/4-16 UNF-2B (SAE-08)



OPERATING PRINCIPLE



— The PLKE08 valve is a proportional pressure control valve, direct operated, cartridge type. They can be used in blocks and manifolds with SAE-08 seat.

— The valve is suitable as a pilot stage for remote control of two stage pressure control and reducing valves.

— The design of this valve has a mechanical pressure limitation feature for higher safety of the application.

— The valve can be controlled directly by a current control supply unit or combined with an external electronic card to maximize the valve performances (see point 11).

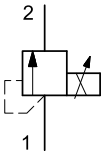
— The valve is available in four pressure control ranges up to 350 bar.

PERFORMANCES

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

Maximum operating pressure (**NOTE**): - port 1 - port 2	bar	 400 210
Minimum controlled pressure	see p min = f(Q)	
Nominal flow Maximum flow	l/min	1 2
Step response	see point 5	
Hysteresis (with PWM 200 Hz)	% of p nom	< 5%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see point 4	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	0.42

HYDRAULIC SYMBOL



NOTE: The maximum operating pressure is the sum of set pressure and return flow pressure.

1 - IDENTIFICATION CODE

PL	K	E	08	-		/	10		-			/	

Pressure control valve

Cartridge type

Electrical proportional control

Size

Pressure control range
080 = up to 80 bar
170 = up to 170 bar
250 = up to 250 bar
350 = up to 390 bar

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

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

Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K2 = plug for connector type AMP JUNIOR
K7 = plug for connector type DEUTSCH DT04-2P male

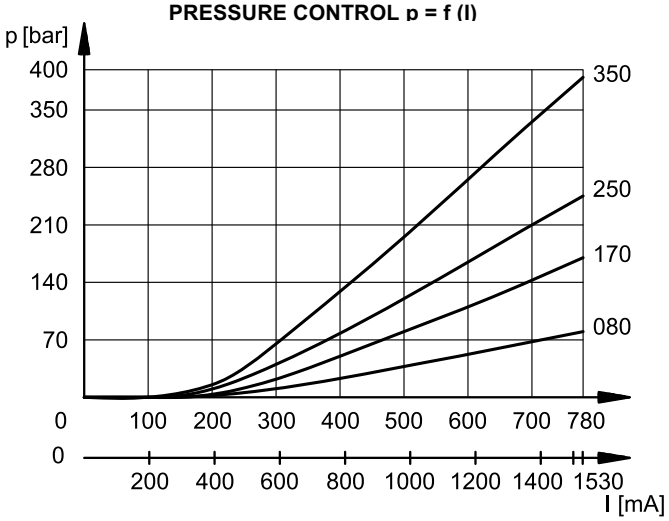
Option: manual override (see at point 11)

2 - CHARACTERISTIC CURVES

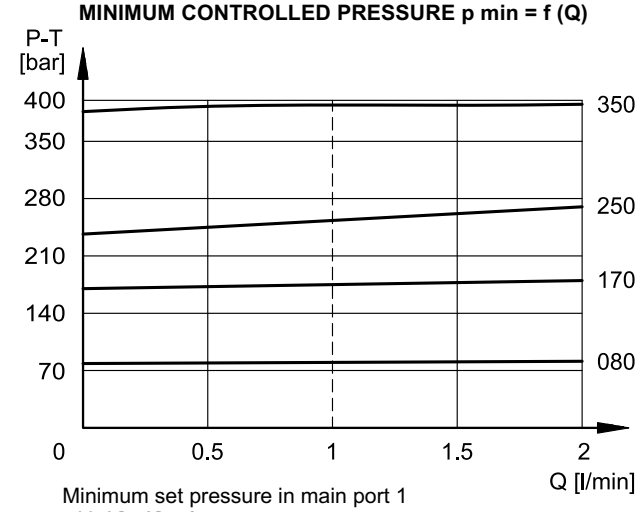
(measured with viscosity of 36 cSt at 50 °C)

Typical control curves according to the current supplied to the solenoid, measured with input flow rate Q = 1 l/min. The curves have been obtained without any hysteresis and linearity compensation and they are measured without any backpressure.

PRESSURE CONTROL p = f (I)

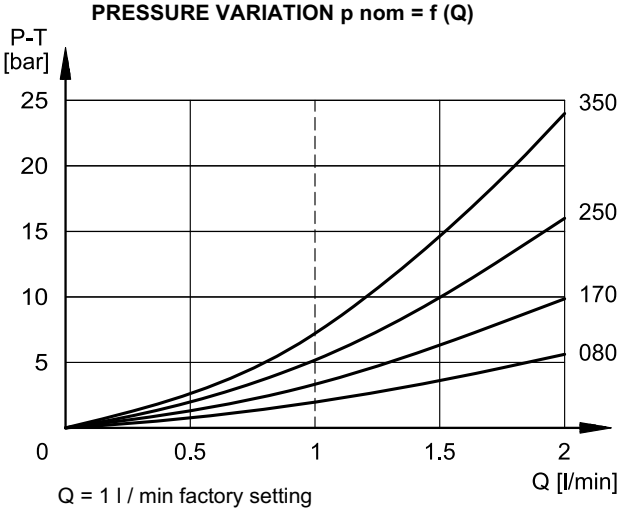


MINIMUM CONTROLLED PRESSURE p min = f (Q)



Minimum set pressure in main port 1
with I [mA] = 0

PRESSURE VARIATION p nom = f (Q)



Q = 1 l / min factory setting

3 - MAX PRESSURE VALUES

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures that the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 1 l/min

		PLKE08-080	PLKE08-170	PLKE08-250	PLKE08-350
pressure value at 780 mA	bar	80	170	250	390
max pressure value when $I > I_{max}$	bar	90	190	290	440

4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube and secured by means of a lock nut. It can be rotated through 360° depending on installation clearances.

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K2	IP65	
K7	IP65/67	

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	4.98	21
NOMINAL CURRENT	A	1.53	0.78
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	class H class F		

5 - STEP RESPONSE

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

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

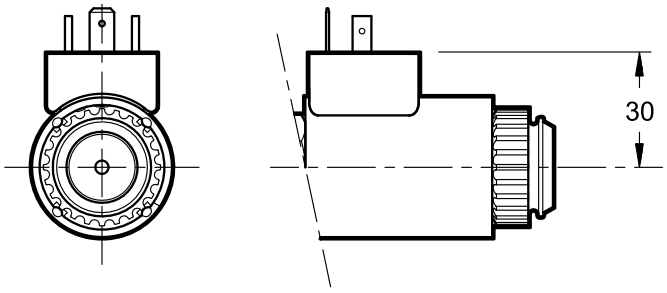
The table illustrates typical step response times measured with a PLKE08-350 bar and with input flow rate Q = 0,5 l/min.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	80	50

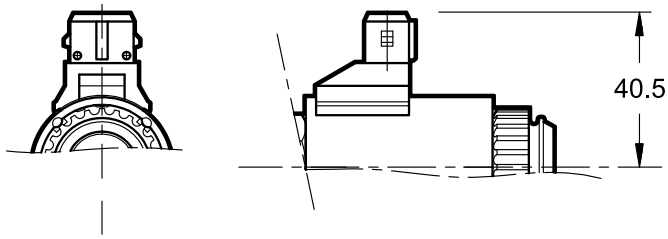
6 - ELECTRIC CONNECTIONS

Connectors for K1 connection are always delivered together with the valve.

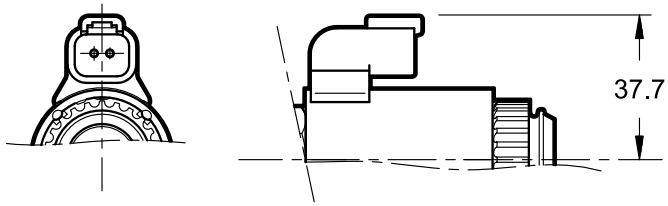
connection for EN 175301-803
connector
code **K1** (**standard**)



connection for AMP JUNIOR
connector type
code **K2**

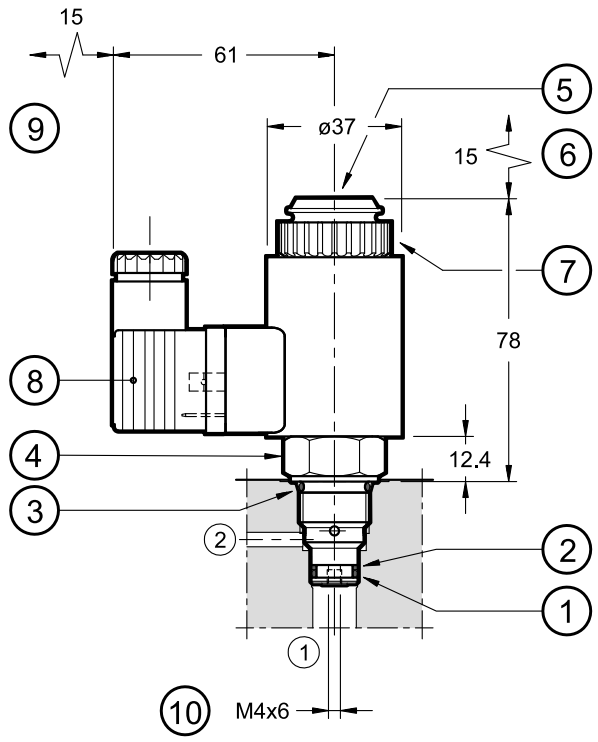


connection for
DEUTSCH DT06-2S male connector
code **K7**



7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	OR type 2037 (9.25x1.78) - 90 shore
2	PARBAK type 8-012 (9.96x1.14x1.35)
3	OR type 3-908 (16.36x2.2) - 70 shore
4	Cartridge tightening: spanner 24 Tightening torque 50 Nm
5	Manual override, integrated in the solenoid tube
6	Coil removal space
7	Coil locking ring: tightening torque 5 Nm ± 0,5
8	Electric connector type EN 175301-803 (ex DIN 43650)
9	Connector removal space
10	Seat for optional calibrated flow restrictor

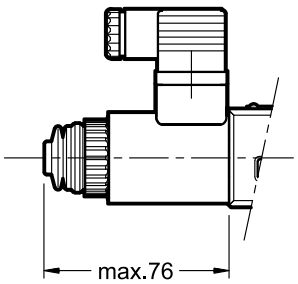
8 - MANUAL OVERRIDES

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

Two different manual override versions are available upon request:

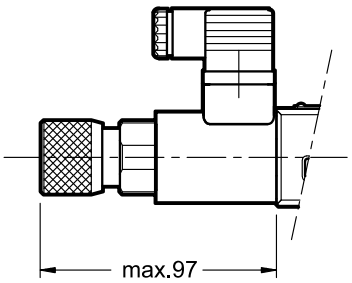
- **CM** version, manual override boot protected.
- **CK1** version, knob to screw

CM Version



Code: 3404100043

CK1 Version



Code: 3404100041

9 - 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 fluid types 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.

10 - INSTALLATION

These valves can be installed in any position without impairing correct operation if it is ensured that there is no air in the hydraulic circuit.

Otherwise, vertical mounting with solenoid downward is preferable. In this case you must consider possible variations of the minimum controlled pressure values reported in point 2.

Connect the valve main port 2 directly to the reservoir.

NOTE: Occurring return pressures are to be added up to the value of pressure setting at main port 1.

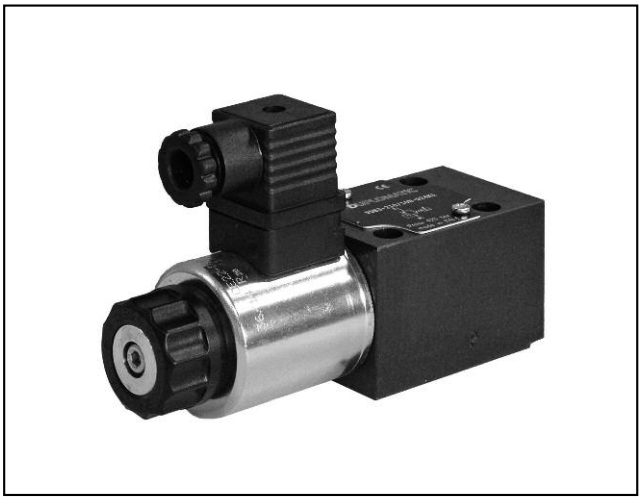
11 - ELECTRONIC CONTROL UNITS

For one valve

EDM-M102	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 251
EDM-M163	12V DC solenoids		

For two valves

EDM-M30022	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 251
EDM-M36633	12V DC solenoids		



PDE3

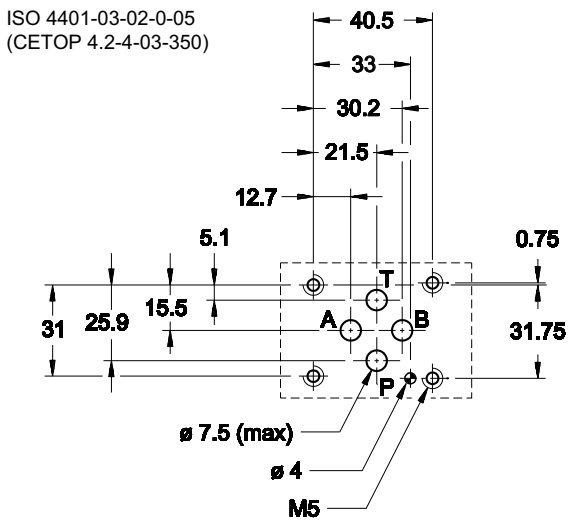
PROPORTIONAL PRESSURE RELIEF VALVE, DIRECT OPERATED

SERIES 10

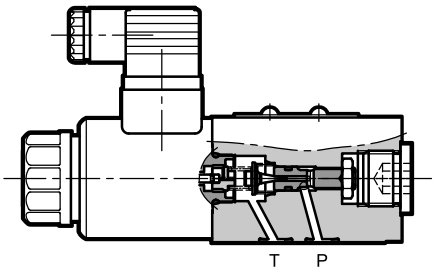
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **2** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



— The PDE3 valve is a direct operated proportional pressure relief valve, with mounting interface in compliance with ISO 4401 standards.

— It is suitable to pilot two-stage valves or for pressure control in hydraulic circuits.

— The design of this valve has a mechanical pressure limitation feature for higher safety of the application.

— The valve can be controlled directly by a current control supply unit or by an electronic control unit, to exploit valve performance to the full (see par. 9).

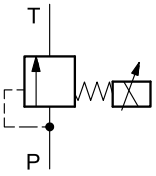
— The valve is available in five pressure control ranges up to 350 bar.

PERFORMANCES

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

Maximum operating pressure: - P port - T port	bar	 350 2
Minimum controlled pressure	see p min = f(Q) diagram	
Nominal flow Maximum flow (see p min = f(Q) diagram)	l/min	1 2
Step response	see paragraph 6	
Hysteresis (with PWM 200 Hz)	% of p nom	< 5%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see paragraph 5	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	1,6

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	D	E	3	-		/	10		-		K1

Pressure control valve

Direct operated

Electrical proportional control

Size ISO 4401-03

Pressure control range
025 = 0,9 - 25 bar
070 = 1,6 - 70 bar
140 = 2,4 - 140 bar
210 = 3,2 - 210 bar
350 = 5 - 350 bar

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

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Coil electrical connection:
plug for connector type
EN 175301-803 (ex DIN 43650)
(**standard**)

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

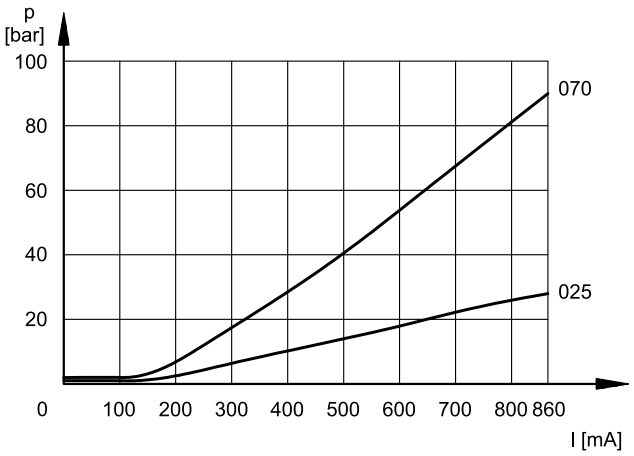
2 - CHARACTERISTIC CURVES

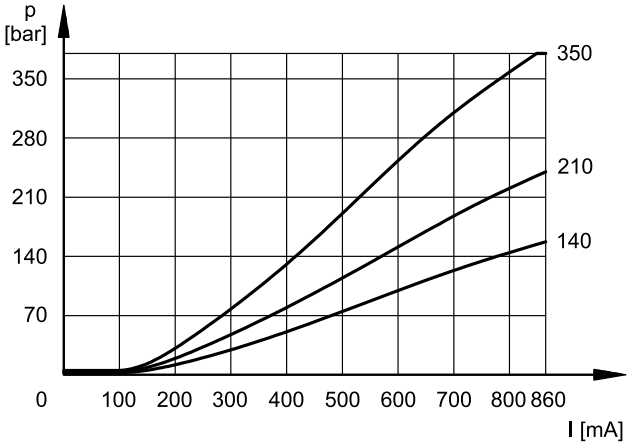
(obtained with viscosity of 36 cSt at 50°C, and valves with D24 coil)

Typical control curves according to the current supplied to the solenoid, measured with input flow rate Q = 1 l/min.

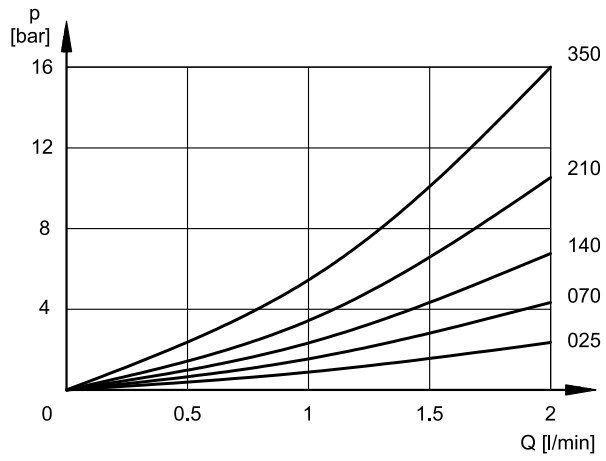
Curves have been obtained without any hysteresis and linearity compensation and they are measured without any backpressure in T. The full scale pressure is set in factory with a flow rate of 1 l/min. In case of higher flow rate, the full scale pressure will increase considerably (see diagram pmax = f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

PRESSURE CONTROL p = f(I)

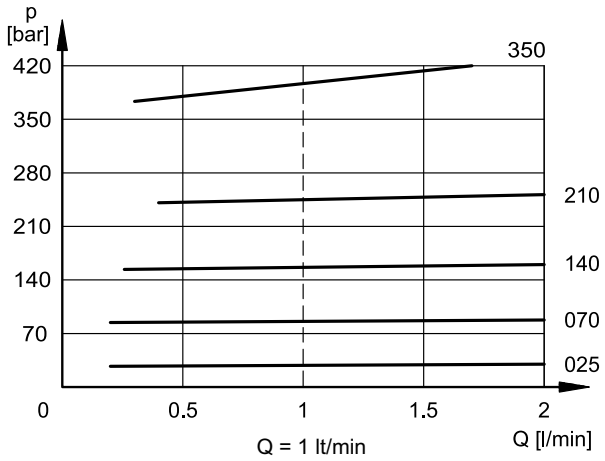




MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



Q = 1 lt/min
factory setting

3 - MAX PRESSURE VALUES

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures that the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 1 l/min

		PDE3-025	PDE3-070	PDE3-140	PDE3-210	PDE3-350
pressure value at 800 mA	bar	25	77	142	217	360
max pressure value when $I > I_{max}$	bar	33,5	90	161	252	390

4 - 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.

5 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
CLASS OF PROTECTION atmospheric agents (EN 60529) coil insulation (VDE 0580) Impregnation	IP65 class H class F		

6 - STEP RESPONSE

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

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 PDE3-210 and with an input flow rate of Q = 1 l/min and pressure oil volume of 0,1 litre. The response time is affected both by the flow rate and the oil volume in the pipework.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	60	70

7 - INSTALLATION

We recommend installing these valves with the solenoid downward, either in horizontal or vertical position. If the valve is installed on vertical axis with the solenoid upward, you should consider possible variations of the minimum controlled pressure from those indicated in paragraph 2.

Ensure that there is no air in the hydraulic circuit. In certain applications it might be necessary to vent the air entrapped in the solenoid tube by unfastening the drain screw placed in the solenoid tube.

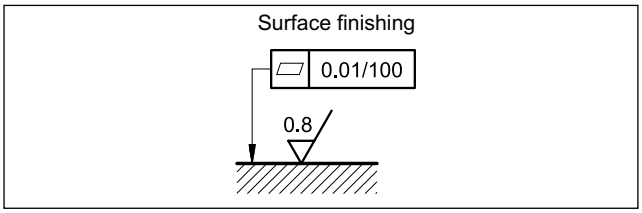
Ensure the solenoid tube is always filled with oil. Make sure the drain screw has been put back correctly at the end of the task.

Connect the valve T port 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.

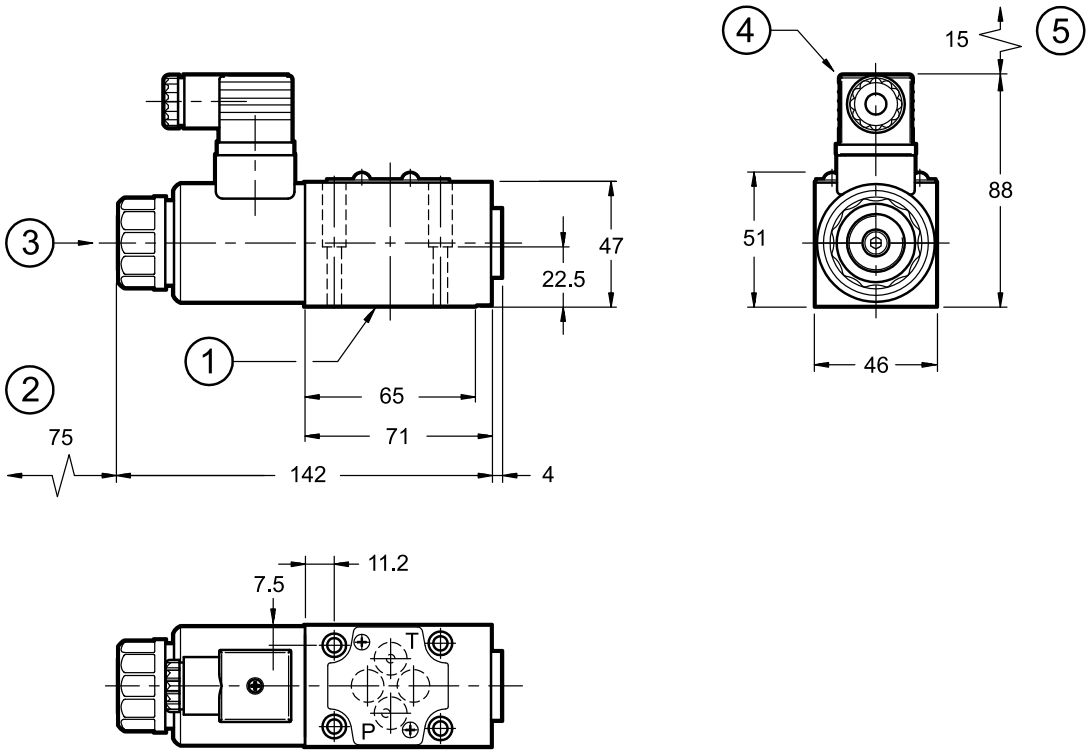
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols.

If minimum values are not observed, fluid can easily leaks between the valve and support surface.



8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (3) placed at the end of the solenoid tube.

Valve fastening: 4 SHC screws M5x30 - ISO 4762	
Tightening torque: 5 Nm (A 8.8 screws)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Coil removal space
3	Breather (Allen key 4)
4	EN 175301-803 (ex DIN 43650) connector, included in the supply
5	Connector removal space

9 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251
EDM-M142	for solenoid 12V DC		

10 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions: P, T, A, B: 3/8” BSP thread

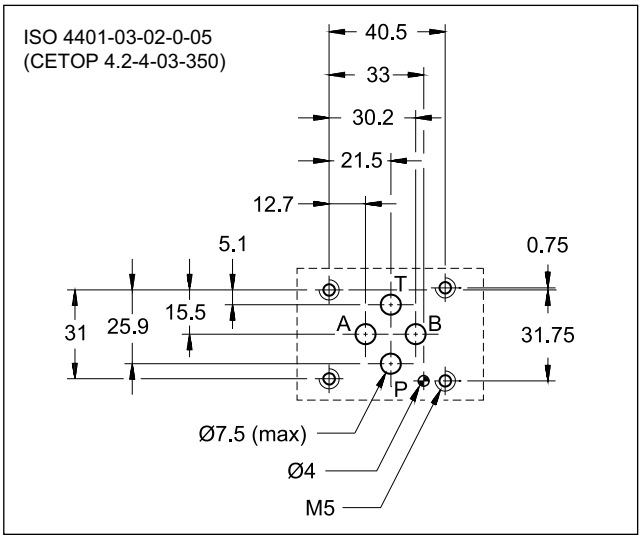
PDE3G*

PROPORTIONAL PRESSURE CONTROL VALVE WITH INTEGRATED ELECTRONICS

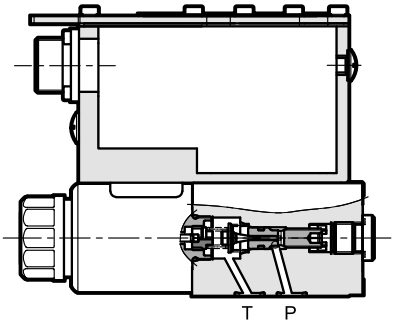
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **2** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The PDE3G* valve is a proportional pressure control valve, direct operated, with mounting surface in compliance with ISO 4401 standards.

— It is suitable to pilot two-stage valves, for pressure control in hydraulic circuits.

— Valves are available with different types of electronics, with analogue or fieldbus interfaces

— A solenoid current monitoring signal is available.

— Five pressure control ranges are available, up to 350 bar.

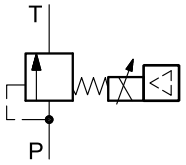
— The valves are easy to install. The driver manages digital settings directly.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and p = 140 bar)

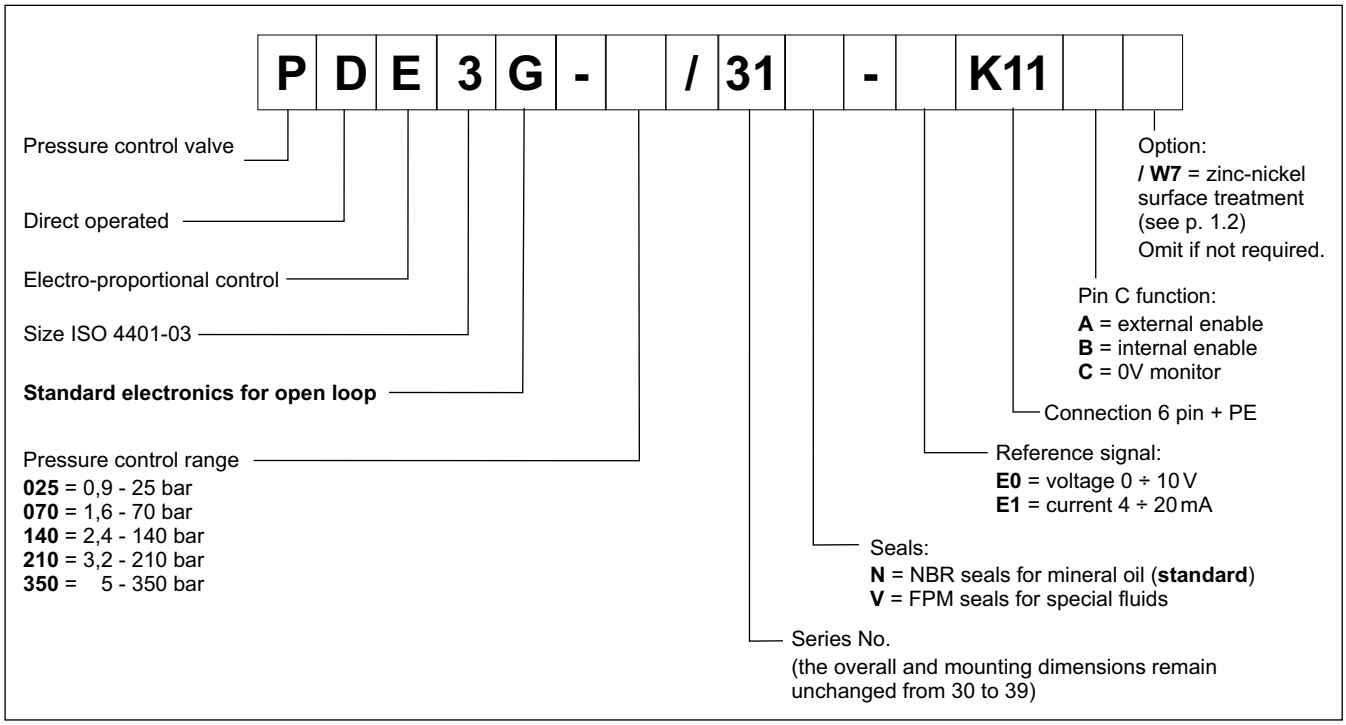
Maximum operating pressure: - P port - T port	bar	 350 2
Nominal flow Maximum flow (see diagram p min = f(Q))	l/min	1 2
Step response	see point 7	
Hysteresis	% of p nom	< 3%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see point 2	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	2

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODES AND CONFIGURATION

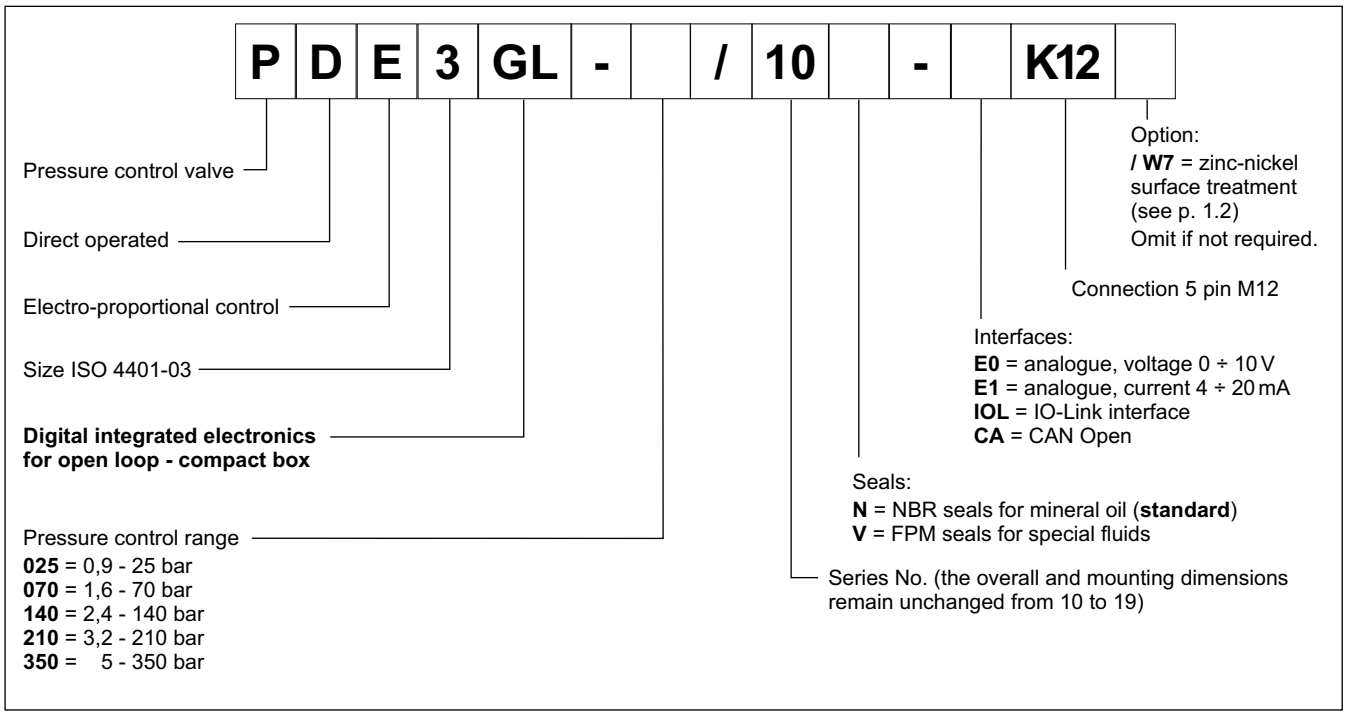
1.1 - Standard electronics



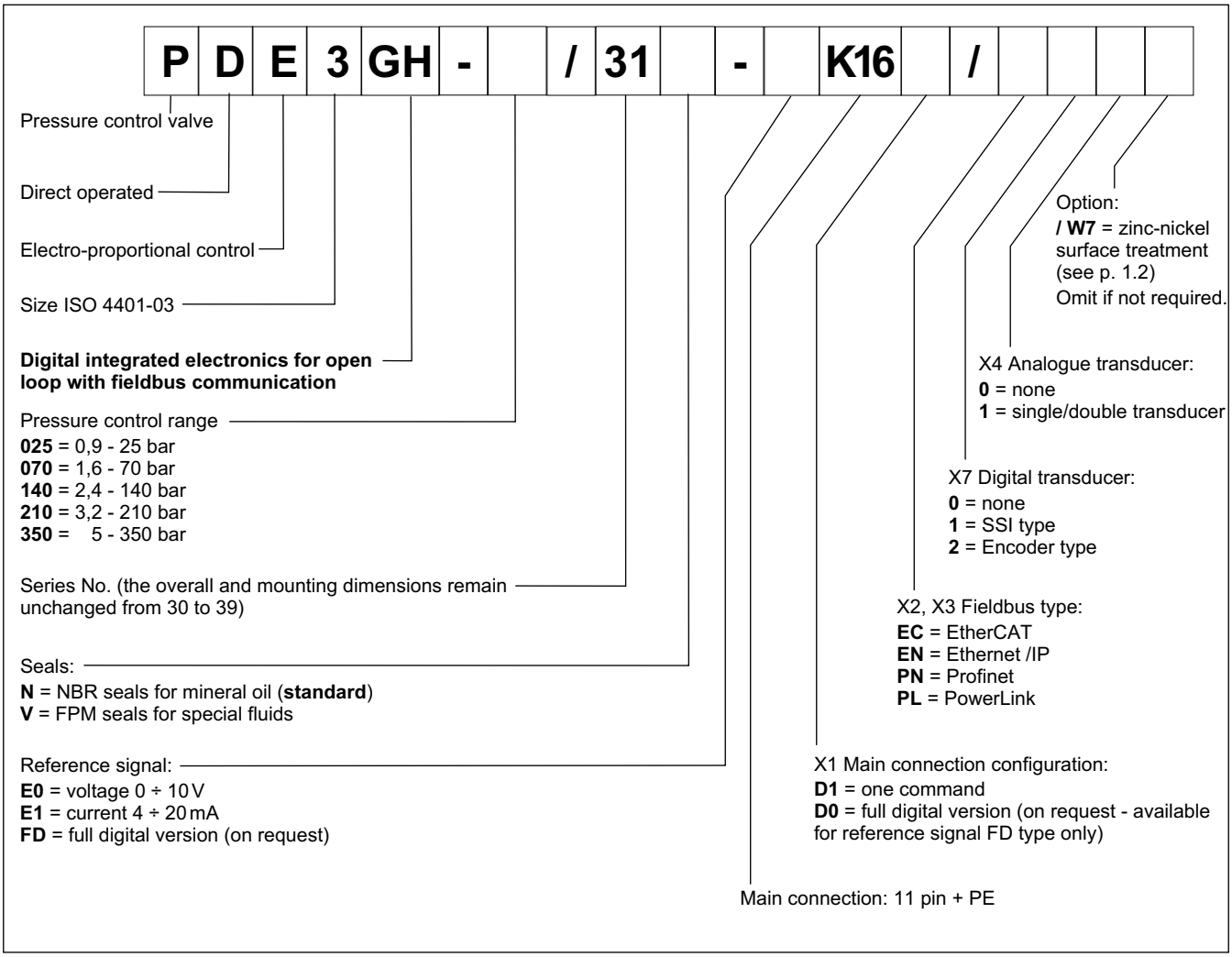
1.2 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.3 - Configurations



1.4 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect with caps any unused connections.

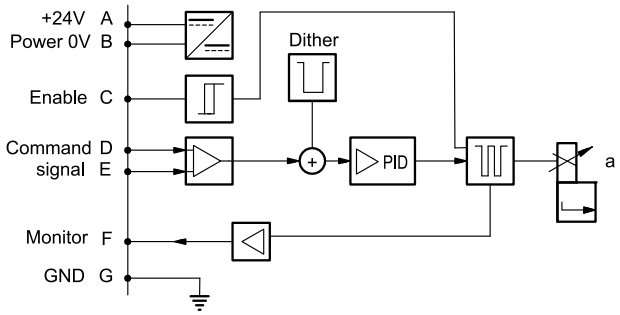
3 - PDE3G - STANDARD ELECTRONICS

3.1 - Electrical characteristics

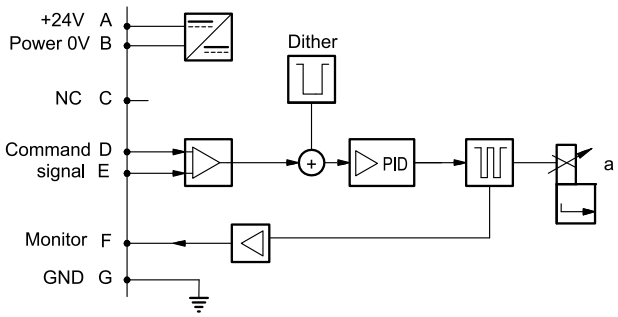
Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

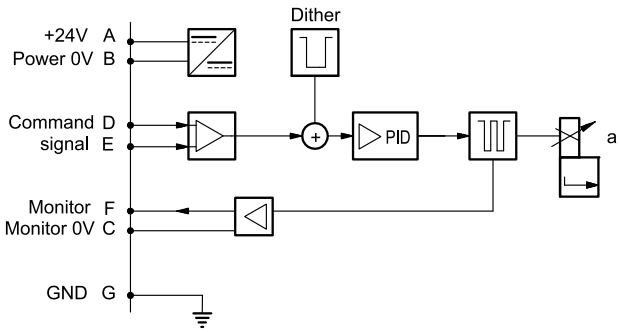
VERSION A - External Enable



VERSION B - Internal Enable

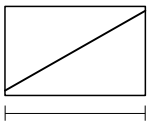


VERSION C - 0V Monitor

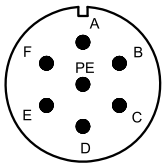


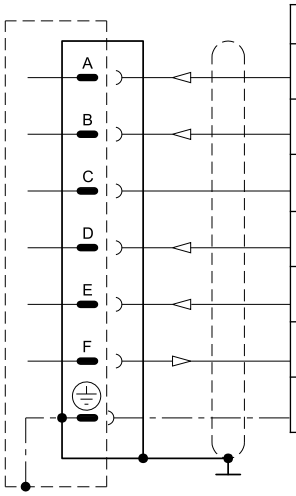
3.3 - Versions with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**



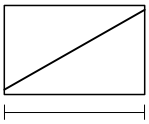


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

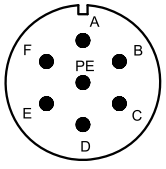
3.4 - Versions with current command (E1)

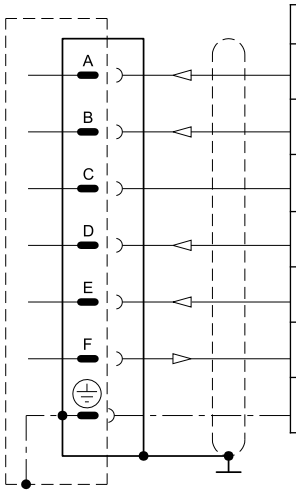
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - PDE3GL - COMPACT ELECTRONICS

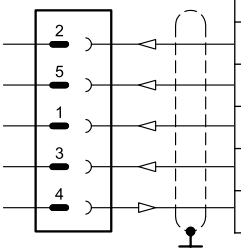
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	kBaud	IO-Link Port Class B 230,4
Can Open communication (CA): Data rate	kbit	10 ÷ 1000
Data register (IOL and CA versions only)		solenoid voltage supply, solenoid faults (shortcircuit, bad config, internal), box temperature, switch-on time, vibrations
Connection		5-pin M12 code A (IEC 61076-2-101)

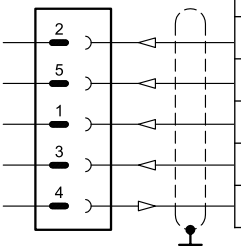
4.2 - Pin tables

'E0' connection



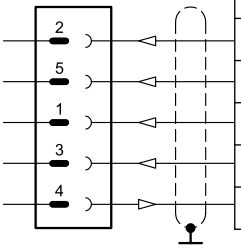
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0 V	Command reference
4	0 ÷ 5 V	Monitor (0V reference: pin 5)

'E1' connection



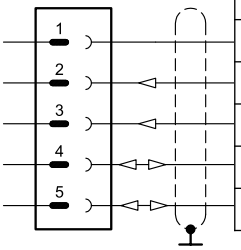
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



Pin	Values		Function
2	2L+	24 V DC	Supply of the power stage
5	2L-	0 V (GND)	Internal galvanic isolation from PIN 3
1	1L+	+24 V DC	IO-Link supply voltage
3	1L-	0V (GND)	
4	C/Q		IO-Link Communication

'CA' connection



Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

5 - PDE3GH - FIELDBUS ELECTRONICS

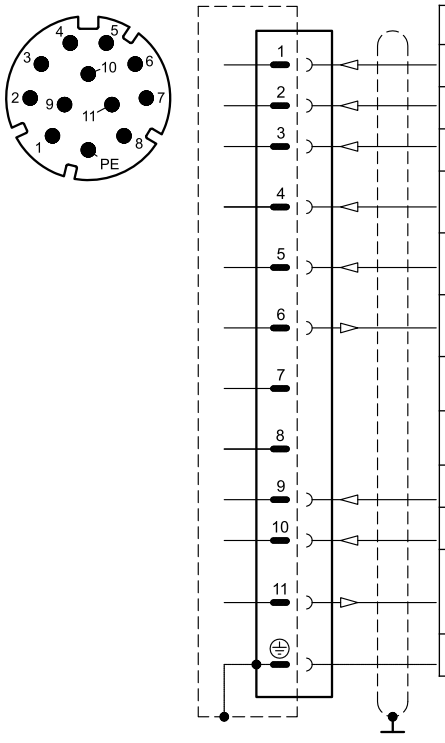
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

Command - valve position schemes as for the standard electronics. Please refer to pictures in point 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female

Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

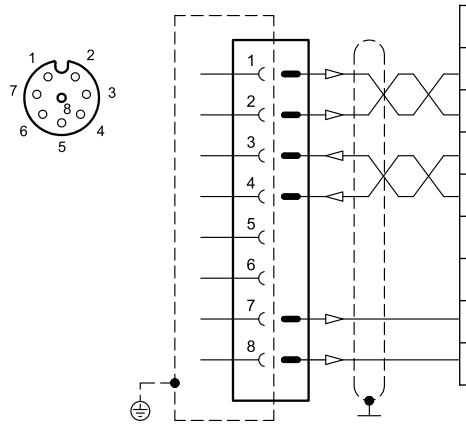
X3 (OUT) connection: M12 D 4 pin female

Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

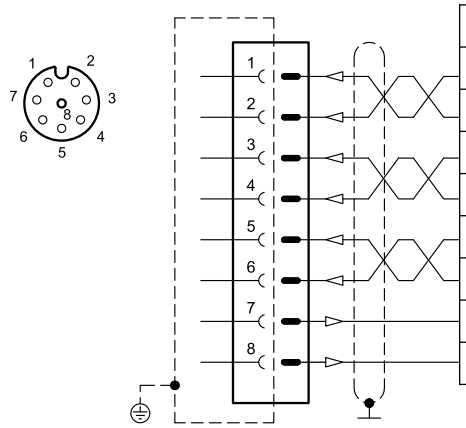
5.4 - Digital transducer connection
X7 connection: M12 A 8 pin female

VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

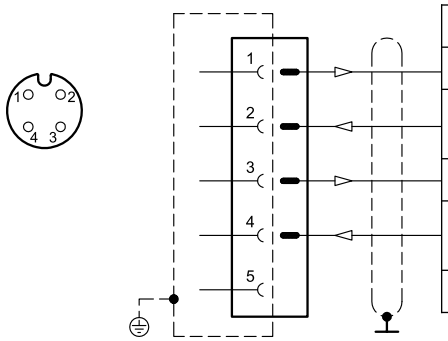
VERSION 2: ENCODER type



Pin	Values	Function	Notes
1	ENC_Z+	input channel Z+	Input - digital signal
2	ENC_Z-	input channel Z-	
3	ENC_A+	input channel A+	
4	ENC_A-	input channel A+	
5	ENC_B+	input channel B+	
6	ENC_B-	input channel B+	
7	+5 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection
X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer
(single or double is a software-selectable option)



Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

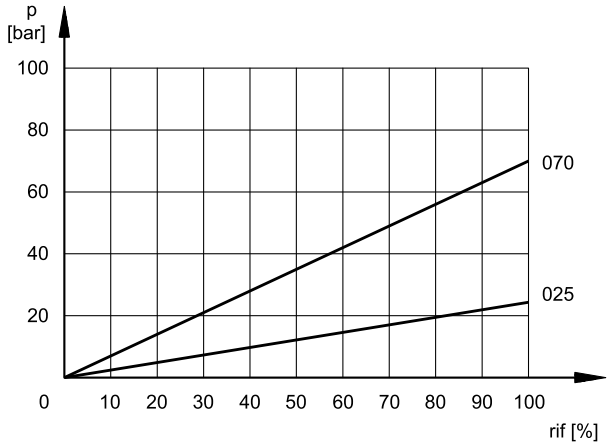
6 - CHARACTERISTIC CURVES

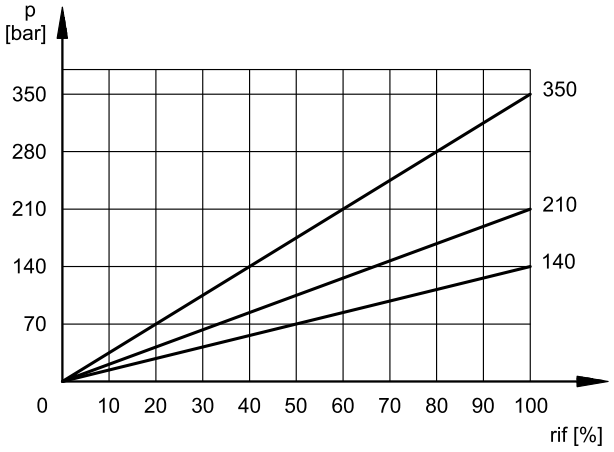
(measured with viscosity of 36 cSt at 50°C)

Typical control curves according to the reference signal for pressure control ranges, measured with input flow rate Q = 1 l/min. Characteristic curves measured without backpressure in T, with linearity compensation set by the onboard electronics.

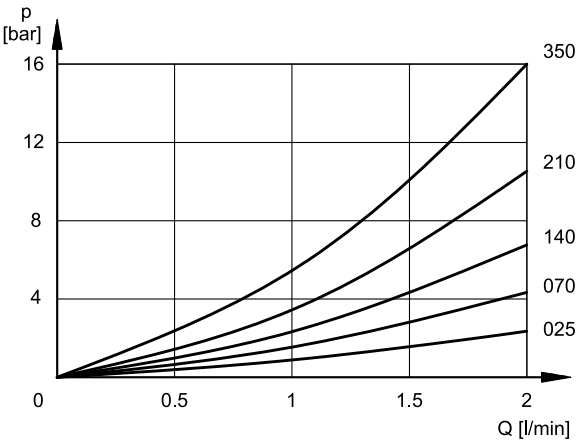
The full scale pressure is set in factory with a flow rate of 1 l/min. In case of higher flow rate, the full scale pressure will increase considerably. See diagram pmax = f (Q).

PRESSURE CONTROL p = f (I)

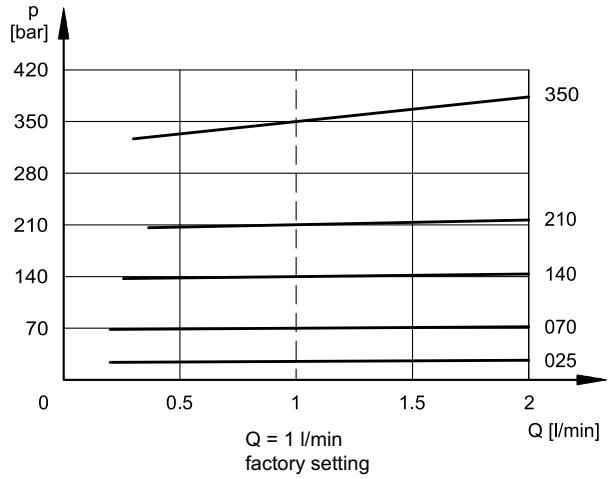




MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



7 - STEP RESPONSE

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

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

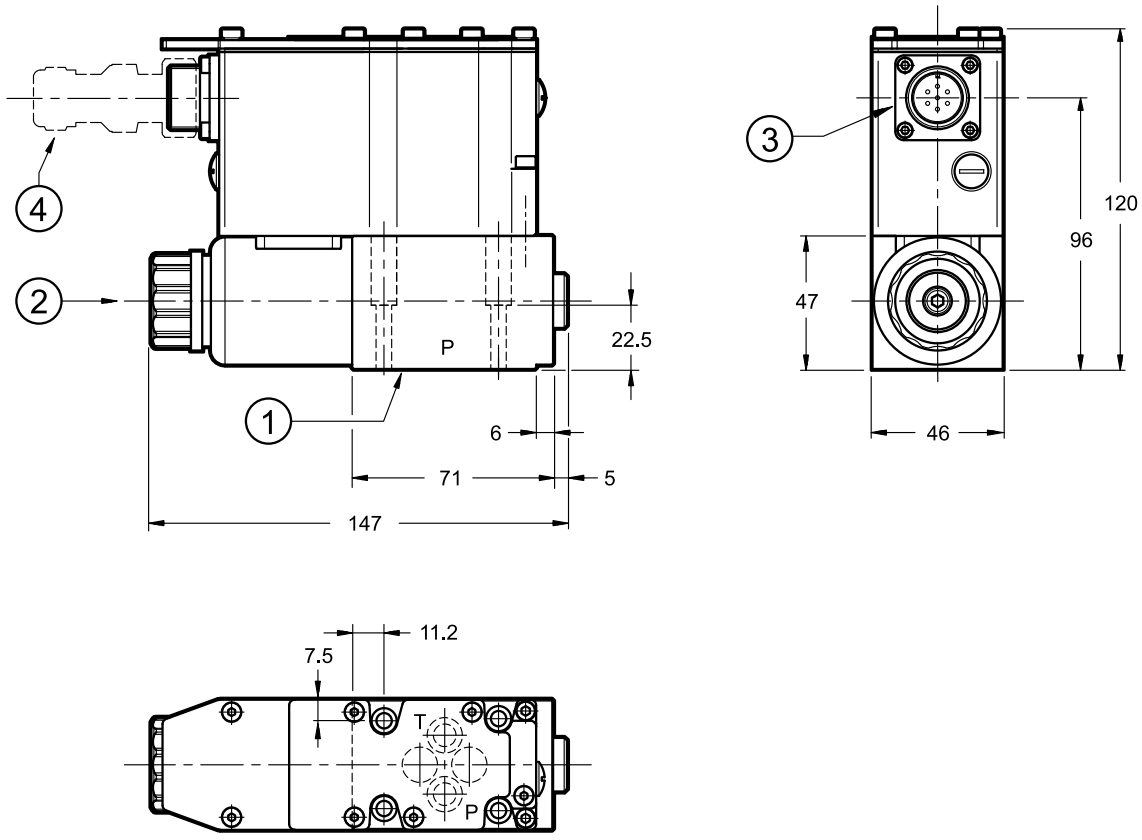
The table illustrates typical step response times measured with a PDE3G-210 and with an input flow rate of Q = 1 l/min and pressure oil volume of 0,1 litre.

The response time is affected both by the flow rate and the oil volume in the pipework.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	60	20

8 - PDE3G - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

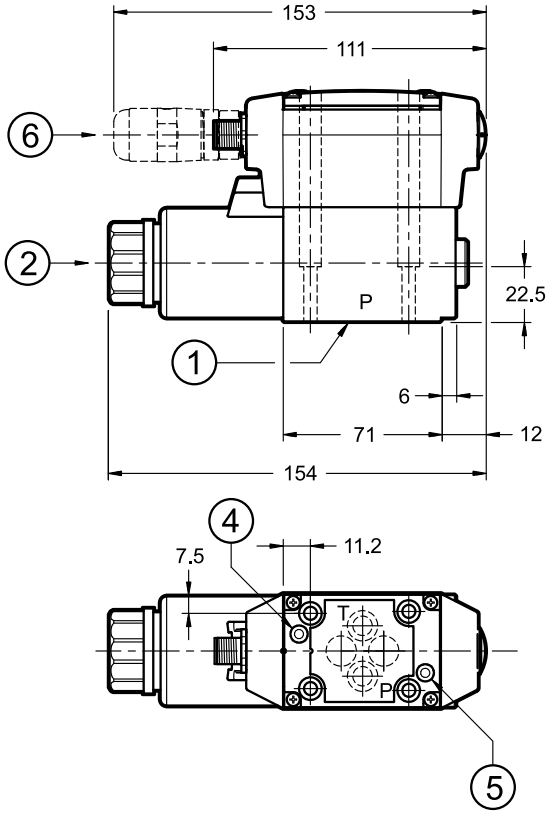


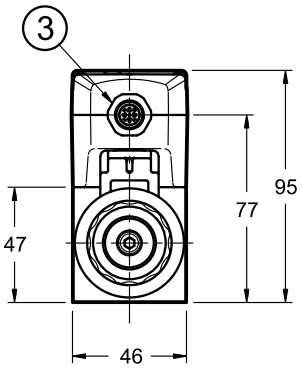
NOTE:
at the first start up or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) - 90 Shore
2	Breather: Allen key 4
3	Main connection 6 pin + PE
4	Mating connector 6 poles + PE, female type MIL-5015-G **To be ordered separately** See catalogue 89 000

9 - PDE3GL - OVERALL AND MOUNTING DIMENSIONS



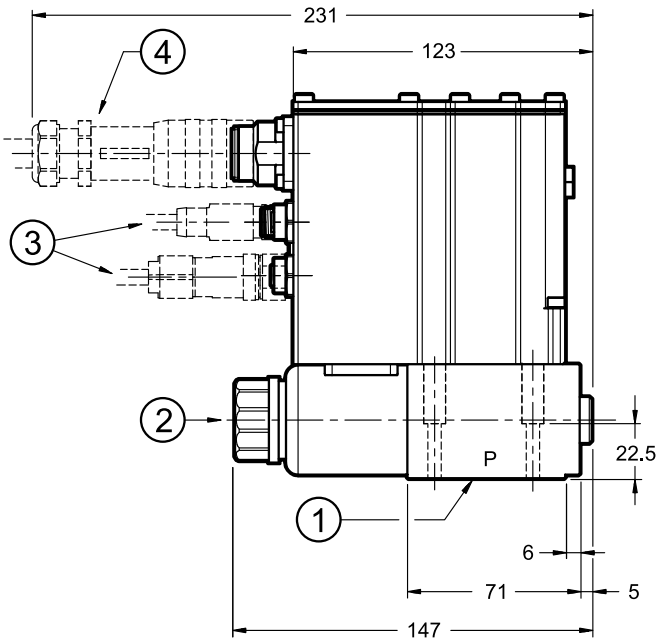


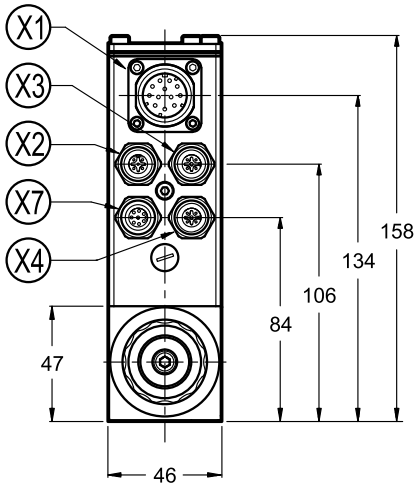
1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Connection M12 A 5 pin
4	L1 LED
5	L2 LED
6	Mating connector M12 5 poles code A, female **To be ordered separately.** See catalogue 89 000

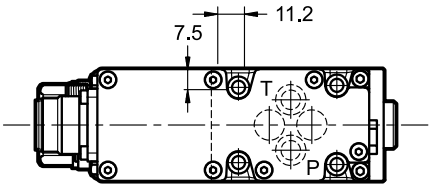
Fastening bolts: 4 SHCS M5x30- ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

10 - PDE3GH - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm







X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
4	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHCS M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

NOTE: Depending on the chosen version, X4 and X7 connections may not be present.
Please refer to section 5 for connection descriptions and pinout.

11 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. 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.

12 - INSTALLATION

We recommend installing these valves in vertical position with the solenoid downward, either horizontal. If the valve is installed on vertical axis with the solenoid upward, you should consider possible variations of the minimum controlled pressure from those indicated at point 6.

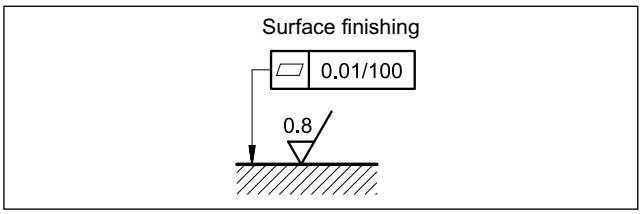
Ensure that there is no air in the hydraulic circuit. In certain applications it might be necessary to vent the air entrapped in the solenoid tube by unfastening the drain screw placed in the solenoid tube.

Ensure the solenoid tube is always filled with oil. Make sure the drain screw has been put back correctly at the end of the task. Connect the valve T port 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 leaks between the valve and support surface.



13 - ACCESSORIES

(to be ordered separately)

13.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

13.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

13.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

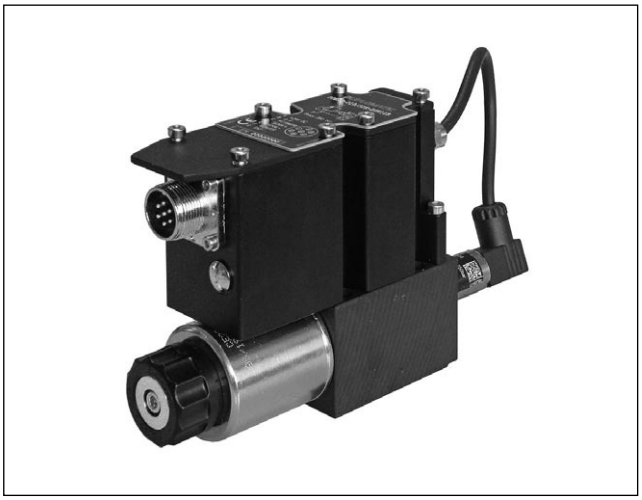
13.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

14 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP



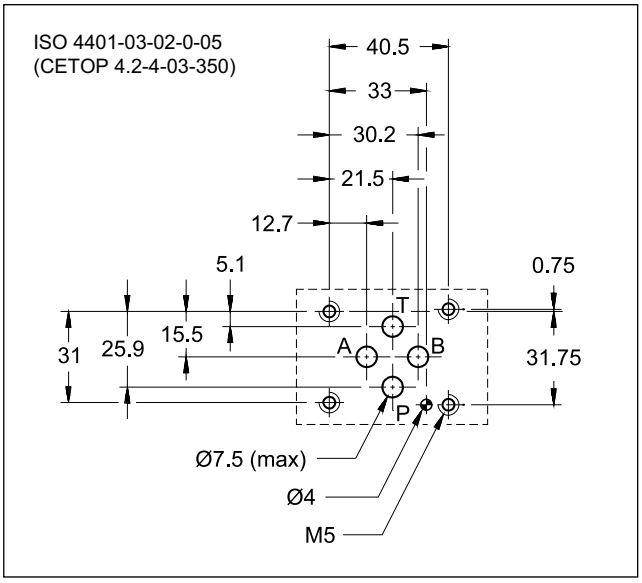
PDE3J*

PROPORTIONAL PRESSURE CONTROL VALVE, WITH PRESSURE FEEDBACK AND INTEGRATED ELECTRONICS

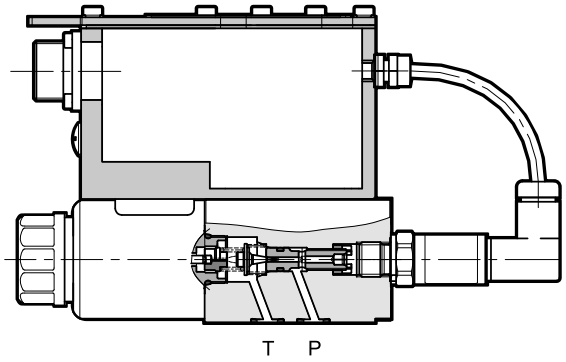
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **2** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The PDE3J* is a direct operated proportional pressure control valve with pressure feedback and mounting interface in compliance with ISO 4401 standards.

— It is suitable to pilot two-stage valves, for pressure control in hydraulic circuits.

— It is available with different types of electronics, with analogue or fieldbus interfaces.

— The monitoring of the value detected by the pressure transmitter is available on pin F.

— Three pressure adjustment ranges are available up to 350 bar .

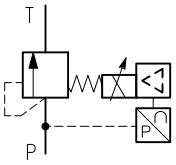
— The valve is easy to install. The driver manages digital settings directly.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

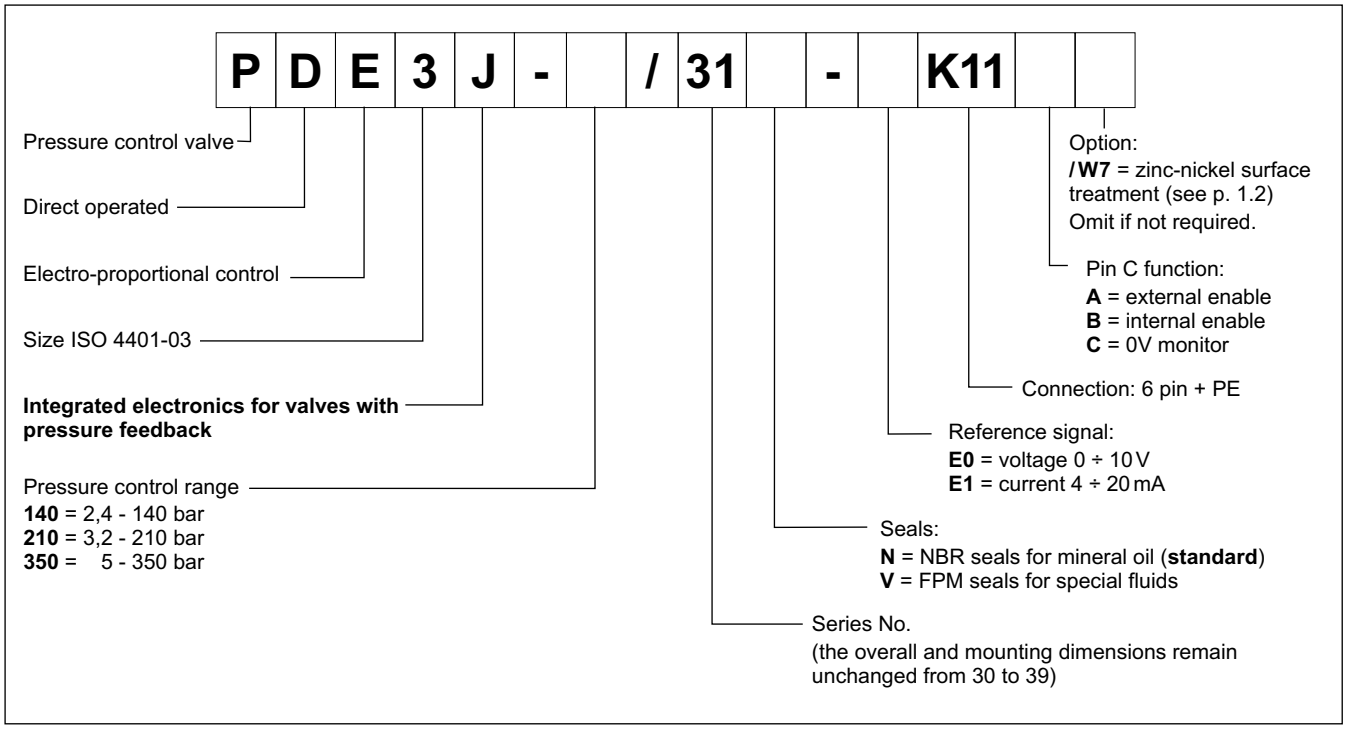
Maximum operating pressure: - P port - T port	bar	 350 2
Nominal flow Maximum flow (see p min= f(Q) diagram)	l/min	1 2
Step response	see point 7	
Hysteresis	% of p nom	< 1%
Repeatability	% of p nom	< ±0,5%
Electrical characteristic	see point 2	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	2,5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

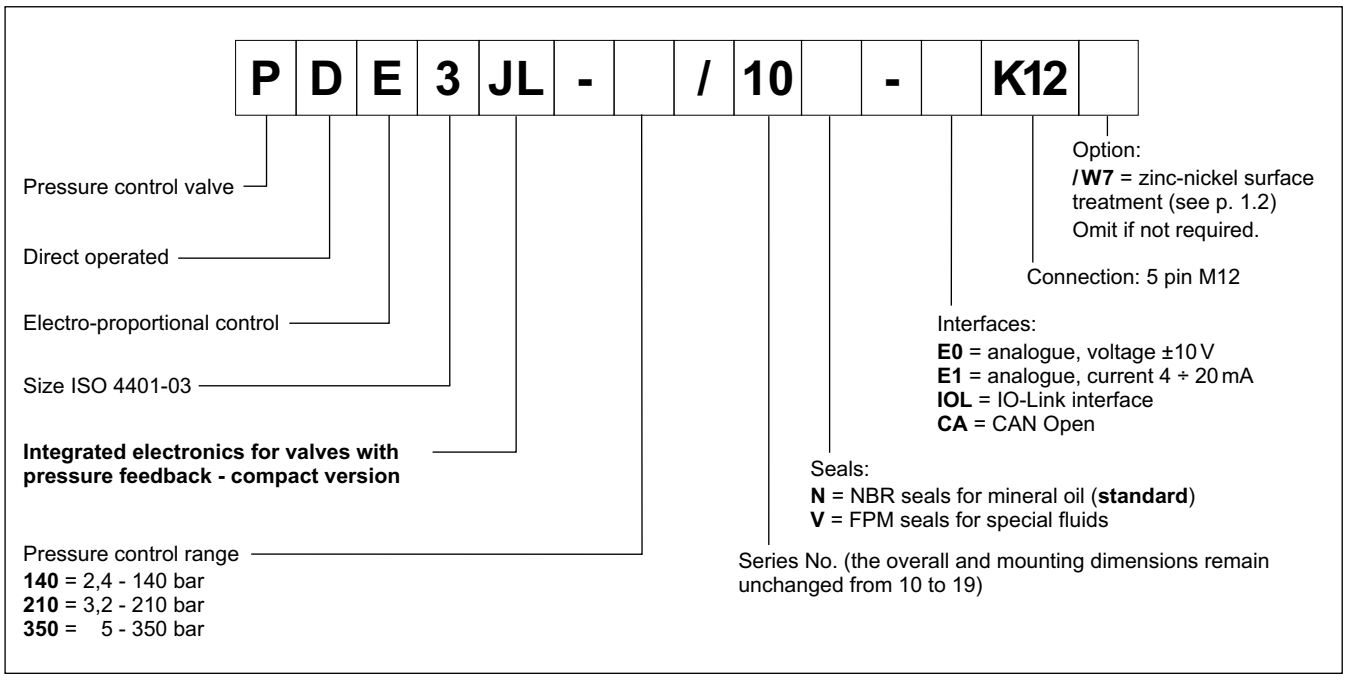
1.1 - Standard electronics



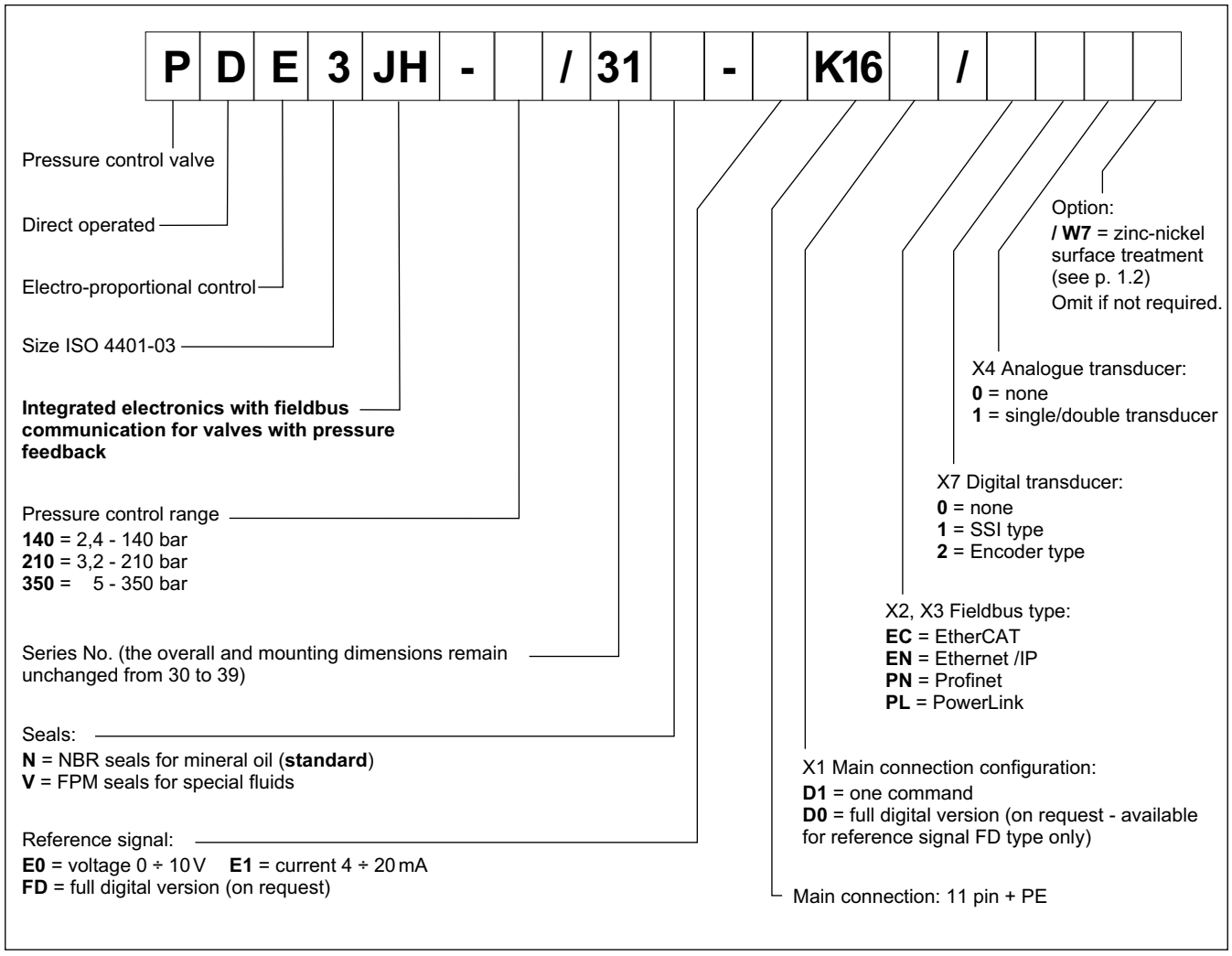
1.2 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.3 - Compact electronics



1.4 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65/IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the JH versions it is necessary to protect with caps any unused connections.

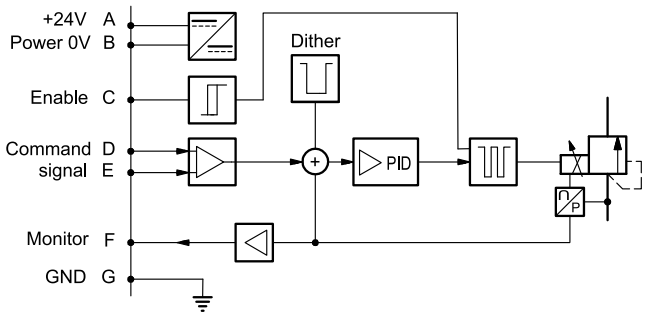
3 - PDE3J - STANDARD ELECTRONICS

3.1 - Electrical characteristics

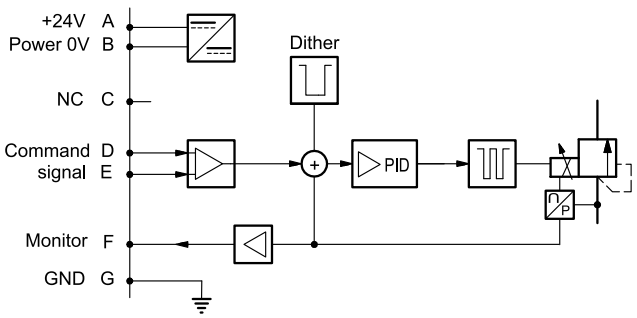
Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

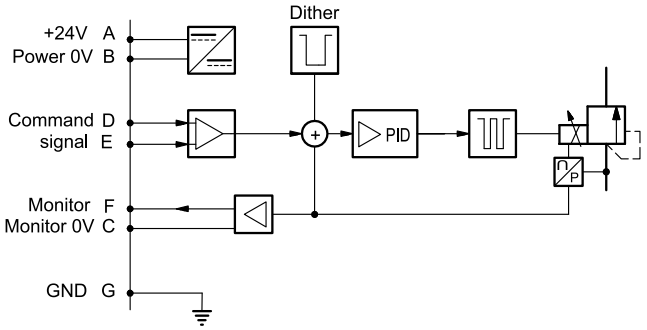
VERSION A - External Enable



VERSION B - Internal Enable

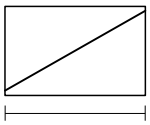


VERSION C - 0V Monitor

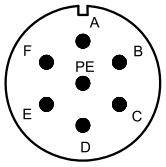


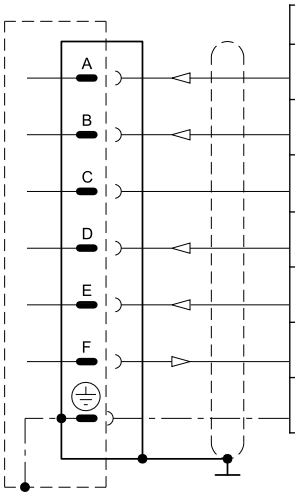
3.3 - Version with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**



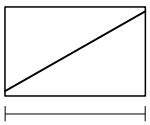


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command (differential input)		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

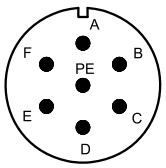
3.4 - Versions with current command (E1)

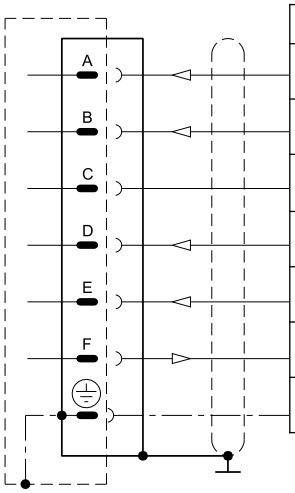
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - PDE3JL - COMPACT ELECTRONICS

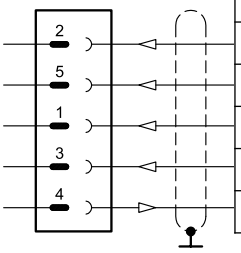
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	 IO-Link Port Class B 230.4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		solenoid voltage supply, solenoid faults (shortcircuit, bad config, internal), box temperature, switch-on time, vibrations
Connection		5-pin M12 code A (IEC 61076-2-101)

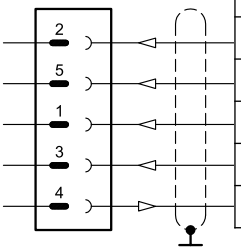
4.2 - Pin tables

'E0' connection



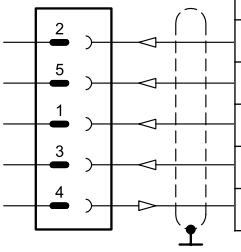
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection



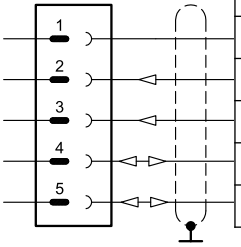
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



Pin	Values	Function
2	2L+ 24 V DC	Supply of the power stage
5	2L- 0 V (GND)	Internal galvanic isolation from PIN 3
1	1L+ +24 V DC	IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

'CA' connection



Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

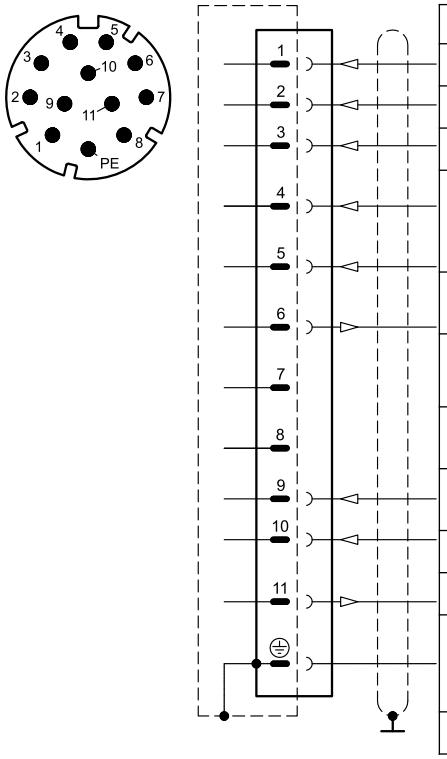
5 - PDE3JH - FIELDBUS ELECTRONICS

The 11+ PE pin connection allows separate supply voltage for electronics and solenoid. Command - valve position schemes as for the standard electronics. Please refer to pictures in point 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm) via fieldbus
Monitor signal (pressure at transducer): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female

Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

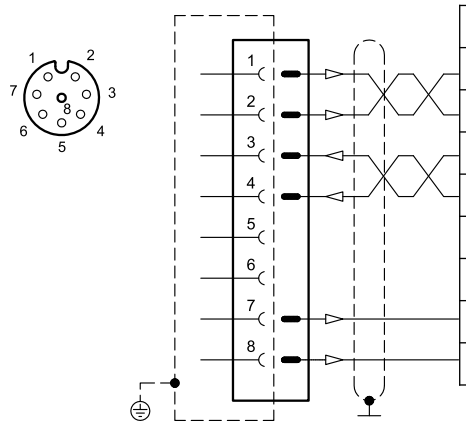
X3 (OUT) connection: M12 D 4 pin female

Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

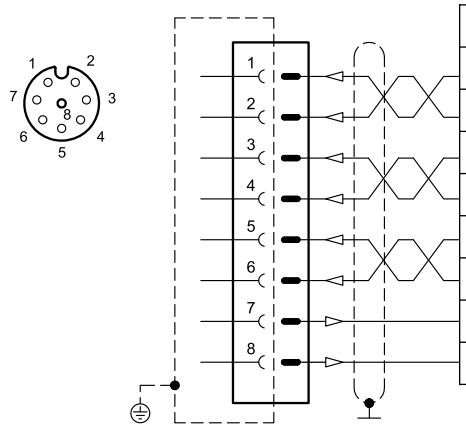
5.4 - Digital transducer connection
X7 connection: M12 A 8 pin female

VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

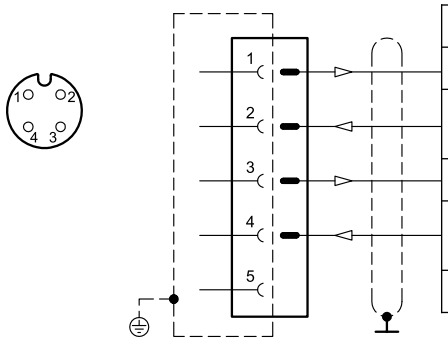
VERSION 2: ENCODER type



Pin	Values	Function	Notes
1	ENC_Z+	input channel Z+	Input - digital signal
2	ENC_Z-	input channel Z-	
3	ENC_A+	input channel A+	
4	ENC_A-	input channel A+	
5	ENC_B+	input channel B+	
6	ENC_B-	input channel B+	
7	+5 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection
X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer
(single or double is a software-selectable option)



Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

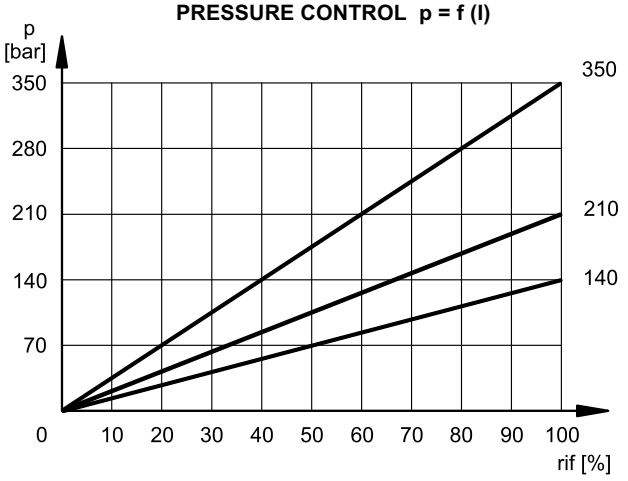
6 - CHARACTERISTIC CURVES

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

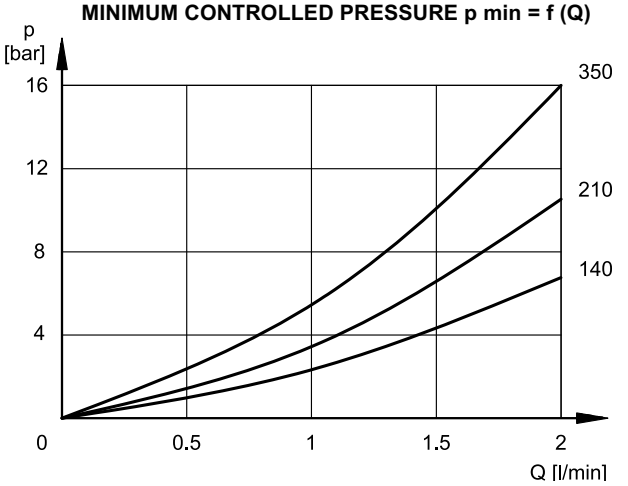
Typical control characteristics, according to the reference signal for available pressure control ranges, measured with input flow rate Q = 1 l/min.

Characteristic curves measured without backpressure in T, with linearity and hysteresis compensation set by the onboard electronics.

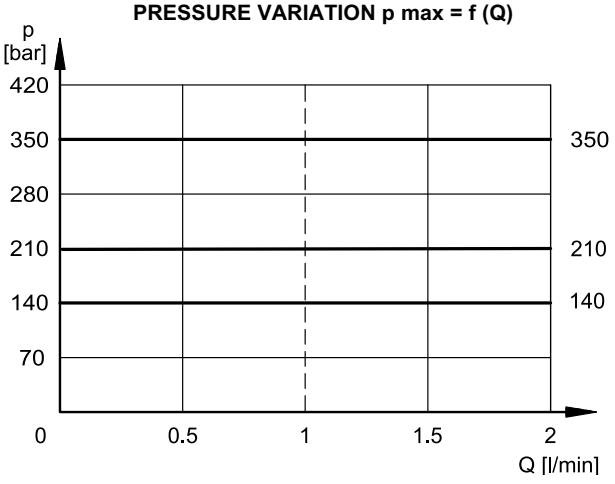
PRESSURE CONTROL p = f (I)



MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



7 - STEP RESPONSE

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

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

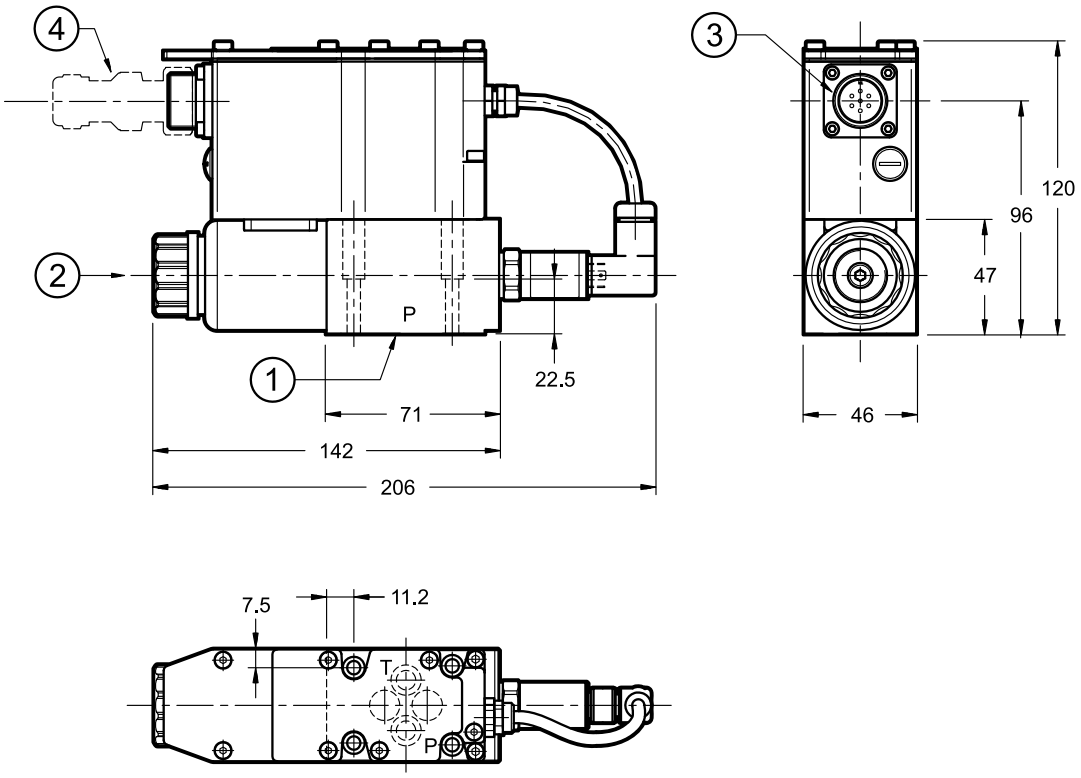
The table illustrates typical step response times measured with a PDE3J-210 and with an input flow rate of Q = 1 l/min and pressure oil volume of 0,1 litre.

The response time is affected both by the flow rate and the oil volume in the pipework.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	60	20

8 - PDE3J - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



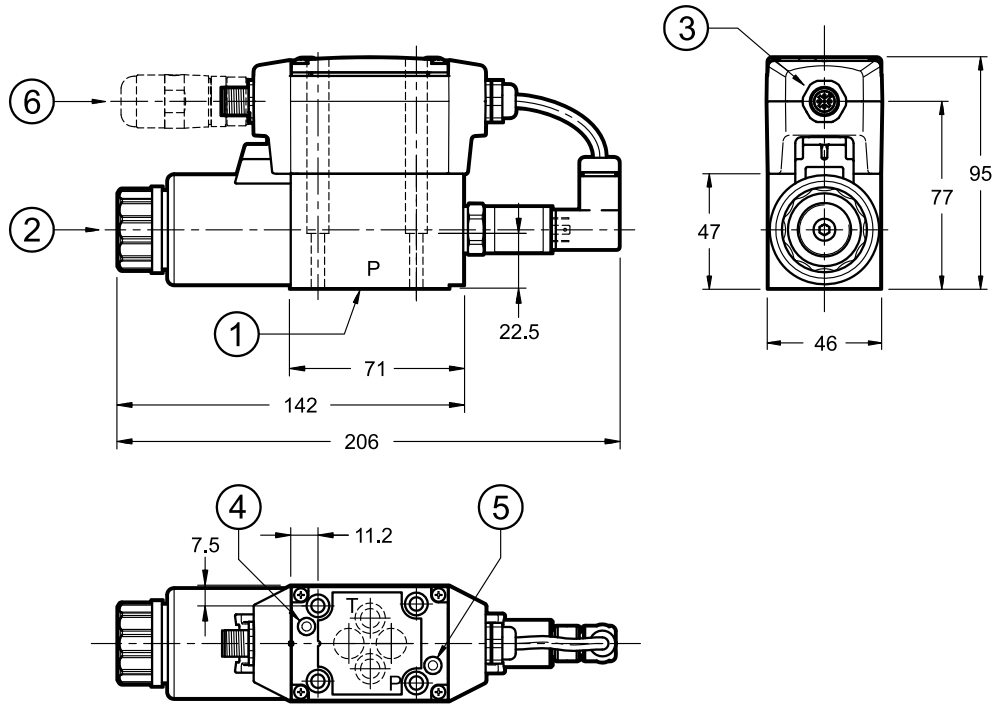
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHC screws M5x30- ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Breather: Allen key 4
3	Main connection
4	Mating connector 6 poles + PE , female type MIL-5015-G **To be ordered separately.** See catalogue 89 000

9 - PDE3JL - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



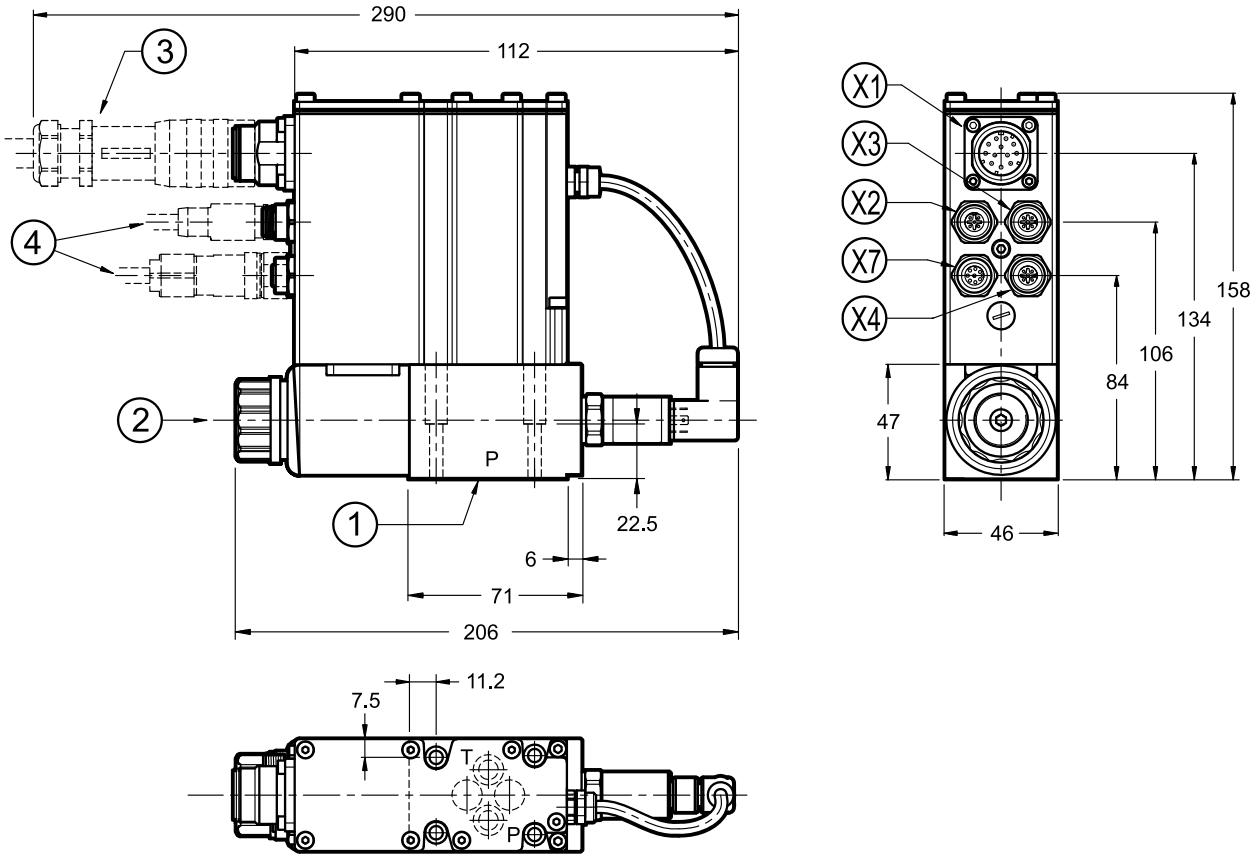
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHC screws M5x30- ISO 4762	
Torque: 5 Nm (A8.8)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Connection M12 A 5 pin
4	L1 LED
5	L2 LED
6	Mating connector M12 5 poles - code A, female **To be ordered separately.** See catalogue 89 000

10 - PDE3JH - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
4	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHC screws M5x30 ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

NOTE 1: Depending on the chosen version, X4 and X7 connections may not be present.
Please refer to section 5 for connection descriptions and pinout.

NOTE 2: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

11 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. 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.

12 - INSTALLATION

We recommend installing these valves with the solenoid downward, either in horizontal or vertical position. If the valve is installed on vertical axis with the solenoid upward, you should consider possible variations of the minimum controlled pressure from those indicated in point 5.

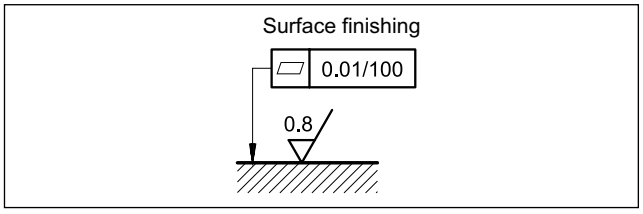
Ensure that there is no air in the hydraulic circuit. In certain applications it might be necessary to vent the air entrapped in the solenoid tube by unfastening the drain screw placed in the solenoid tube.

Ensure the solenoid tube is always filled with oil. Make sure the drain screw has been put back correctly at the end of the task. Connect the valve T port 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 leaks between the valve and support surface.



13 - ACCESSORIES

(to be ordered separately)

13.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

13.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

13.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

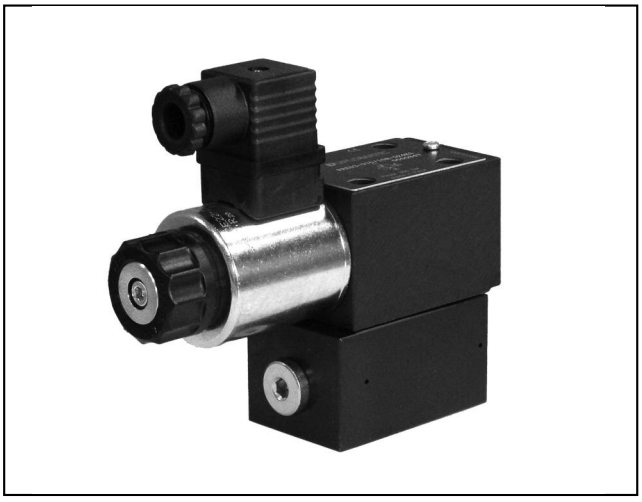
13.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

14 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP



PRE3

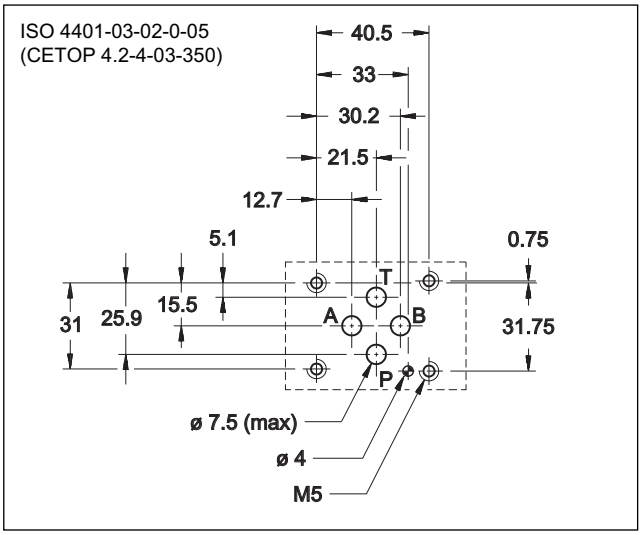
PILOT OPERATED PRESSURE CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 20

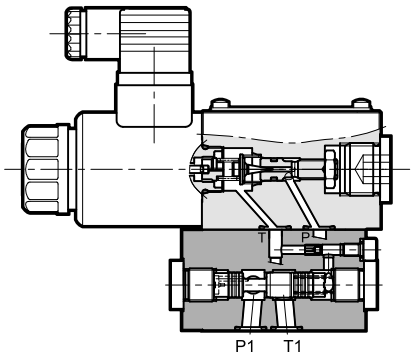
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The PRE3 is a pilot operated pressure control valve with electric proportional control and mounting interface in compliance with ISO 4401 standards.

— It is suitable to modulate the pressure in hydraulic circuits.

— The valve can be controlled directly by a current control supply unit or by an electronic control unit to exploit valve performance to the full (see at paragraph 9).

— The design of this valve has a mechanical pressure limitation feature for higher safety of the application.

— Five pressure control ranges up to 350 bar are available.

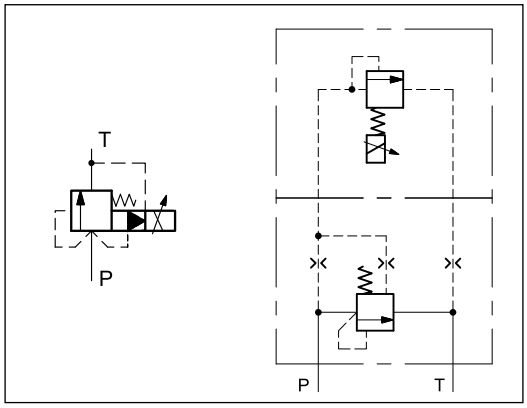
PERFORMANCES

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

Maximum operating pressure: - P port - T port	bar	 350 2
Minimum controlled pressure	see p min = f(Q) diagram	
Minimum flow Maximum flow (see graph p max= f(Q))	l/min	2 40
Step response	see paragraph 6	
Hysteresis (with PWM 200 Hz)	% of p nom	< 5%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see paragraph 5	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	3,5

HYDRAULIC SYMBOL

simplified **detailed**



1 - IDENTIFICATION CODE

P	R	E	3	-		/	20		-		K1

Pressure control valve, pilot operated

Electrical proportional control

Size ISO 4401-03

Pressure control range
025 = 4 - 25 bar
070 = 4 - 70 bar
140 = 4 - 140 bar
210 = 5 - 210 bar
350 = 5 - 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 20 to 29)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

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

Coil electrical connection:
for connector type EN 175301-803
(ex DIN 43650) (**standard**)

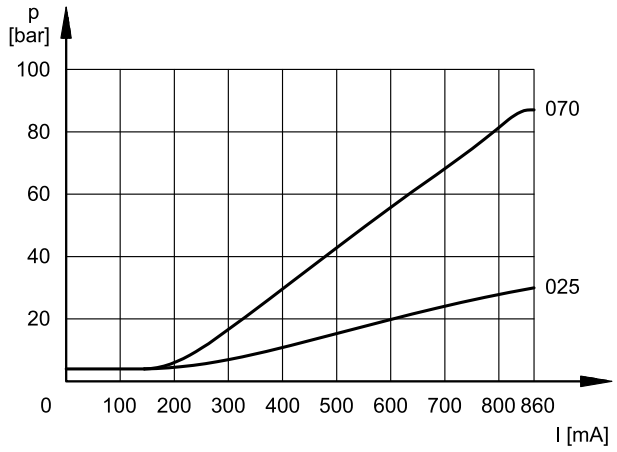
2 - CHARACTERISTIC CURVES

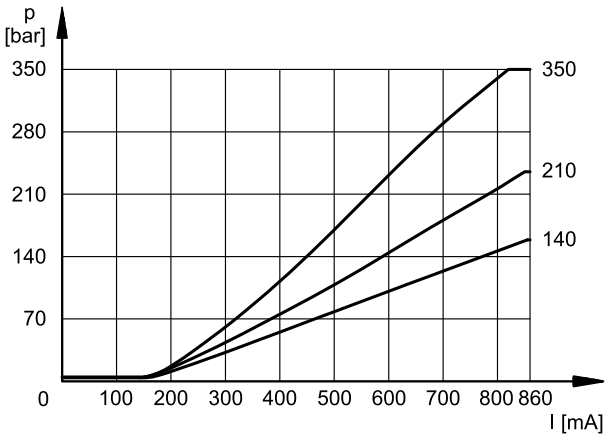
(measured with viscosity of 36 cSt at 50°C)

Typical control curves according to the current supplied to the solenoid (D24 version with maximum current 860 mA) for the available pressure control ranges, measured with input flow rate Q = 10 l/min. Curves have been obtained without any hysteresis and linearity compensation and they have been measured without any backpressure in T.

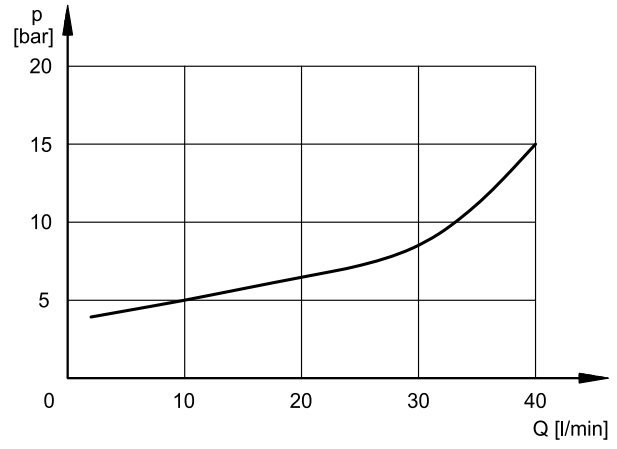
The full scale pressure is set in factory with a flow rate of 10 l/min. In case of higher flow rate, the full scale pressure will increase (see diagram pmax = f (Q)).

PRESSURE CONTROL p = f (I)

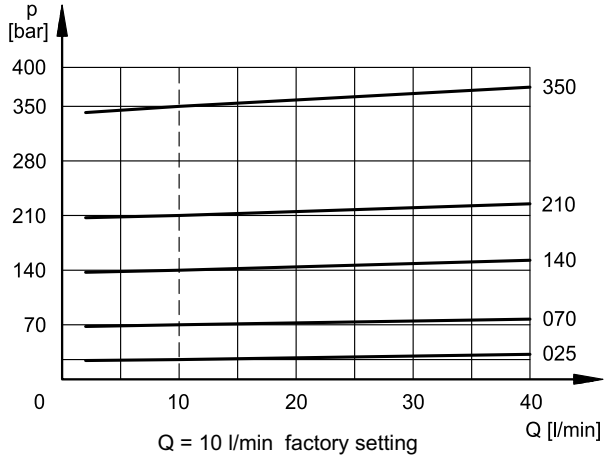




MINIMUM CONTROLLED PRESSURE pmin = f (Q)



PRESSURE VARIATION pmax = f (Q)



Q = 10 l/min factory setting

3 - MAX PRESSURE VALUES

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 10 l/min

		PRE3-025	PRE3-070	PRE3-140	PRE3-210	PRE3-350
pressure value at 800 mA	bar	28	82	145	215	335
max pressure value when $I > I_{max}$	bar	30	86	155	230	350

4 - 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 fluid types 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.

5 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
MAXIMUM CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
PROTECTION FROM ATMOSPHERIC AGENTS (IEC 60529)	IP65		
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	class H class F		

6 - STEP RESPONSE

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

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 PRE3-210 and with input flow rate Q = 10 l/min, and a pressure oil volume of 1 litre. The response time is affected by both the flow rate and the oil volume inside the piping.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	80	40

7 - INSTALLATION

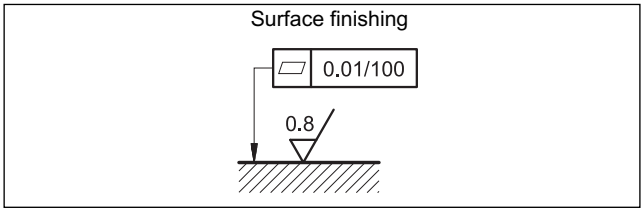
We recommend to install the PRE3 valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

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

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value.

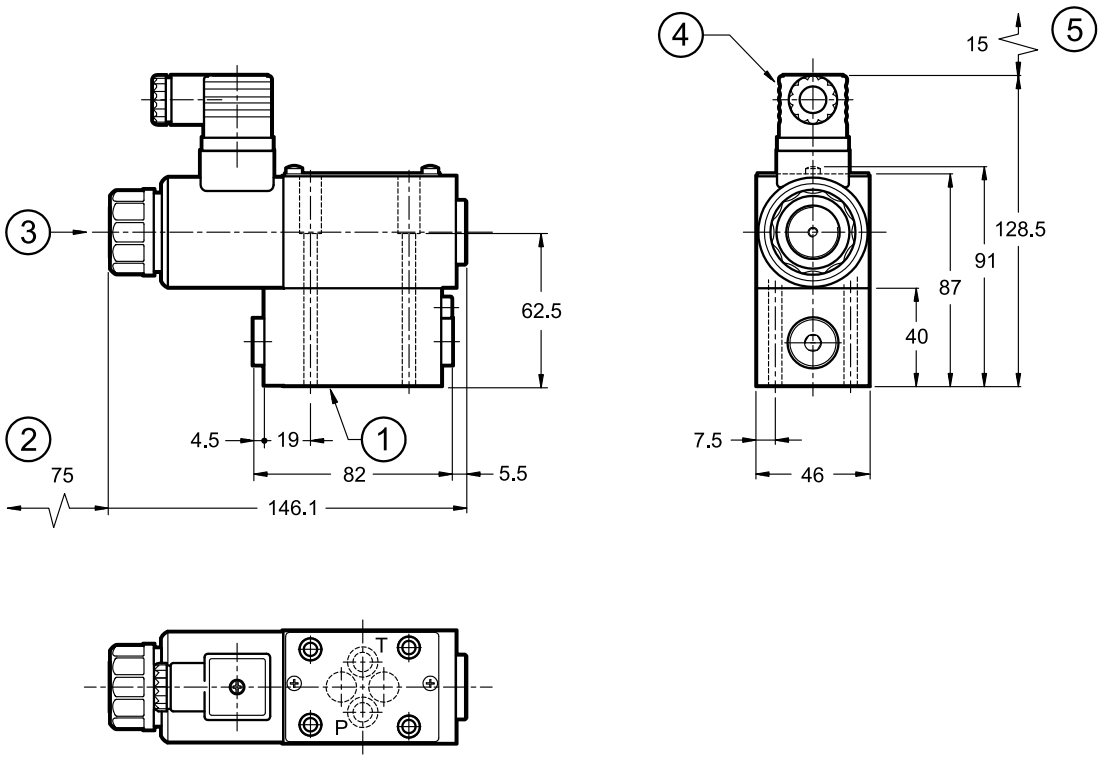
Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

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.



8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (3) placed at the end of the solenoid tube.

Fastening bolts: 4 SHC screws M5x70 - ISO 4762	
Torque: 5 Nm (A8.8)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Coil removal space
3	Breather (male hexagonal spanner 4)
4	EN 175301-803 (ex DIN 43650) connector (included in the delivery)
5	Connector removal space

9 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see catalogue 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see catalogue 89 251
EDM-M142	for solenoid 12V DC		

10 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A and B: 3/8” BSP thread

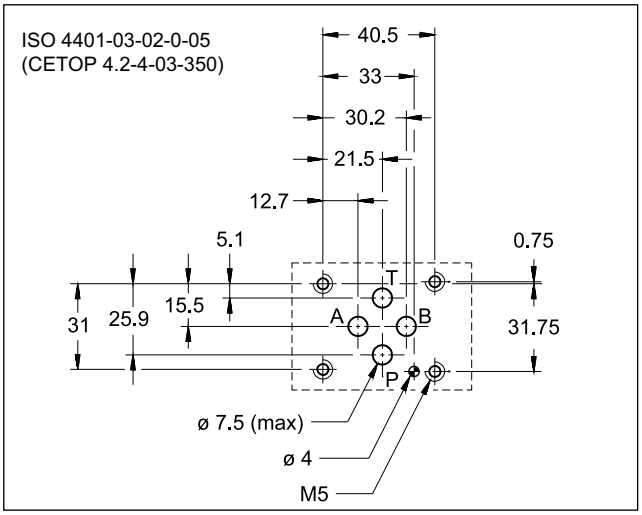
PRE3G*

PROPORTIONAL PRESSURE CONTROL VALVE, PILOT OPERATED WITH INTEGRATED ELECTRONICS

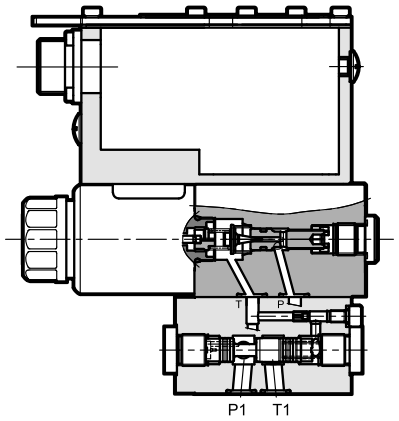
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The PRE3G* valve is a proportional pressure control valve, pilot operated, with mounting surface in compliance with ISO 4401 standards.

— It is suitable to modulate the pressure in hydraulic circuits.

— It is available with different types of electronics, with analogue or fieldbus interfaces.

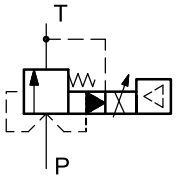
— Valves are easy to install. The driver manages digital settings directly.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and p = 140 bar)

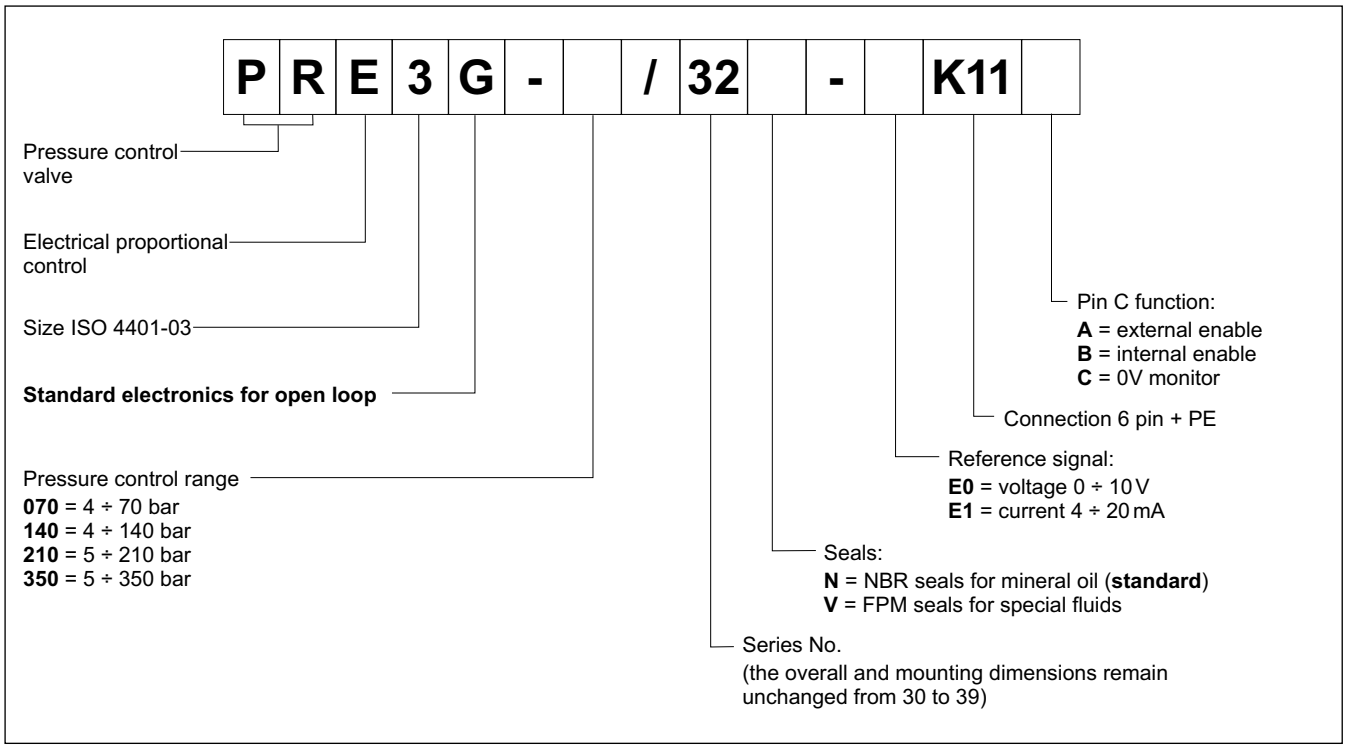
Maximum operating pressure: - P port - T port	bar	 350 2
Minimum controlled pressure	see p min= f(Q) diagram	
Minimum flow Maximum flow (see p max = f(Q) diagram)	l/min	2 40
Step response	see point 7	
Hysteresis	% of p nom	< 3%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see point 2	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	3.8

HYDRAULIC SYMBOL

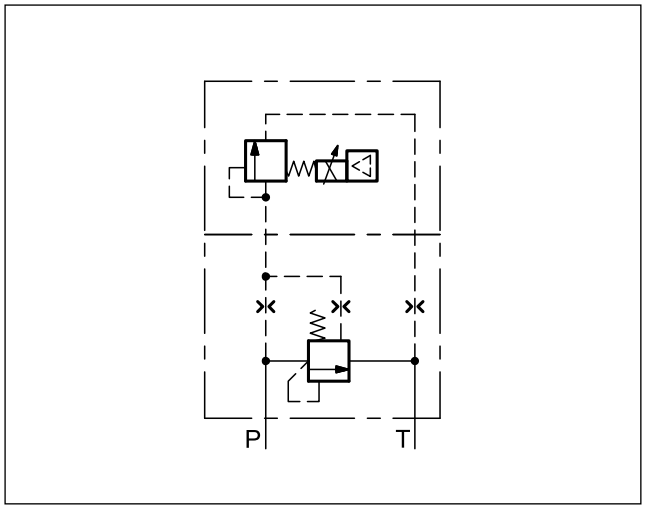


1 - IDENTIFICATION CODE

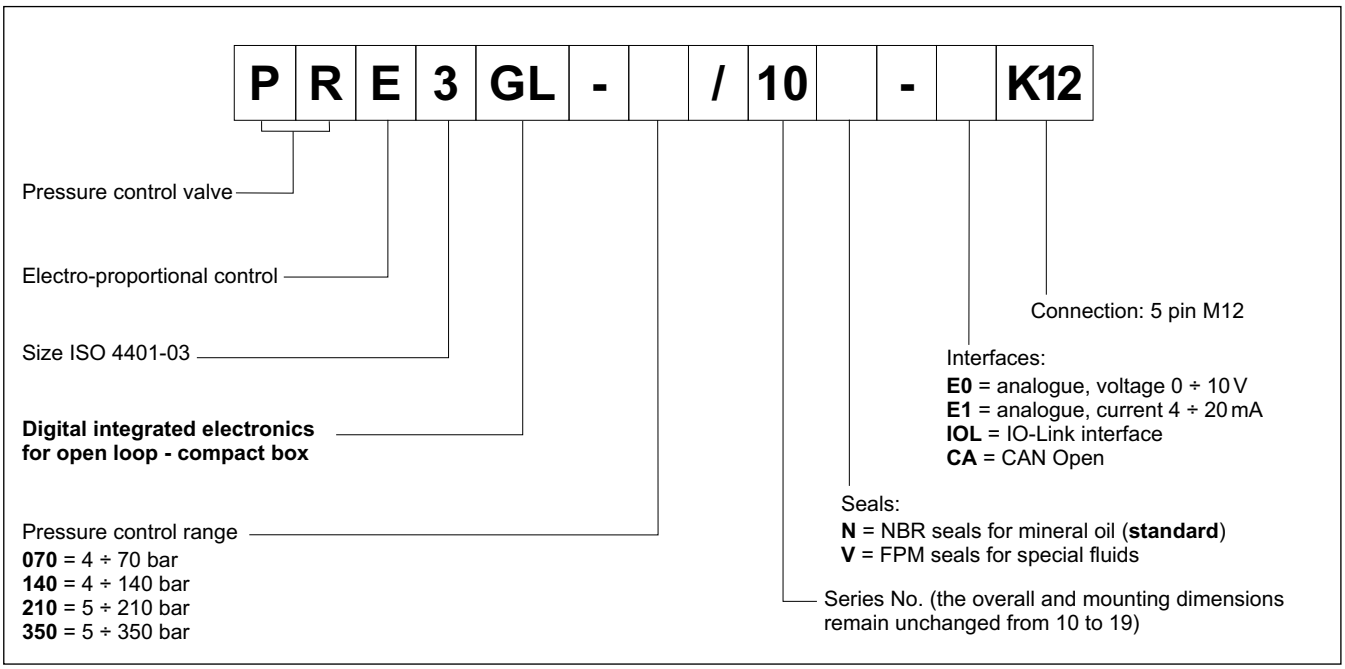
1.1 - Standard electronics



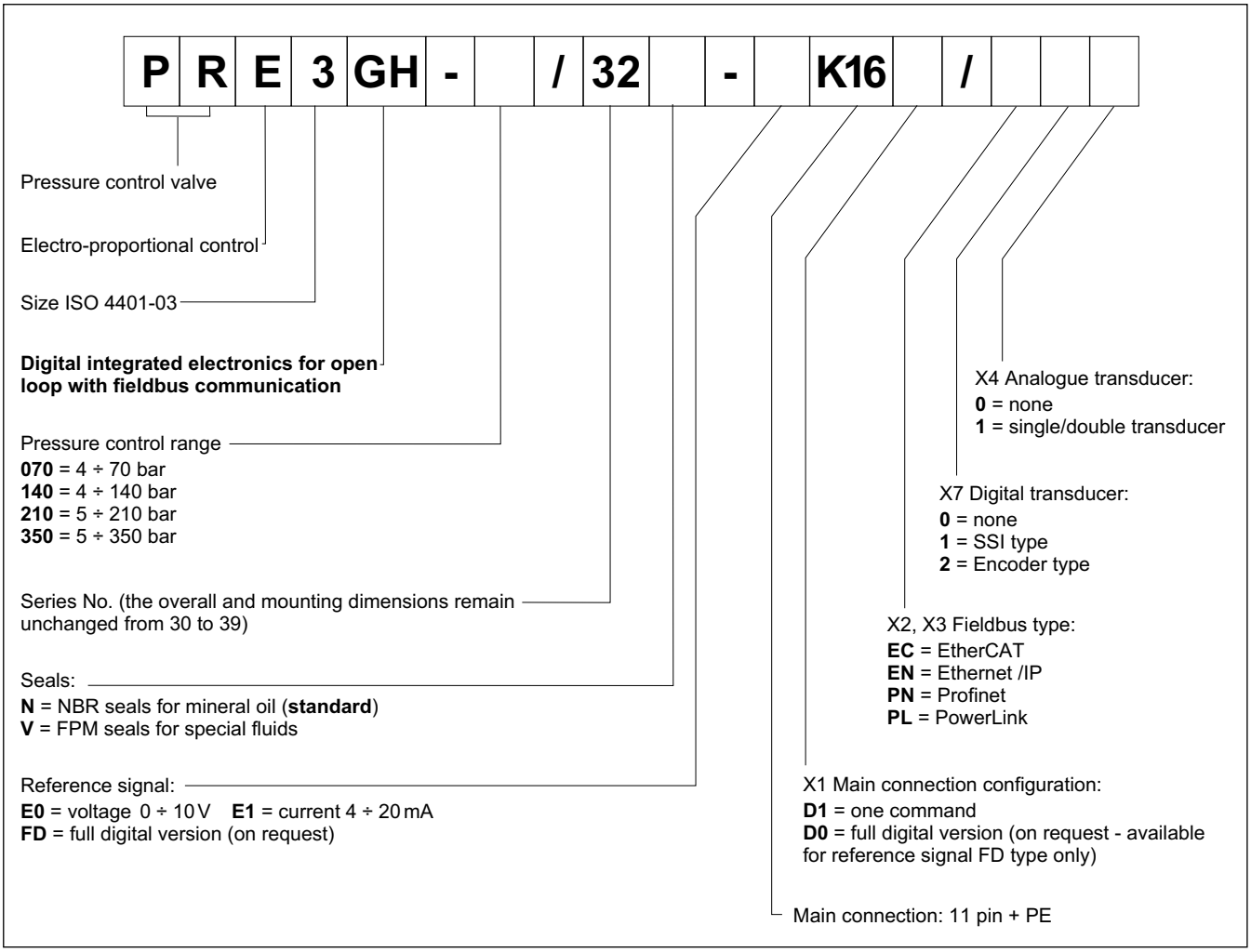
1.2 - Detailed symbol



1.3 - Compact electronics



1.4 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect with caps any unused connections.

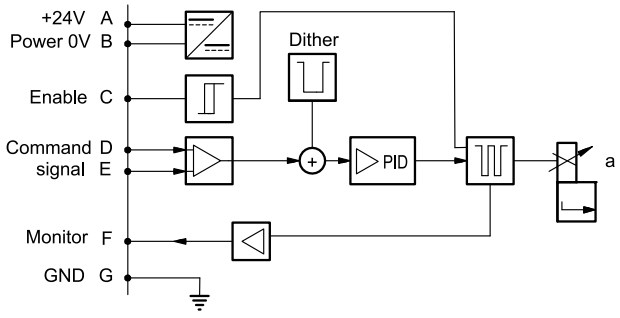
3 - PRE3G - STANDARD ELECTRONICS

3.1 - Electrical characteristics

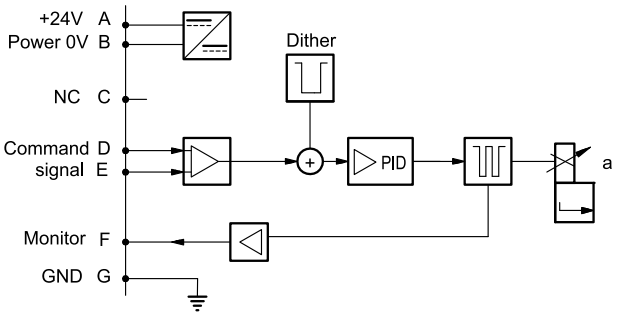
Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

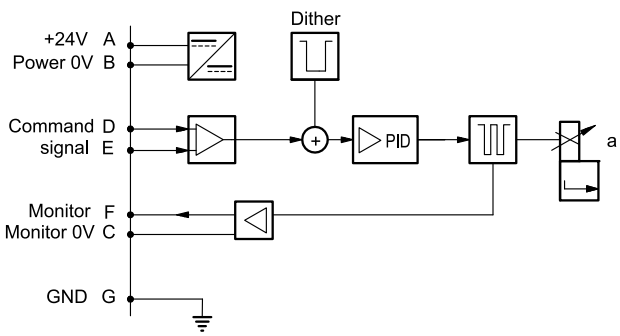
VERSION A - External Enable



VERSION B - Internal Enable

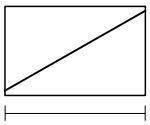


VERSION C - 0V Monitor

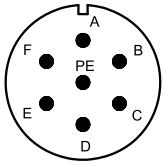


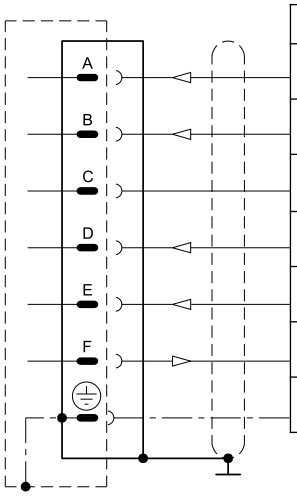
3.3 - Versions with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**



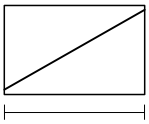


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

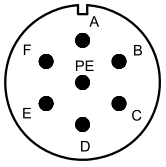
3.4 - Versions with current command (E1)

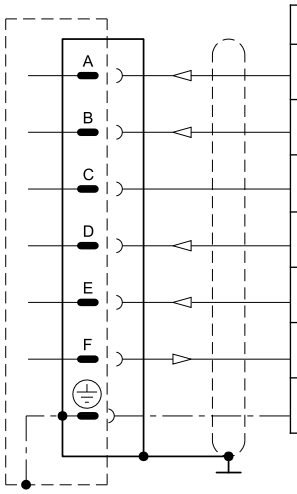
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - PRE3GL - COMPACT ELECTRONICS

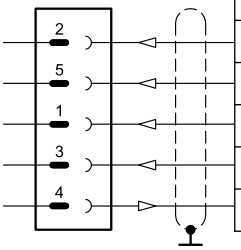
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 230.4
Can Open communication (CA): Data rate	kbit	10 ÷ 1000
Data register (IOL and CA versions only)		solenoid voltage supply, solenoid faults (shortcircuit, bad config, internal), box temperature, switch-on time, vibrations
Connection		5-pin M12 code A (IEC 61076-2-101)

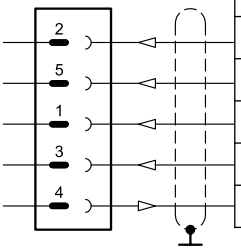
4.2 - Pin tables

'E0' connection



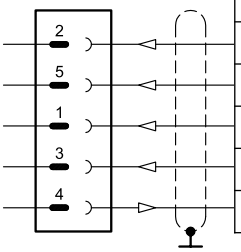
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection



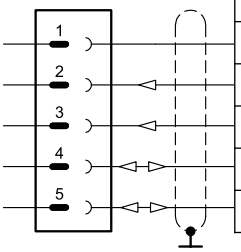
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



Pin	Values		Function
2	2L+	24 V DC	Supply of the power stage
5	2L-	0 V (GND)	Internal galvanic isolation from PIN 3
1	1L+	+24 V DC	IO-Link supply voltage
3	1L-	0V (GND)	
4	C/Q		IO-Link Communication

'CA' connection



Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

5 - PRE3GH - FIELDBUS ELECTRONICS

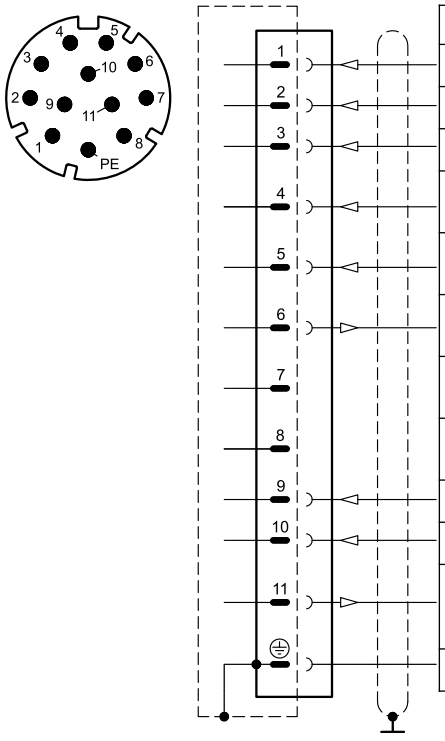
The 11+ PE pin connection allows separate supply voltage for electronics and solenoid.

Command - valve position schemes as for the standard electronics. Please refer to pictures at points. 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female

Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female

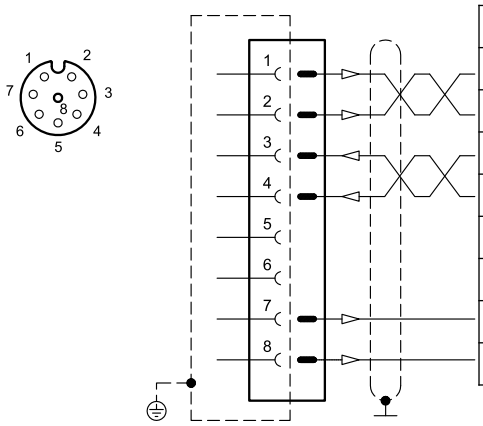
Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

5.4 - Digital transducer connection

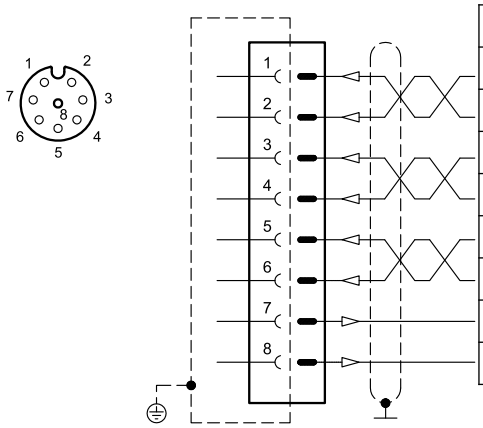
X7 connection: M12 A 8 pin female

VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

VERSION 2: ENCODER type



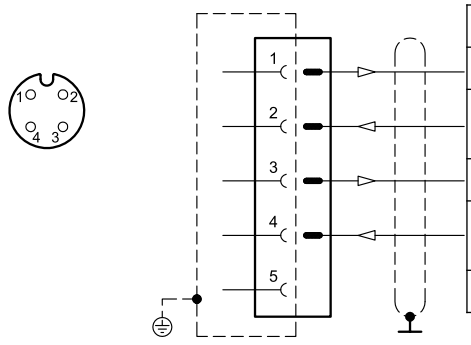
Pin	Values	Function	Notes
1	ENC_Z+	input channel Z+	Input - digital signal
2	ENC_Z-	input channel Z-	
3	ENC_A+	input channel A+	
4	ENC_A-	input channel A+	
5	ENC_B+	input channel B+	
6	ENC_B-	input channel B+	
7	+5 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection

X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer

(single or double is a software-selectable option)



Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

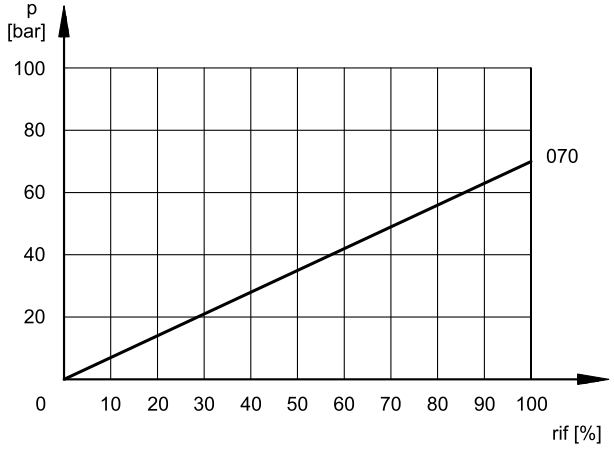
6 - CHARACTERISTIC CURVES

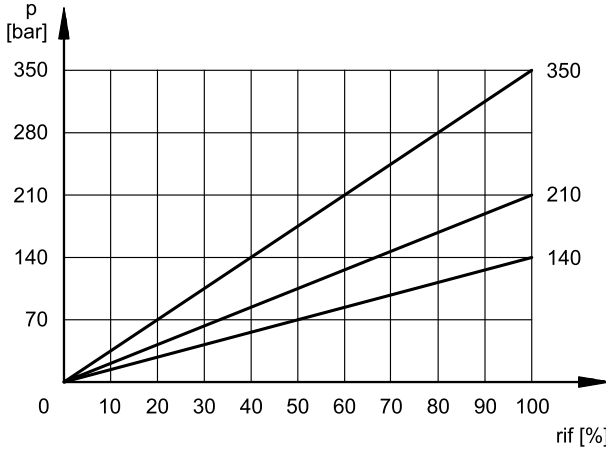
(measured with viscosity of 36 cSt at 50°C)

Typical control characteristics, according to the reference signal for available pressure control ranges, measured with input flow rate Q = 10 l/min. Characteristic curves measured without backpressure in T, with linearity compensation set by the onboard electronics.

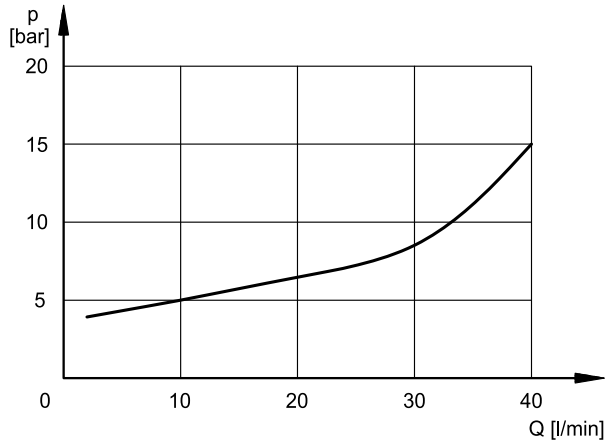
The full scale pressure is set in factory with a flow rate of 10 l/min. In case of higher flow rate, the full scale pressure will increase (see diagram p max = f (Q)).

PRESSURE CONTROL p = f (I)

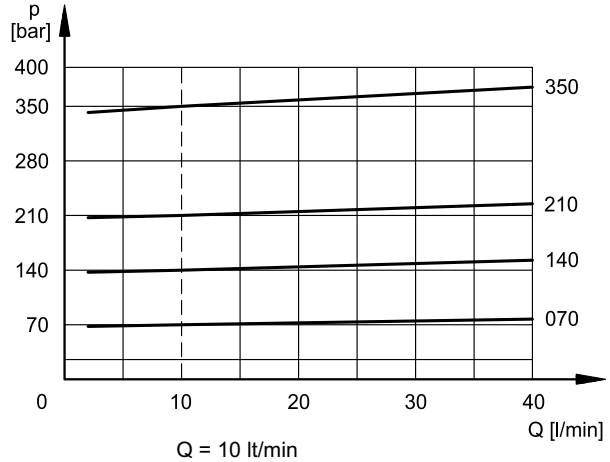




MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



Q = 10 lt/min
factory setting

7 - STEP RESPONSE

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

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

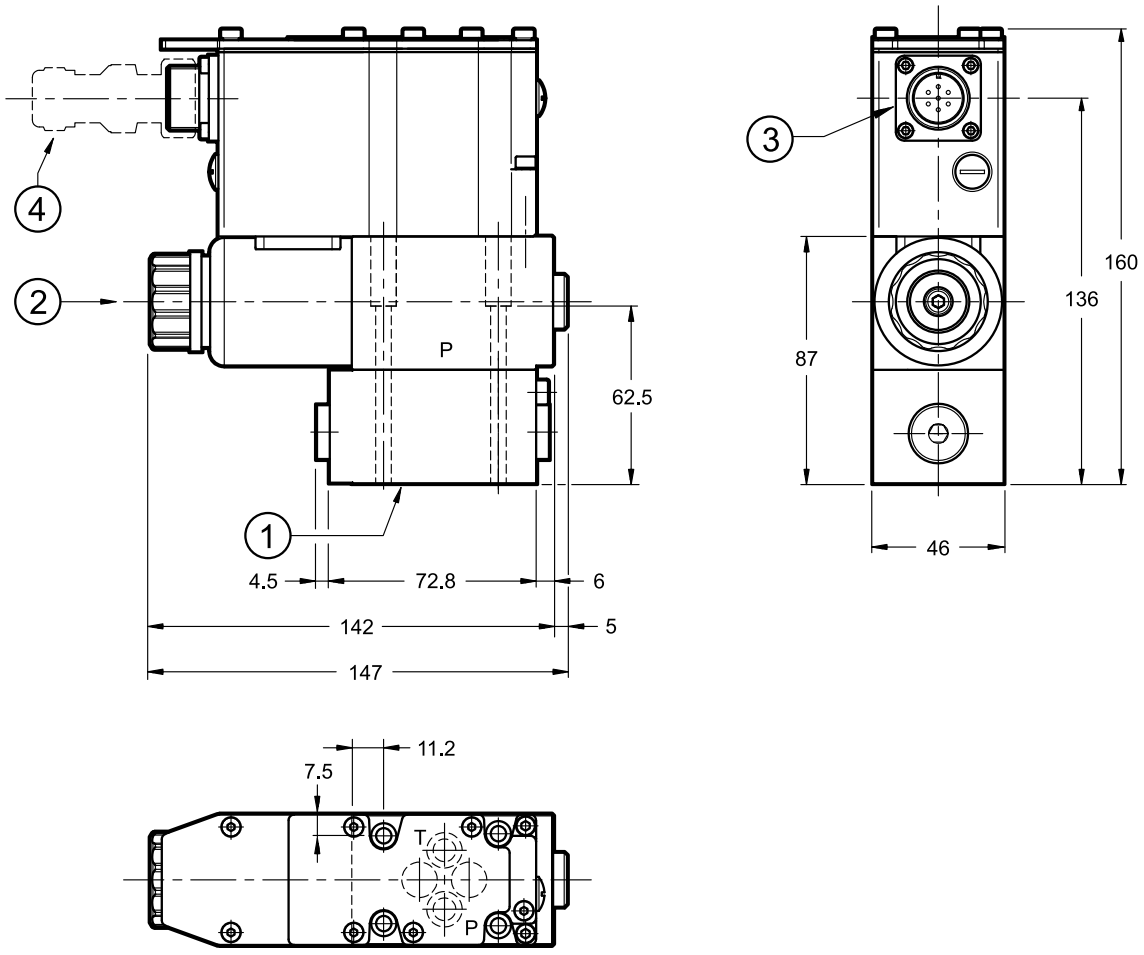
The table illustrates typical step response times measured with a PRE3G-210 and with an input flow rate of Q = 10 l/min and pressure oil volume of 0,1 litre.

The response time is affected both by the flow rate and the oil volume in the pipework.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	80	40

8 - PRE3G - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

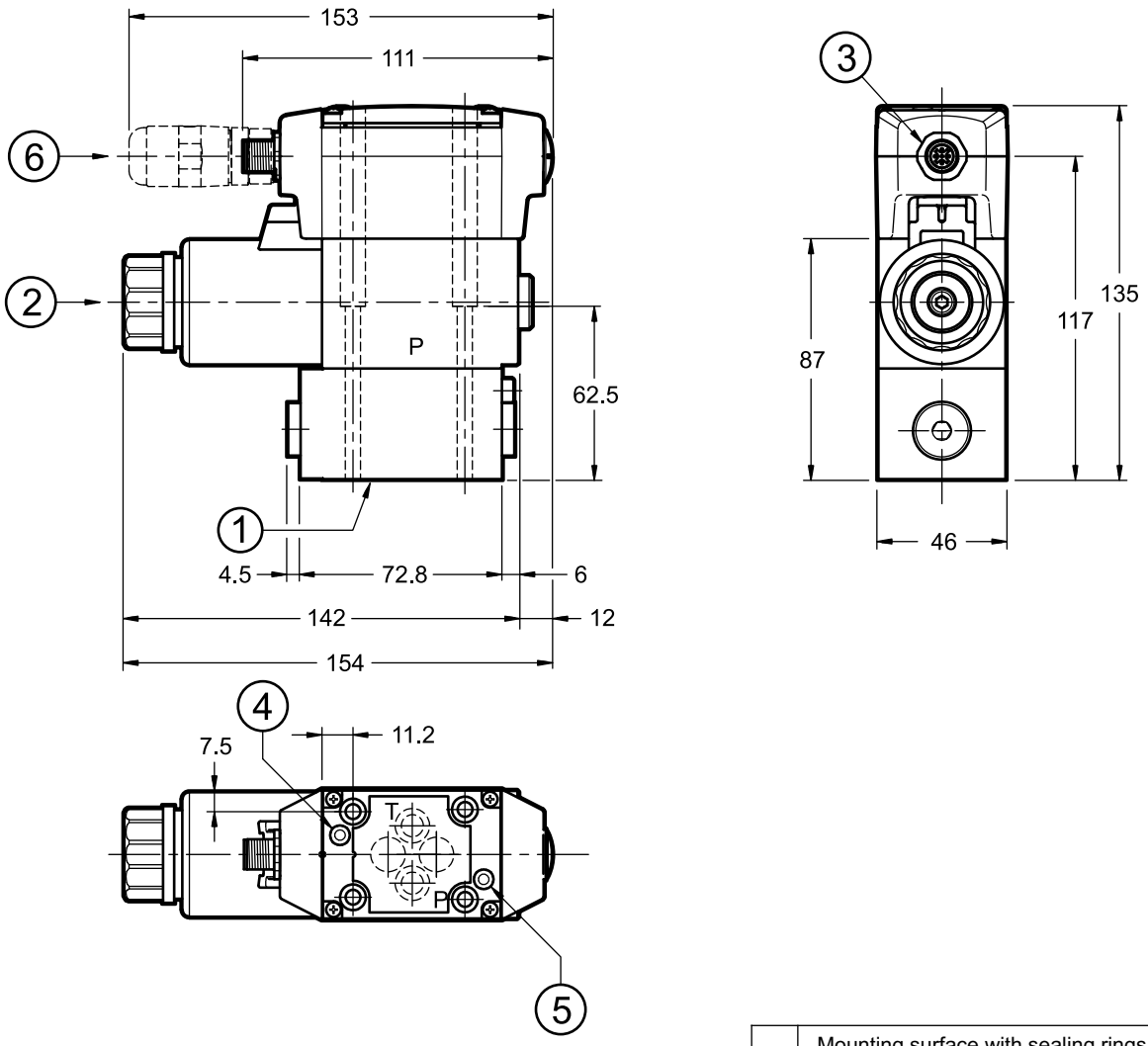


NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHC screws M5x70 - ISO 4762	
Torque: 5 Nm (A8.8)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25 x 1.78)
2	Breather: Allen key 4
3	Main connection 6 pin + PE
4	Mating connector 6 poles + PE , female type MIL-5015-G **To be ordered separately.** See catalogue 89 000

9 - PRE3GL - OVERALL AND MOUNTING DIMENSIONS



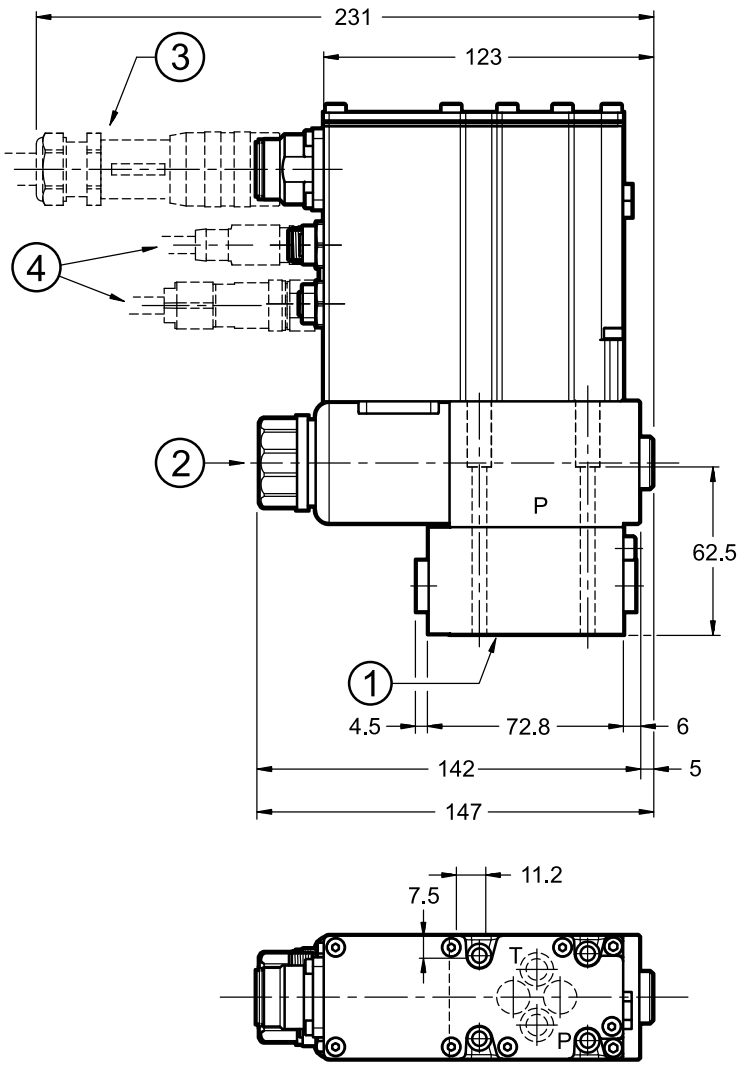
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

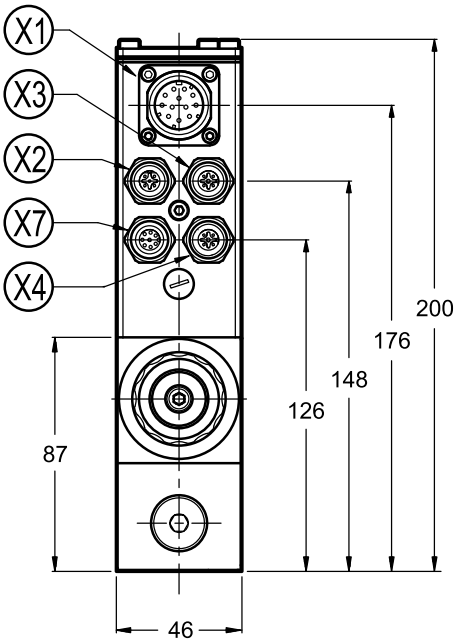
Fastening bolts: 4 bolts M5x70- ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Connection M12 A 5 pin
4	L1 led
5	L2 led
6	Mating connector M12 5 poles code A, female **To be ordered separately.** See catalogue 89 000

10 - PRE3GH - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

Fastening bolts: 4 bolts M5x70 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

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 (2) placed at the end of the solenoid tube.

NOTE 2: Depending on the chosen version, X4 and X7 connections may not be present.

Please refer to section 5 for connection descriptions and pinout.

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
4	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000

11 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. 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.

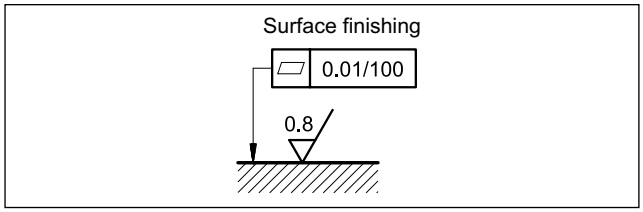
12 - INSTALLATION

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 point 6.

Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube. So, ensure the solenoid tube is always filled with oil. When finished, make sure you have screwed the screw back in correctly.

Connect the valve T port 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.



13 - ACCESSORIES

(to be ordered separately)

13.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

13.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

13.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

13.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

14 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A, B: 3/8” BSP thread

PRE*

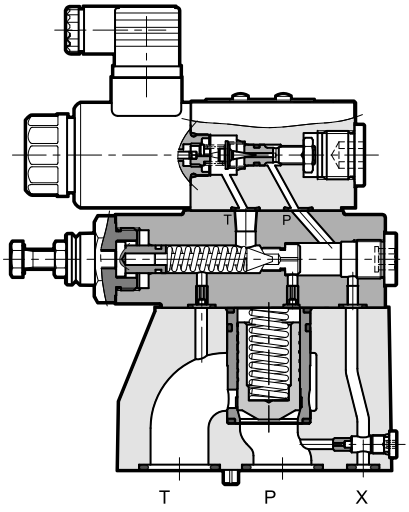
PROPORTIONAL PRESSURE RELIEF VALVES, PILOT OPERATED

SERIES 20

SUBPLATE MOUNTING ISO 6264

p max **350** bar
Q max (see table of performances)

OPERATING PRINCIPLE



— PRE* valves are pilot operated pressure relief valves with electric proportional control and mounting interface in compliance with ISO 6264 standards.

— These valves are used to control hydraulic circuit pressure and to enable the use of the full flow rate of the pump, even with settings approach the calibration value.

— The two-stage design and wide passages ensure reduced pressure drops thereby improving the system energy performance.

— The design of these valves has a mechanical pressure limitation feature inside the pilot stage, for higher safety of the application.

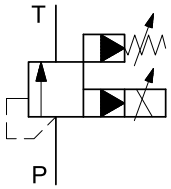
— Valves can be controlled directly by a current control supply unit or by means of an electronic control unit, to exploit valve performance to the full (see par. 11).

— They are fitted with a manual pressure relief valve which is factory set to ≥15% of the maximum value in the pressure control range.

— They are available in three sizes for flow rates up to 500 l/min and in five pressure control ranges up to 350 bar.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)		**PRE10**	**PRE25**	**PRE32**
Maximum operating pressure:	bar	350		
Minimum controlled pressure		see Δp-Q diagram		
Maximum flow	l/min	200	400	500
Step response		see paragraph 6		
Hysteresis (PWM 200 Hz)	% of p nom	< 5%		
Repeatability	% of p nom	< ±1,5%		
Electrical characteristic		see paragraph 5		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree		According to ISO 4406:1999 class 18/16/13		
Recommended viscosity	cSt	25		
Mass:	kg	5	5,8	8

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	R	E		-		/	20		-		K1

Pilot operated pressure relief valve

Electric proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Pressure control range:
025 = up to 25 bar
070 = up to 70 bar
140 = up to 140 bar
210 = up to 210 bar
350 = up to 350 bar

Series No.
(from 20 to 29 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

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

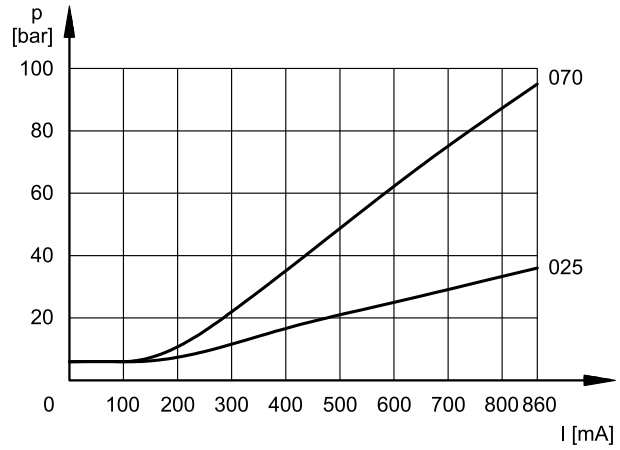
Coil electrical connection:
plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)

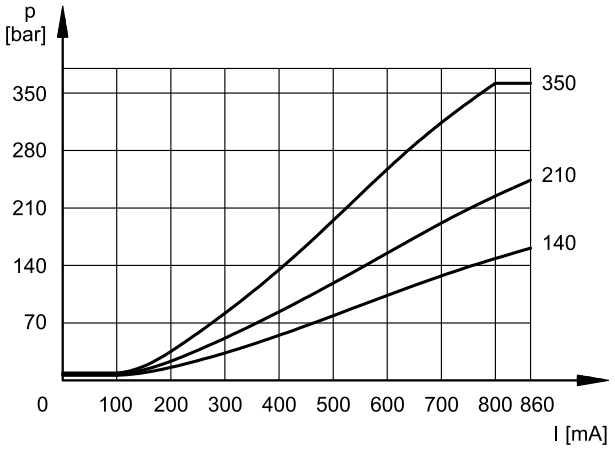
2 - CHARACTERISTIC CURVES

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

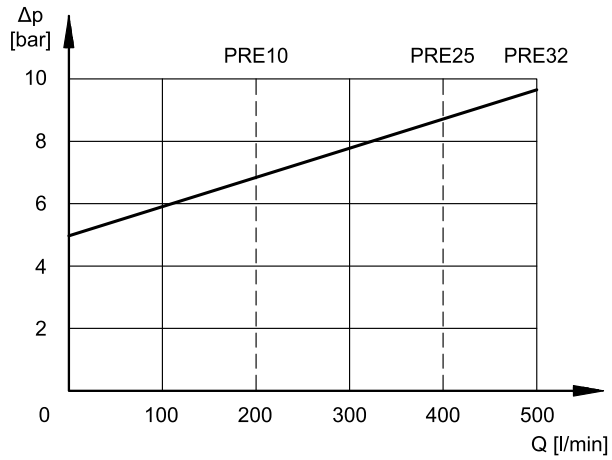
Typical control curves according to the current supplied to the solenoid (D24 version with maximum current 860 mA) for the available pressure control ranges, measured with input flow rate Q = 50 l/min. Curves have been obtained without any hysteresis and linearity compensation and they have been measured without any backpressure in T.

PRESSURE CONTROL p = f (I)

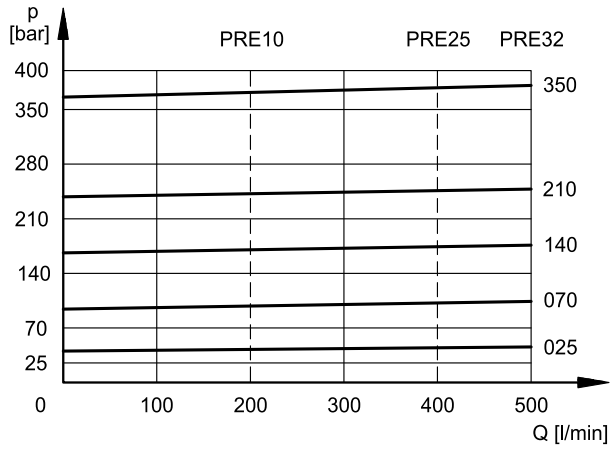




MINIMUM CONTROLLED PRESSURE pmin = f (Q)



PRESSURE VARIATION pmax = f (Q))



3 - MAX PRESSURE VALUES

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C, Q = 50 l/min

	PRE*-025	PRE*-070	PRE*-140	PRE*-210	PRE*-350
pressure value at 800 mA (bar)	27	85	147	220	365
max pressure value when $I > I_{max}$ (bar)	35	95	165	255	370

4 - 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.

5 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
CLASS OF PROTECTION atmospheric agents (IEC 60529) coil insulation (VDE 0580) impregnation	IP 65 class H class F		

6 - STEP RESPONSE

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

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 PRE32-210 and with input flow rate Q = 50 l/min, and a pressure oil volume of 2 litres. The response time is affected by both the flow rate and the oil volume inside the piping.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	120	90

7 - INSTALLATION

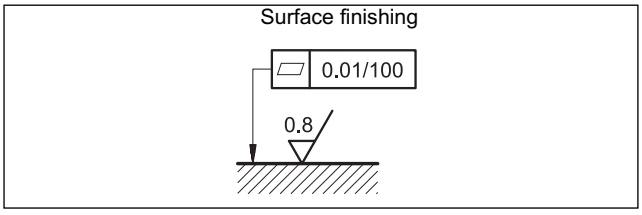
We recommend installing the PRE* valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

Ensure there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air entrapped inside the solenoid tube, by using the apposite drain screw (see par. 8 - 9 - 10). 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.

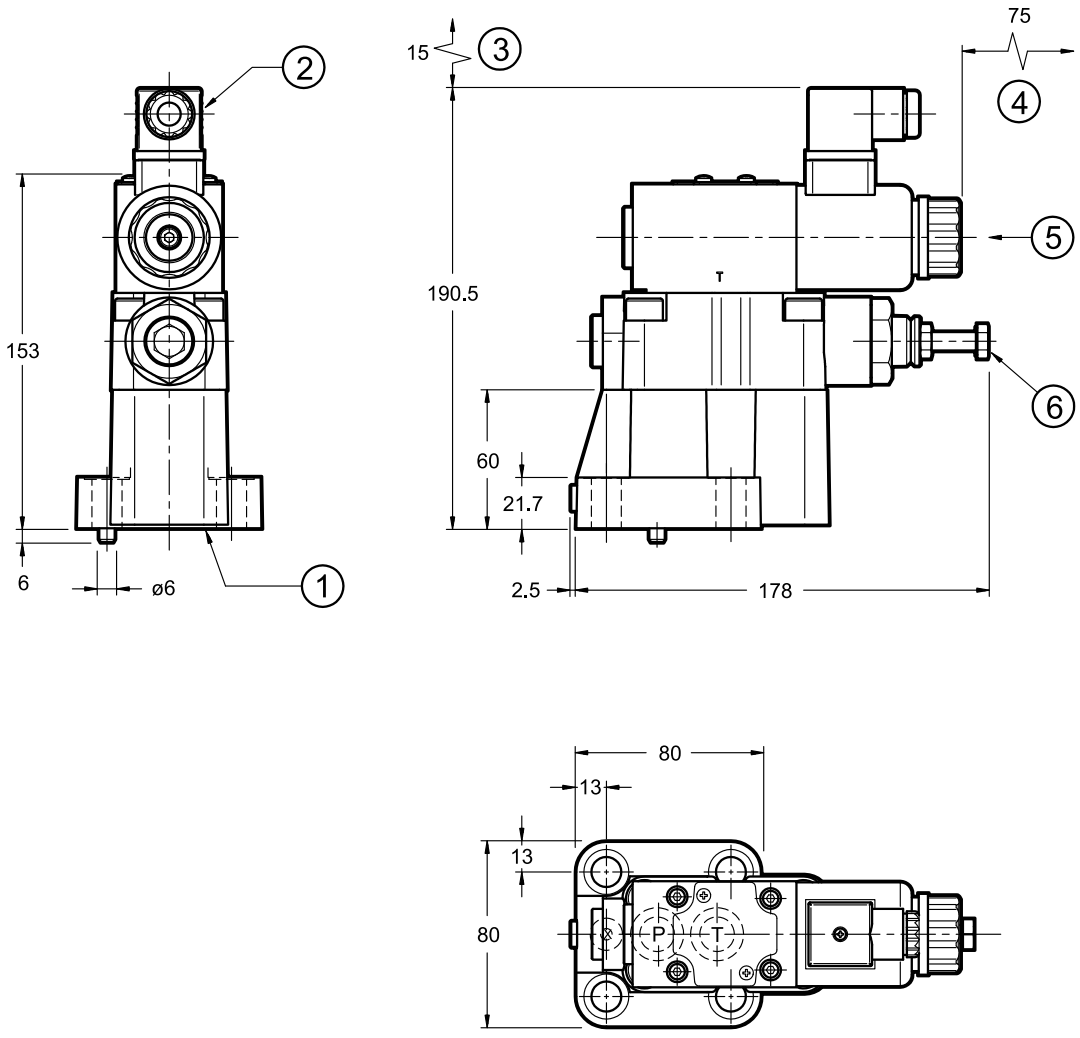
Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

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.



8 - PRE10 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

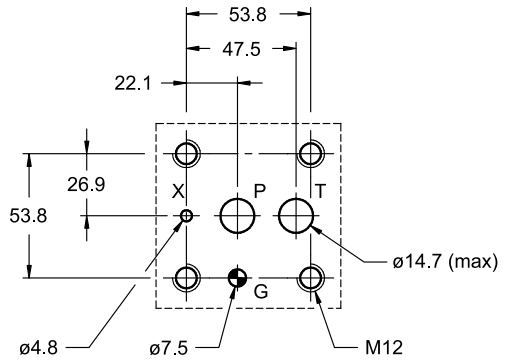


NOTE:
at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (5) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M12x40 - ISO 4762
Torque: 69 Nm (A8.8 screws)
Thread of mounting holes: M12x20

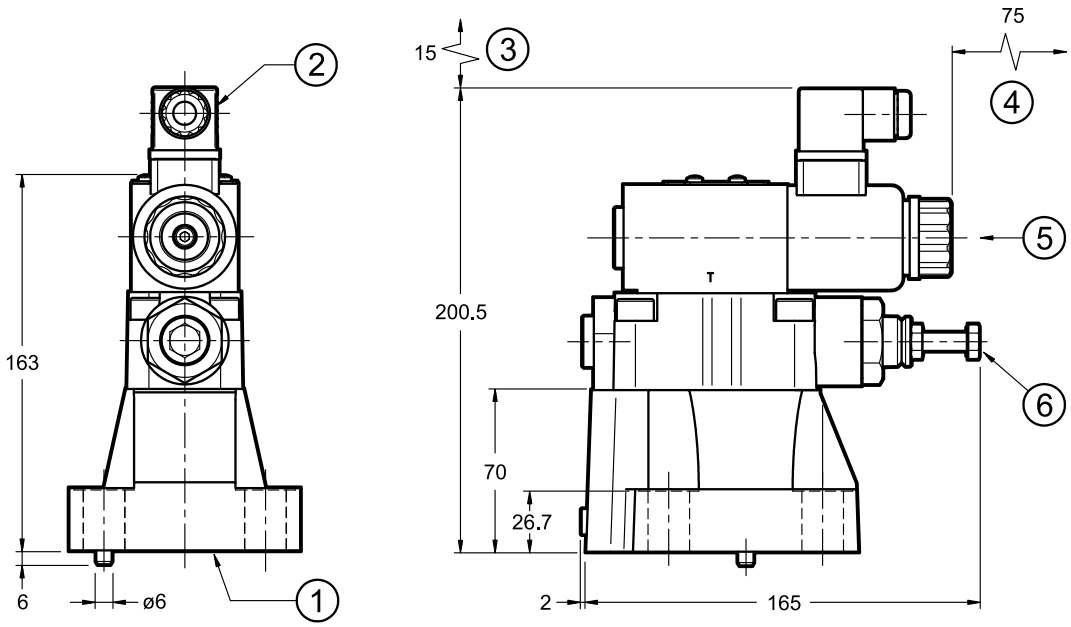
1	Mounting surface with sealing rings: 2 OR type 123 (17.86x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	EN 175301-803 (ex DIN 43650) electric connector
3	Connector removal space
4	Coil removal space
5	Breather (male hexagonal spanner 4)
6	Pressure relief valve (factory set)

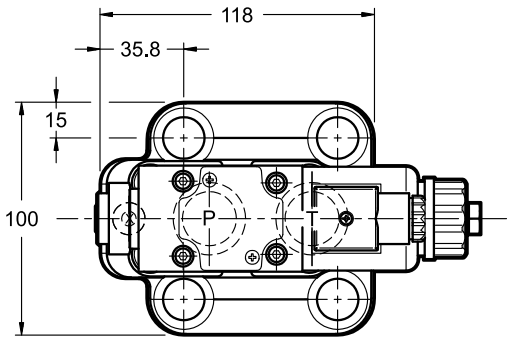
MOUNTING INTERFACE:
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)



9 - PRE25 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



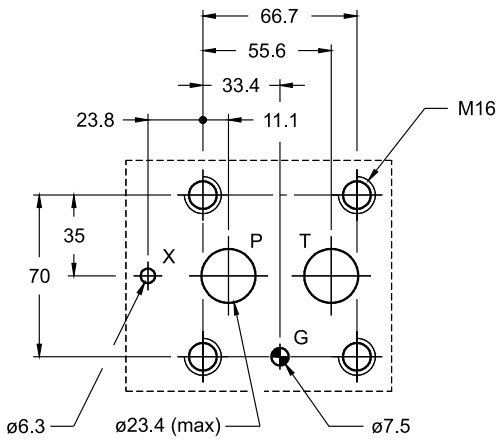


NOTE:
at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (5) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M16x60 - ISO 4762
Torque: 170 Nm (A8.8 screws)
Thread of mounting holes: M16x25

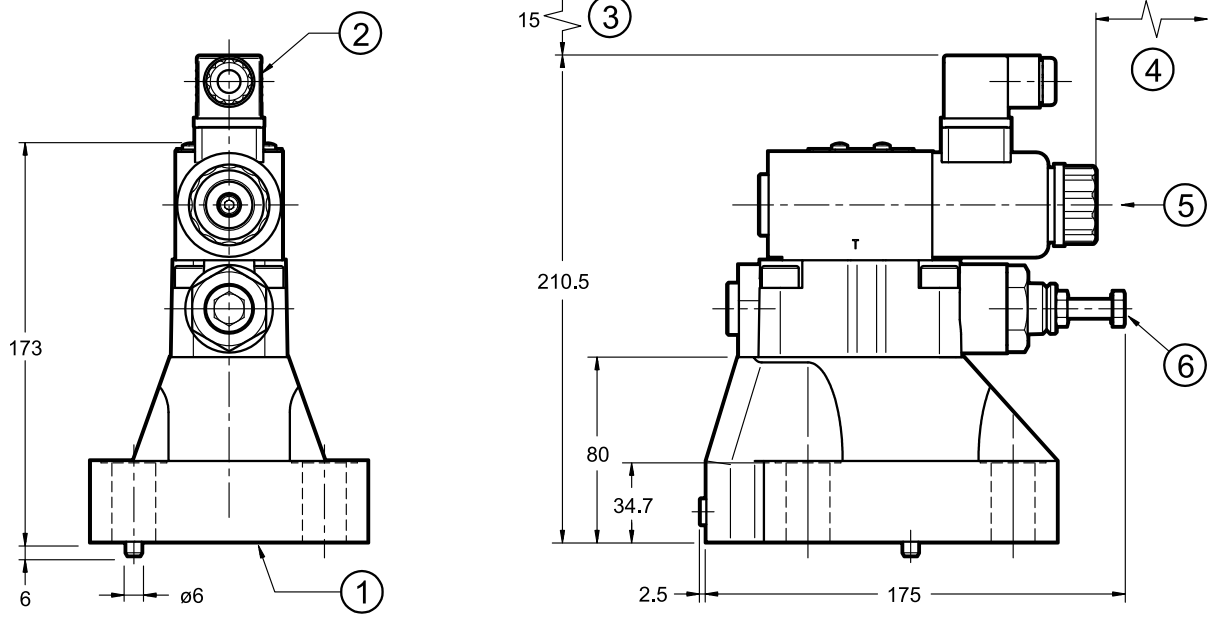
1	Mounting surface with sealing rings: 2 OR type 3118 (29.82x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	EN 175301-803 (ex DIN 43650) electric connector
3	Connector removal space
4	Coil removal space
5	Breather (male hexagonal spanner 4)
6	Pressure relief valve (factory set)

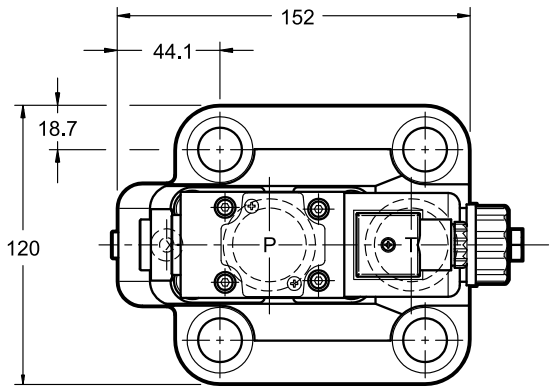
MOUNTING INTERFACE:
ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)



10 - PRE32 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

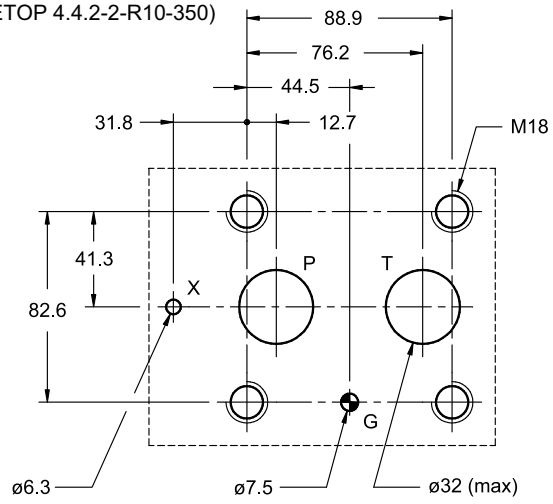




NOTE:
at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (5) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M18x60 - ISO 4762
Torque: 235 Nm (A8.8 screws)
Thread of mounting holes: M18x27

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



1	Mounting surface with sealing rings: 2 OR type 4137 (34.52x3.53) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore)
2	EN 175301-803 (ex DIN 43650) electric connector
3	Connector removal space
4	Coil removal space
5	Breather (male hexagonal spanner 4)
6	Pressure relief valve (factory set)

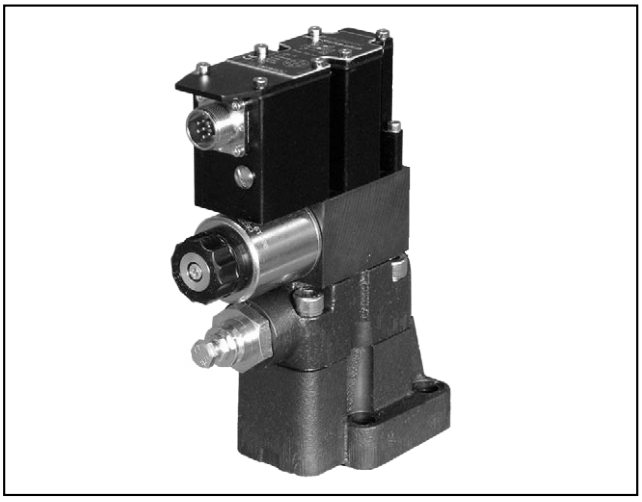
11 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251
EDM-M142	for solenoid 12V DC		

12 - SUBPLATES

(see catalogue 51 000)

	PRE10	**PRE25**	**PRE32**
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, T ports dimensions	P: 1/2" BSP T: 3/4" BSP	1" BSP	1" ¼ BSP
X port dimensions	1/4" BSP	1/4" BSP	1/4" BSP



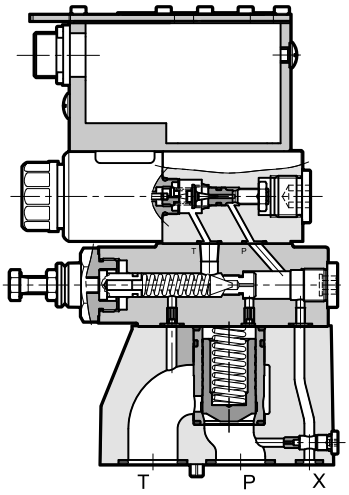
PRE*G*

PROPORTIONAL PRESSURE RELIEF VALVES, PILOT OPERATED, WITH INTEGRATED ELECTRONICS

SUBPLATE MOUNTING
ISO 6264

p max **350** bar
Q max (see table of performances)

OPERATING PRINCIPLE



— The PRE*G* valves are proportional pressure relief valves, pilot operated, with integrated electronics and mounting interface in compliance with ISO 6264 standards.

— These valves are used to control hydraulic circuit pressure and enable the use of the full flow rate of the pump, even with settings approaching calibrated values.

— The two-stage design and wide passages ensure reduced pressure drops thereby improving the system energy performance.

— They are fitted with a manual pressure relief valve which is factory set to ≥15% of the maximum value in the pressure control range.

— Valves are available with different types of electronics, with analogue or fieldbus interfaces.

— They are available in three sizes with flow rates up to 500 l/min and in four pressure control ranges up to 350 bar.

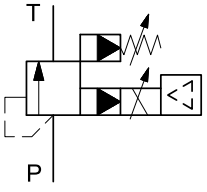
— The valves are easy to install. The driver directly manages digital settings.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and p = 140 bar)

		PRE10G*	PRE25G*	PRE32G*
Maximum operating pressure	bar	350		
Maximum flow	l/min	200	400	500
Step response		see paragraph 8		
Hysteresis	% of p nom	< 3%		
Repeatability	% of p nom	< ±1%		
Electrical characteristic		see paragraph 3		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	5.5	6.3	8.5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

1.1 - Standard electronics

P	R	E		G	-		/	32		-		K11		

Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Standard electronics for pressure control in open loop

Pressure control range
070 = up to 70 bar **210** = up to 210 bar
140 = up to 140 bar **350** = up to 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage 0 ÷ 10 V **E1** = current 4 ÷ 20 mA

Connection 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

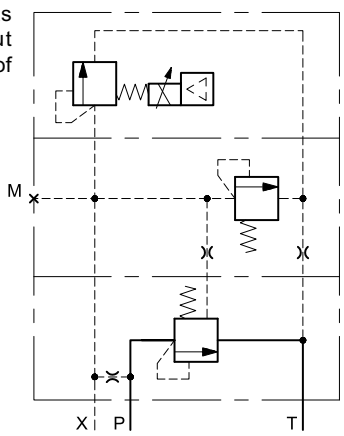
Option:
/ W7 = Zinc-nickel surface treatment
(see **NOTE**)
Omit if not required

NOTE: The standard valve is supplied with surface treatment of phosphating black on the valve body.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 240 hours (test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.2 - Detailed symbol

Port X is not intended as a pilot supply line, but exclusively as a signal of the input pressure .



1.3 - Compact electronics

P	R	E		GL	-		/	10		-		K12	

Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Digital integrated electronics for open loop compact box

Pressure control range
070 = up to 70 bar **210** = up to 210 bar
140 = up to 140 bar **350** = up to 350 bar

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

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Interfaces:
E0 = analogue, voltage 0 ÷ 10 V
E1 = analogue, current 4 ÷ 20 mA
IOL = IO-Link interface
CA = CAN Open

Connection 5 pin M12

Option:
/ W7 = Zinc-nickel surface treatment
(see **NOTE** par. 1.1)
Omit if not required

1.4 - Electronics with fieldbus communication

P R E GH - / 32 - K16 /

Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Digital integrated electronics for open loop with fieldbus communication

Pressure control range
070 = up to 70 bar
140 = up to 140 bar
210 = up to 210 bar
350 = up to 350 bar

Series No. (the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage 0 ÷ 10 V
E1 = current 4 ÷ 20 mA
FD = full digital version (on request)

Main connection 11 pin + PE

X1 Main connection configuration:
D1 = one command
D0 = full digital version (on request - available for reference signal FD type only)

X2, X3 Fieldbus type:
EC = EtherCAT
EN = Ethernet /IP
PN = Profinet
PL = PowerLink

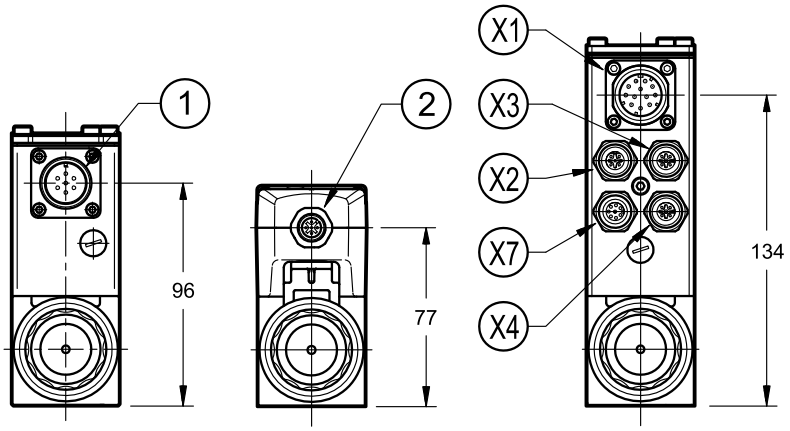
X7 Digital transducer:
0 = none
1 = SSI type
2 = Encoder type

X4 Analogue transducer:
0 = none
1 = single/double transducer

Option:
/ W7 = zinc-nickel surface treatment (see p. 1.2)
Omit if not required.

2 - COMPARISON AMONG INTEGRATED ELECTRONICS

G type **GL type** **GH type** dimensions in mm



1	Connection 6 pin + PE
2	Connection M12 5 pin, code A, male
X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	Connection for analogue transducer
X7	Connection for digital transducer

NOTE 1: Depending on the chosen version, X4 and X7 connections may not be present. Please refer to sections 4, 5 and 6 for connections descriptions and pinouts.
NOTE 2: Related mating connectors have to be ordered separately. See catalogue 89 000.

3 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67 (**NOTE)**
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect with caps any unused connections.

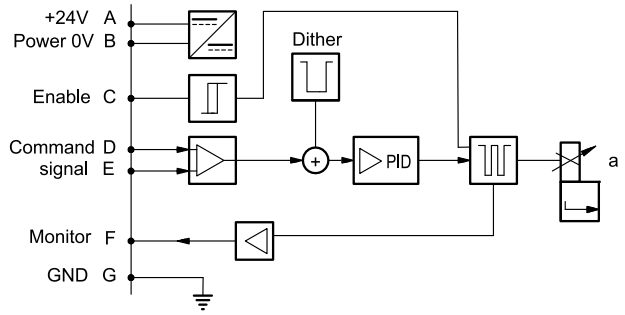
4 - PRE*G - STANDARD ELECTRONICS

4.1 - Electrical characteristics

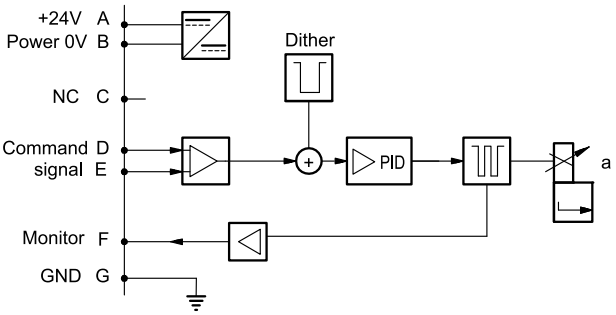
Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

4.2 - On-board electronics diagrams

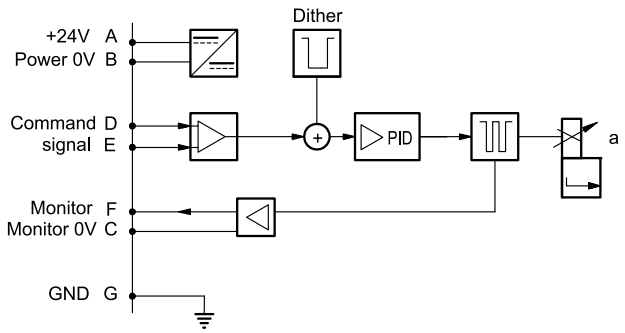
VERSION A - External Enable



VERSION B - Internal Enable

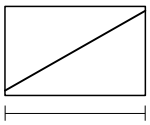


VERSION C - 0V Monitor

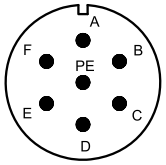


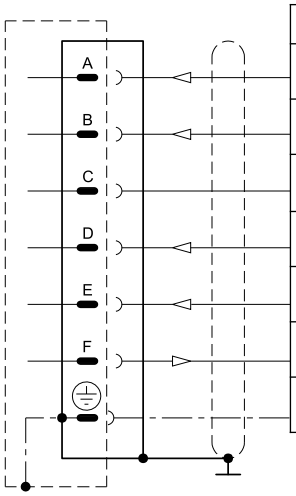
4.3 - Versions with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**



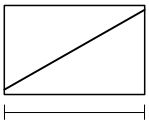


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

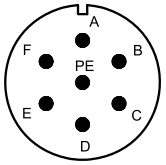
4.4 - Versions with current command (E1)

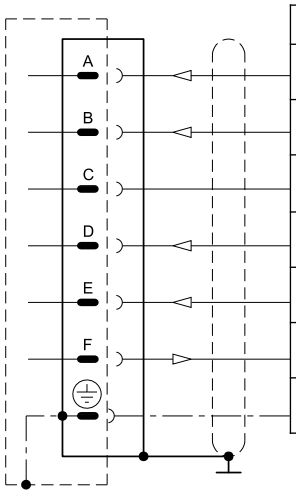
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

5 - PRE*GL - COMPACT ELECTRONICS

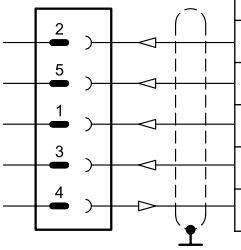
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 230.4
Can Open communication (CA): Data rate	kbit	10 ÷ 1000
Data register (IOL and CA versions only)		solenoid voltage supply, solenoid faults (shortcircuit, bad config, internal), box temperature, switch-on time, vibrations
Connection		5-pin M12 code A (IEC 61076-2-101)

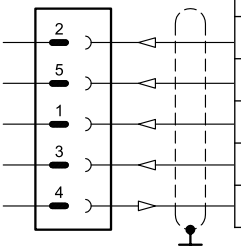
5.2 - Pin tables

'E0' connection



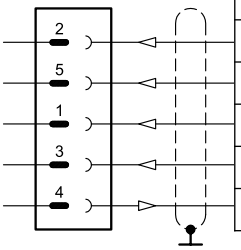
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection



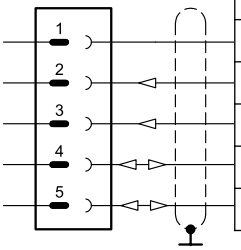
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



Pin	Values		Function
2	2L+	24 V DC	Supply of the power stage
5	2L-	0 V (GND)	Internal galvanic isolation from PIN 3
1	1L+	+24 V DC	IO-Link supply voltage
3	1L-	0V (GND)	
4	C/Q		IO-Link Communication

'CA' connection



Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

6 - PRE*GH - FIELDBUS ELECTRONICS

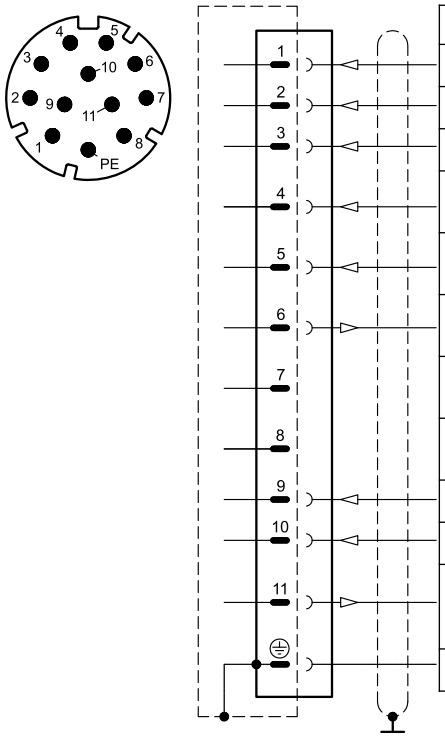
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

Command - valve position schemes as for the standard electronics. Please refer to pictures in par. 4.3 and 4.4.

6.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

6.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

6.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female

Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female

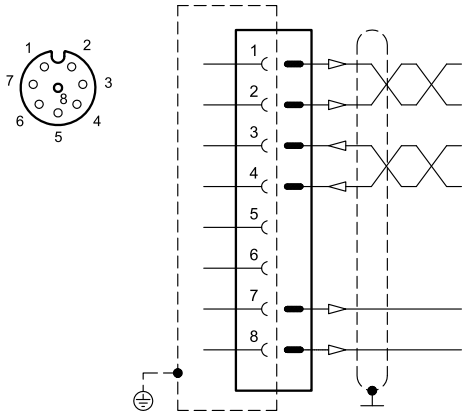
Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

6.4 - Digital transducer connection

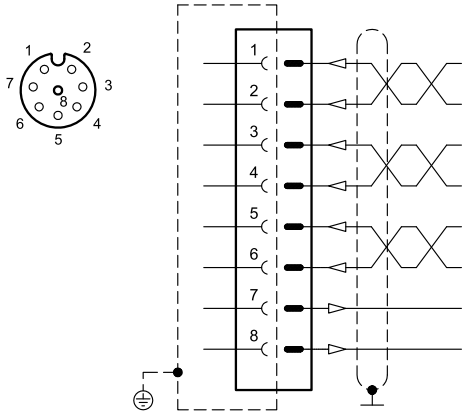
X7 connection: M12 A 8 pin female

VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

VERSION 2: ENCODER type



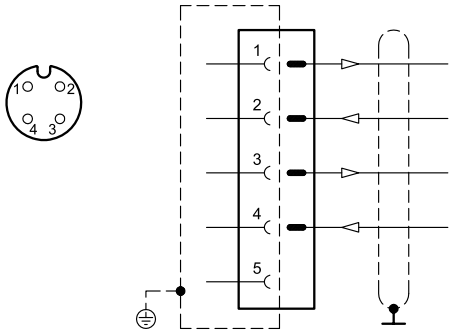
Pin	Values	Function	Notes
1	ENC_Z+	input channel Z+	Input - digital signal
2	ENC_Z-	input channel Z-	
3	ENC_A+	input channel A+	
4	ENC_A-	input channel A+	
5	ENC_B+	input channel B+	
6	ENC_B-	input channel B+	
7	+5 V	transducer power supply	Output power supply
8	0 V	-	Common GND

6.5 - Analogue transducer connection

X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer

(single or double is a software-selectable option)



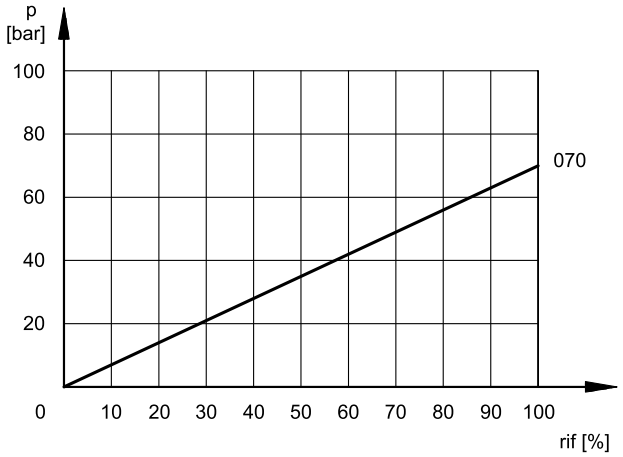
Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

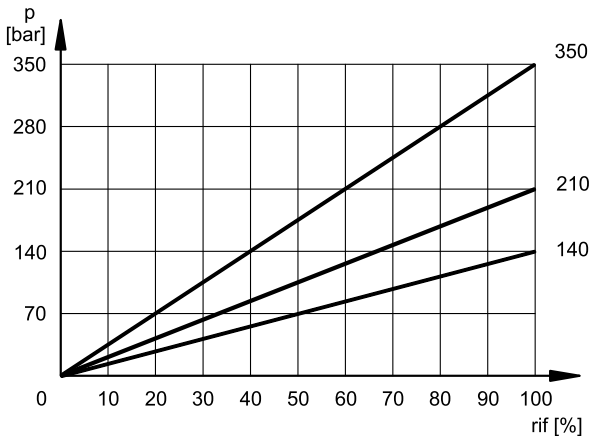
7 - CHARACTERISTIC CURVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

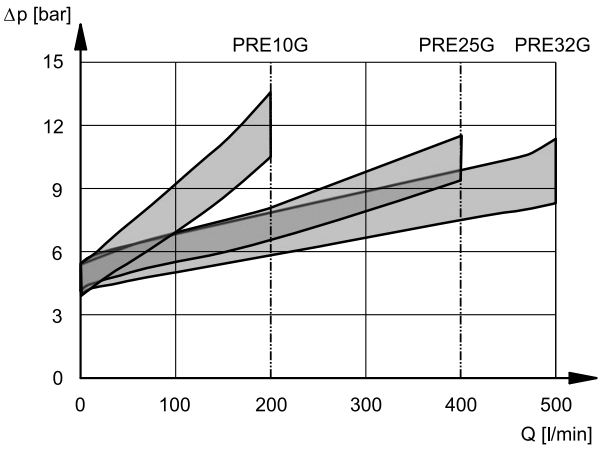
Typical control characteristics, according to the reference signal for available pressure control ranges, measured with input flow rate Q = 50 l/min. Characteristic curves measured without backpressure in T, with linearity compensation set by the onboard electronics.

PRESSURE CONTROL p = f (I)



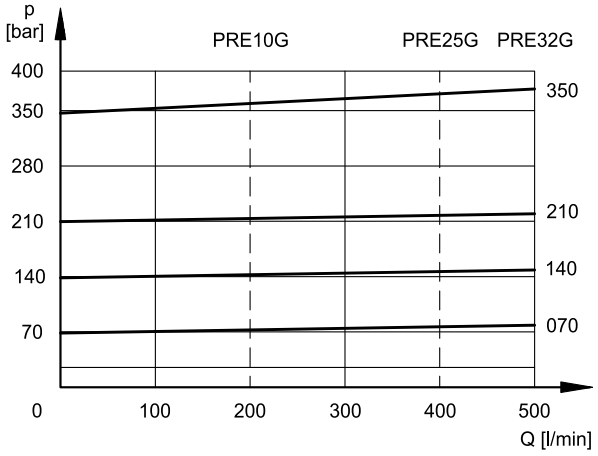


MINIMUM CONTROLLED PRESSURE p min = f (Q)



minimum regulated pressure for pressure control ranges between 70 bar and 350 bar.

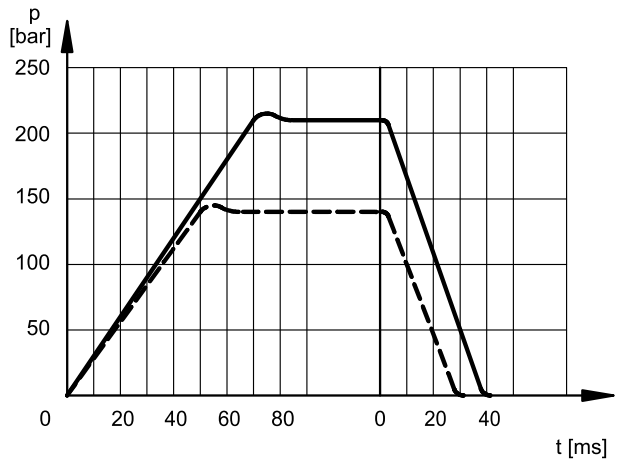
PRESSURE VARIATION p max = f (Q)



8 - STEP RESPONSE

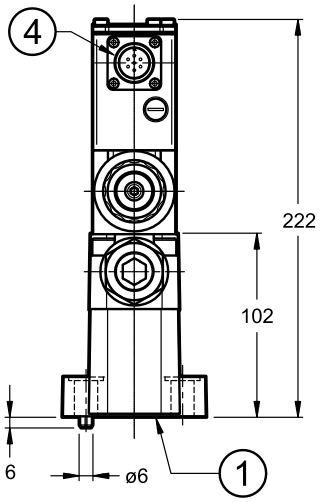
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

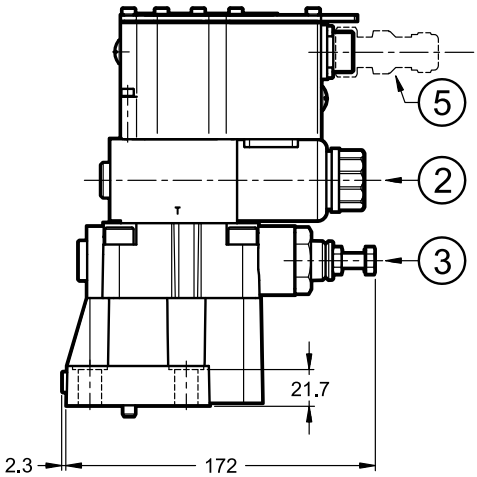
Response times obtained withh PRE*G-210 valves, with an input flow rate of 50 l/min and a pressure oil volume of 2 litres. The response time is affected both by the flow rate and the oil volume in the pipework.

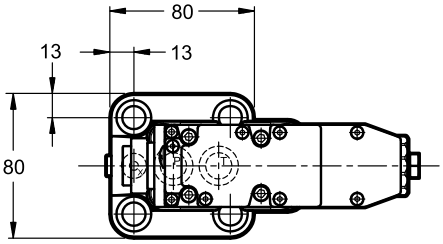


9 - OVERALL AND MOUNTING DIMENSIONS PRE10G*

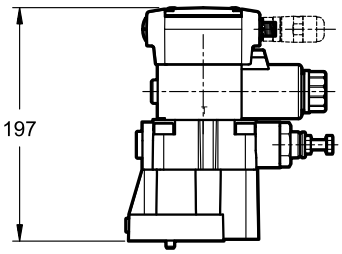
dimensions in mm



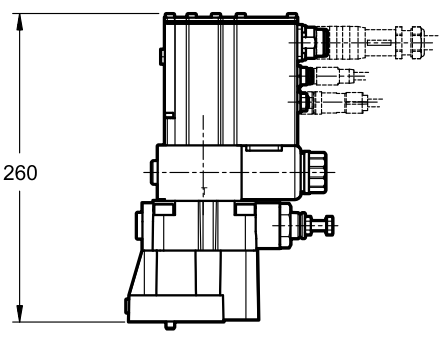




PRE10GL



PRE10GH



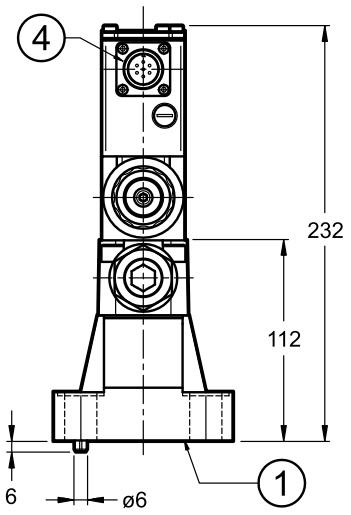
NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.
NOTE 2: Mounting interface at par. 12.

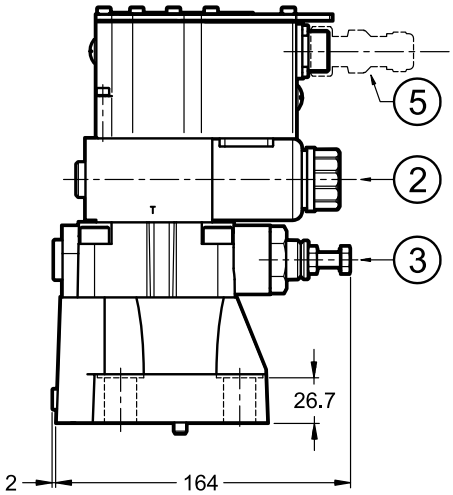
1	Mounting surface with sealing rings: 2 OR type 123 (17.86x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating connector **To be ordered separately**. See catalogue 89 000

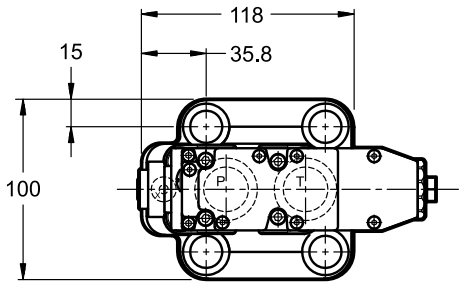
Valve fastening: 4 SHCS M12x40 - ISO 4762
Torque: 69 Nm (screws A8.8)
Thread of mounting holes: M12x20

10 - OVERALL AND MOUNTING DIMENSIONS PRE25G*

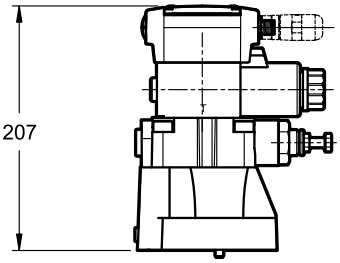
dimensions in mm



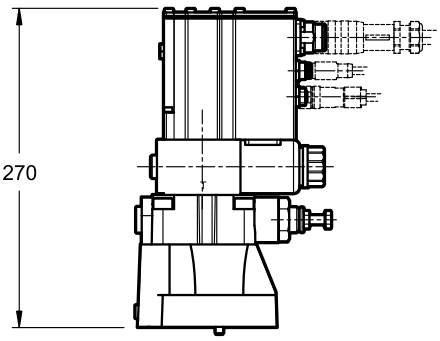




PRE25GL



PRE25GH



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 (2) placed at the end of the solenoid tube.

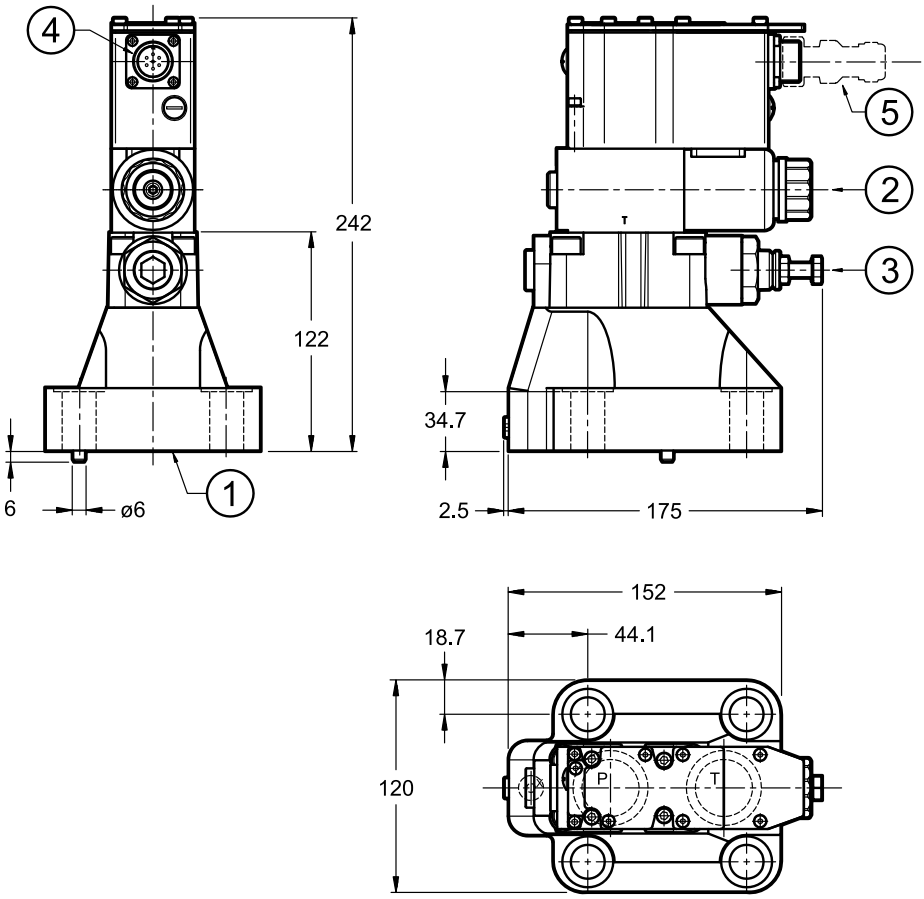
NOTE 2: Mounting interface at par. 12.

1	Mounting surface with sealing rings: 2 OR type 3118 (29.82x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating connector **To be ordered separately**. See catalogue 89 000

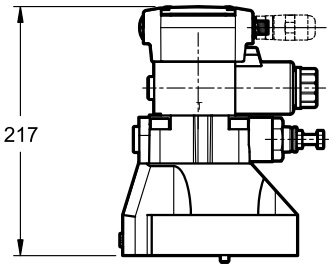
Valve fastening: 4 SHCS M16x60 - ISO 4762
Torque: 170 Nm (screws A8.8)
Thread of mounting holes: M16x25

11 - OVERALL AND MOUNTING DIMENSIONS PRE32G*

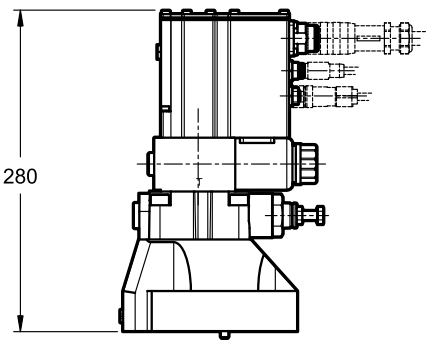
dimensions in mm



PRE32GL



PRE32GH



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 (2) placed at the end of the solenoid tube.

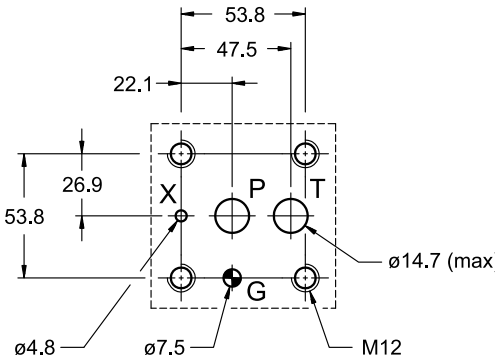
NOTE 2: Mounting interface at par. 12.

1	Mounting surface with sealing rings: 2 OR type 4137 (34.52x3.53) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating electrical connector **To be ordered separately**. See catalogue 89 000

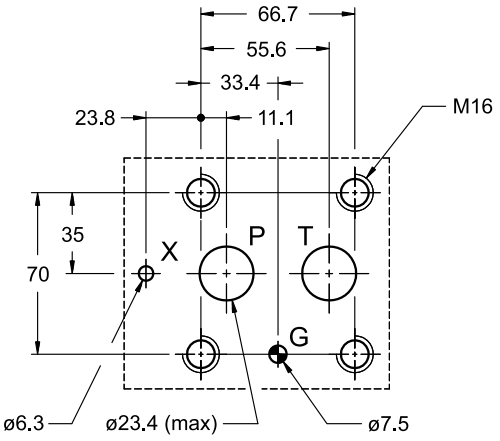
Valve fastening: 4 SHCS M18x60 - ISO 4762
Torque: 235 Nm (screws A8.8)
Thread of mounting holes: M18x27

12 - MOUNTING INTERFACES

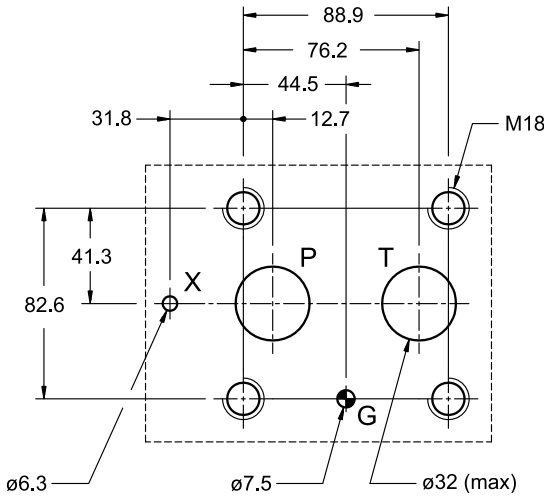
PRE10G*:
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)



PRE25G*:
ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)



PRE32G*:
ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)



13 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. 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.

14 - INSTALLATION

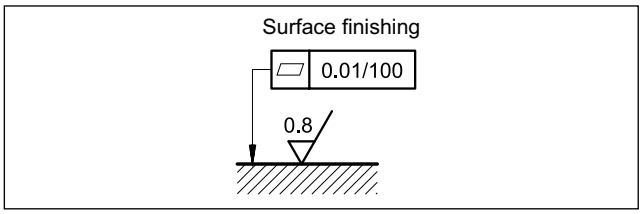
We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 7.

Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube.

Ensure the solenoid tube is always filled with oil. At the end of the operation, make sure of having correctly replaced the drain screw. Connect the valve T port 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.



15 - ACCESSORIES

(to be ordered separately)

15.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

15.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

15.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

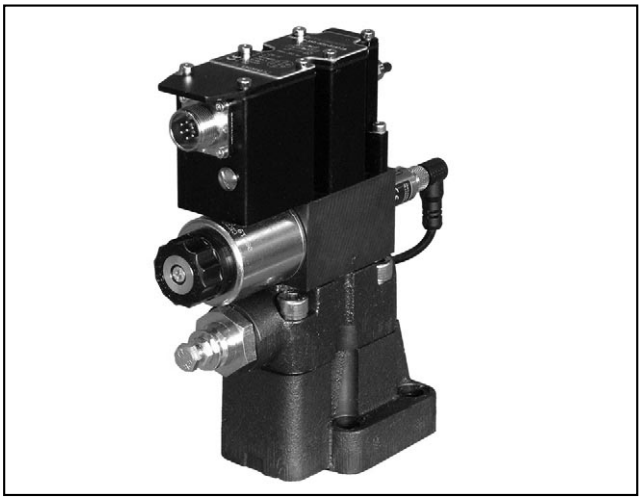
15.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

16 - SUBPLATES

(see catalogue 51 000)

	PRE10G*	**PRE25G***	**PRE32G***
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, **T** port dimensions	P: 1/2” BSP T: 3/4” BSP	1” BSP	1” ¼ BSP
X port dimensions	1/4” BSP	1/4” BSP	1/4” BSP



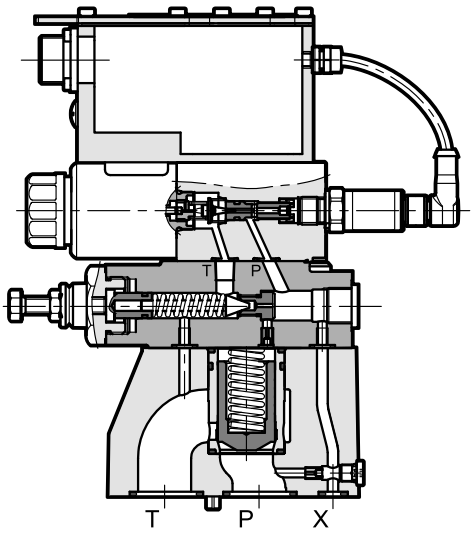
PRE*J*

PROPORTIONAL PRESSURE RELIEF VALVES, PILOT OPERATED, WITH PRESSURE FEEDBACK AND INTEGRATED ELECTRONICS

SUBPLATE MOUNTING

p max **350** bar
Q max (see table of performances)

OPERATING PRINCIPLE



— PRE*J* valves are proportional pressure relief valves, pilot operated, with integrated electronics and pressure closed loop, with mounting interface in compliance with ISO 6264 standard.

— These valves are used to control hydraulic circuit pressure and enable the use of the full flow rate of the pump, even with settings approaching calibrated values.

— The two-stage design and wide passages ensure reduced pressure drops thereby improving the system energy performance.

— They are fitted with a manual pressure relief valve which is factory set to ≥ 15% of the maximum value in the pressure control range.

— Valves are available with different types of electronics, with analogue or fieldbus interfaces.

— They are available in three sizes with flow rates up to 500 l/min and in four pressure control ranges up to 350 bar.

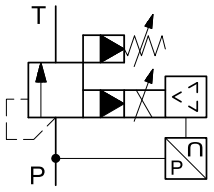
— The valves are easy to install. The driver directly manages digital settings.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50 °C and p = 140 bar)

		PRE10J*	PRE25J*	PRE32J*
Maximum operating pressure	bar	350		
Maximum flow	l/min	200	400	500
Step response		see point 8		
Hysteresis	% of p nom	< 1%		
Repeatability	% of p nom	< ± 0,5%		
Electrical characteristic		see point 3		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	5,5	6,3	8,5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

1.1 - Standard electronics

P	R	E		J	-		/	33		-		K11		

Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Integrated electronics for valves with pressure feedback

Pressure control range
140 = up to 140 bar **210** = up to 210 bar
350 = up to 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage 0 ÷ 10 V **E1** = current 4 ÷ 20 mA

Connection 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

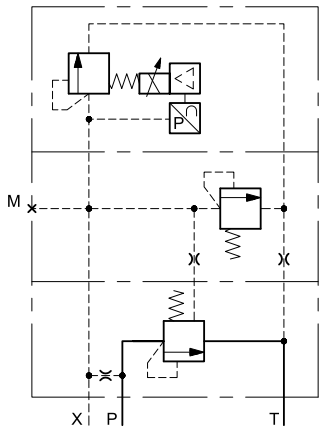
Option:
/ W7 = Zinc-nickel surface treatment
(see **NOTE**)
Omit if not required

NOTE: The standard valve is supplied with surface treatment of phosphating black on the valve body.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 240 hours (test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.2 - Detailed symbol

Port X is not intended as a pilot supply line, but exclusively as a signal of the input pressure .



1.3 - Compact electronics

P	R	E		JL	-		/	10		-		K12	

Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Integrated electronics for valves with pressure feedback - compact version

Pressure control range
140 = up to 140 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:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Interfaces:
E0 = analogue, voltage 0 ÷ 10 V
E1 = analogue, current 4 ÷ 20 mA
IOL = IO-Link interface
CA = CAN Open

Connection 5 pin M12

Option:
/ W7 = Zinc-nickel surface treatment
(see **NOTE** point 1.1)
Omit if not required

1.4 - Electronics with fieldbus communication

P	R	E		JH	-		/	33		-		K16		/				

Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Integrated electronics with fieldbus communication for valves with pressure feedback

Pressure control range
140 = up to 140 bar
210 = up to 210 bar
350 = up to 350 bar

Series No. (the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage 0 ÷ 10 V
E1 = current 4 ÷ 20 mA
FD = full digital version (on request)

Main connection 11 pin + PE

X1 Main connection configuration:
D1 = one command
D0 = full digital version (on request - available for reference signal FD type only)

X2, X3 Fieldbus type:
EC = EtherCAT
EN = Ethernet /IP
PN = Profinet
PL = PowerLink

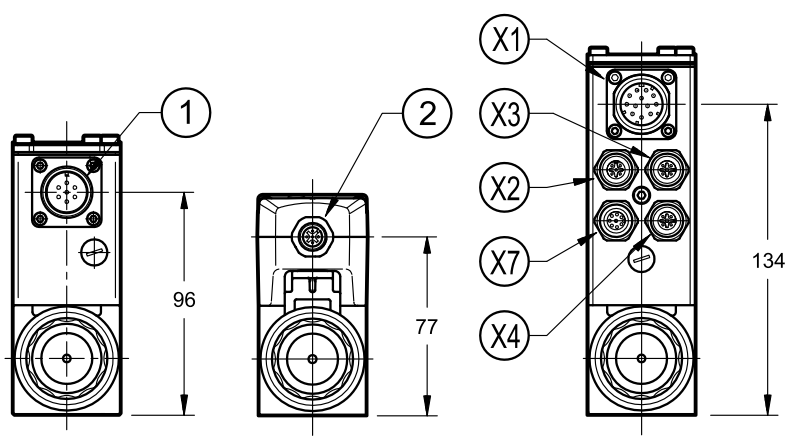
X7 Digital transducer:
0 = none
1 = SSI type
2 = Encoder type

X4 Analogue transducer:
0 = none
1 = single/double transducer

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE** at p. 1.1)
Omit if not required

2 - COMPARISON AMONG INTEGRATED ELECTRONICS

J type **JL type** **JH type** dimensions in mm



1	Connection 6 pin + PE
2	Connection M12 5 pin, code A, male
X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	Connection for analogue transducer
X7	Connection for digital transducer

NOTE 1: Depending on the chosen version, X4 and X7 connections may not be present. Please refer to sections 6 for connections descriptions and pinouts.
NOTE 2: Related mating connectors have to be ordered separately. See catalogue 89 000.

3 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65/IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the JH versions it is necessary to protect with caps any unused connections.

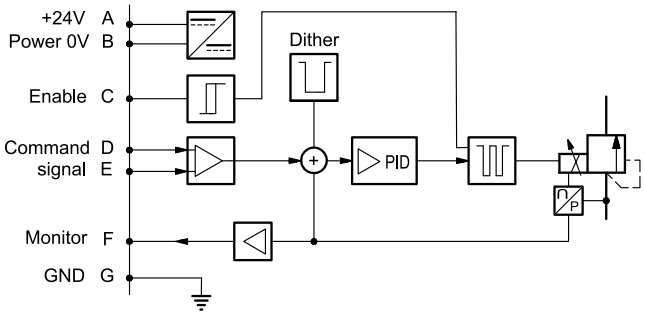
4 - PRE*J - STANDARD ELECTRONICS

4.1 - Electrical characteristics

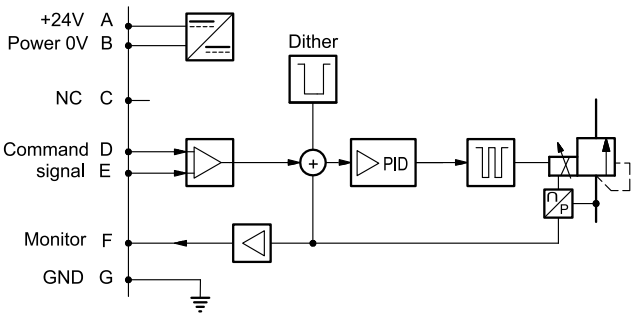
Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer): voltage (E0) current (E1)	 V DC mA	 0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

4.2 - On-board electronics diagrams

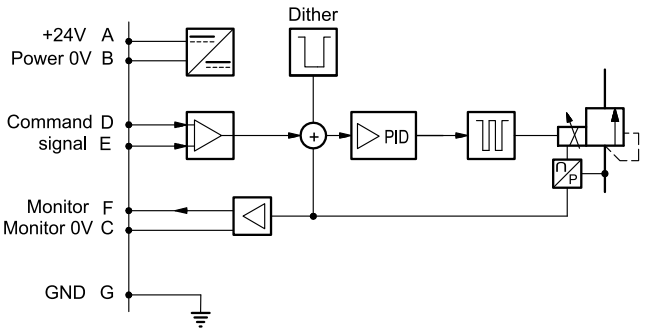
VERSION A - External Enable



VERSION B - Internal Enable

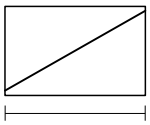


VERSION C - 0V Monitor

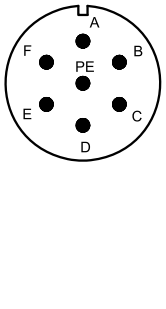


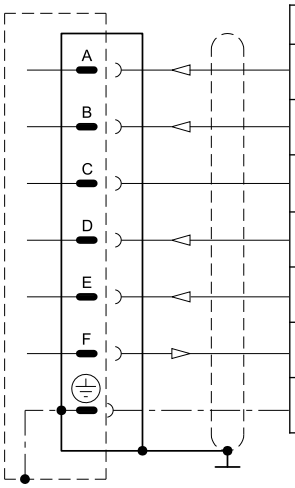
4.3 - Version with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**



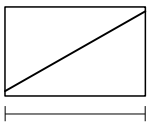


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

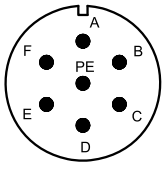
4.4 - Version with current command (E1)

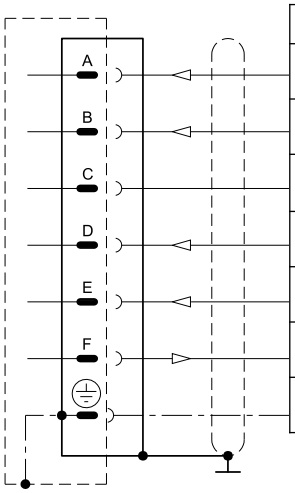
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

5 - PRE*JL - COMPACT ELECTRONICS

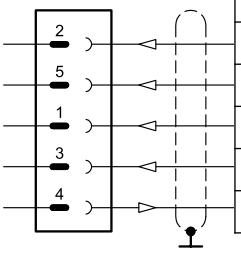
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	 IO-Link Port Class B 230.4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		solenoid voltage supply, solenoid faults (shortcircuit, bad config, internal), box temperature, switch-on time, vibrations
Connection		5 pin M12 code A (IEC 61076-2-101)

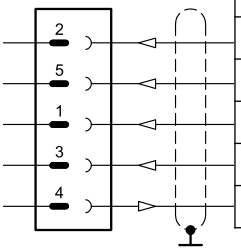
5.2 - Pin tables

'E0' connection



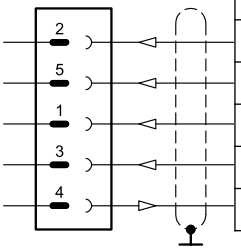
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection



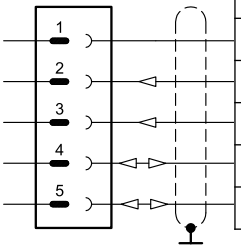
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



Pin	Values	Function
2	2L+ 24 V DC	Supply of the power stage
5	2L- 0 V (GND)	Internal galvanic isolation from PIN 3
1	1L+ +24 V DC	IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

'CA' connection



Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

6 - PRE*JH - FIELDBUS ELECTRONICS

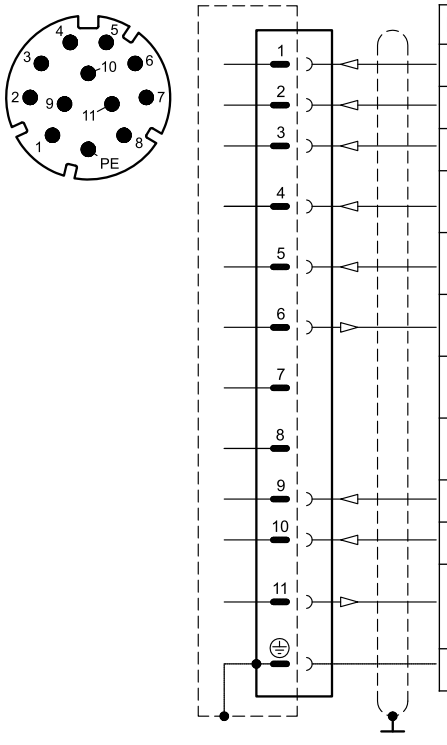
The 11+ PE pin connection allows separate supply voltage for electronics and solenoid.

Command - valve position schemes as for the standard electronics. Please refer to pictures in point 4.3 and 4.4.

6.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm) via fieldbus
Monitor signal (pressure at transducer): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

6.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

6.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female

Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female

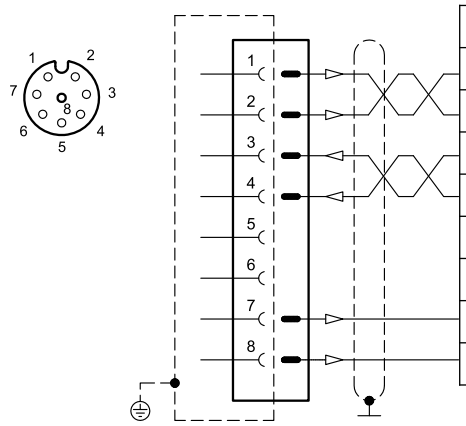
Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

6.4 - Digital transducer connection

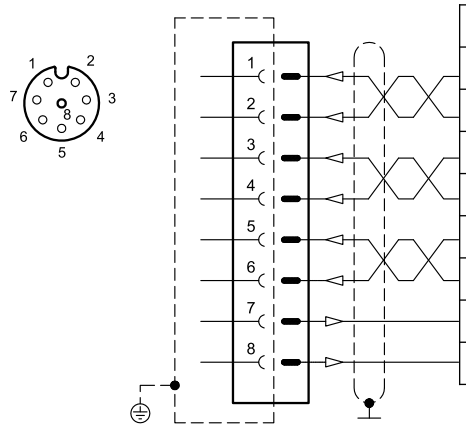
X7 connection: M12 A 8 pin female

VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

VERSION 2: ENCODER type



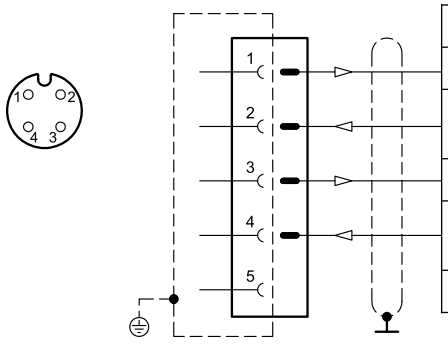
Pin	Values	Function	Notes
1	ENC_Z+	input channel Z+	Input - digital signal
2	ENC_Z-	input channel Z-	
3	ENC_A+	input channel A+	
4	ENC_A-	input channel A+	
5	ENC_B+	input channel B+	
6	ENC_B-	input channel B+	
7	+5 V	transducer power supply	Output power supply
8	0 V	-	Common GND

6.5 - Analogue transducer connection

X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer

(single or double is a software-selectable option)



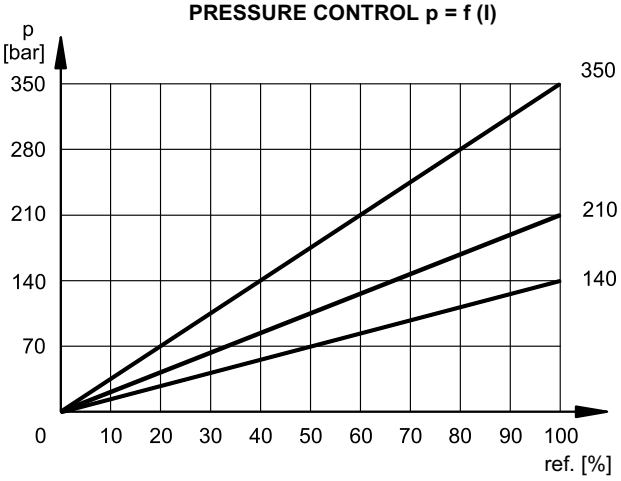
Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

7 - CHARACTERISTIC CURVES

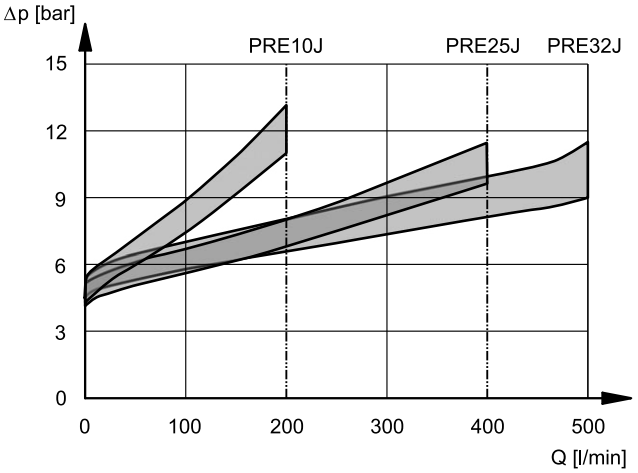
(measured with viscosity of 36 cSt at 50°C)

Typical control characteristics, according to the reference signal for available pressure control ranges, measured with input flow rate Q = 50 l/min. Characteristic curves measured without backpressure in T, with linearity and hysteresis compensation set by the onboard electronics.

PRESSURE CONTROL p = f (I)

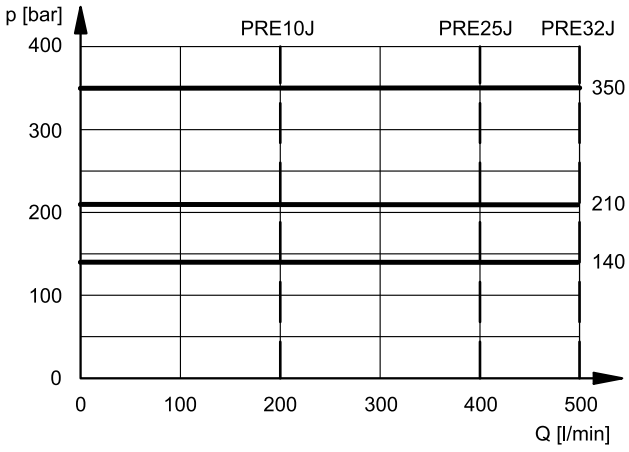


MINIMUM CONTROLLED PRESSURE p min = f (Q)



minimum controlled pressure for pressure control ranges between 140 bar and 350 bar.

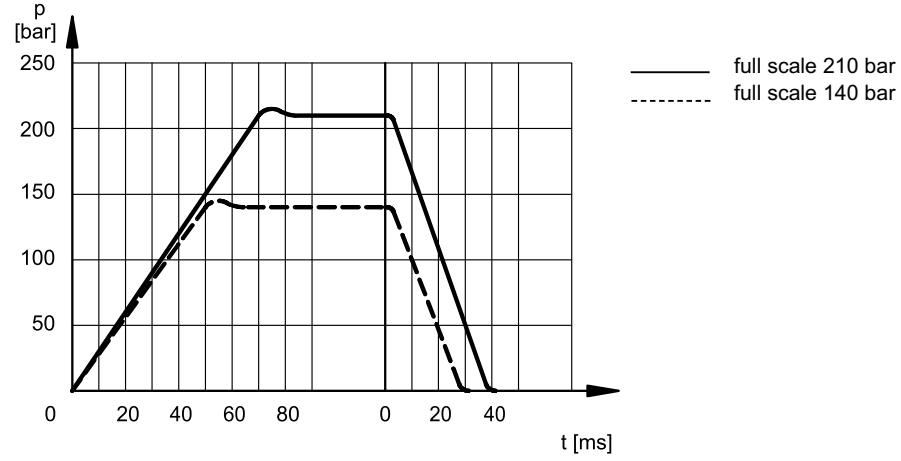
PRESSURE VARIATION p max = f (Q)



8 - STEP RESPONSE

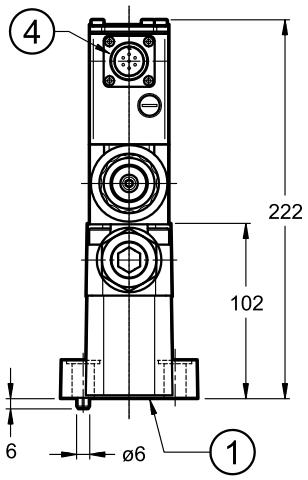
(obtained with mineral oil with viscosity of 36 cSt at 50 °C)

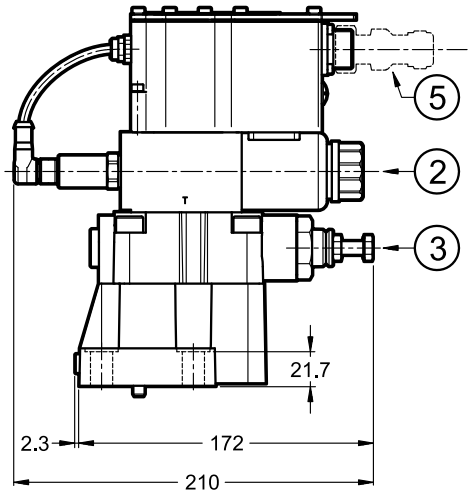
Response times obtained with PRE*J-210 valves, with an input flow rate of 50 l/min and a pressure oil volume of 2 litres. The response time is affected both by the flow rate and the oil volume in the pipework.

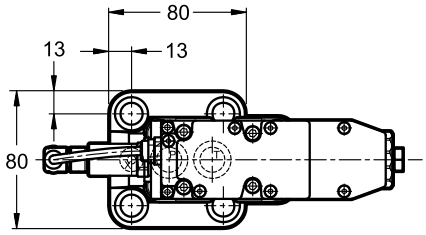


9 - OVERALL AND MOUNTING DIMENSIONS PRE10J*

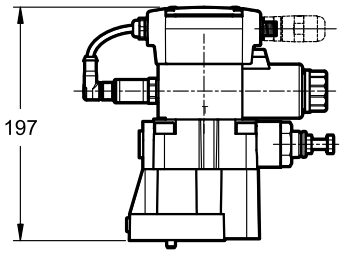
dimensions in mm



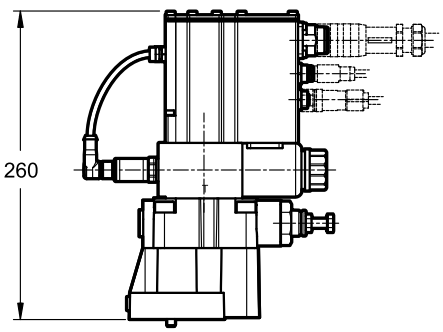




PRE10JL



PRE10JH



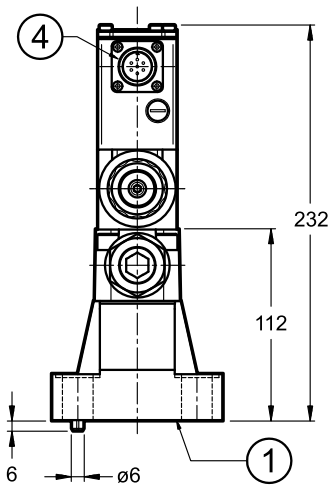
NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.
NOTE 2: Mounting interface at par. 12.

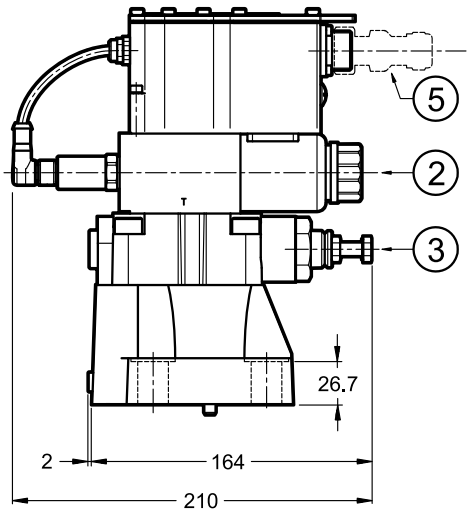
1	Mounting surface with sealing rings: 2 OR type 123 (17.86x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating connector **To be ordered separately**. See catalogue 89 000

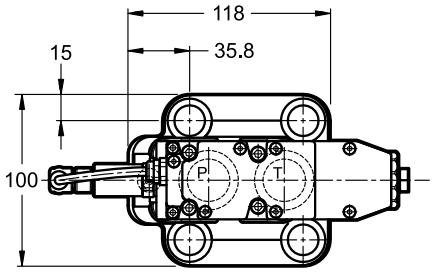
Valve fastening: 4 SHCS M12x40 - ISO 4762
Torque: 69 Nm (viti A8.8)
Thread of mounting holes: M12x20

10 - OVERALL AND MOUNTING DIMENSIONS PRE25J*

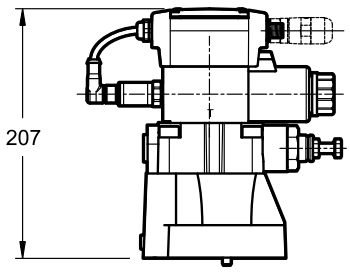
dimensions in mm



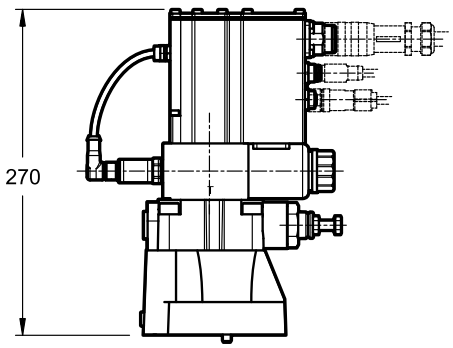




PRE25JL



PRE25JH



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 (2) placed at the end of the solenoid tube.

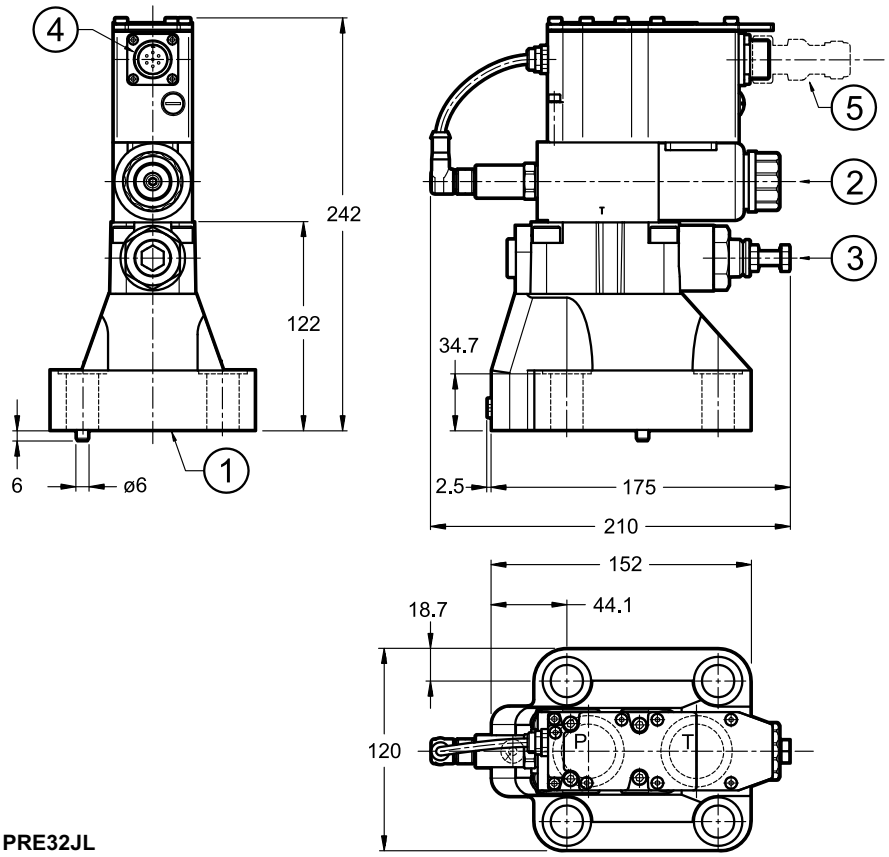
NOTE 2: Mounting interface at par. 12.

1	Mounting surface with sealing rings: 2 OR type 3118 (29.82x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating connector **To be ordered separately**. See catalogue 89 000

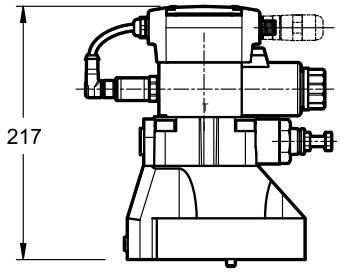
Valve fastening: 4 SHCS M16x60 - ISO 4762
Torque: 170 Nm (viti A8.8)
Thread of mounting holes: M16x25

11 - OVERALL AND MOUNTING DIMENSIONS PRE32J*

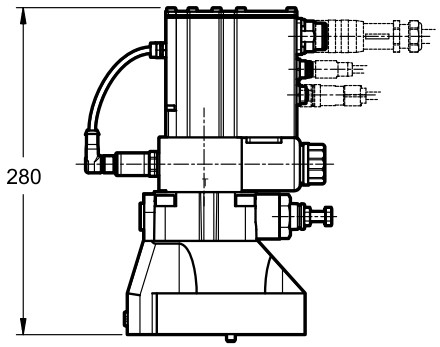
dimensions in mm



PRE32JL



PRE32JH



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 (2) placed at the end of the solenoid tube.

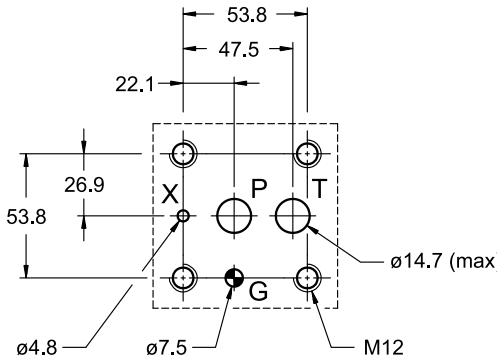
NOTE 2: Mounting interface at par. 12.

1	Mounting surface with sealing rings: 2 OR type 4137 (34.52x3.53) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Main connection 6 pin + PE
5	Mating electrical connector **To be ordered separately**. See catalogue 89 000

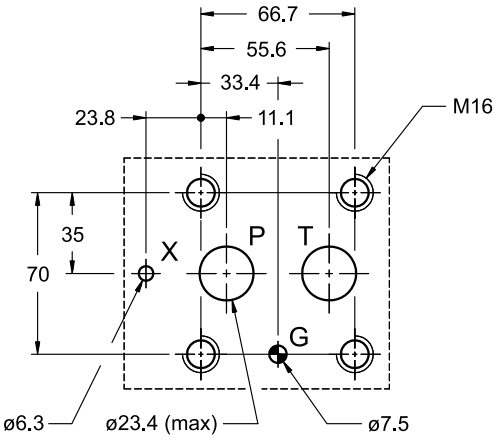
Valve fastening: 4 SHCS M18x60 - ISO 4762
Torque: 235 Nm (viti A8.8)
Thread of mounting holes: M18x27

12 - MOUNTING INTERFACES

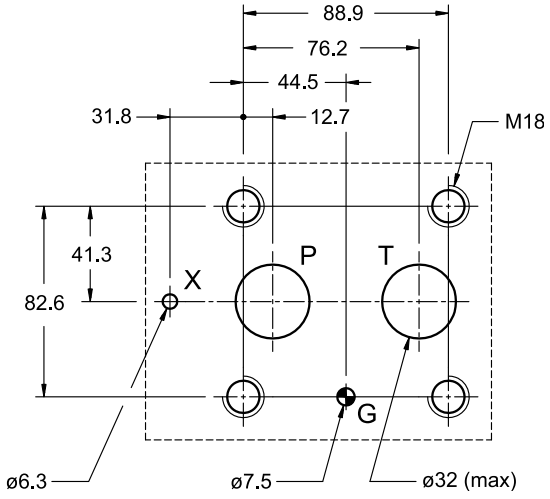
PRE10J*:
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)



PRE25J*:
ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)



PRE32J*:
ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)



13 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. 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.

14 - INSTALLATION

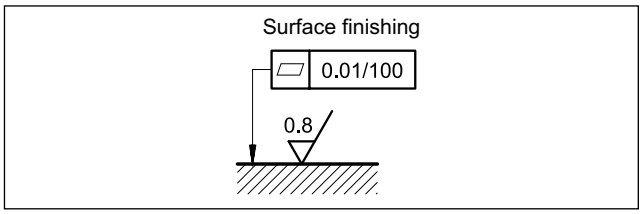
We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in point 7.

Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube.

Ensure the solenoid tube is always filled with oil. At the end of the operation, make sure of having correctly replaced the drain screw. Connect the valve T port 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.



15 - ACCESSORIES

(to be ordered separately)

15.1 -Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

15.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

15.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

15.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

16 - SUBPLATES

(see catalogue 51 000)

	PRE10J*	**PRE25J***	**PRE32J***
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, T port dimensions	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

PZME3

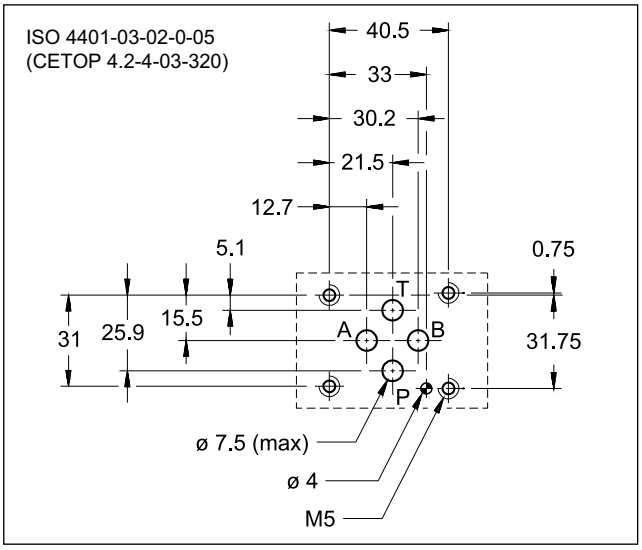
PROPORTIONAL THREE-PORT PRESSURE REDUCING VALVE PILOT OPERATED

SERIES 10

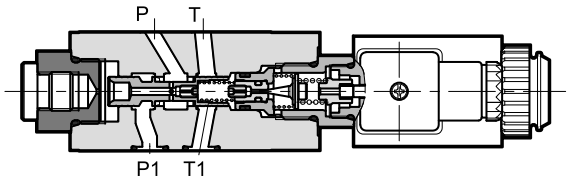
MODULAR VERSION ISO 4401-03

p max **320** bar
Q max (see table of performances)

MOUNTING SURFACE



OPERATING PRINCIPLE



— PZME3 valves are three-port pressure reducing valves, pilot operated, with proportional control. They are designed in modular version with mounting interface in compliance with ISO 4401-03 standards.

— These valves reduce pressure in the secondary branches of the circuit thus ensuring stability of controlled pressure in the event of variations in the flow rate through the valve.

— The valve can be controlled directly by a current control supply unit or by an electronic control card, to maximize the valve performance (see point. 9).

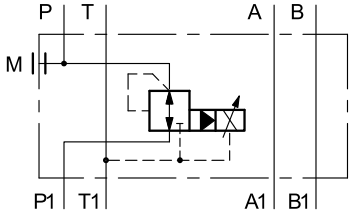
— The PZME3 valve is available in three pressure control ranges of up to 230 bar.

PERFORMANCES

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

Maximum operating pressure: - P-A-B ports - T port	bar	 320 2
Minimum controlled pressure	see Δp-Q diagram	
Maximum flow in P line Maximum flow on free flow paths Drain flow	l/min	40 50 0,4
Step response	see point 6	
Hysteresis (with PWM 200 Hz)	% of p nom	< 3%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see point 5	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	1.5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

PZ	M	E	3	-		/	10		-			/	

Three-port pressure reducing valve

Modular version

Electrical proportional control

Size: ISO 4401-03

Pressure control range
070 = from 5 to 70 bar
150 = from 5.5 to 150 bar
230 = from 6 to 230 bar

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

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

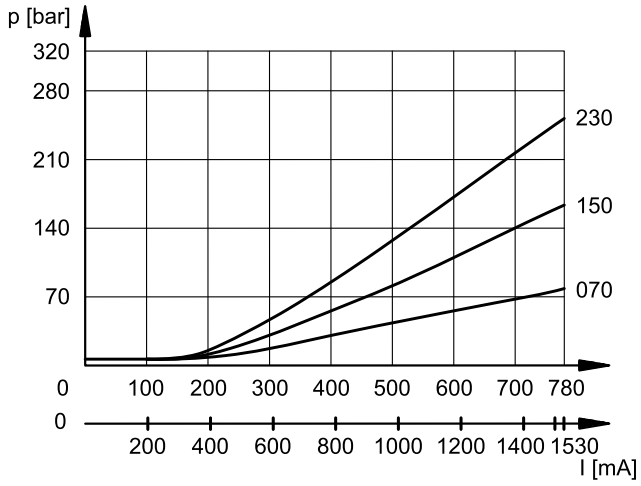
Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K2 = plug for connector type AMP JUNIOR
K7 = plug for connector type DEUTSCH DT04-2P male

Option: manual override (see point 9)

2 - CHARACTERISTIC CURVES

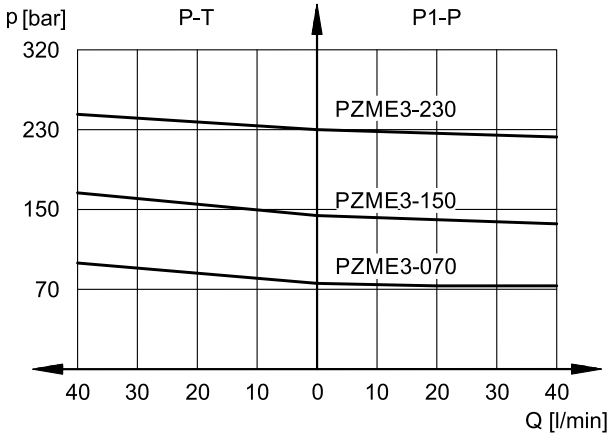
(measured with viscosity 36 cSt at 50 °C)

PRESSURE CONTROL p = f (I)



The curves have been obtained with working lines closed (without flow).

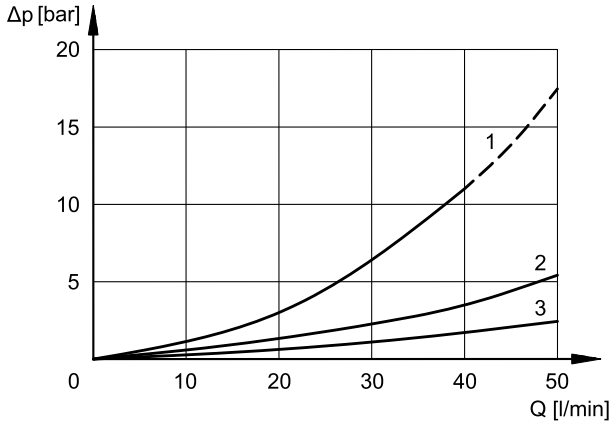
PRESSURE VARIATION p = f(Q)



The curves have been obtained with inlet pressure 50 bar greater than nominal pressure.

Pressure values in P1 greater than 50 bar reduce flow values considerably.

PRESSURE DROP Δp = f(Q)



1. pressure drops P1→ P
2. pressure drop in passing lines (ex. A ↔ A1)
3. pressure drops T 1→T

3 - MAX PRESSURE VALUES

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures that the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C. Values obtained with working lines closed (without flow).

		PZME3-070	PZME3-150	PZME3-230
pressure value at 780 mA	bar	75	155	240
max pressure value when $I > I_{max}$	bar	95	185	260

4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals.

For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other fluid types 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.

5 - ELECTRICAL CHARACTERISTICS

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube and is secured by means of a lock nut. It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	4.98	21
NOMINAL CURRENT	A	1.53	0.78
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	class H class F		

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K2	IP65	
K7	IP65/67	

6 - STEP RESPONSE

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

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 input flow rate of Q = 25 l/min.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	60	60

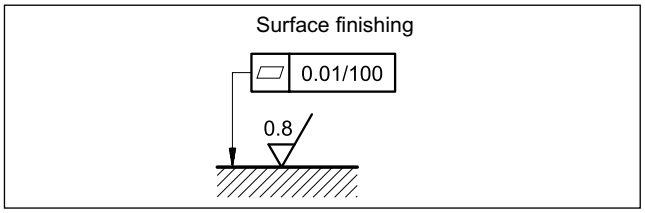
7 - INSTALLATION

These valves can be installed in any position without impairing correct operation if it is ensured that there is no air in the hydraulic circuit. Otherwise, vertical mounting with solenoid downward is preferable. In this case you must consider possible variations of the minimum controlled pressure values reported in point 2. Connect the valve T port directly to the reservoir.

Add any return pressure value detected in the T line to the reduced pressure value.

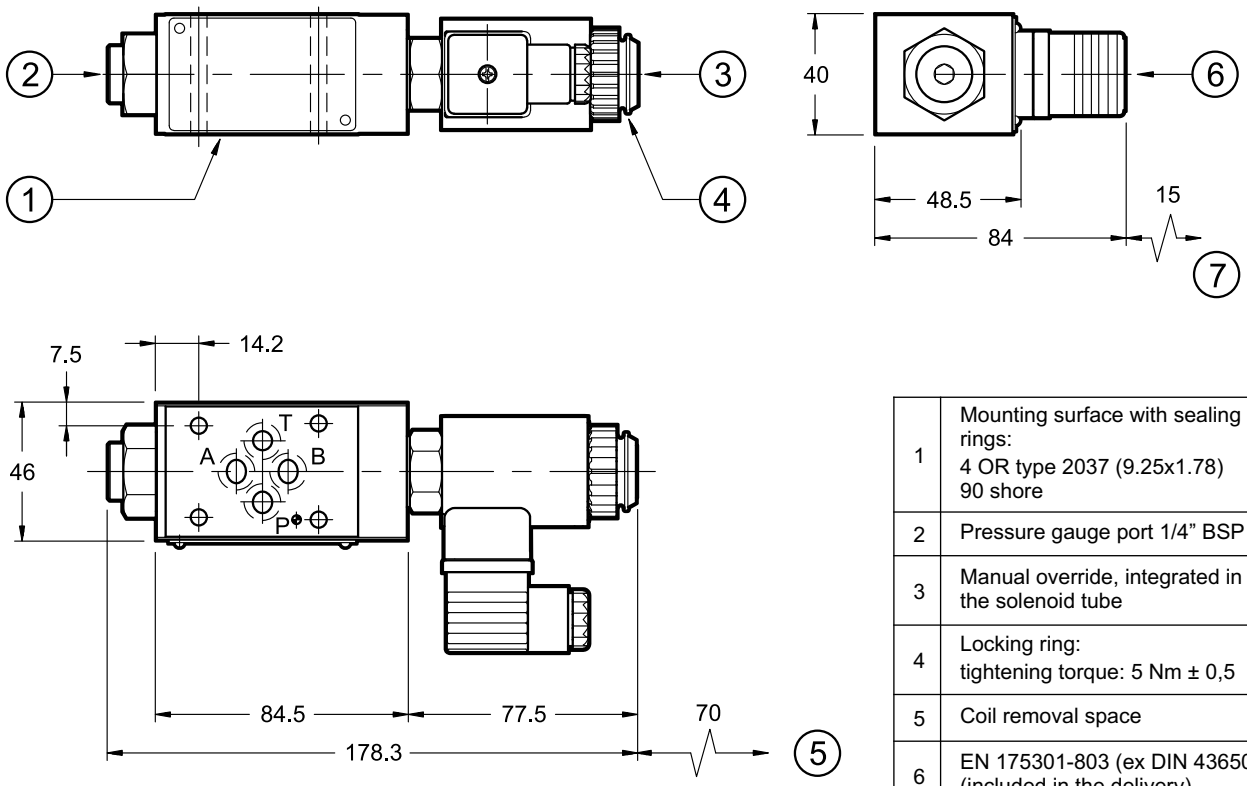
NOTE: Occurring return pressures are to be added up to the value of pressure setting at T port.

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.



8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) 90 shore
2	Pressure gauge port 1/4” BSP
3	Manual override, integrated in the solenoid tube
4	Locking ring: tightening torque: 5 Nm ± 0,5
5	Coil removal space
6	EN 175301-803 (ex DIN 43650) (included in the delivery)
7	Connector removal space

NOTE: Refer to catalog 81 101 for the dimensions of the K2 and K7 type electrical connections

9 - MANUAL OVERRIDE

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface. Two different manual override versions are available upon request: **CM** version, manual override boot protected, and **CK1** version, knob to screw.

For more information about these manual overrides, see the catalogue 81 101.

10 - ELECTRONIC CONTROL UNITS

EDM-M102	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 251
EDM-M163	12V DC solenoids		

PZME5

PROPORTIONAL PRESSURE REDUCING VALVE, TWO-PORT, PILOT OPERATED

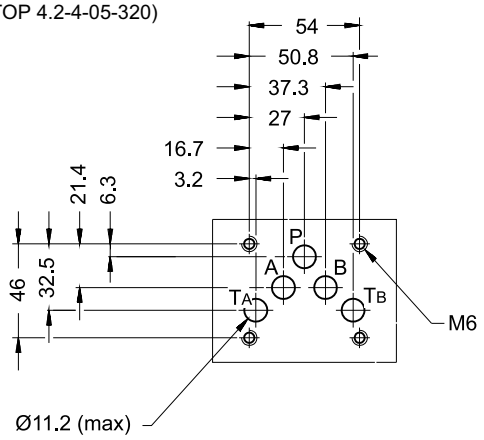
SERIES 10

MODULAR VERSION ISO 4401-05

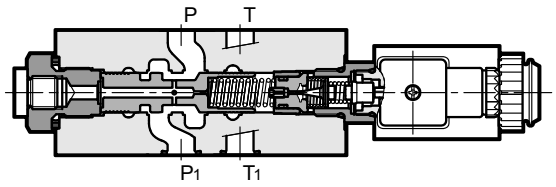
p max **320** bar
Q max **100** l/min

MOUNTING SURFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)



OPERATING PRINCIPLE



— PZME5 valves are two-ports pressure reducing valves, pilot operated, with proportional control. They are designed in modular version with mounting interface in compliance with ISO 4401-05 standards.

— These valves reduce pressure in the secondary branches of the circuit thus ensuring stability of controlled pressure in the event of variations in the flow rate through the valve.

— The valve can be controlled directly by a current control supply unit or by an electronic control card, to maximize the valve performance (see point. 10).

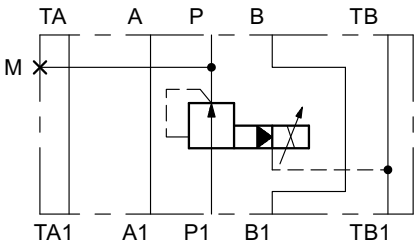
— The PZME5 valve is available in three pressure control ranges of up to 230 bar.

PERFORMANCES

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

Maximum operating pressure: - P-A-B ports - T port	bar	 320 2
Minimum controlled pressure	see Δp-Q diagram	
Maximum flow in P line Maximum flow on free flow paths Drain flow	l/min	100 100 0,4
Step response	see point 6	
Hysteresis (with PWM 200 Hz)	% of p nom	< 3%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see point 5	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	2.9

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

PZ	M	E	5	-	P		/	10		-			/	

Pressure reducing valve

Modular version

Electrical proportional control

Size: ISO 4401-05

Pressure reduction in P port

Pressure control range
070 = from 7 to 80 bar
150 = from 7 to 165 bar
230 = from 17 to 230 bar

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

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

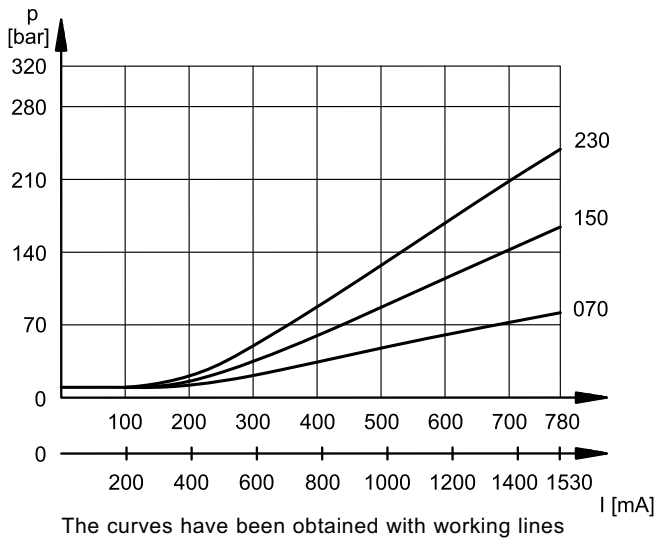
Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K2 = plug for connector type AMP JUNIOR
K7 = plug for connector type DEUTSCH DT04-2P male

Option: manual override (see point 9)

2 - CHARACTERISTIC CURVES

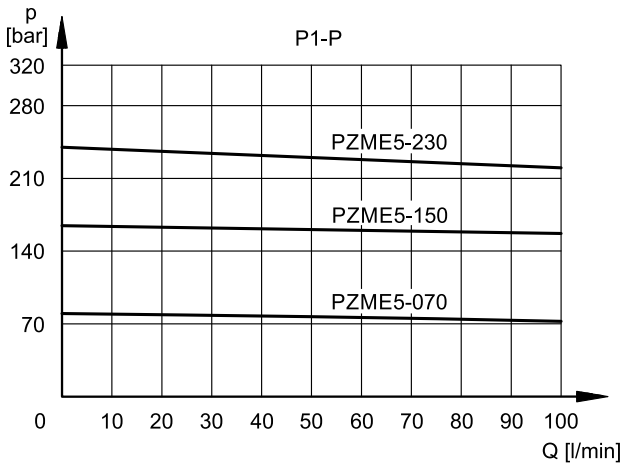
(measured with viscosity 36 cSt at 50 °C)

PRESSURE CONTROL p = f (I)



The curves have been obtained with working lines closed (without flow).

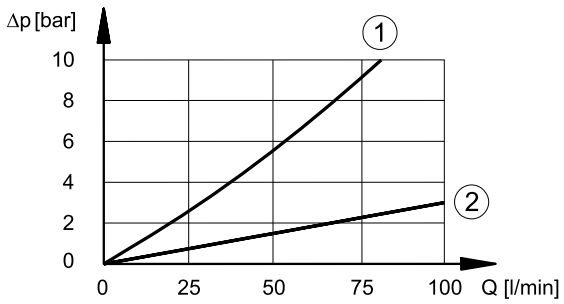
PRESSURE VARIATION p = f(Q)



The curves have been obtained with inlet pressure 50 bar higher than the reduced pressure.

With this Δp > 50 bar the flow rate values reduce considerably.

PRESSURE DROP Δp = f(Q)



1. pressure drops P1→ P
2. pressure drop in passing lines (ex. A ↔ A1)
3. pressure drops T 1→T

3 - MAX PRESSURE VALUES

This valve incorporates a mechanical limit of the maximum pressure, that operates independently of the applied current. This kind of design ensures that the pressure cannot rise over even if the solenoid current exceeds the maximum current ($I > I_{max}$).

Values obtained with oil viscosity of 36 cSt at 50°C. Values obtained with working lines closed (without flow).

		PZME5-070	PZME5-150	PZME5-230
pressure value at 780 mA	bar	80	165	230
max pressure value when $I > I_{max}$	bar	95	180	250

4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals.

For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other fluid types 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.

5 - ELECTRICAL CHARACTERISTICS

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube and is secured by means of a lock nut. It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	4.98	21
NOMINAL CURRENT	A	1.53	0.78
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	class H class F		

Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

electric connection	electric connection protection	whole valve protection
K1	IP65	IP65
K2	IP65	
K7	IP65/67	

6 - STEP RESPONSE

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

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 input flow rate of Q = 20 l/min with closed working lines.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	40	50

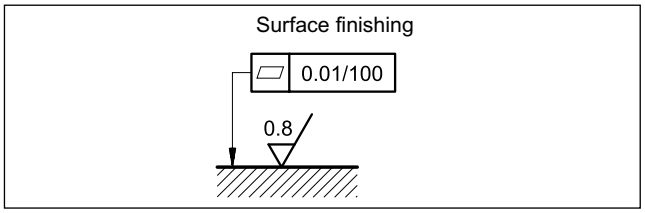
7 - INSTALLATION

These valves can be installed in any position without impairing correct operation if it is ensured that there is no air in the hydraulic circuit. Otherwise, vertical mounting with solenoid downward is preferable. In this case you must consider possible variations of the minimum controlled pressure values reported in point 2.

Connect the valve TB1 port directly to the reservoir.

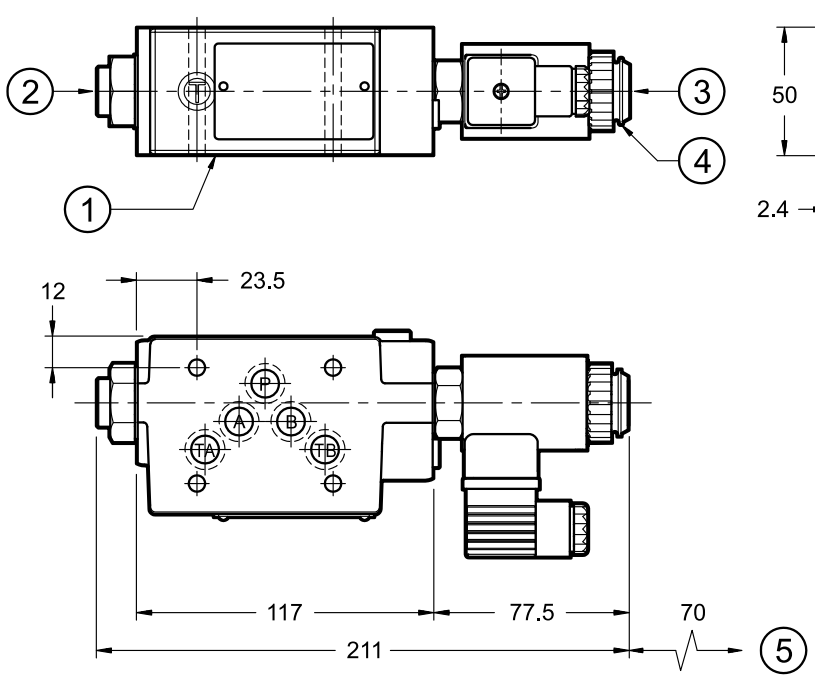
NOTE: Occurring return pressures are to be added up to the value of pressure setting at T port.

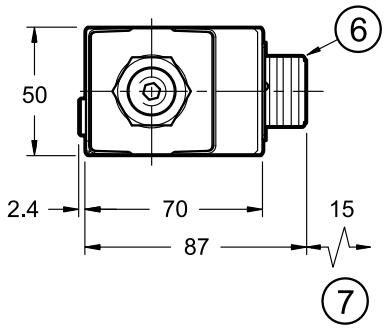
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.



8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) 90 shore
2	Pressure gauge port 1/4” BSP
3	Manual override, integrated in the solenoid tube
4	Locking ring: tightening torque: 5 Nm ± 0,5
5	Coil removal space
6	EN 175301-803 (ex DIN 43650) (included in the delivery)
7	Connector removal space

NOTE: Refer to catalog 81 101 for the dimensions of the K2 and K7 type electrical connections

9 - MANUAL OVERRIDE

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface. Two different manual override versions are available upon request: **CM** version, manual override boot protected, and **CK1** version, knob to screw.

For more information about these manual overrides, see the catalogue 81 101.

10 - ELECTRONIC CONTROL UNITS

EDM-M102	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 251
EDM-M163	12V DC solenoids		

PZE3

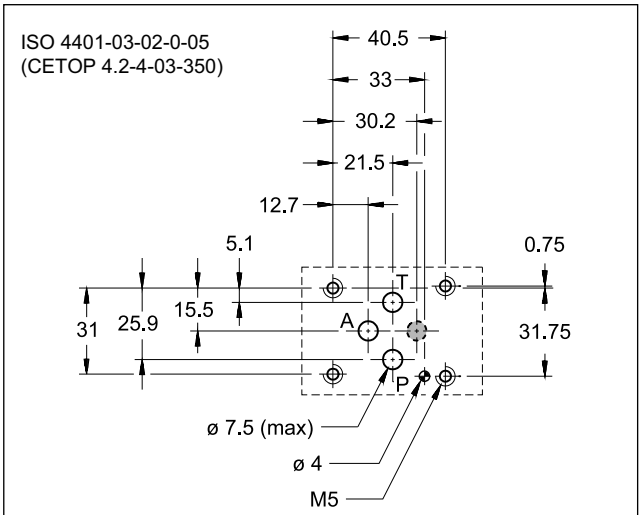
PROPORTIONAL 3-WAY PRESSURE REDUCING VALVE, PILOT OPERATED

SERIES 11

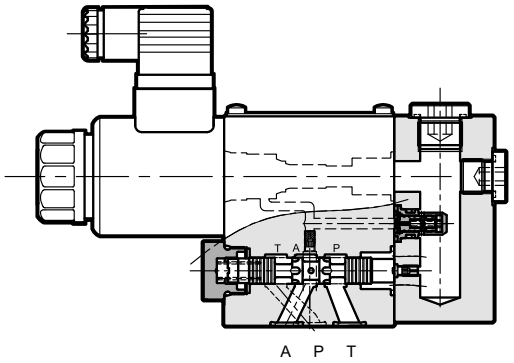
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



— The PZE3 valve is a proportional 3-way pressure reducing valve, pilot operated with mounting surface according to ISO 4401-03 standards.

— This valve controls the outlet pressure on port A by an electrical proportional control, reducing the inlet pressure from line P or relieving the overpressure from line A into T keeping it at the set value. (typically: hydraulic counter-weight or load balancing)

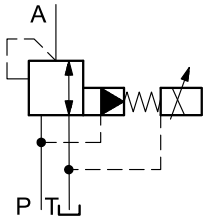
— PZE3 valves can be controlled directly by an amplifier or a proper electronic control unit

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

Maximum operating pressure: - P port - T port	bar	 350 2
Maximum flow (see p max = f(Q) diagram)	l/min	40
Step response	see paragraph 5	
Hysteresis	% of p nom	< 5%
Repeatability	% of p nom	< ±2%
Electrical characteristic	see paragraph 4	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	2,4

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	Z	E	3	-		/	11		/		K1

3-way pressure reducing valve, pilot operated

Electrical proportional control

Size ISO 4401-03

Pressure control range:
025 = 0 ÷ 25 bar
070 = 0 ÷ 70 bar
140 = 0 ÷ 140 bar
210 = 0 ÷ 210 bar
310 = 0 ÷ 310 bar

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

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

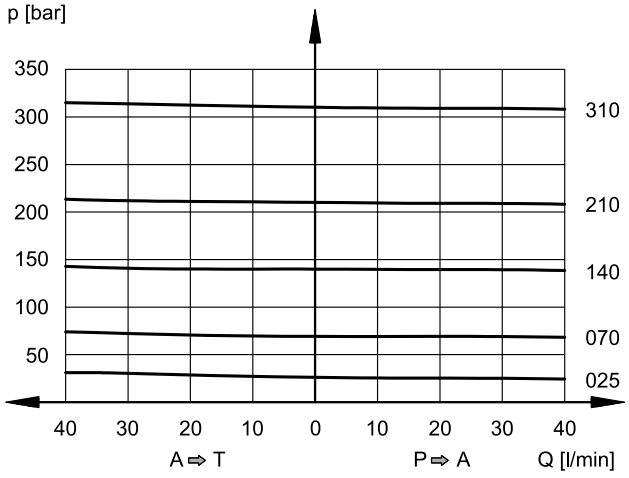
Nominal solenoids voltage:
D12 = 12 V CC
D24 = 24 V CC

Coil electrical connection:
for connector type EN 175301-803
(ex DIN 43650) (**standard**)

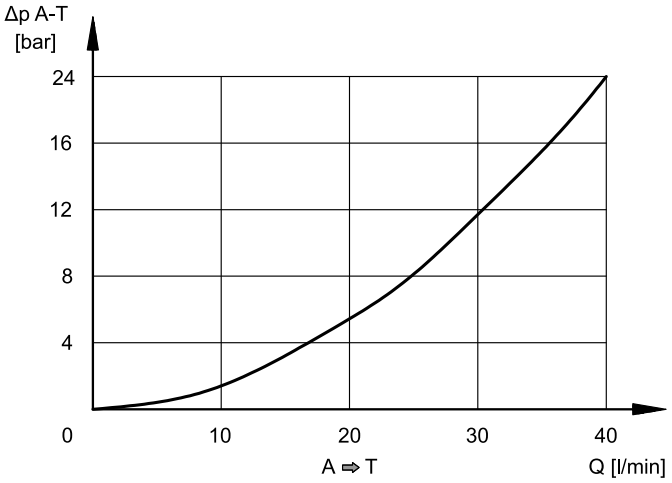
2 - CHARACTERISTIC CURVES

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

SET PRESSURE

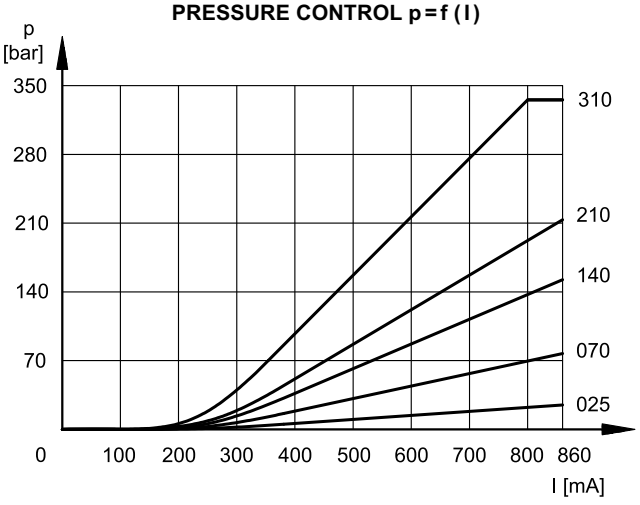


MINIMUM PRESSURE Δp = f (Q)



Pressure drops A →T vs. flow, without backpressure in T port and command signal = 0V.

PRESSURE CONTROL p = f (I)



3 - 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 fluid types 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.

4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube, secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
MAXIMUM CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
PROTECTION FROM: Atmospheric agents (EN 60529)	IP 65		
CLASS OF PROTECTION: Coil insulation (VDE 0580) Impregnation	class H class F		

5 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

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

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	80	80

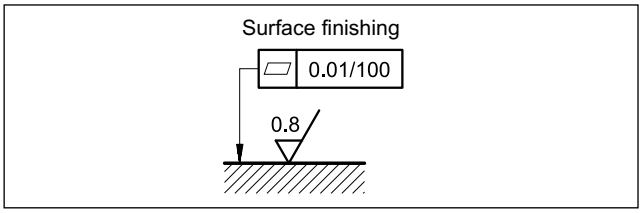
6 - INSTALLATION

We recommend installing the PZE3 valve 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 shown in paragraph 2.

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

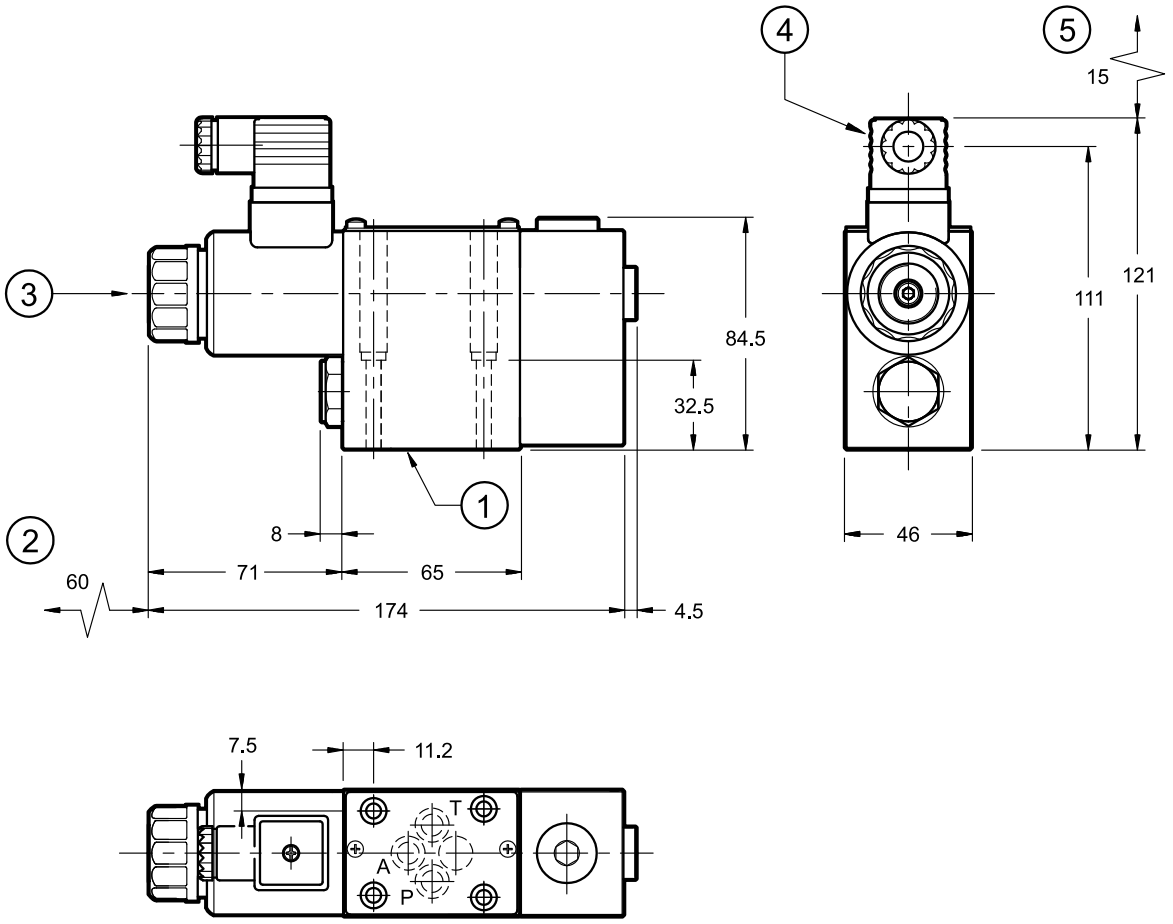
Connect the valve T port directly to the tank. **Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.**

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



7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



NOTE: at first start up, or after a long period of no use, it is necessary to vent the air through the breather (3) placed at the end of the solenoid tube.

Valve fastening: N. 4 bolts M5x40 - ISO 4762	
Tightening torque: 5 Nm (A8.8 screws)	
Threads of mounting holes: M5x10	

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Coil removal space
3	Breather (male hexagonal spanner 4)
4	EN 175301-803 (ex DIN 43650) electric connector (included in the delivery)
5	Connector removal space

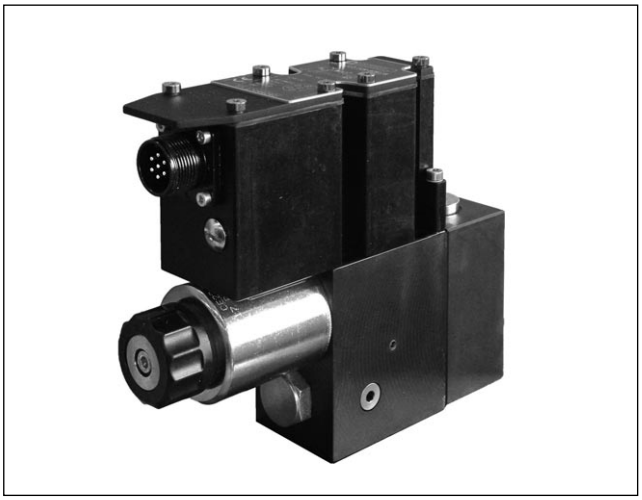
8 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251
EDM-M142	for solenoid 12V DC		

9 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A and B: 3/8” BSP thread



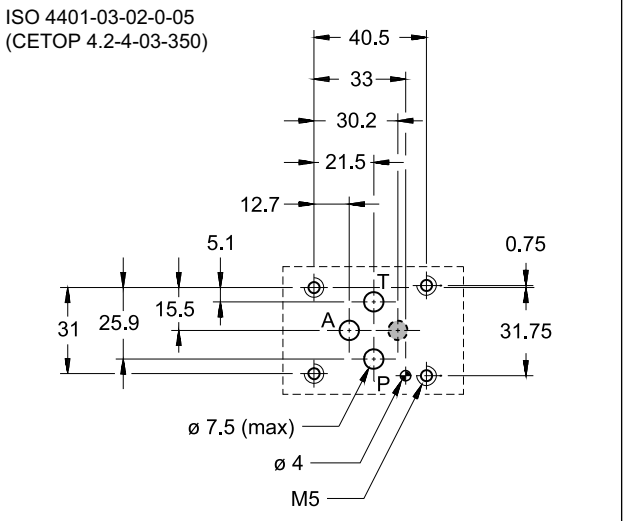
PZE3G*

PROPORTIONAL THREE-PORT PRESSURE REDUCING VALVE, PILOT OPERATED, WITH INTEGRATED ELECTRONICS

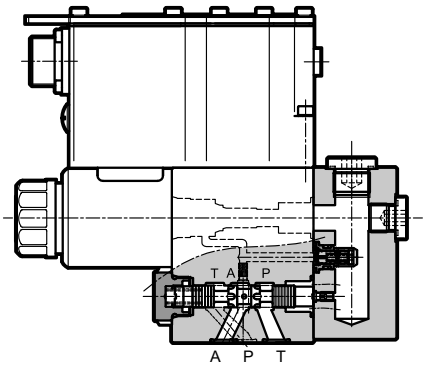
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



— PZE3G* valve is a proportional three-port pressure reducing valve, pilot operated, with on-board electronics with mounting surface according to ISO 4401-03 standards.

— This valve controls the outlet pressure on port A, reducing the inlet pressure from line P or relieving the overpressure from line A into T keeping it at the set value. (typically: hydraulic counter-weight or load balancing)

— It is suitable to modulate the pressure in hydraulic circuits.

— It is available with different types of electronics, with analogue or fieldbus interfaces.

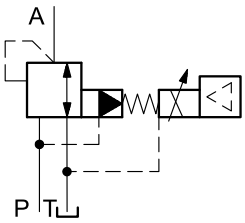
— Valves are easy to install. The driver directly manages digital settings.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

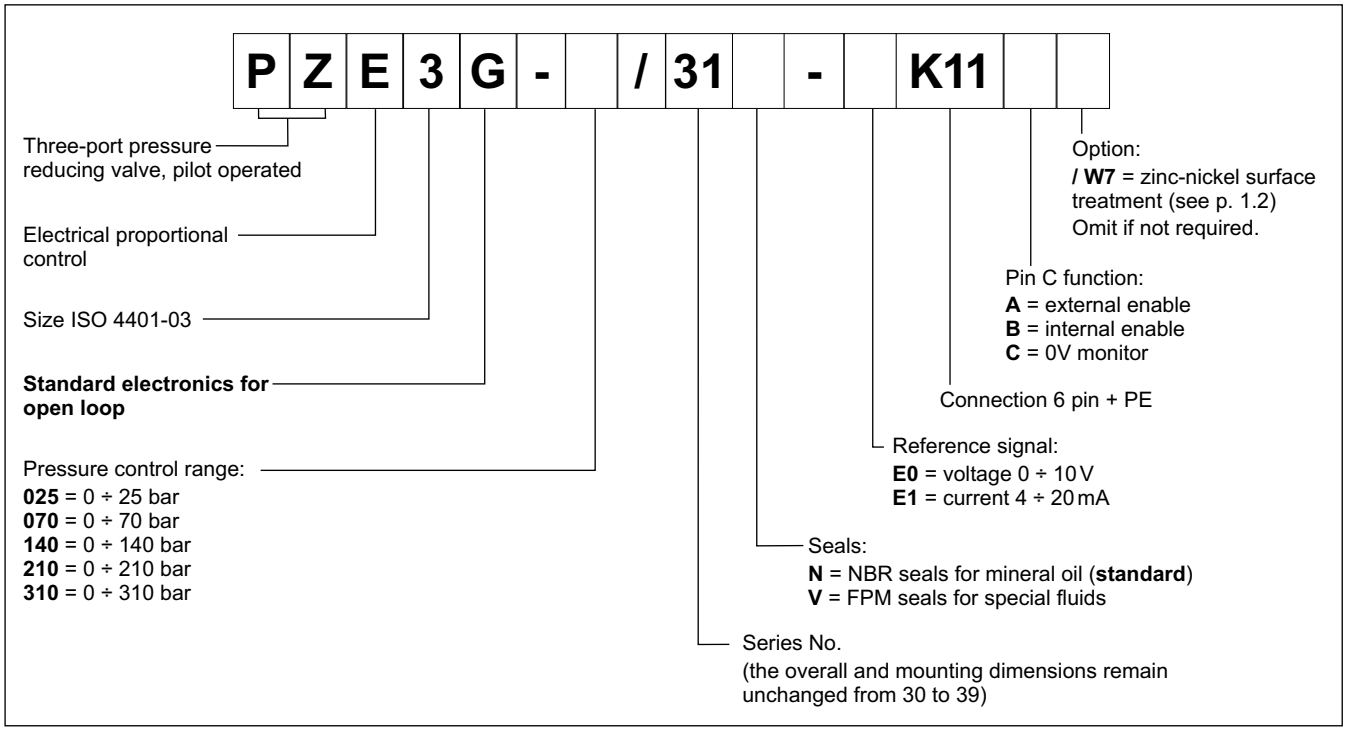
Maximum operating pressure: - P port - T port	bar	 350 2
Maximum flow (see p max = f(Q) diagram)	l/min	40
Step response	see point 7	
Hysteresis	% of p nom	< 3%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see point 2	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	2.7

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

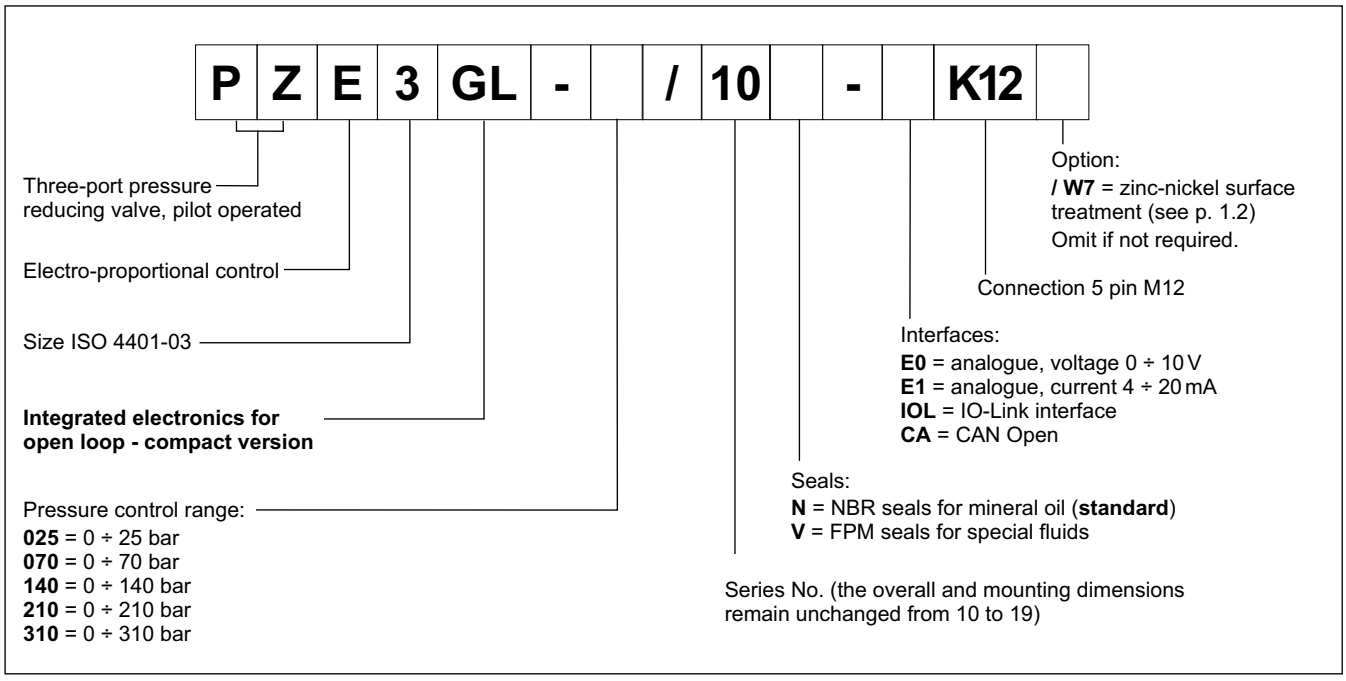
1.1 - Standard electronics



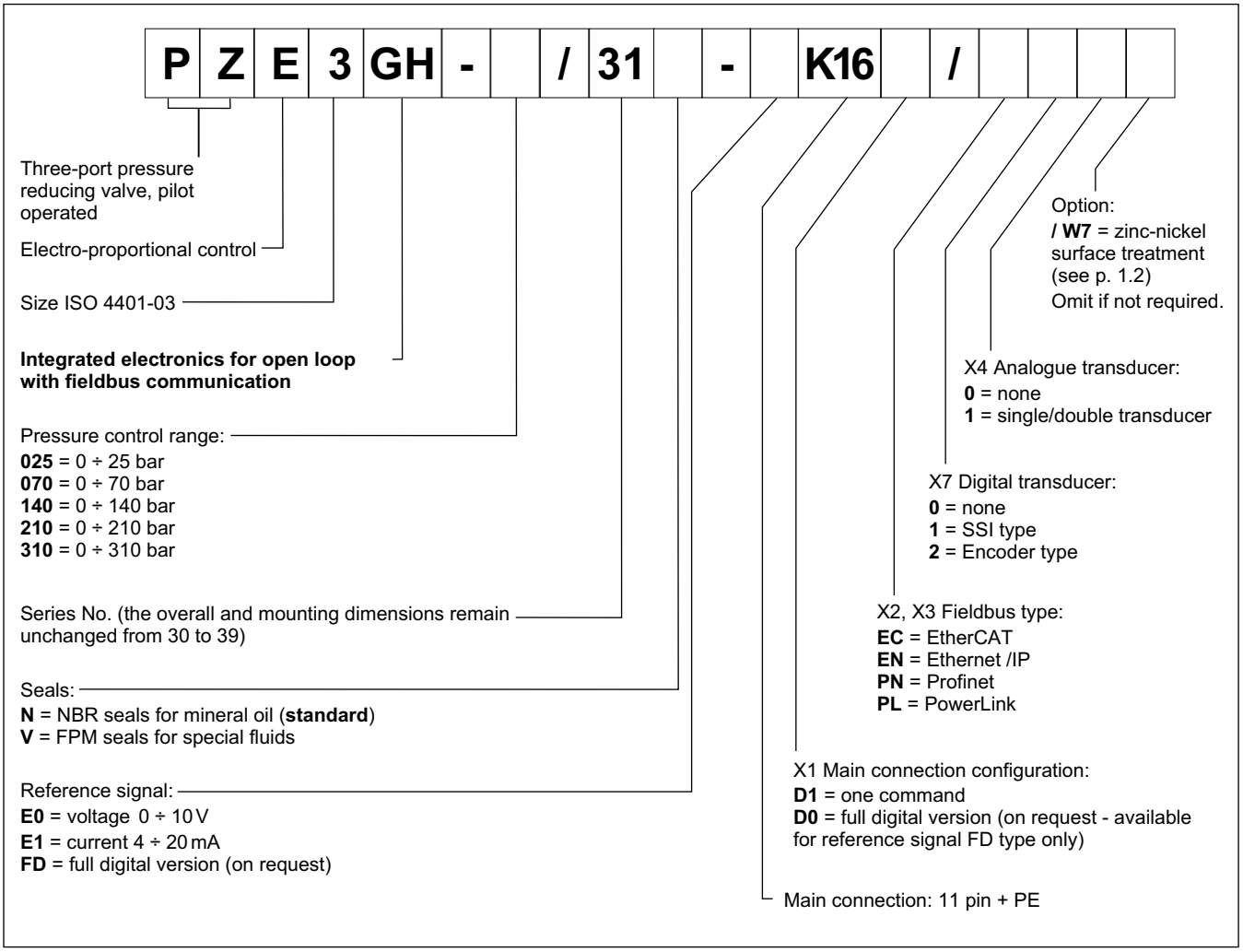
1.2 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.3 - Compact electronics



1.4 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect with caps any unused connections.

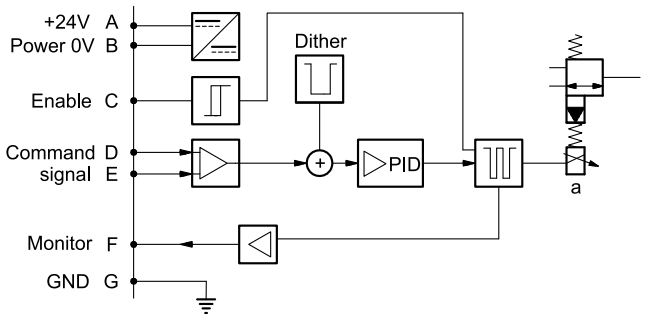
3 - PZE3G - STANDARD ELECTRONICS

3.1 - Electrical characteristics

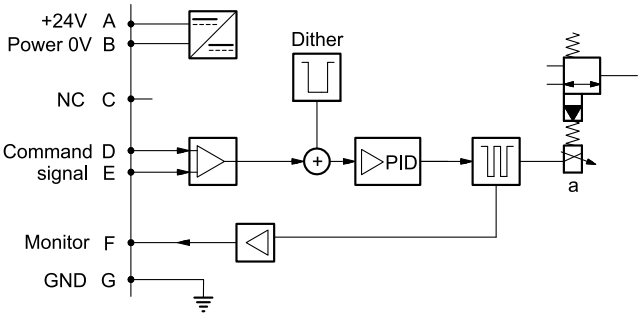
Command signal:	voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid):	voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication for diagnostic			LIN-bus Interface (by means of the optional kit)
Connection			6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

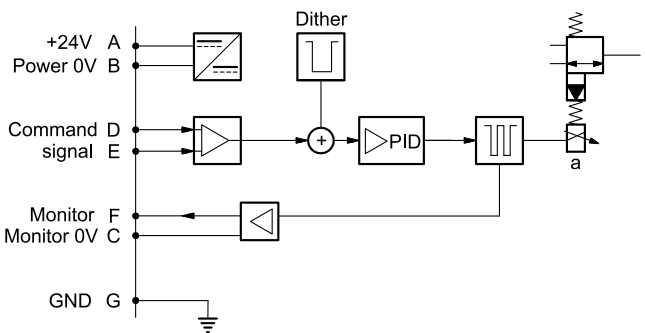
VERSION A - External Enable



VERSION B - Internal Enable

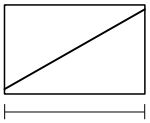


VERSION C - 0V Monitor

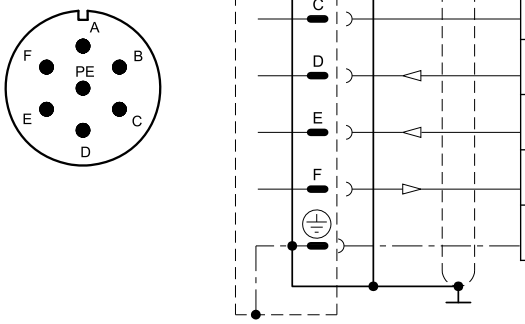


3.3 - Versions with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**

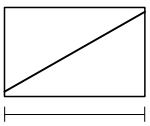


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command (differential input)		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

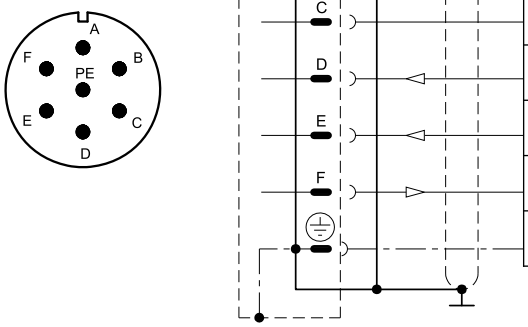
3.4 - Version with current command (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**



Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - PZE3GL - COMPACT ELECTRONICS

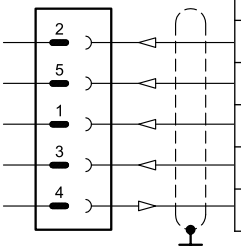
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	IO-Link Port Class B 230.4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Data register (IOL and CA versions only)		solenoid voltage supply, solenoid faults (shortcircuit, bad config, internal), box temperature, switch-on time, vibrations
Connection		5-pin M12 code A (IEC 61076-2-101)

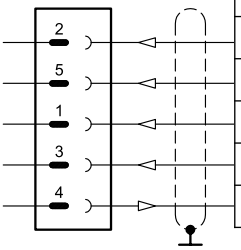
4.2 - Pin tables

'E0' connection



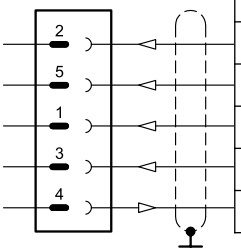
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection



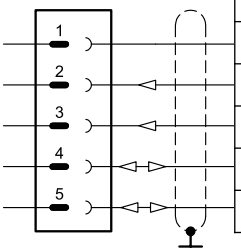
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



Pin	Values		Function
2	2L+	24 V DC	Supply of the power stage
5	2L-	0 V (GND)	Internal galvanic isolation from PIN 3
1	1L+	+24 V DC	IO-Link supply voltage
3	1L-	0V (GND)	
4	C/Q		IO-Link Communication

'CA' connection



Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

5 - PZE3GH - FIELDBUS ELECTRONICS

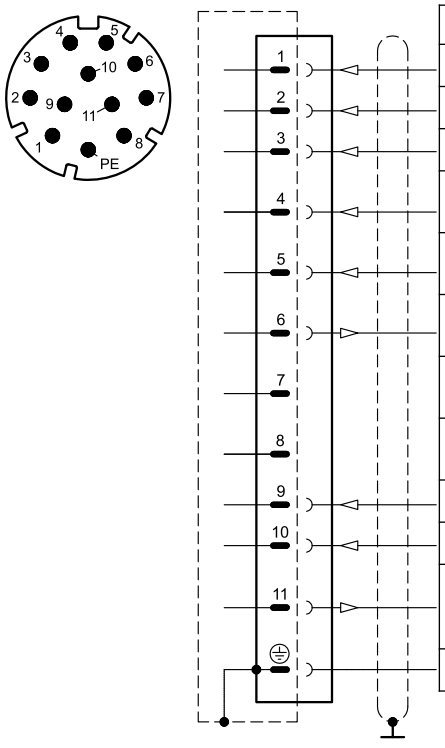
The 11+ PE pin connection allows separate supply voltage for electronics and solenoid.

Command - valve position schemes as for the standard electronics. Please refer to pictures in par. 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female

Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

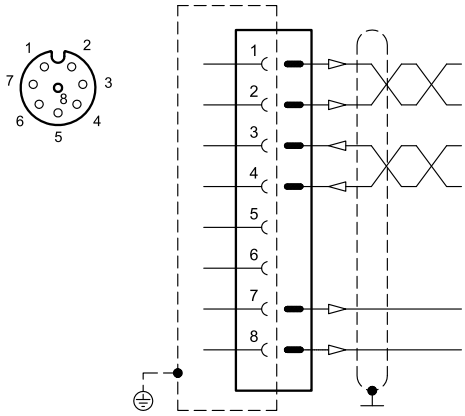
X3 (OUT) connection: M12 D 4 pin female

Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

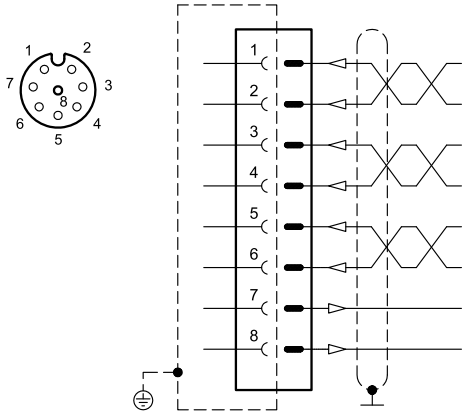
5.4 - Digital transducer connection
X7 connection: M12 A 8 pin female

VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

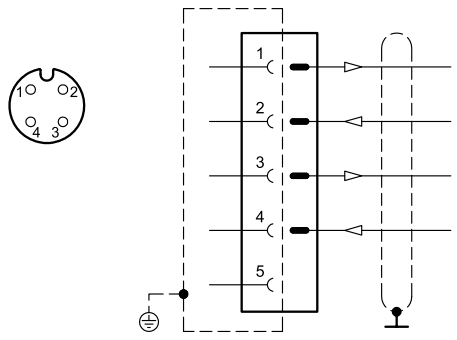
VERSION 2: ENCODER type



Pin	Values	Function	Notes
1	ENC_Z+	input channel Z+	Input - digital signal
2	ENC_Z-	input channel Z-	
3	ENC_A+	input channel A+	
4	ENC_A-	input channel A+	
5	ENC_B+	input channel B+	
6	ENC_B-	input channel B+	
7	+5 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection
X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer
(single or double is a software-selectable option)



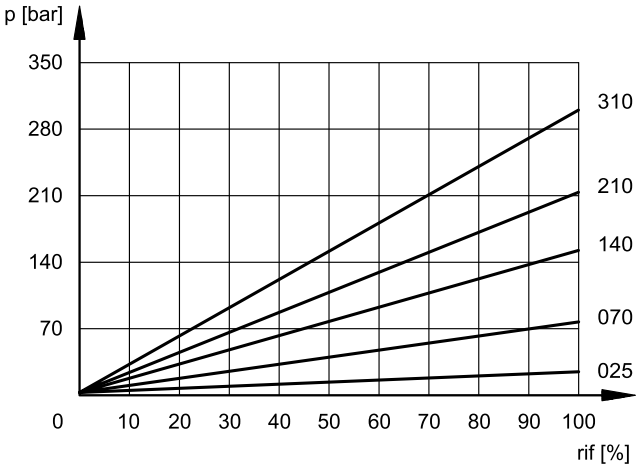
Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

6 - CHARACTERISTIC CURVES

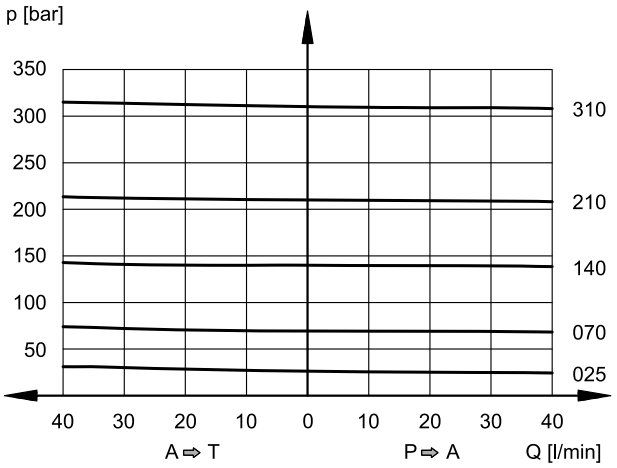
(measured with viscosity of 36 cSt at 50°C)

Typical control characteristics, according to the reference signal for available pressure control ranges. Characteristic curves measured without backpressure in T, with linearity compensation set by the onboard electronics.

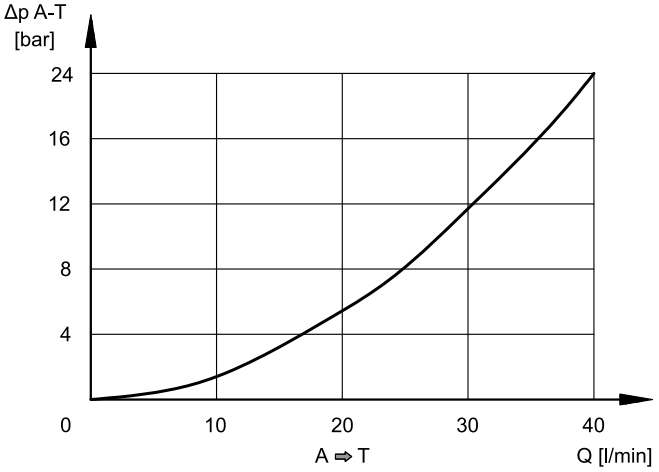
PRESSURE CONTROL p = f (I)



SET PRESSURE p max = f (Q)



MIN. CONTROLLED PRESSURE p min = f (Q)



Pressure drops A →T vs. flow, without backpressure in T port and reference signal = 0 %

7 - RESPONSE TIMES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

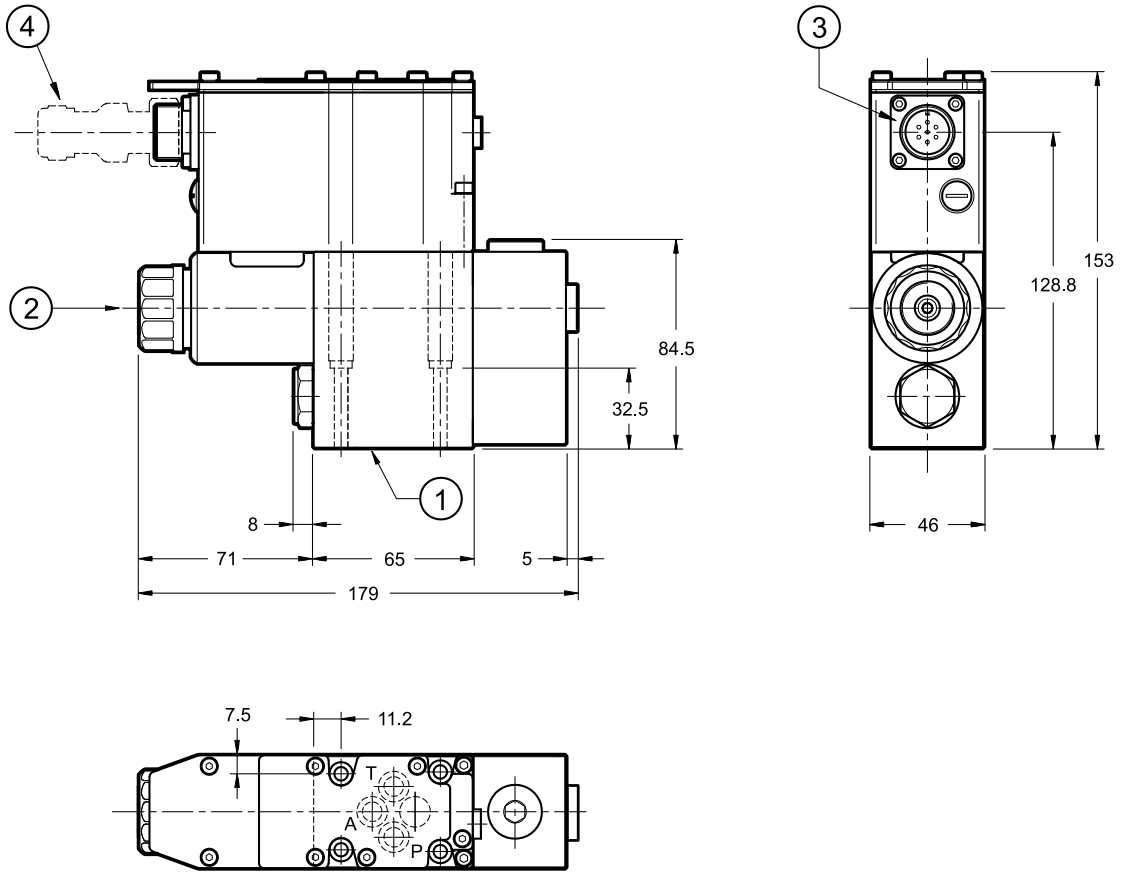
Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The response time is affected both by the flow rate and the oil volume in the pipework.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	80	80

8 - PZE3G - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



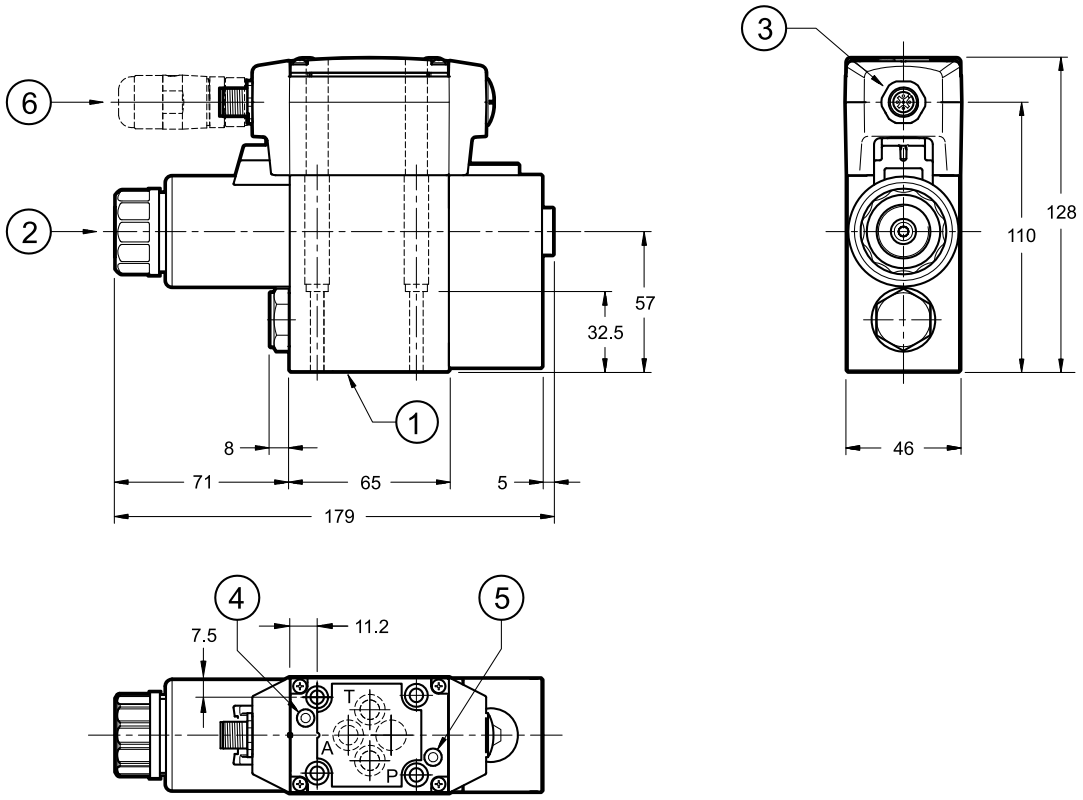
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Valve fastening: N. 4 SHC screws M5x40 - ISO 4762
Tightening torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25 x 1.78)
2	Breather: Allen key 4
3	Main connection 6 pin + PE
4	Mating connector 6 poles + PE , female type MIL-5015-G **To be ordered separately.** See catalogue 89 000

9 - PZE3GL - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



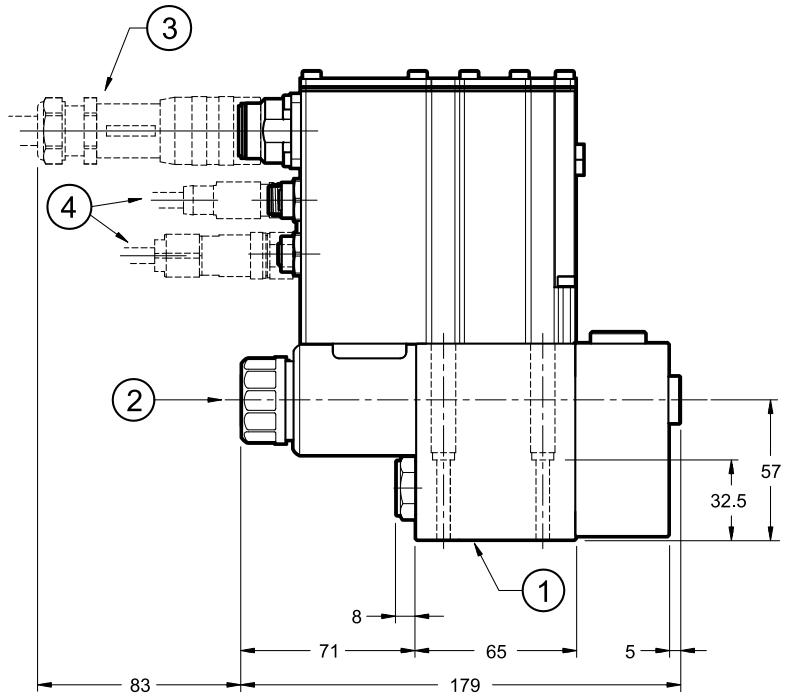
1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Connection M12 A 5 pin
4	L1 LED
5	L2 LED
6	Mating connector M12 5 poles - code A, female **To be ordered separately.** See catalogue 89 000

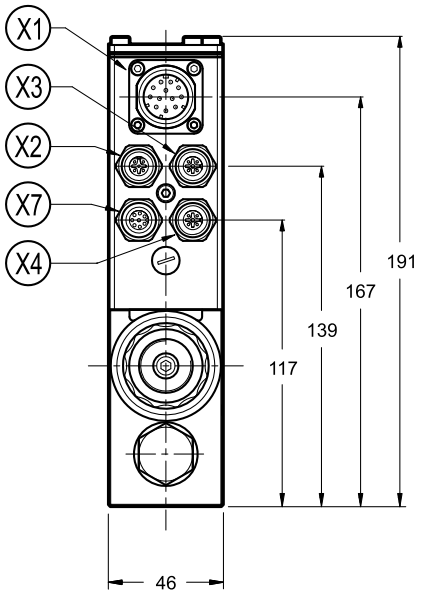
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

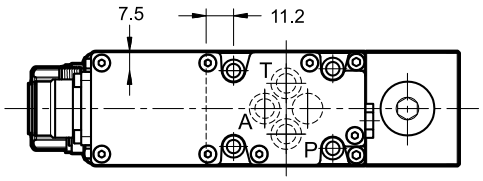
Valve fastening: N. 4 SHC screws M5x40 - ISO 4762
Tightening torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

10 - PZE3GH - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm







X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

Fastening bolts: 4 bolts M5x40 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

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 (2) placed at the end of the solenoid tube.

NOTE 2: Depending on the chosen version, X4 and X7 connections may not be present.

Please refer to section 5 for connection descriptions and pinout.

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
4	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000

11 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. 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.

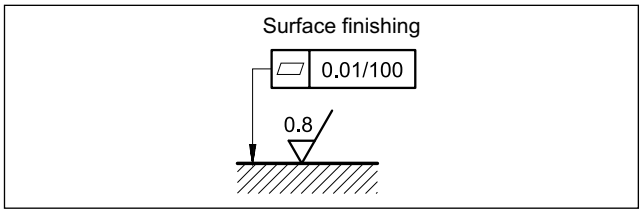
12 - INSTALLATION

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 section 6.

Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube. So, ensure the solenoid tube is always filled with oil. When finished, make sure you have screwed the screw back in correctly.

Connect the valve T port 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.



13 - ACCESSORIES

(to be ordered separately)

13.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

13.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

13.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

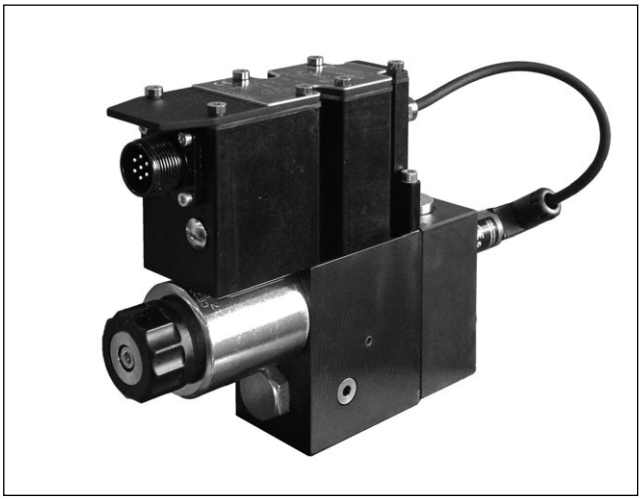
13.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

14 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A, B: 3/8” BSP thread



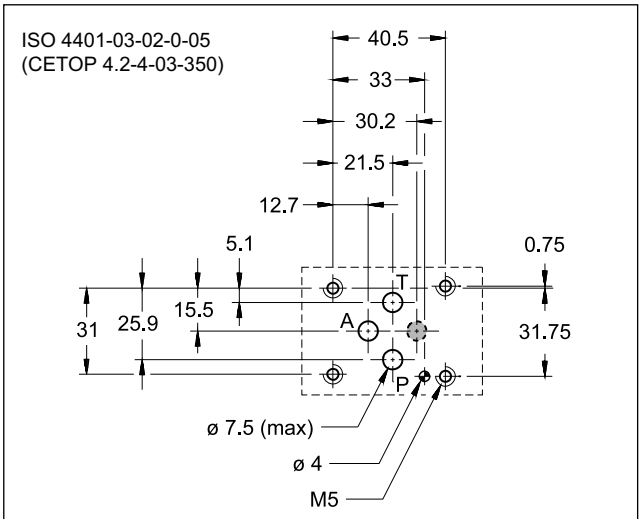
PZE3J*

PROPORTIONAL THREE-PORT PRESSURE REDUCING VALVE, WITH PRESSURE CLOSED LOOP AND INTEGRATED ELECTRONICS

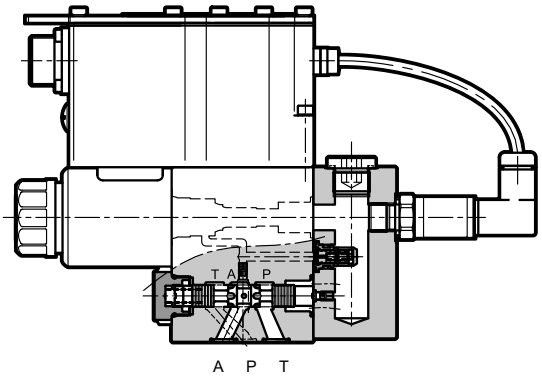
SUBPLATE MOUNTING ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



— PZE3J* valve is a proportional three-port pressure reducing valve, pilot operated, with pressure feedback, on-board electronics and mounting surface according to ISO 4401-03 standards.

— This valve controls the outlet pressure on port A, reducing the inlet pressure from line P or relieving the overpressure from line A into T keeping it at the set value. (typically: hydraulic counter-weight or load balancing)

— The valve is available with different types of electronics, with analogue or fieldbus interfaces.

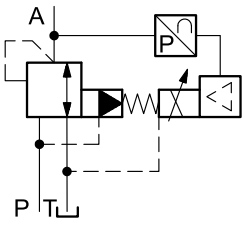
— The valve is easy to install. The driver directly manages digital settings.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

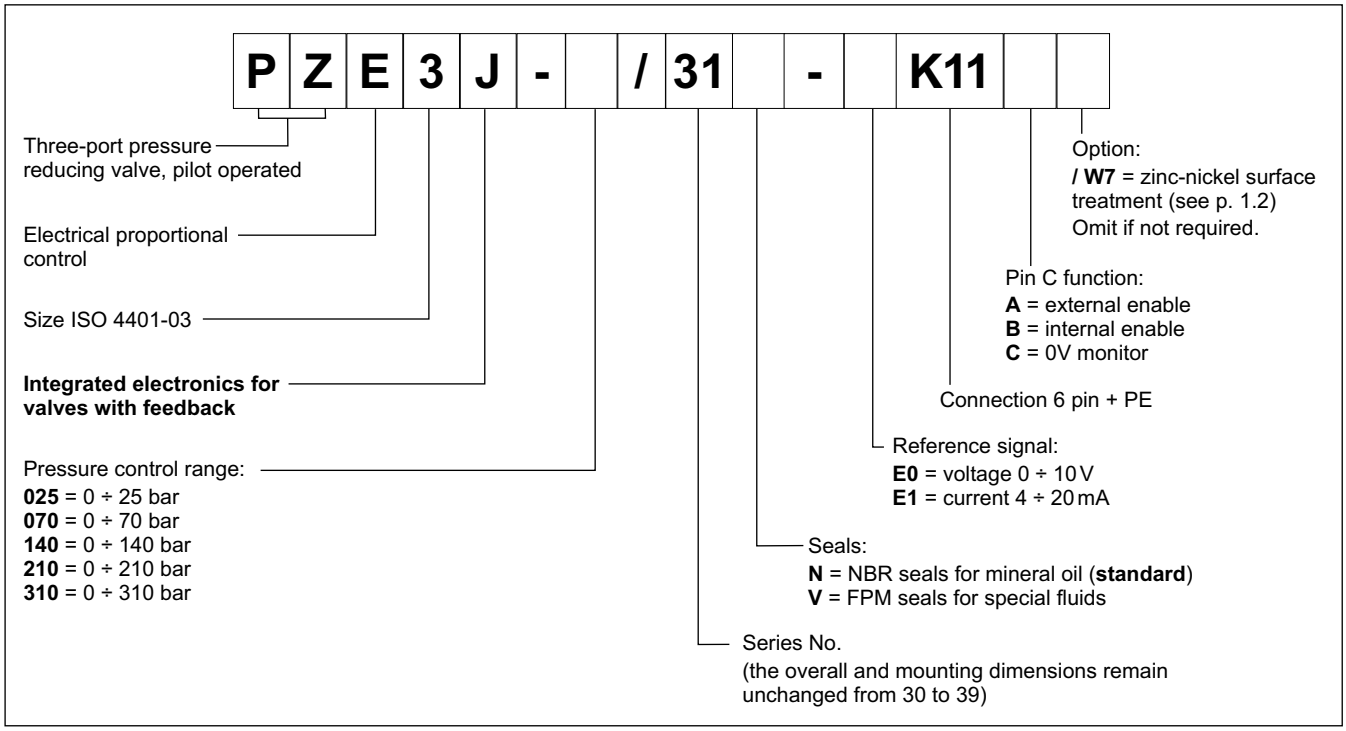
Maximum operating pressure: - P port - T port	bar	 350 2
Maximum flow (see p max = f(Q) diagram)	l/min	40
Step response	see point 7	
Hysteresis	% of p nom	< 1 %
Repeatability	% of p nom	< ± 0.5%
Electrical characteristic	see point 2	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	3

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

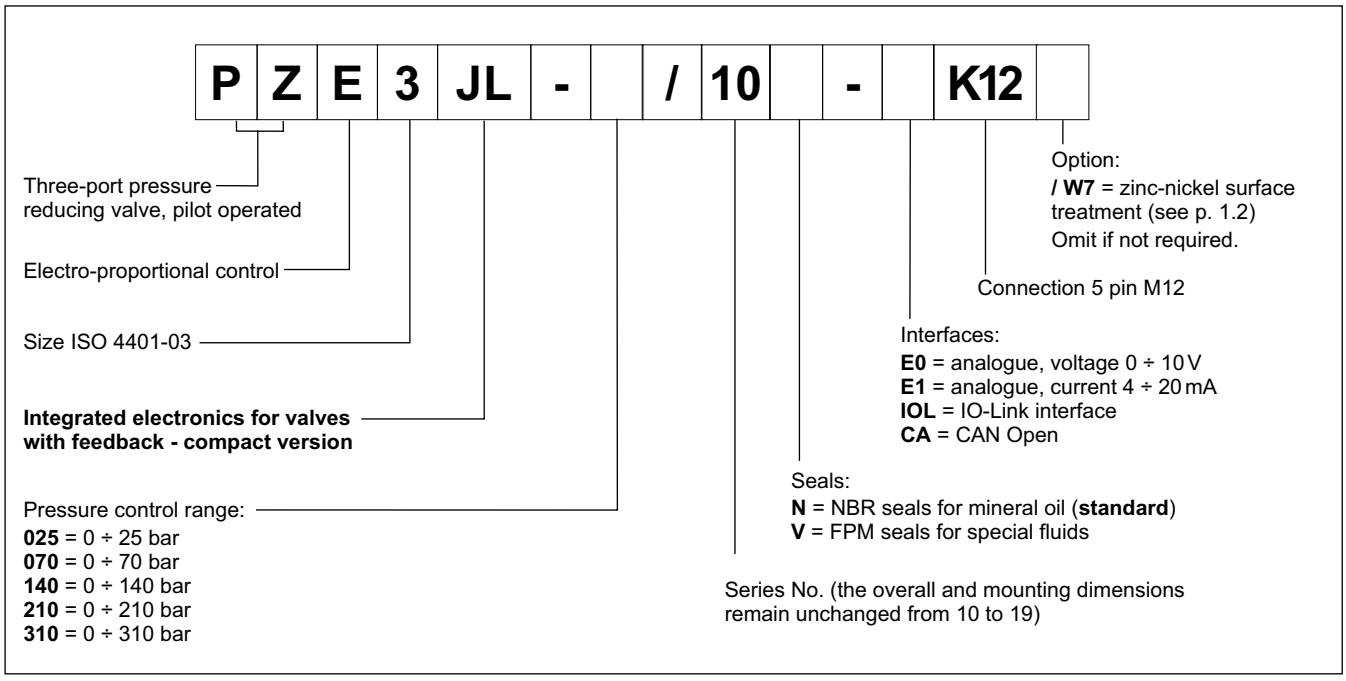
1.1 - Standard electronics



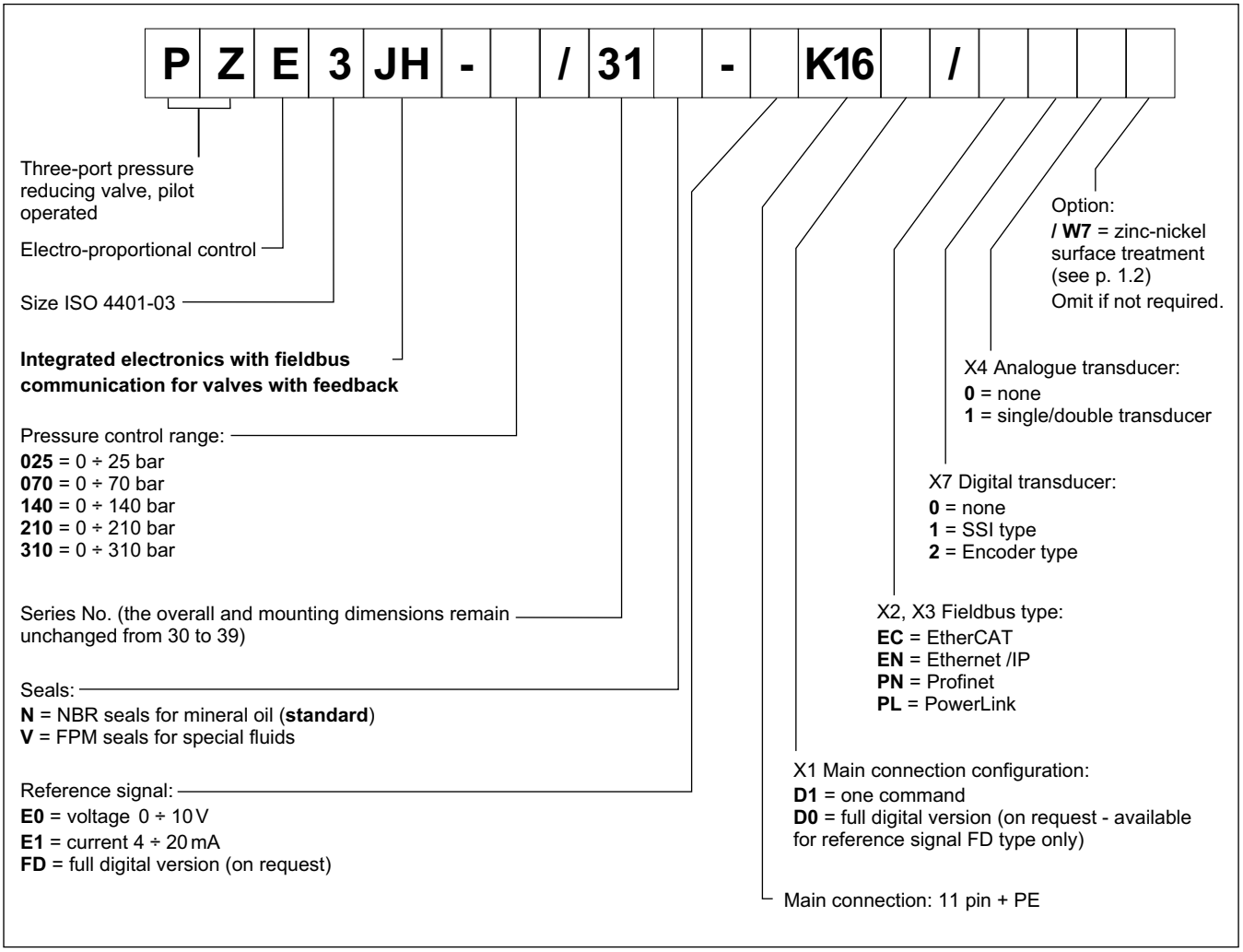
1.2 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.3 - Compact electronics



1.4 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	2A time lag
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the JH versions it is necessary to protect with caps any unused connections.

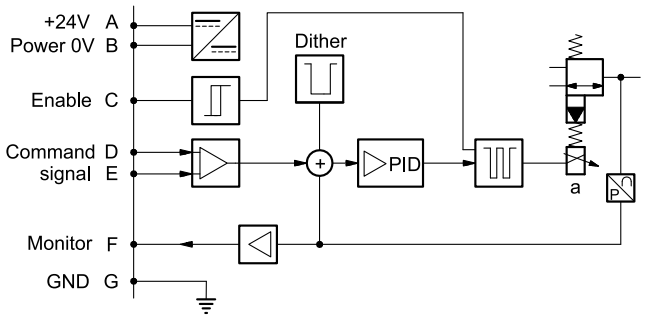
3 - PZE3J - STANDARD ELECTRONICS

3.1 - Electrical characteristics

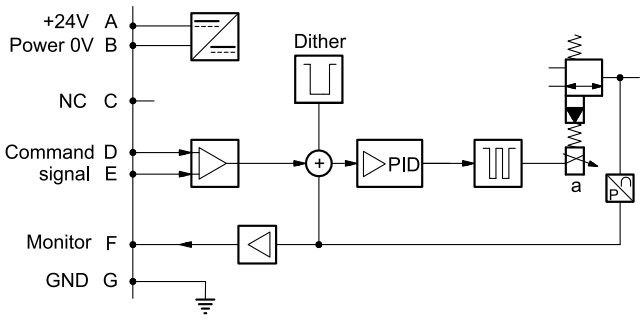
Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

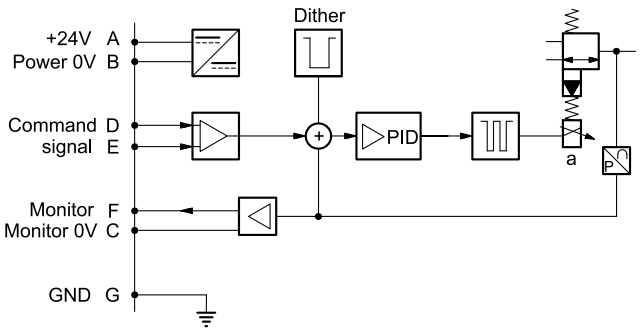
VERSION A - External Enable



VERSION B - Internal Enable

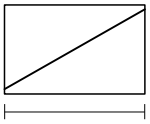


VERSION C - 0V Monitor

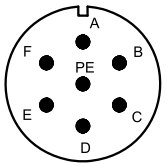


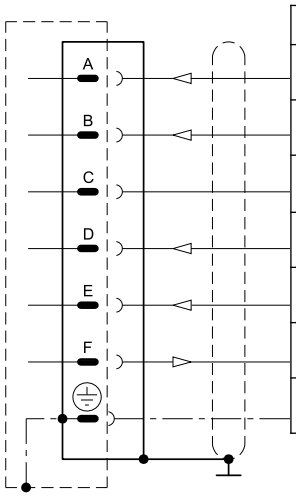
3.3 - Versions with voltage command (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**



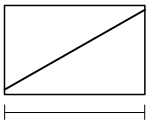


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	0 ÷ 10 V	Command (differential input)		
E	0 V	Command reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

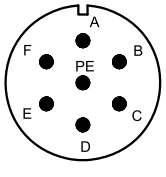
3.4 - Versions with current command (E1)

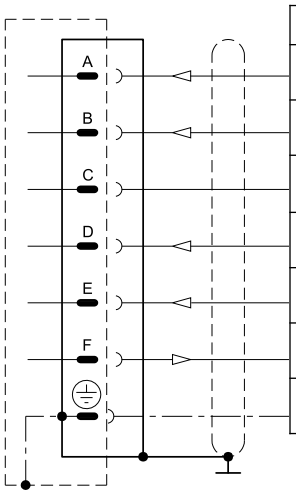
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - PZE3JL - COMPACT ELECTRONICS

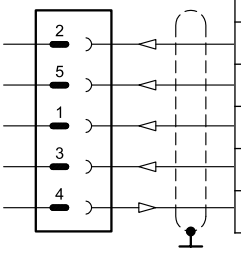
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	kBaud	IO-Link Port Class B 230.4
Can Open communication (CA): Data rate	kbit	10 ÷ 1000
Data register (IOL and CA versions only)		solenoid voltage supply, solenoid faults (shortcircuit, bad config, internal), box temperature, switch-on time, vibrations
Connection		5-pin M12 code A (IEC 61076-2-101)

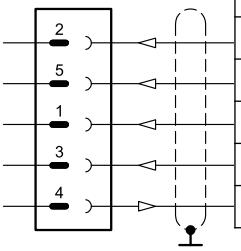
4.2 - Pin tables

'E0' connection



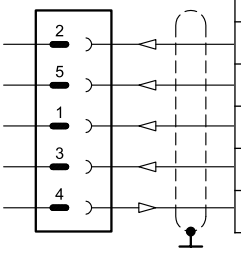
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	0 ÷ 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection



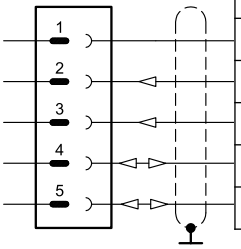
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



Pin	Values	Function
2	2L+ 24 V DC	Supply of the power stage
5	2L- 0 V (GND)	Internal galvanic isolation from PIN 3
1	1L+ +24 V DC	IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

'CA' connection



Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

5 - PZE3JH - FIELDBUS ELECTRONICS

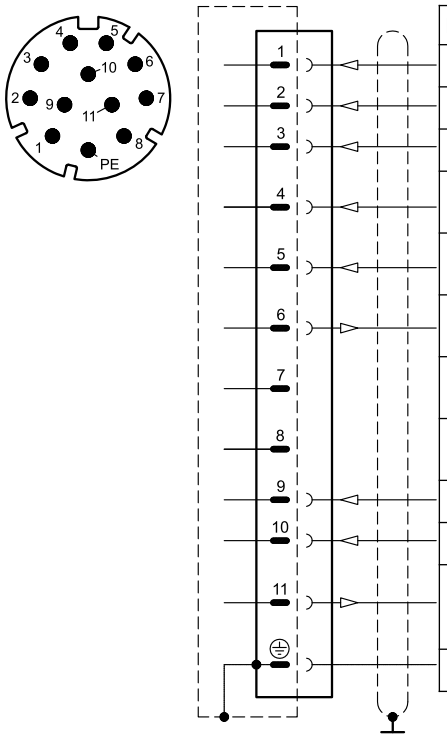
The 11+ PE pin connection allows separate supply voltage for electronics and solenoid.

Command - valve position schemes as for the standard electronics. Please refer to pictures in point 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	V DC mA	0 ÷ 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm) via fieldbus
Monitor signal (pressure at transducer): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standard		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table



D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	0 ÷ 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female

Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

X3 (OUT) connection: M12 D 4 pin female

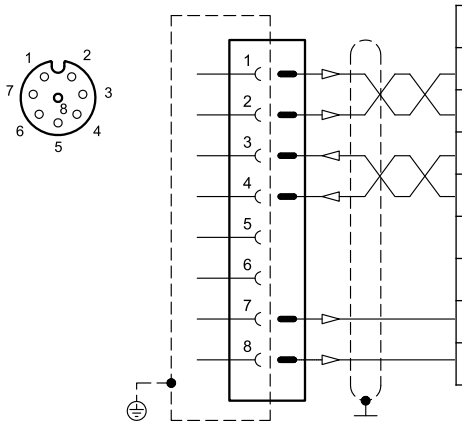
Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

5.4 - Digital transducer connection

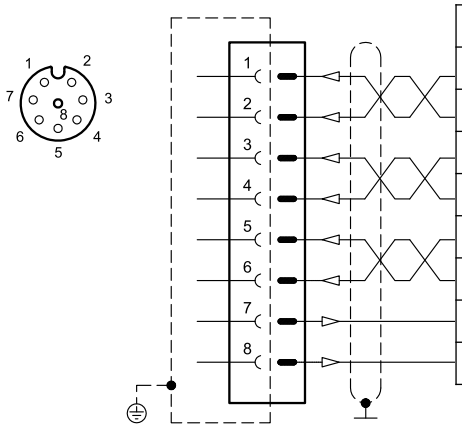
X7 connection: M12 A 8 pin female

VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

VERSION 2: ENCODER type



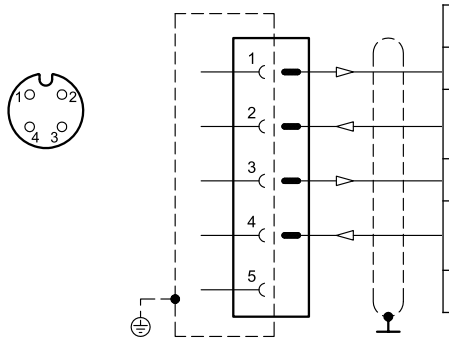
Pin	Values	Function	Notes
1	ENC_Z+	input channel Z+	Input - digital signal
2	ENC_Z-	input channel Z-	
3	ENC_A+	input channel A+	
4	ENC_A-	input channel A+	
5	ENC_B+	input channel B+	
6	ENC_B-	input channel B+	
7	+5 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection

X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer

(single or double is a software-selectable option)



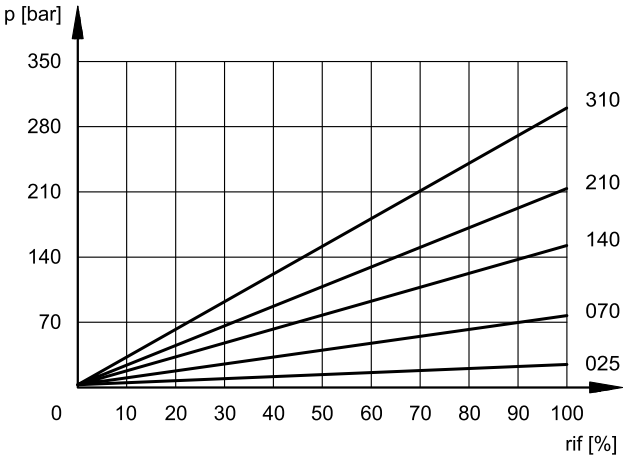
Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

6 - CHARACTERISTIC CURVES

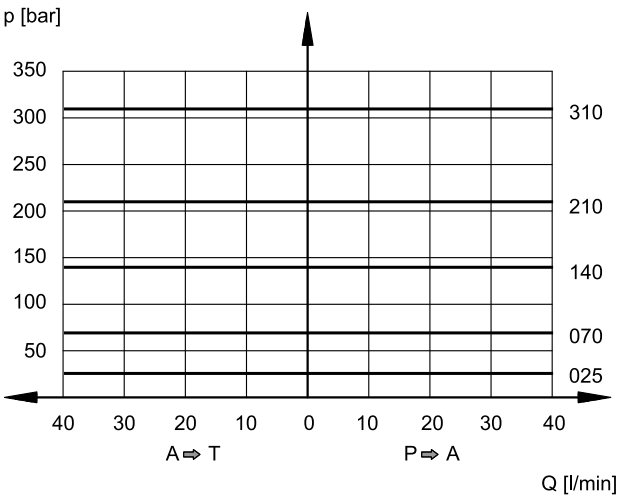
(measured with viscosity of 36 cSt at 50°C)

Typical control characteristics, according to the reference signal for available pressure control ranges. Characteristic curves measured without backpressure in T, with linearity and hysteresis compensation set by the onboard electronics.

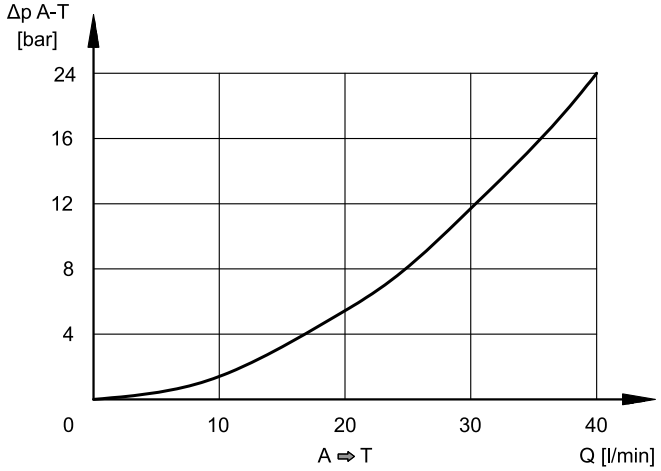
PRESSURE CONTROL p = f (I)



SET PRESSURE p max = f (Q)



MIN CONTROLLED PRESSURE p min = f (Q)

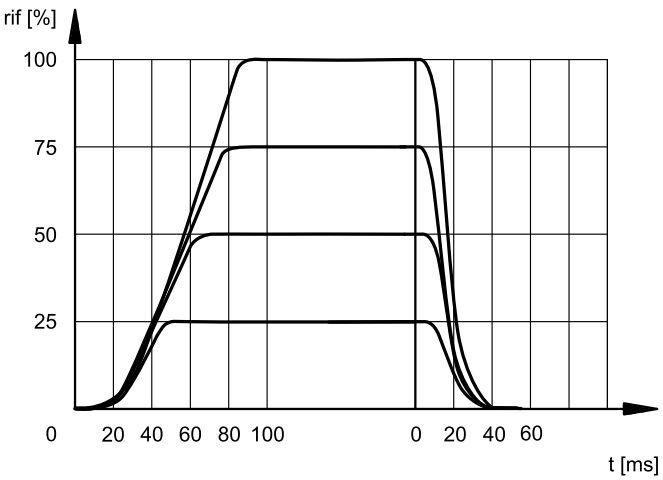


Pressure drops A →T vs. flow, without backpressure in T port and reference signal = 0 %

7 - RESPONSE TIMES

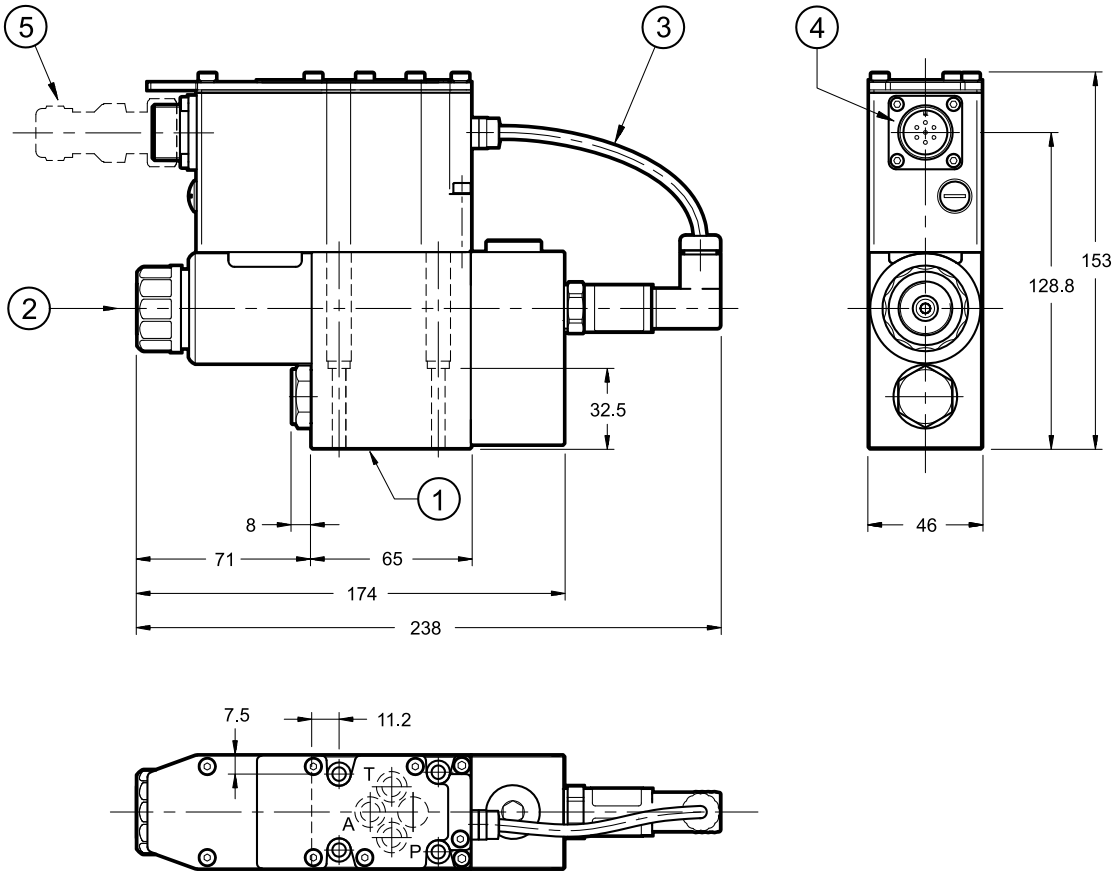
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

The response time is affected by both the flow rate and the oil volume in the pipework.



8 - PZE3J - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



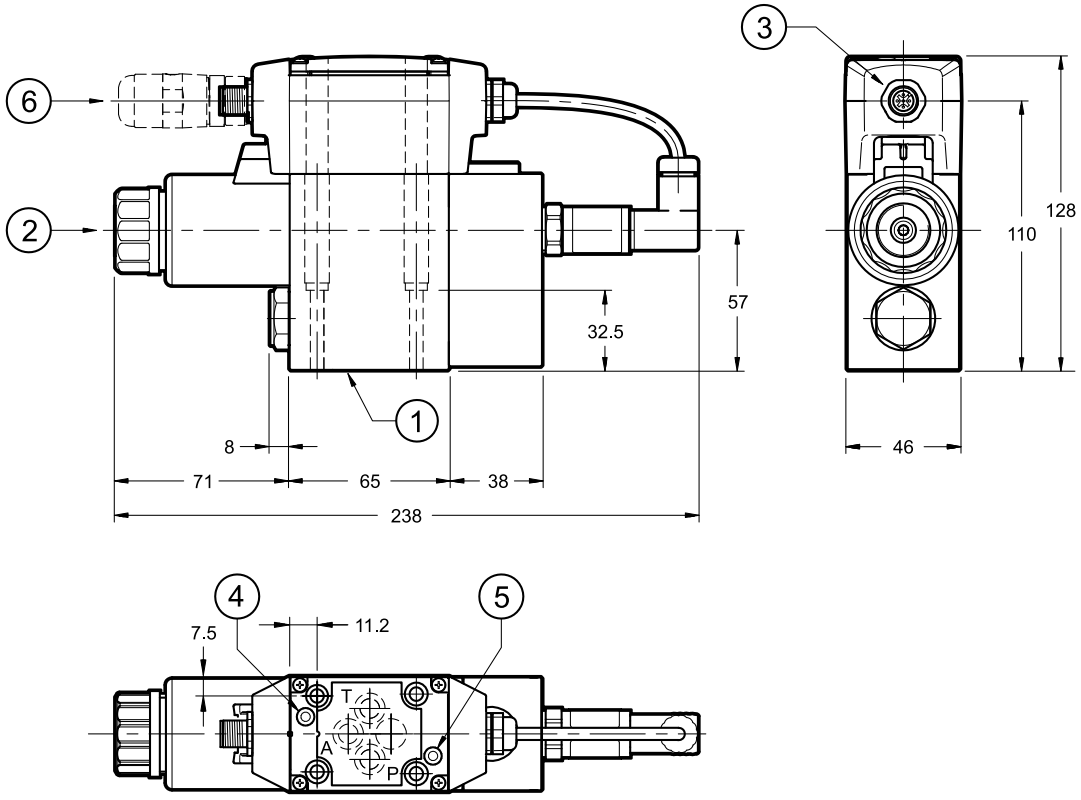
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHC screws M5x40 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Breather: Allen key 4
3	Cable with connector for pressure transducer
4	Main connection
5	Mating connector 6 poles + PE , female type MIL-5015-G **To be ordered separately.** See catalogue 89 000 0

9 - PZE3JL - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



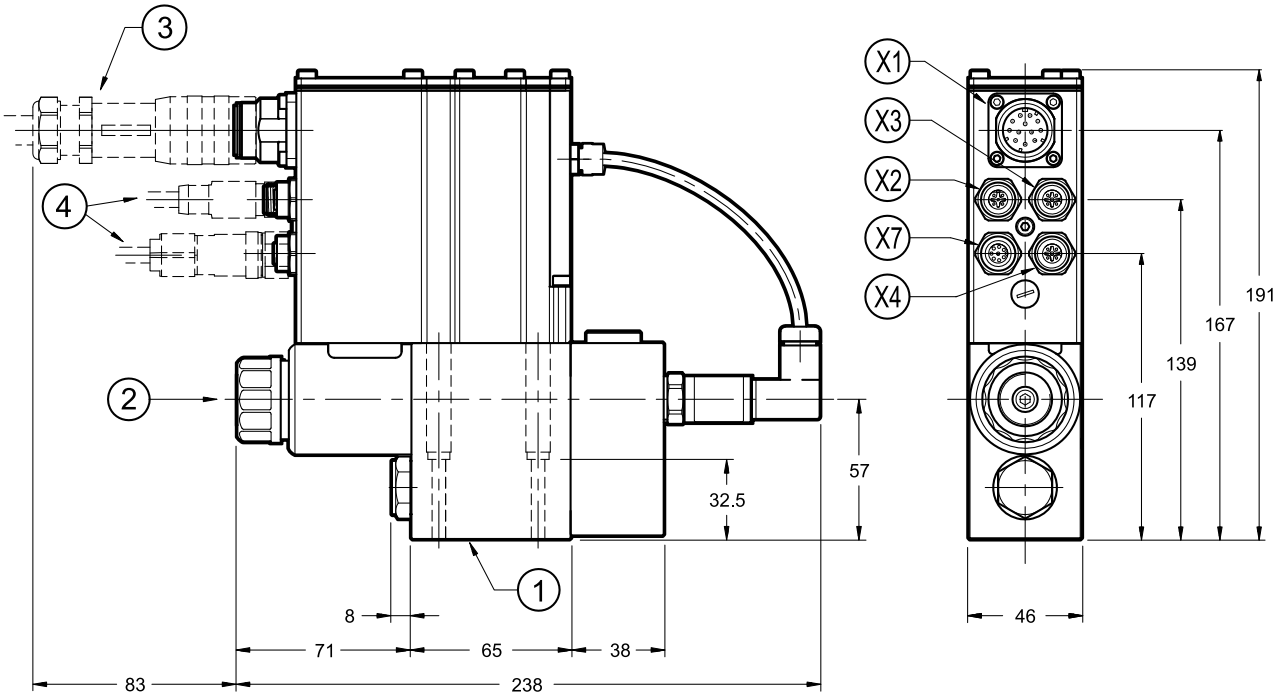
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

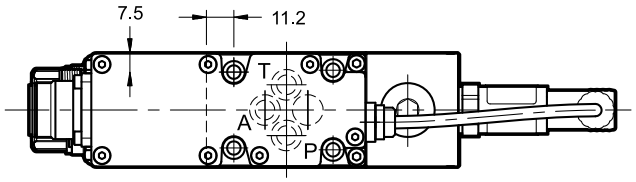
Fastening bolts: 4 SHC screws M5x40 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Connection M12 A 5 pin
4	L1 LED
5	L2 LED
6	Mating connector M12 5 poles - code A, female **To be ordered separately.** See catalogue 89 000

10 - PZE3JH - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Breather: Allen key 4
3	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
4	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHC screws M5x40 ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

NOTE 1: Depending on the chosen version, X4 and X7 connections may not be present.
Please refer to section 5 for connection descriptions and pinout.

NOTE 2: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

11 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. 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.

12 - INSTALLATION

We recommend installing these valves with the solenoid downward, either in horizontal or vertical position. If the valve is installed on vertical axis with the solenoid upward, you should consider possible variations of the minimum controlled pressure from those indicated in point 5.

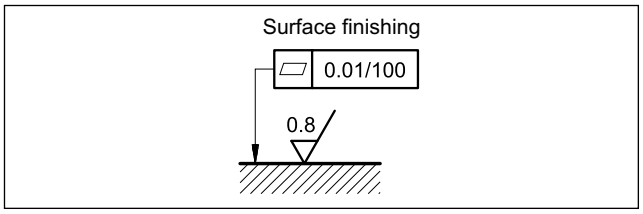
Ensure that there is no air in the hydraulic circuit. In certain applications it might be necessary to vent the air entrapped in the solenoid tube by unfastening the drain screw placed in the solenoid tube.

Ensure the solenoid tube is always filled with oil. Make sure the drain screw has been put back correctly at the end of the task. Connect the valve T port 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 leaks between the valve and support surface.



13 - ACCESSORIES

(to be ordered separately)

13.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

13.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

13.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

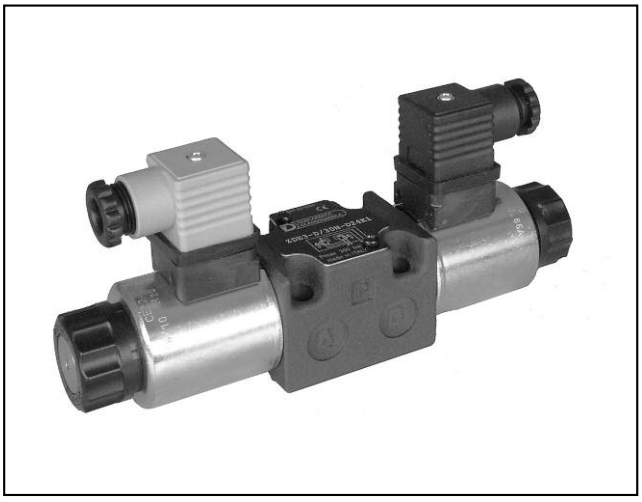
13.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

14 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A, B: 3/8” BSP thread



ZDE3

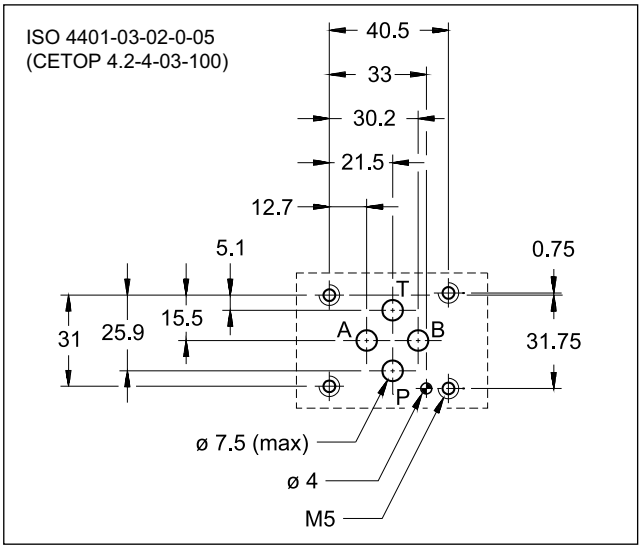
DIRECT OPERATED PRESSURE REDUCING VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 30

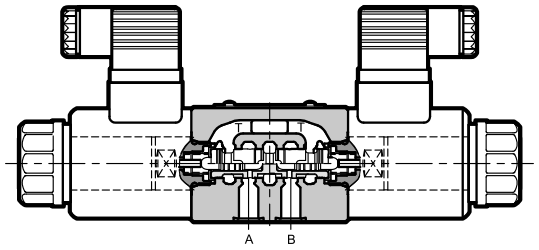
SUBPLATE MOUNTING ISO 4401-03

p max **100** bar
Q max **15** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— ZDE3 valves are direct operated pressure reducing valves with electric proportional control, with mounting interface in compliance with ISO 4401 standards.

— These valves are used to reduce pressure in the secondary circuit branches thus ensuring stability of controlled pressure in the event of variations of the flow rate through the valve.

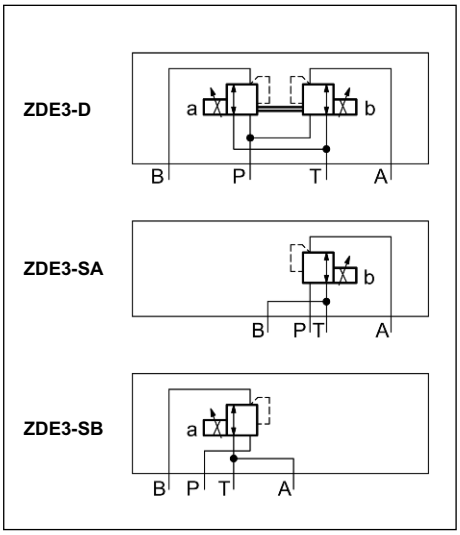
— The valve can be controlled directly by a current control supply unit or by means of the relative electronic control units to exploit valve performance to the full (see par. 10).

PERFORMANCES

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

Pressure allowed on P port	bar	30 ÷ 100
Pressure allowed on T port (see par. 3)	bar	0 ÷ 30
Controlled pressure	bar	23
Minimum controlled pressure	see Δp-Q diagram	
Maximum flow	l/min	15
Step response	see paragraph 4	
Hysteresis (with PWM 200 Hz)	% of p nom	< 4%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see paragraph 3	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,6 2

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

Z	D	E	3	-		/	30		-			/		

Pressure reducing valve

Electric proportional control

Size ISO 4401-03

Solenoids:
D = pressure reduction in A and B ports
SA = pressure reduction in A port (solenoid on side B)
SB = pressure reduction in B port (solenoid on side A)

Series No.
(from 30 to 39 sizes and mounting dimensions remain unchanged)

NOTE: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 240 hours (test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

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

Coil electrical connection:
(see paragraph 5)
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7 = plug for connector type DEUTSCH DT04-2P male

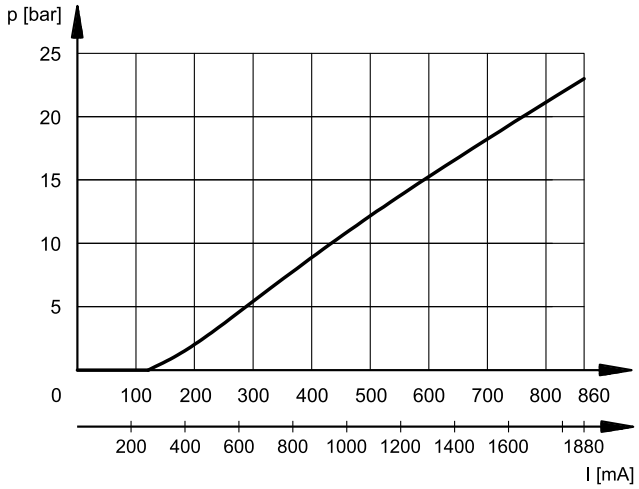
Manual override (see par. 7)

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

2 - CHARACTERISTIC CURVES

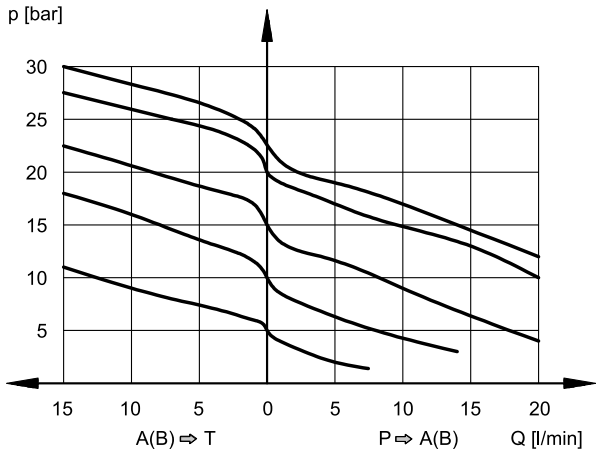
(values obtained with a ZDE3-D/30N-D24K1 PWM 100 Hz and oil with viscosity 36 cSt at 50°C)

PRESSURE CONTROL p = f (I)



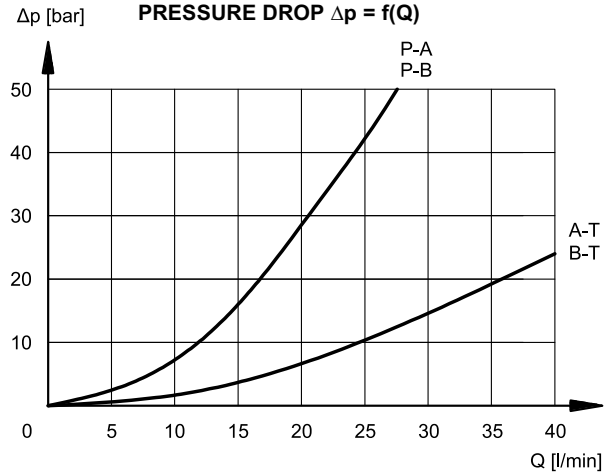
Pressure regulation is 0.5 bar lower in versions SA and SB

PRESSURE VARIATION p = f(Q)



Curves have been obtained with inlet pressure 100 bar.

PRESSURE DROP Δp = f(Q)



3 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE		V DC	**12**	**24**
RESISTANCE (at 20°C)	K1 coil K7 coil	Ω	3.66 4	17.6 19
MAXIMUM CURRENT		A	1.88	0.86
DUTY CYCLE			100%	
PWM FREQUENCY		Hz	200	100
ELECTROMAGNETIC COMPATIBILITY (EMC)			According to 2014/30/EU	
PROTECTION FROM: Atmospheric agents (IEC 60529)			IP65	
CLASS OF PROTECTION: Coil insulation (VDE 0580) Impregnation			class H class F	

4 - STEP RESPONSE

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

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

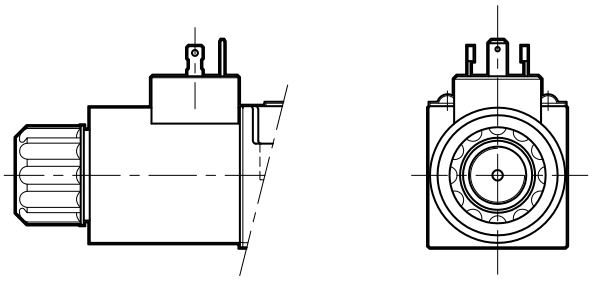
The table illustrates typical step response times measured with input flow rate of Q = 5 l/min and p = 50 bar.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	30	30

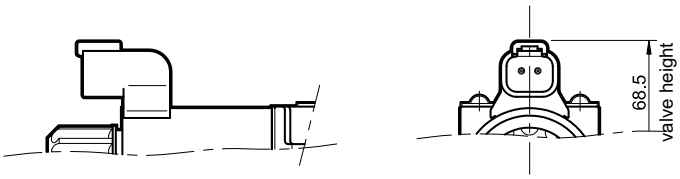
5 - ELECTRIC CONNECTIONS

Connectors for standard K1 connection are always supplied with the valve.

connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)



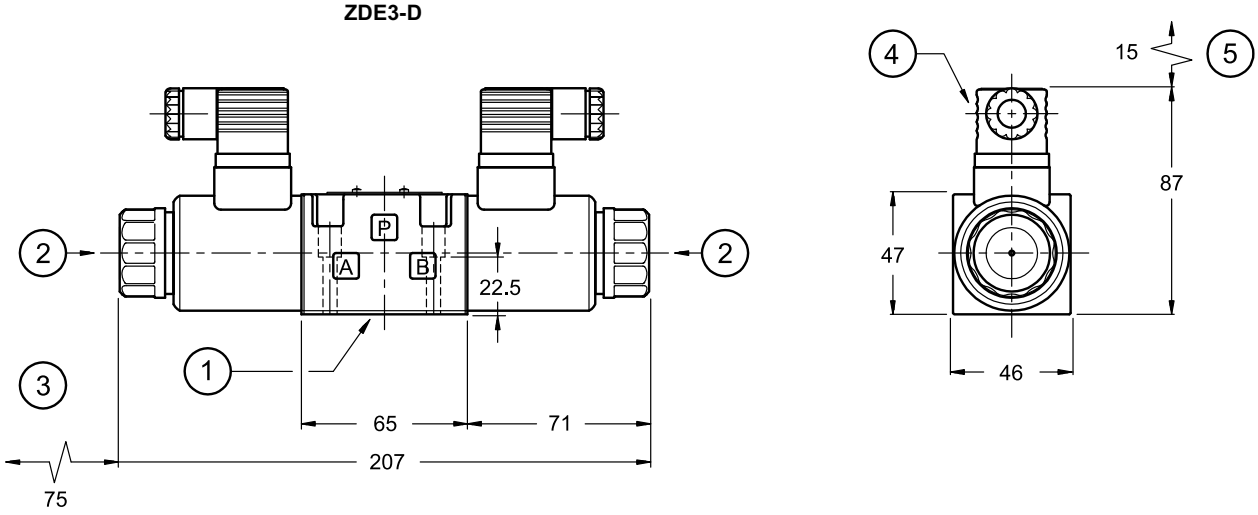
connection for
DEUTSCH DT06-2S male connector
code **K7**

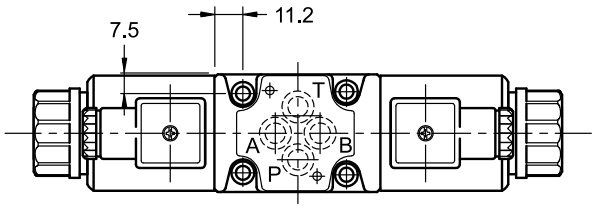


6 - OVERALL AND MOUNTING DIMENSIONS

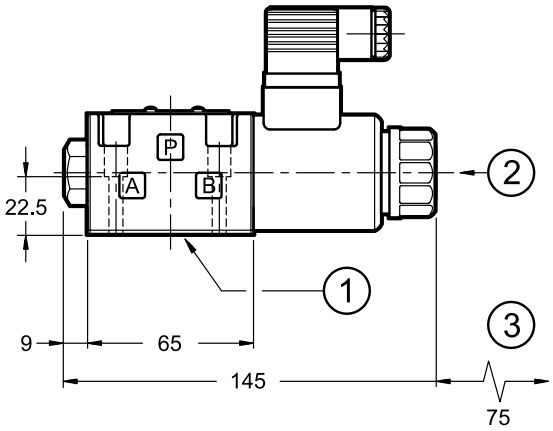
dimensions in mm

ZDE3-D

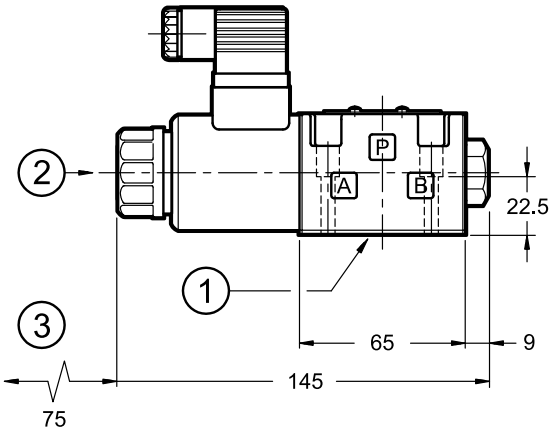




ZDE3-SA



ZDE3-SB



1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25x1.78)
2	Locking ring with boot protected manual override
3	Coil removal space
4	EN 175301-803 (ex DIN 43650) electrical connector
5	Connector removal space

Fastening bolts: 4 bolts M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

7 - MANUAL OVERRIDE

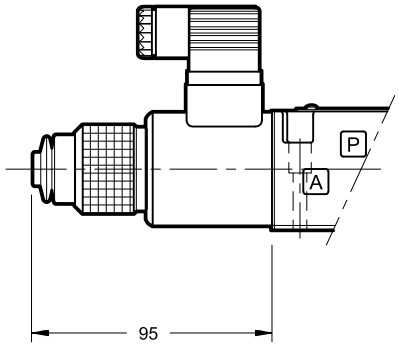
The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

Two different manual override version are available upon request:

- **CM** version, manual override belt protected
- **CS** version, screw override with metal ring nut, provided with a M4 screw and a blocking locknut to allow the continuous mechanical operation.

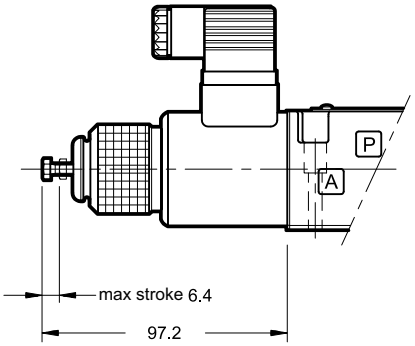
CAUTION!: The manual override use doesn't allow any proportional regulation; indeed using this kind of override, the main stage spool will open completely and the whole inlet pressure will pass through A or B line.

CM Version



Code: 3803210003

CS Version



Code: 3803210004

8 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types 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.

9 - INSTALLATION

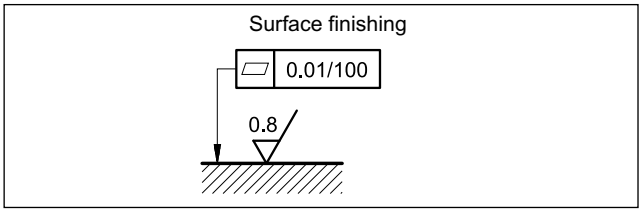
The ZDE3 valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

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.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the reduced pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 30 bar.



10 - ELECTRONIC CONTROL UNITS

ZDE3-SA* ZDE3-SB*

EDC-111	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251
EDM-M142	for solenoid 12V DC		

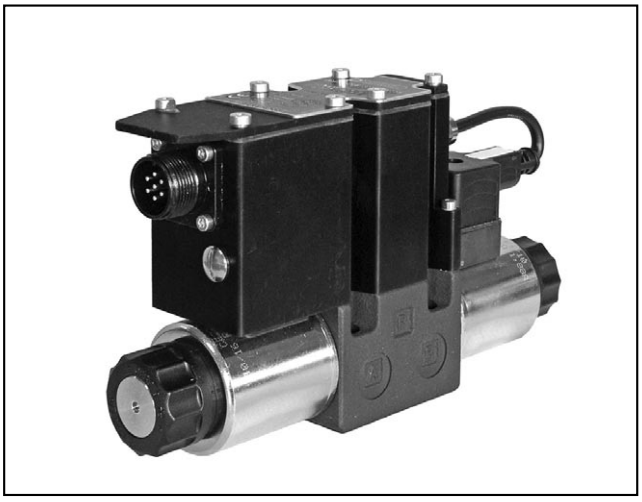
ZDE3-D*

EDM-M211	for solenoid 24V DC	rail mounting DIN EN 50022	see cat. 89 251
EDM-M242	for solenoid 12V DC		

11 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G with rear ports
Type PMMD-AL3G with side ports
P, T, A, B port threading: 3/8” BSP



ZDE3G*

PROPORTIONAL PRESSURE REDUCING VALVE, DIRECT OPERATED, WITH INTEGRATED ELECTRONICS

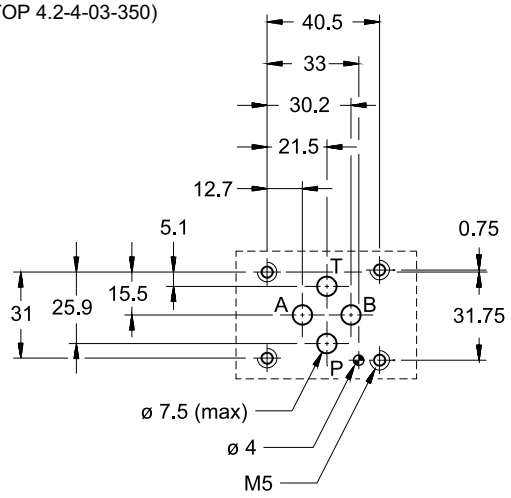
SERIES 32

SUBPLATE MOUNTING ISO 4401-03

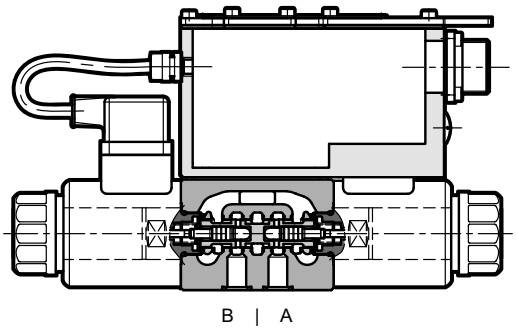
p max **100** bar
Q max **15** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



— The ZDE3G* are direct operated pressure reducing valves with electric proportional control and integrated electronics and with mounting interface in compliance with ISO 4401 standards.

— The valves are used to reduce pressure in the secondary circuit branches thus ensuring stability of controlled pressure in the event of variations of the flow rate through the valve.

— They are available with different types of electronics, with analogue or fieldbus interfaces.

— A solenoid current monitoring signal is available.

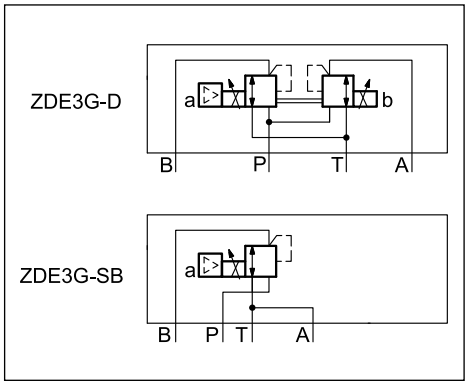
— The valve is easy to install. The driver directly manages digital settings.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

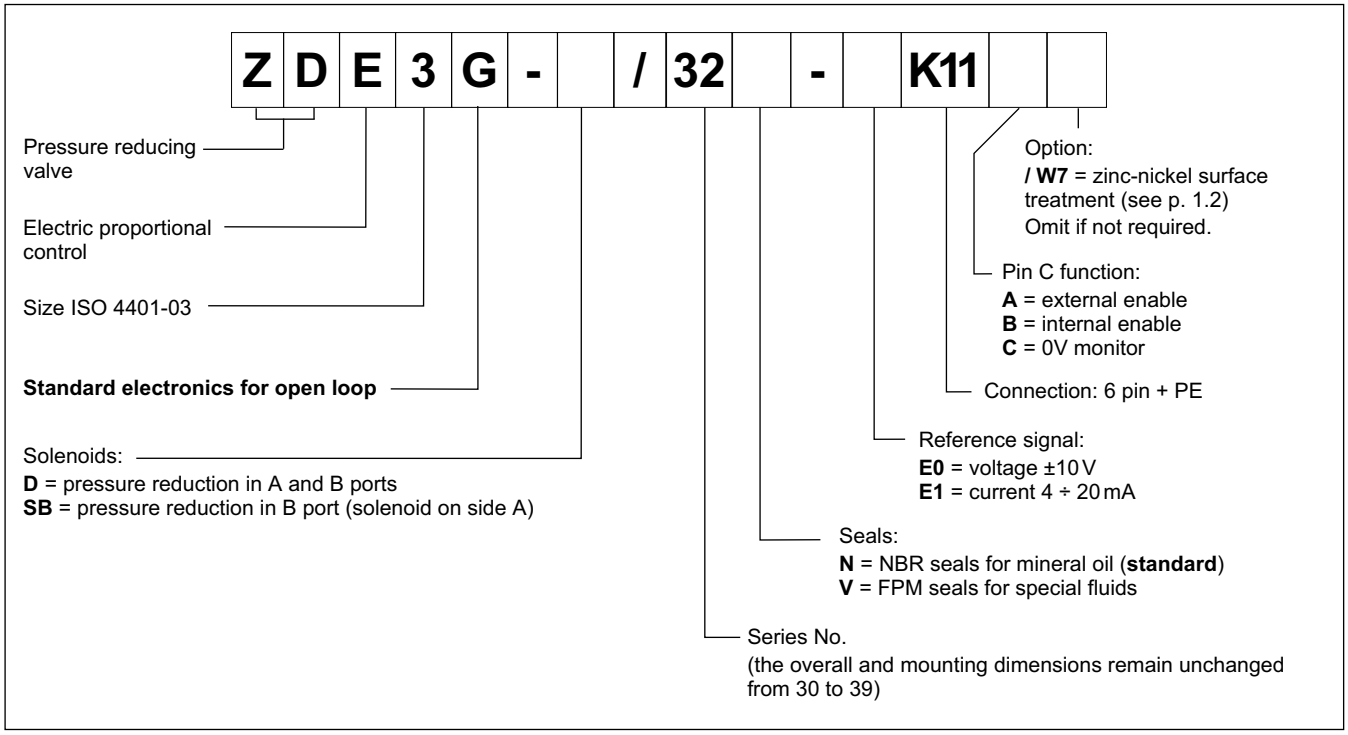
Operating pressure range port P	bar	30 ÷ 100
Operating pressure range port T (par. 5)	bar	0 ÷ 30
Controlled pressure	bar	23
Maximum flow	l/min	15
Hysteresis	% Q max	< 3 %
Repeatability	% Q max	< 1 %
Electrical characteristics	see point 2	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,9 2,4

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODES AND CONFIGURATION

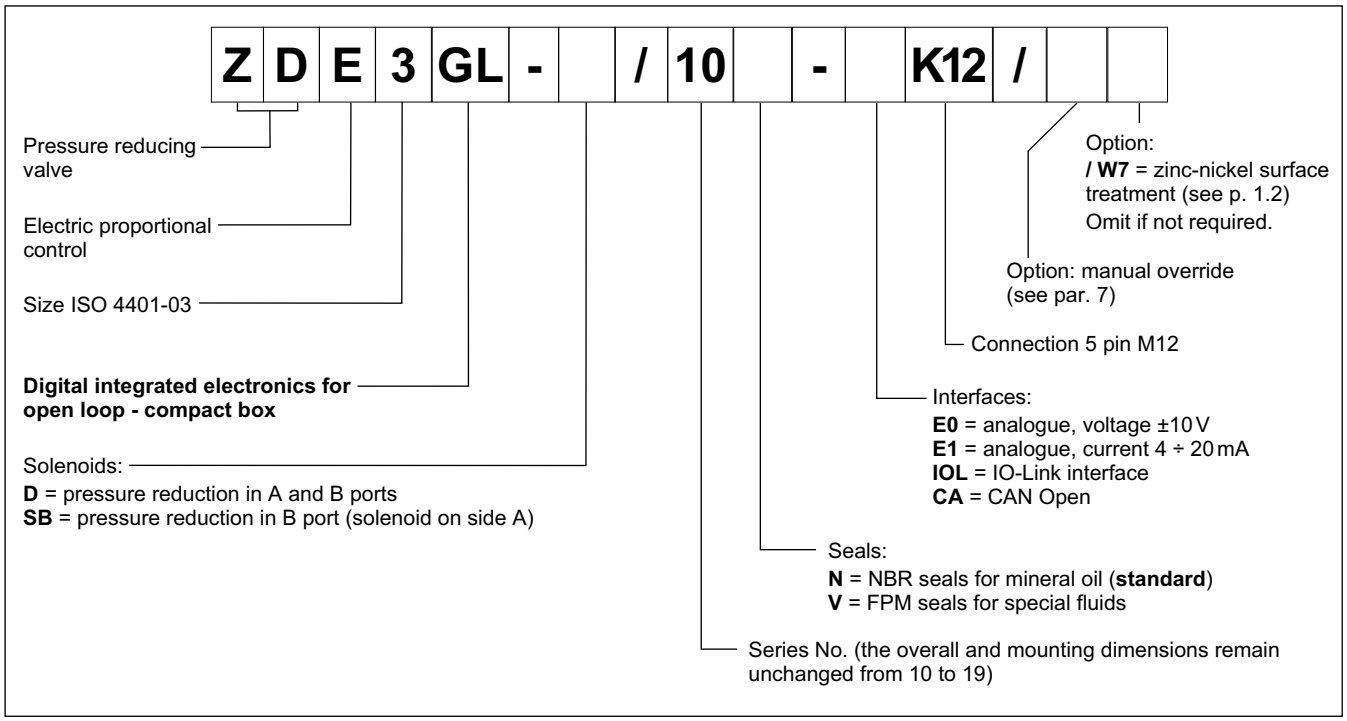
1.1 - Standard electronics



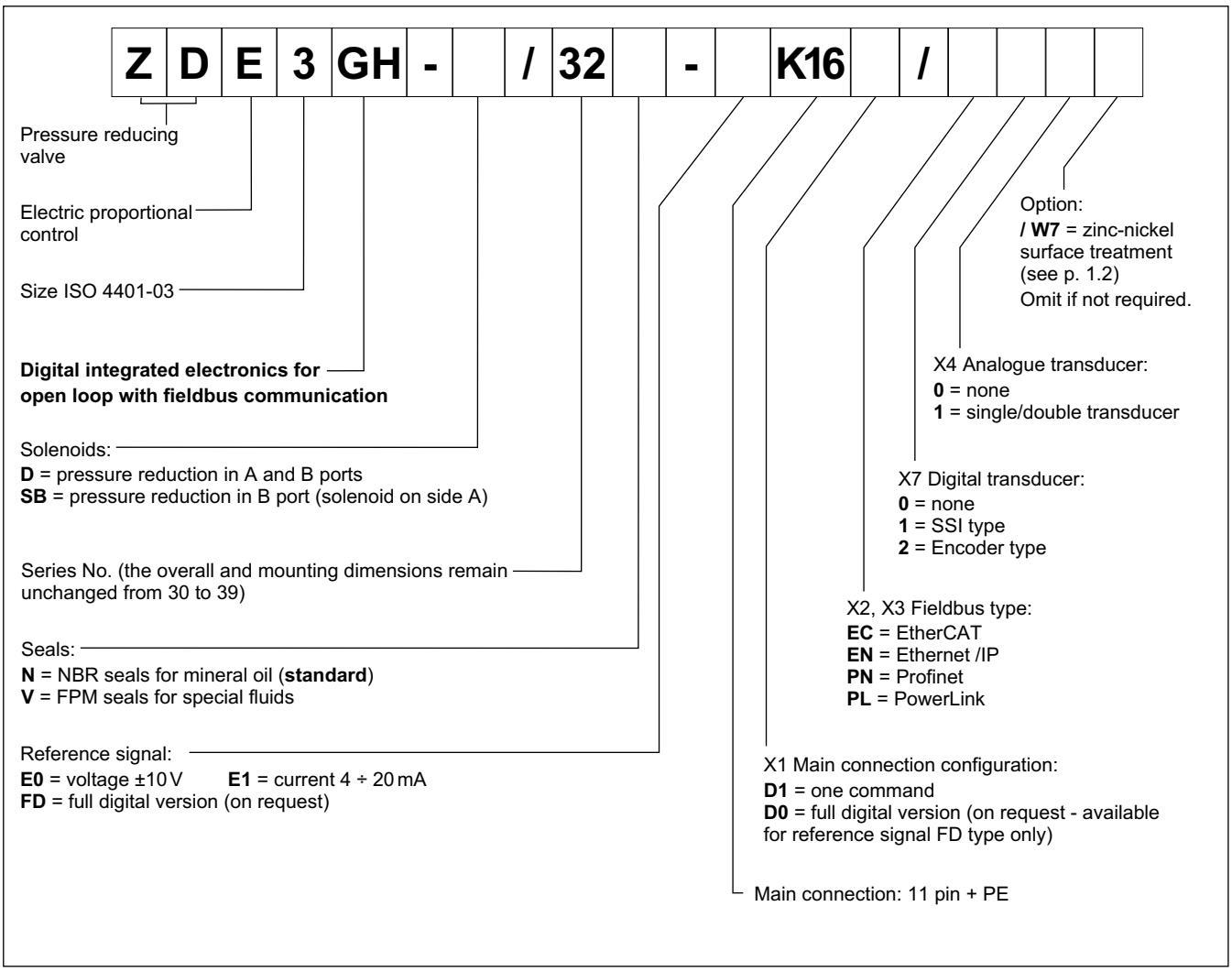
1.2 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

1.3 - Compact version



1.4 - Electronics with fieldbus communication



2 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67 (**NOTE**)
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	3
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

NOTE: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect with caps any unused connections.

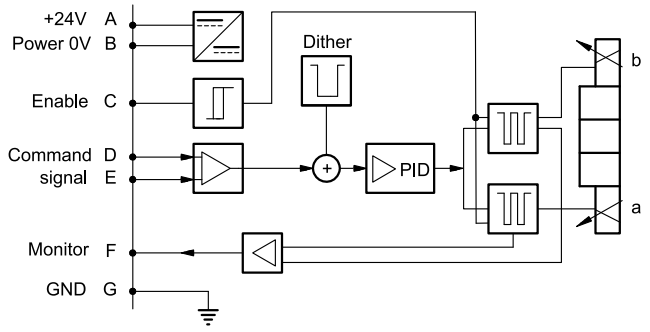
3 - ZDE3G - STANDARD ELECTRONICS

3.1 - Electrical characteristics

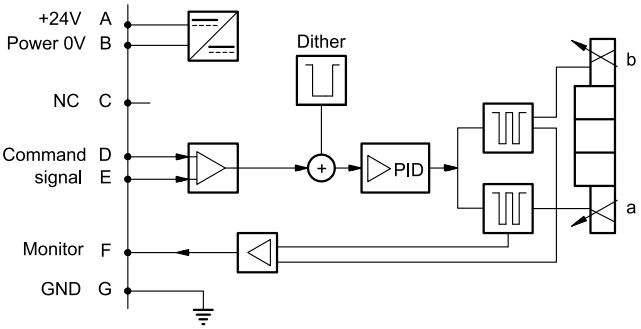
Command signal: voltage (E0) current (E1)	V DC mA	± 10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	± 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

3.2 - On-board electronics diagrams

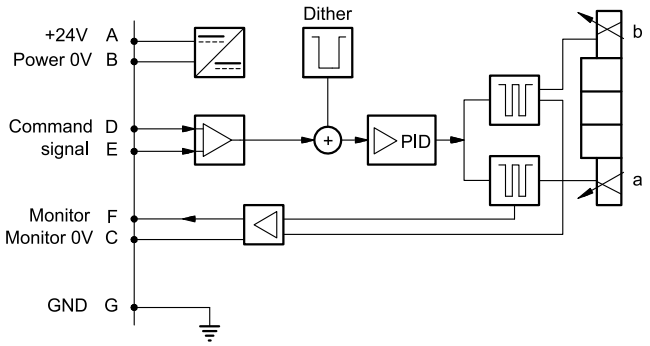
VERSION A - External Enable



VERSION B - Internal Enable

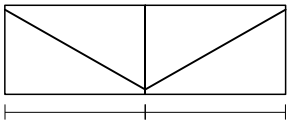


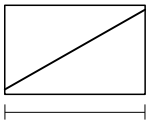
VERSION C - 0V Monitor



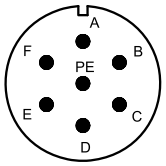
3.3 - Versions with voltage command (E0)

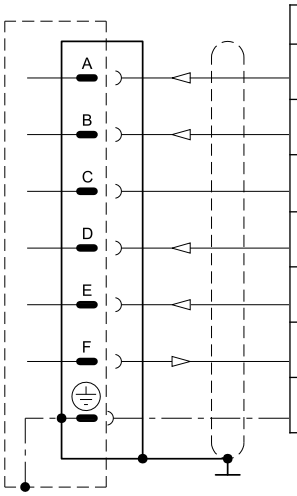
The reference signal is between -10V and +10V on double solenoid valve, and 0 ÷ 10V on single solenoid valve SB. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.





COMMAND	**-10V**	**0V**	**+10V**	**COMMAND**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**	**MONITOR**	**0V**	**+10V**



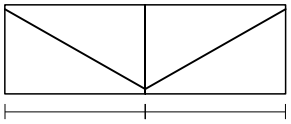


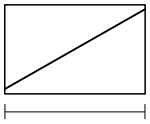
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	±10 V	Command (differential input)		
E	0 V	Command reference		
F	±10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

3.4 - Versions with current command (E1)

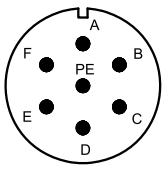
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient restoring the signal.

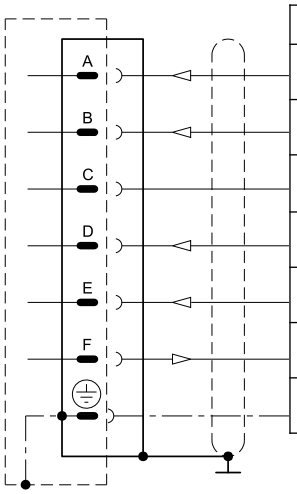
The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.





COMMAND	**4 mA**	**12 mA**	**20 mA**	**COMMAND**	**4 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**	**MONITOR**	**4 mA**	**20 mA**





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	do not connect -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	Command reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - ZDE3GL - COMPACT ELECTRONICS

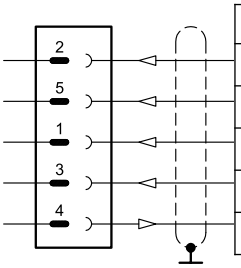
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

4.1 - Electrical characteristics

Command signal: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 0 ÷ 5 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	 kBaud	 IO-Link Port Class B 230,4
Can Open communication (CA): Data rate	 kbit	 10 ÷ 1000
Connection		5-pin M12 code A (IEC 61076-2-101)

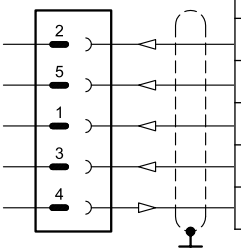
4.2 - Pin tables

'E0' connection



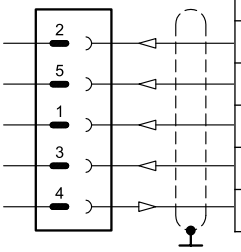
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	± 10 V	Command
3	0V	Command reference
4	0 ÷ 5V	Monitor (0V reference: pin 5)

'E1' connection



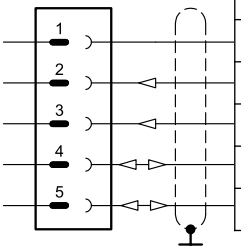
Pin	Values	Function
2	24 V DC	Supply voltage (solenoid and logic)
5	0 V	
1	4 ÷ 20 mA	Command
3	0V	Command reference
4	4 ÷ 20 mA	Monitor (0V reference: pin 5)

'IOL' connection



Pin	Values	Function
2	2L+ 24 V DC	Supply of the power stage
5	2L- 0 V (GND)	Internal galvanic isolation from PIN 3
1	1L+ +24 V DC	IO-Link supply voltage
3	1L- 0V (GND)	
4	C/Q	IO-Link Communication

'CA' connection



Pin	Values	Function
1	CAN_SH	Shield
2	24 V DC	Supply voltage
3	0 V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

5 - ZDE3GH - FIELDBUS ELECTRONICS

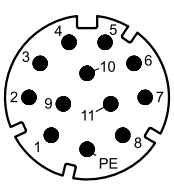
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

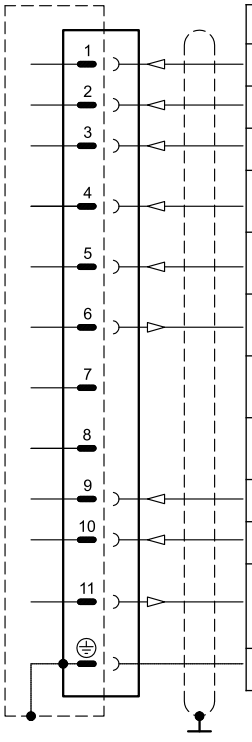
Command - valve position schemes as for the standard electronics. Please refer to pictures in par. 3.3 and 3.4.

5.1 - Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	 V DC mA	 ±10 (Impedance Ri = 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm) via fieldbus
Monitor signal (current to solenoid): voltage (E0) current (E1)	 V DC mA	 ±10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standard		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)

5.2 - X1 Main connection pin table





D1: one command

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	± 10 V (E0) 4 ÷ 20 (E1)	Command
5	0 V	Command reference signal
6	± 10 V (E0) 4 ÷ 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24 V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24 V DC	Logic and control supply
10	0 V	
11	24 V DC	Fault (0V DC) or normal working (24V DC) (0V ref. pin 2)
12	GND	Ground (Earth)

5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

X2 (IN) connection M12 D 4 pin female

Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

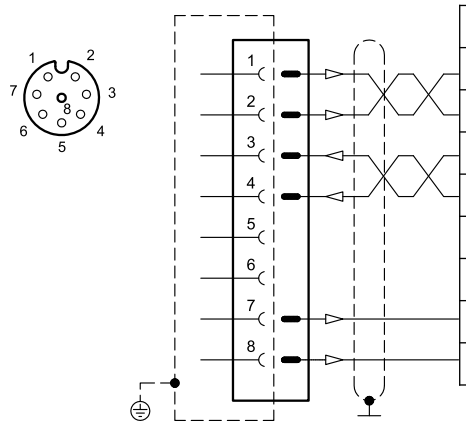
X3 (OUT) connection: M12 D 4 pin female

Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

NOTE: Shield connection on connector housing is recommended.

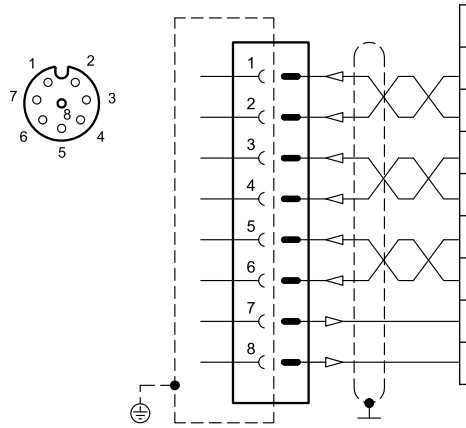
5.4 - Digital transducer connection
X7 connection: M12 A 8 pin female

VERSION 1: SSI type



Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MIS0+	Serial position data (+)	
4	MIS0-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

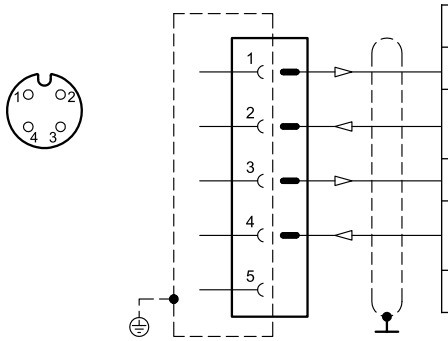
VERSION 2: ENCODER type



Pin	Values	Function	Notes
1	ENC_Z+	input channel Z+	Input - digital signal
2	ENC_Z-	input channel Z-	
3	ENC_A+	input channel A+	
4	ENC_A-	input channel A+	
5	ENC_B+	input channel B+	
6	ENC_B-	input channel B+	
7	+5 V	transducer power supply	Output power supply
8	0 V	-	Common GND

5.5 - Analogue transducer connection
X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer
(single or double is a software-selectable option)



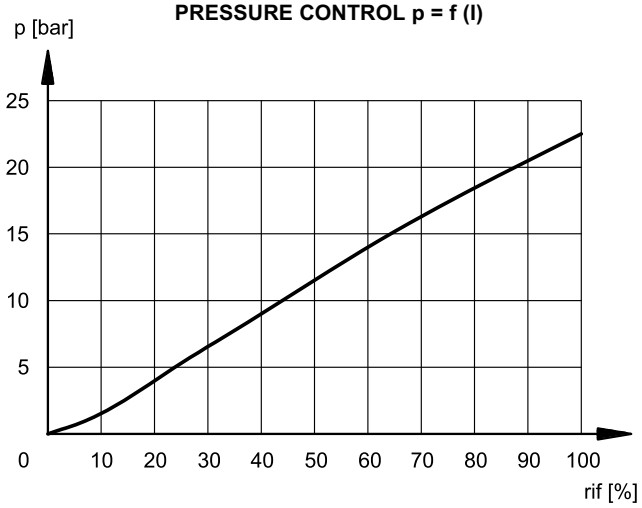
Pin	Values	Notes
1	+24 V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0 V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

6 - CHARACTERISTIC CURVES

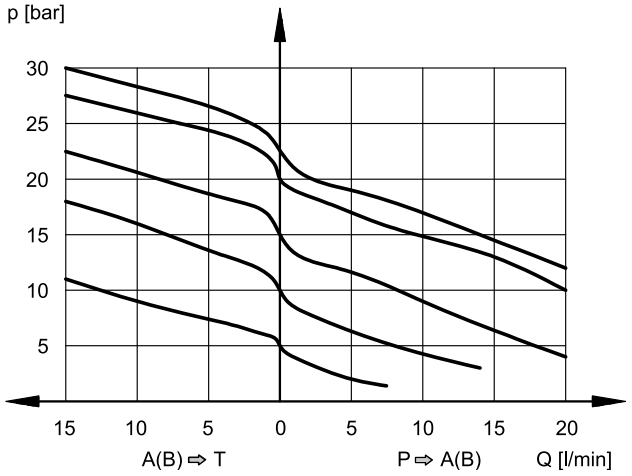
(obtained with oil with viscosity 36 cSt at 50°C)

Adjustment characteristics depending from reference signal, obtained with inlet pressure = 100 bar.

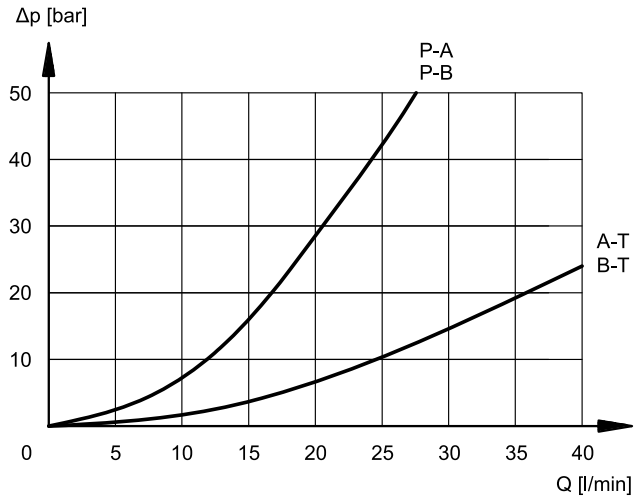
PRESSURE CONTROL p = f (I)



PRESSURE VARIATION p = f(Q)

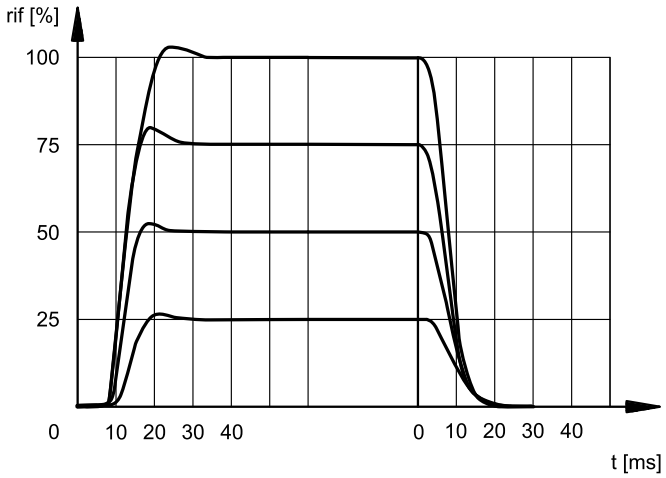


PRESSURE DROP Δp = f(Q)



7 - STEP RESPONSE

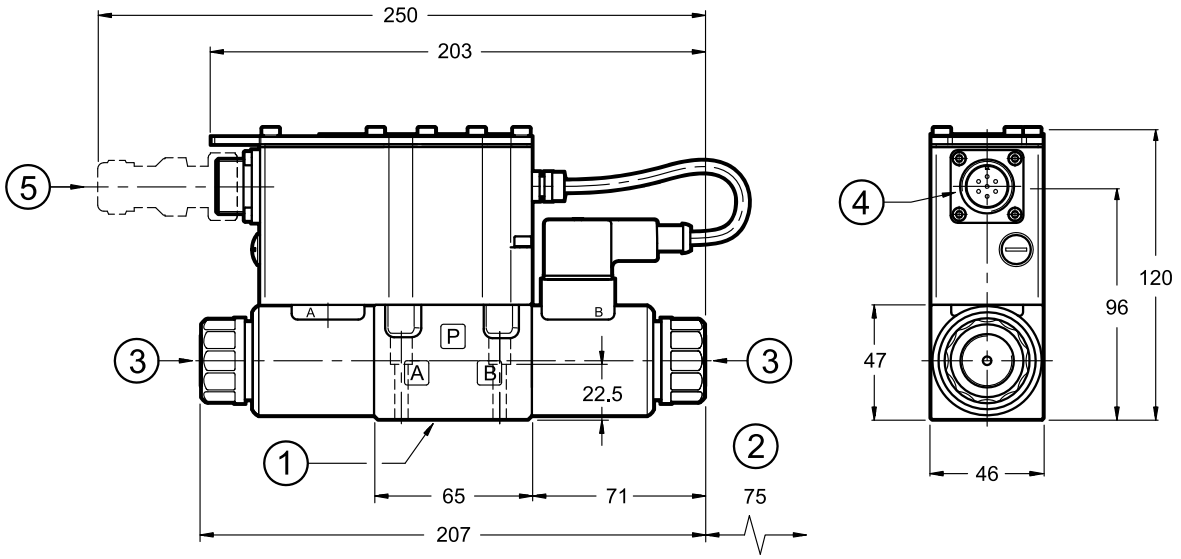
Response times are obtained with an inlet pressure of 100 bar and oil volume of 0,3 litres. The response time is affected both by the flow rate and the oil volume in the pipework.

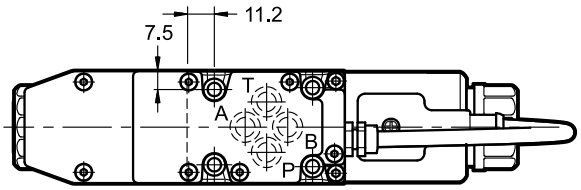


8 - ZDE3G - OVERALL AND MOUNTING DIMENSIONS

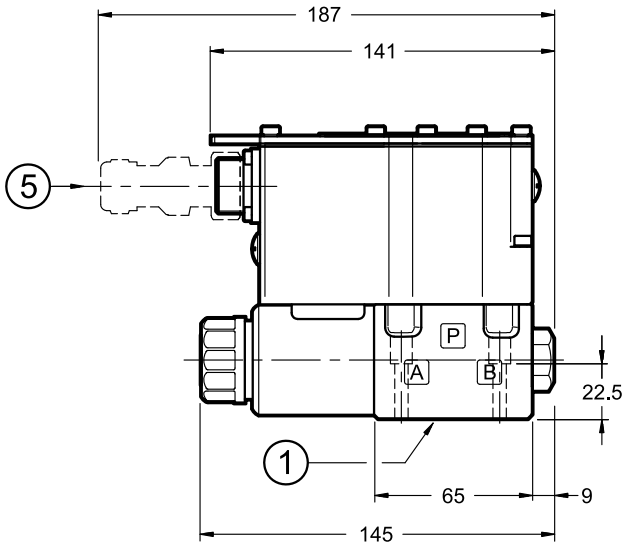
ZDE3G-D/*K11

dimensions in mm





ZDE3G-SB/*K11



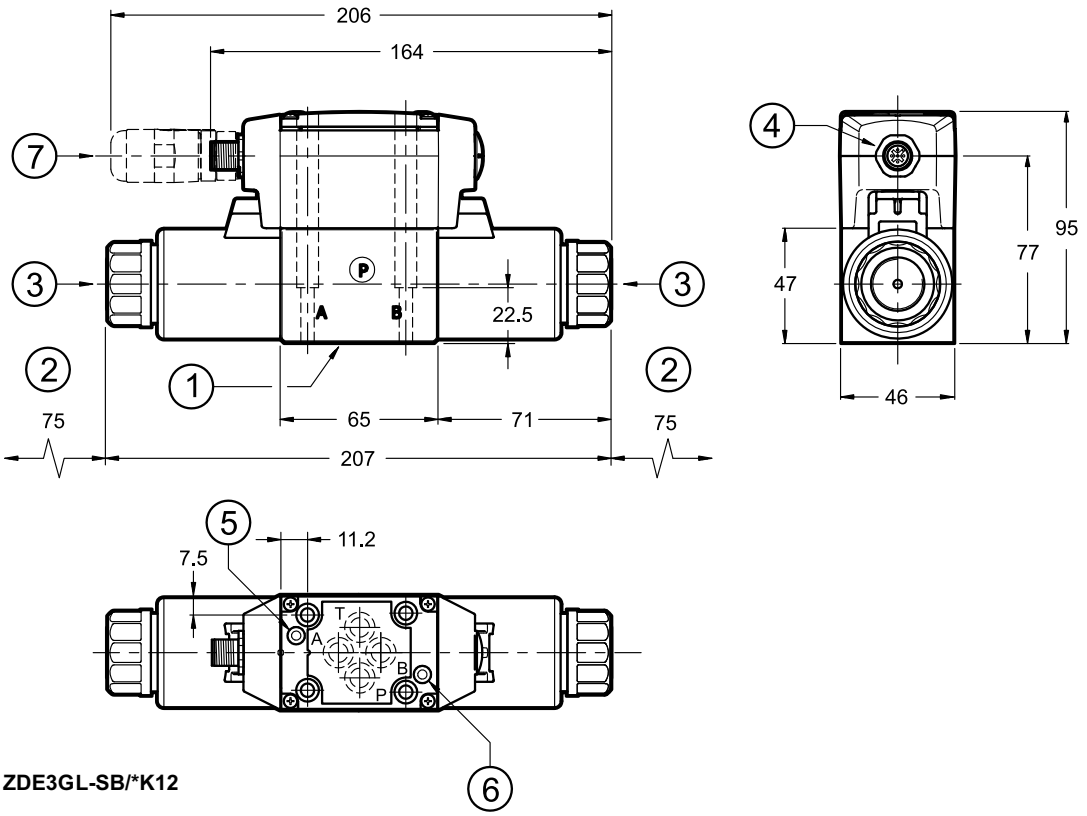
Fastening bolts: 4 SHC screws M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space (solenoid B only)
3	Standard manual override embedded in the solenoid tube
4	Main connection 6 pin + PE
5	Mating connector 6 poles + PE , female type MIL-5015-G **To be ordered separately.** See catalogue 89 000

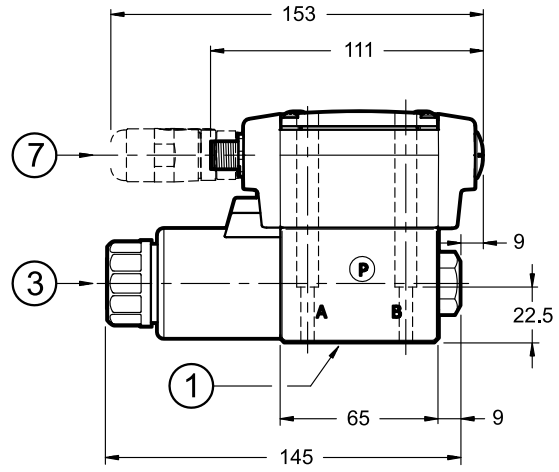
9 - ZDE3GL - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

ZDE3GL-D/*K12



ZDE3GL-SB/*K12



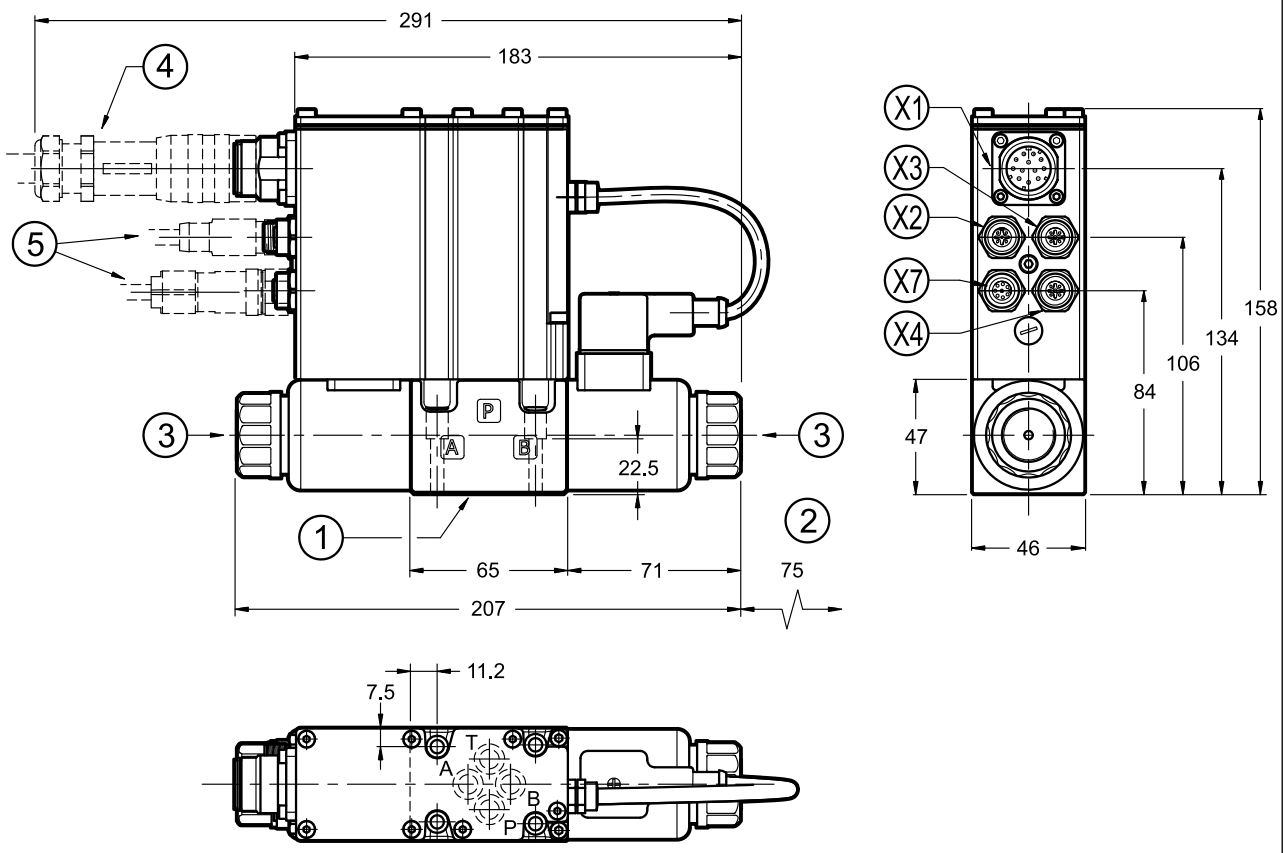
1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space
3	Standard manual override embedded in the solenoid tube
4	Connection M12 A 5 pin
5	L1 LED
6	L2 LED
7	Mating connector M12 5 poles - code A, female **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHC screws M5x30- ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

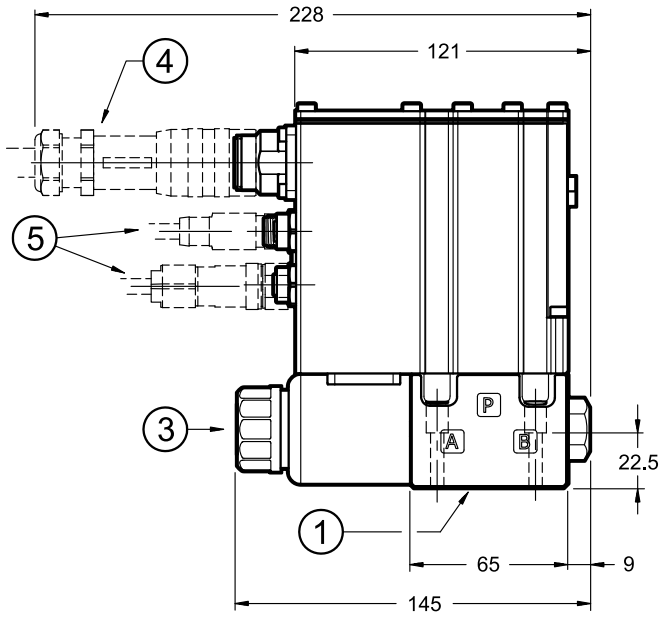
10 - ZDE3GH - OVERALL AND MOUNTING DIMENSIONS

ZDE3GH-D/*K16

dimensions in mm



ZDE3GH-SB/*K16



X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space (solenoid B only)
3	Manual override by pin integrated in the solenoid tube
4	Mating connector 11 poles + PE **To be ordered separately.** See catalogue 89 000
5	Mating connectors for fieldbus communication and signals **To be ordered separately.** See catalogue 89 000

Fastening bolts: 4 SHCS M5x30 ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

NOTE: Depending on the chosen version, X4 and X7 connections may not be present.
Please refer to section 5 for connection descriptions and pinout.

11 - MANUAL OVERRIDE

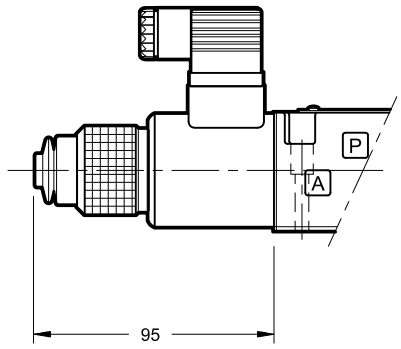
These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

Three other types of manual overrides can fit the ZDE3GL valve:

- **CM** version, manual override boot protected
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.

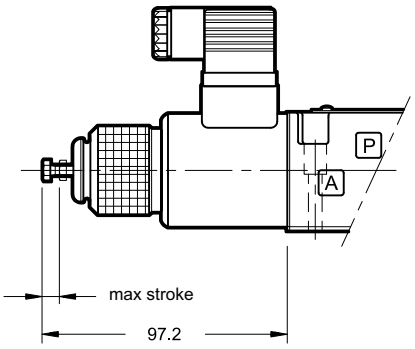
CAUTION!: The manual override use doesn't allow any proportional regulation; indeed using this kind of override, the main stage spool will open completely and the whole inlet pressure will pass through A or B line.

CM Version



Code: 3803210003

CS Version



Code: 3803210004

12 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. 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.

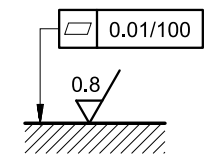
13 - INSTALLATION

ZDE3G* valves can be installed in any position without impairing correct operation. Ensure that there is no air in the hydraulic circuit. Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the reduced pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 30 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.

Surface finishing



14 - ACCESSORIES
(to be ordered separately)

14.1 - Mating connectors
Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

14.2 - Mating connectors and caps for fieldbus communication and for sensors.
Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

14.3 - Connection cable
The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

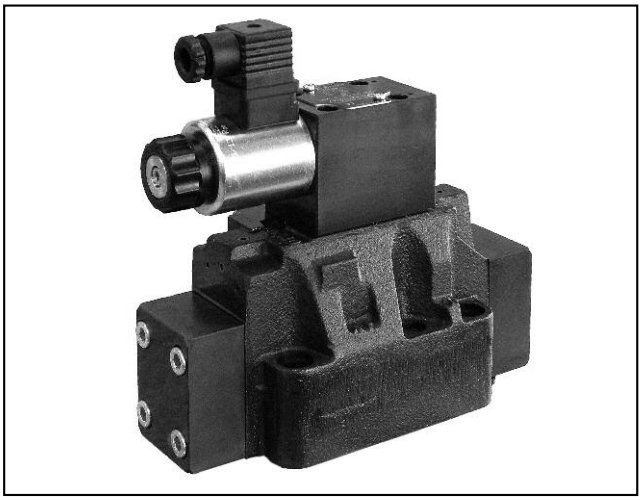
Cross section for power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2 (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm^2

14.4 - Kit for start-up LINPC-USB
Device for service start-up and diagnostic. See catalogue 89 850.

15 - SUBPLATES
(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP



DZCE*

PRESSURE REDUCING VALVE WITH PROPORTIONAL CONTROL

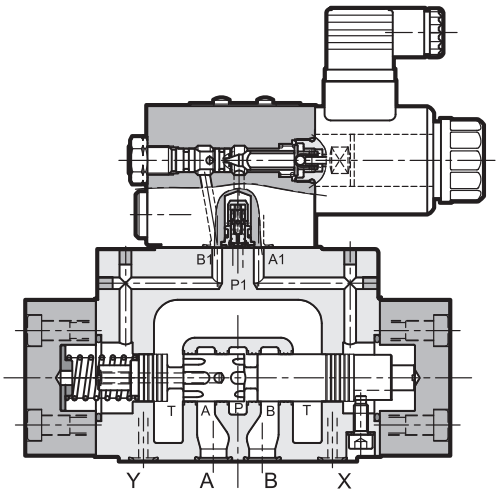
SERIES 11

DZCE5	**CETOP P05**
DZCE5R	**ISO 4401-05**
DZCE7	**ISO 4401-07**
DZCE8	**ISO 4401-08**

p max **350** bar

Q max (see table of performances)

OPERATING PRINCIPLE



— The DZCE* are pressure reducing valves with electric proportional control and mounting interface in compliance with ISO 4401 standards.

— These valves, besides reducing the pressure from line P to working line A, allow the flow to return from the line A to the return line T when a pressure greater than the set value is generated in the downstream circuit (flow path A): a typical case of hydraulic counterweight or load balancing.

— The pressure can be modulated continuously in proportion to the current supplied to the solenoid.

— They can be controlled directly by a current control supply unit or by means of the electronic control units (par. 12) to exploit valve performance to the full .

— They are available in CETOP P05, ISO 4401-05, ISO 4401-07 and ISO 4401-08 sizes.

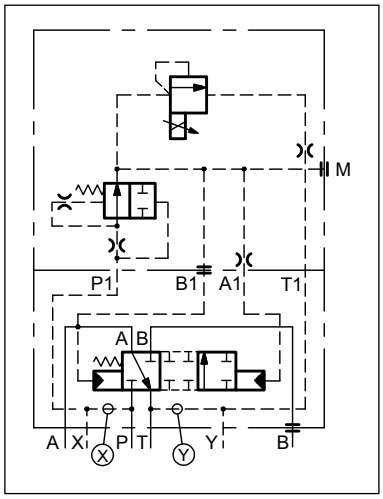
— Every size can be supplied with several controlled flow rates, up to 500 l/min.

PERFORMANCES

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

		DZCE5 DZCE5R	DZCE7	DZCE8
Maximum operating pressure	bar	350		
Maximum flow	l/min	150	300	500
Step response		see paragraph 6		
Hysteresis (with PWM 200 Hz)	% of p_{max}	< 4%		
Repeatability	% of p_{max}	< ±2%		
Electrical characteristic		see paragraph 5		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	7	9,2	15,3

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

D Z C E _ - _ / 11 _ - _ _ / _ K1

Pressure reducing valve

Electric proportional control

Nominal size:
5 = CETOP P05 (**NOTE**)
5R = ISO 4401-05
7 = ISO 4401-07
8 = ISO 4401-08

Pressure control range
070 = 1 ÷ 70 bar
140 = 1 ÷ 140 bar
210 = 1 ÷ 210 bar
300 = 1 ÷ 300 bar

Series N. (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Piloting: **I** = internal
E = external

Drainage: **I** = internal
E = external

Supply voltage:
D12 = voltage 12V DC
D24 = voltage 24V DC

Coil electrical connection: for connector type EN 175301-803 (**standard**)

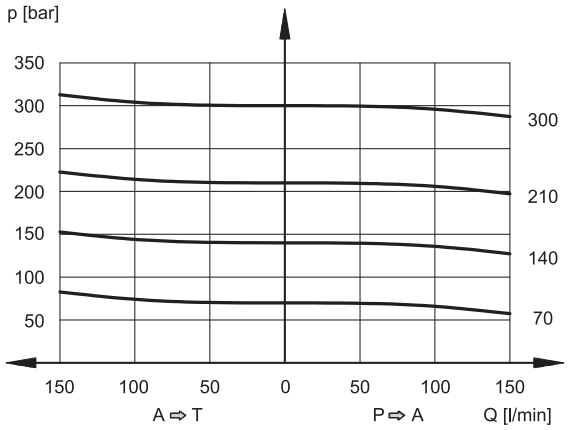
NOTE: This version is interchangeable with the model ZCE4 Duplomatic.

2 - CHARACTERISTIC CURVES

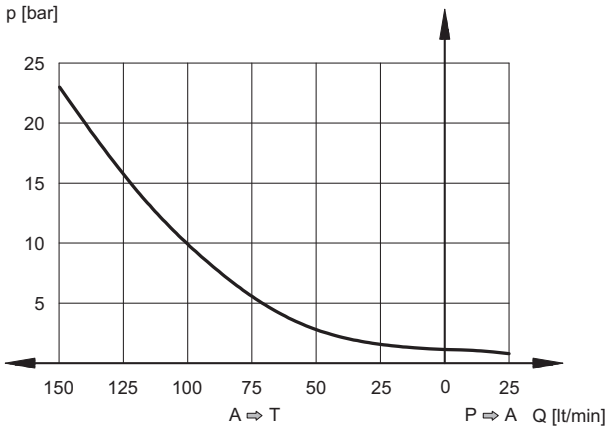
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

2.1 - Characteristic curves DZCE5 and DZCE5R

ADJUSTMENT

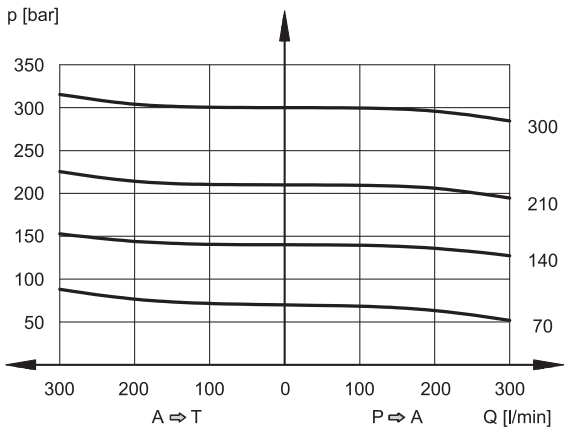


MIN. CONTROLLED PRESSURE p min = f(Q)

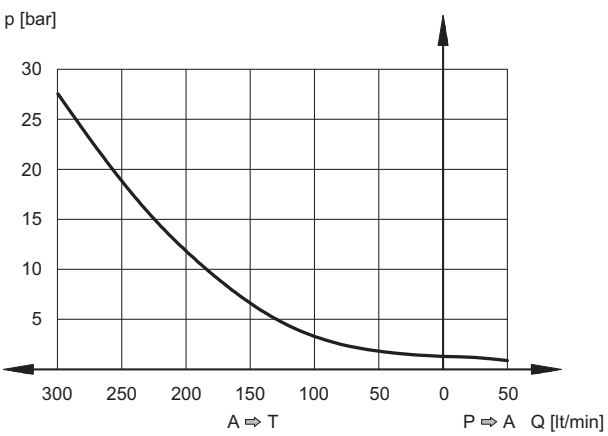


2.2 - Characteristic curves DZCE7

ADJUSTMENT

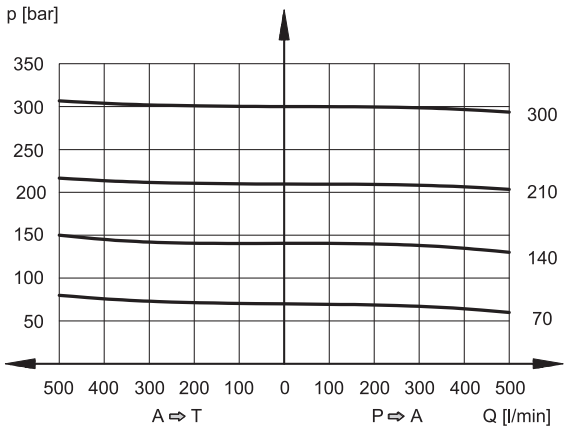


MIN. CONTROLLED PRESSURE p min = f(Q)

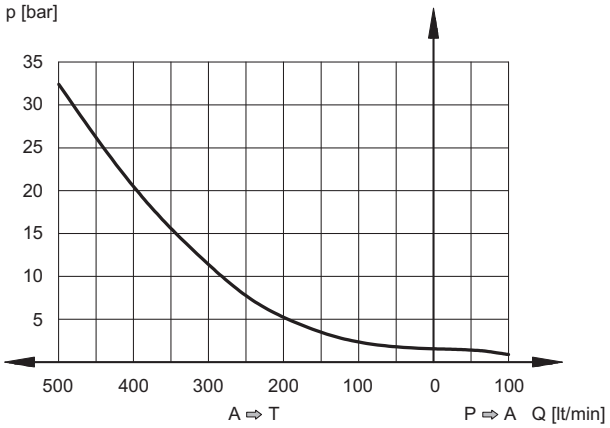


2.3 - Characteristic curves DZCE8

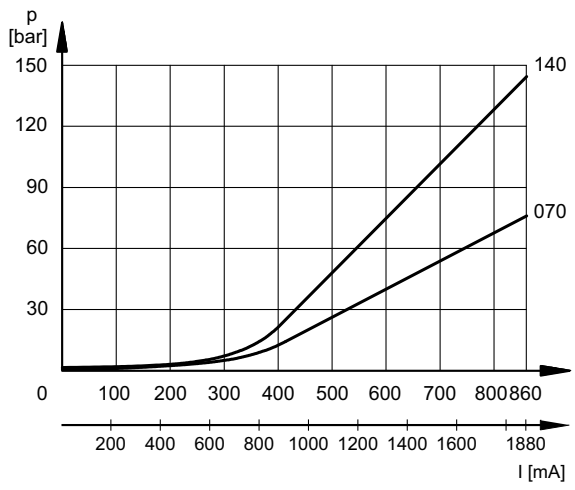
ADJUSTMENT

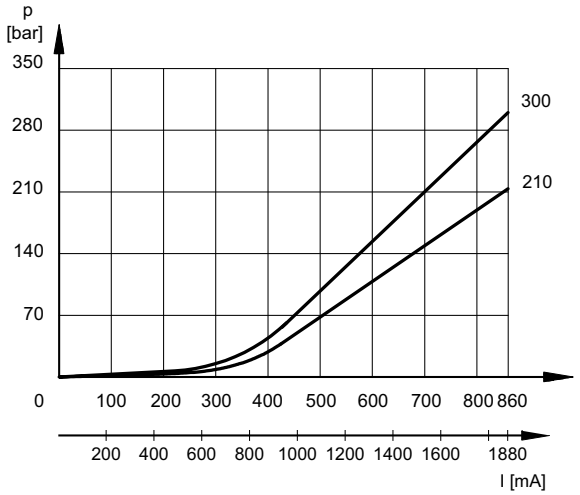


MIN. CONTROLLED PRESSURE p min = f(Q)



2.4 - Pressure control p = f(I) DZCE5, DZCE5R, DZCE7 and DZCE8





3 - 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.

4 - PILOTING AND DRAINAGE

DZCE* valves are available with piloting and drainage, both internal and external.

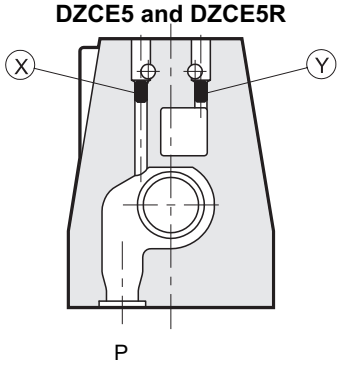
We suggest using the version with external drainage, that allows a higher backpressure on the unloading.

VALVE TYPE		Plug assembly	
		X	**Y**
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

PRESSURES (bar)

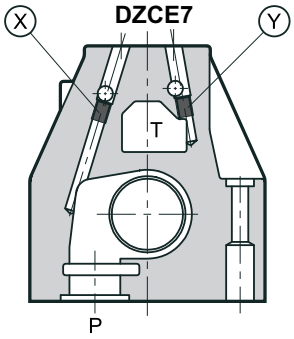
Pressure	MIN	MAX
Piloting pressure on X port	30	350
Pressure on T port with internal drain	-	2
Pressure on T port with external drain	-	250

DZCE5 and DZCE5R



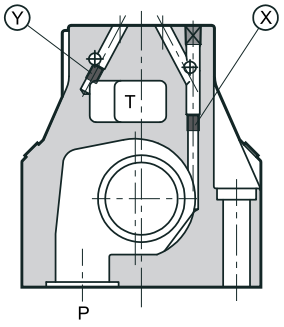
X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DZCE7



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

DZCE8



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

5 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut.

It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
CLASS OF PROTECTION: atmospheric agents (EN 60529) coil insulation (VDE 0580) Impregnation	IP 65 class H class F		

6 - STEP RESPONSE

(measured with mineral oil with viscosity of 36 cSt at 50°C with electronic control card)

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

REFERENCE SIGNAL STEP	0 →100%	100→0%
response times [ms]		
DZCE5 and DZCE5R	100	70
DZCE7	100	50
DZCE8	100	50

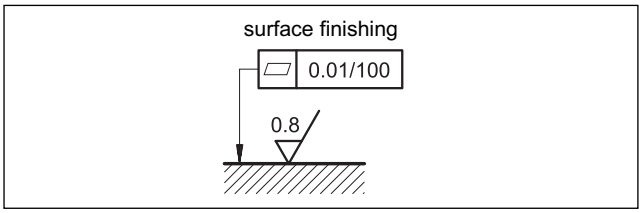
7 - INSTALLATION

We recommend to install the DZCE* valve 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 paragraph 2.

Ensure that there is no air in the hydraulic circuit. In particulars applications,it can be necessary to vent the air entrapped in the solenoid tube, using the special drain screw and then ensure to screwed it correctly.

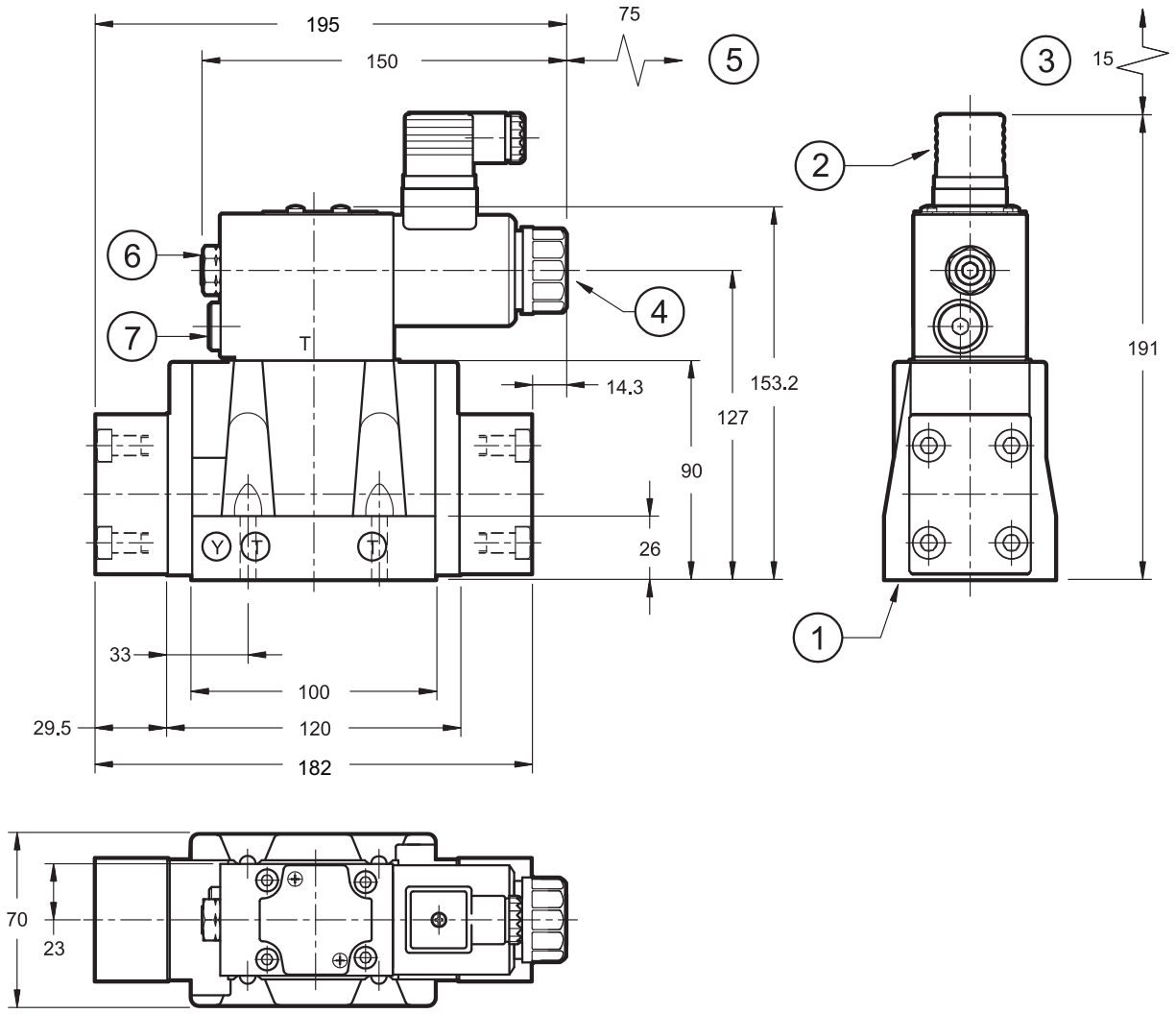
Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. **Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.**

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.



8 - DZCE5 AND DZCE5R OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



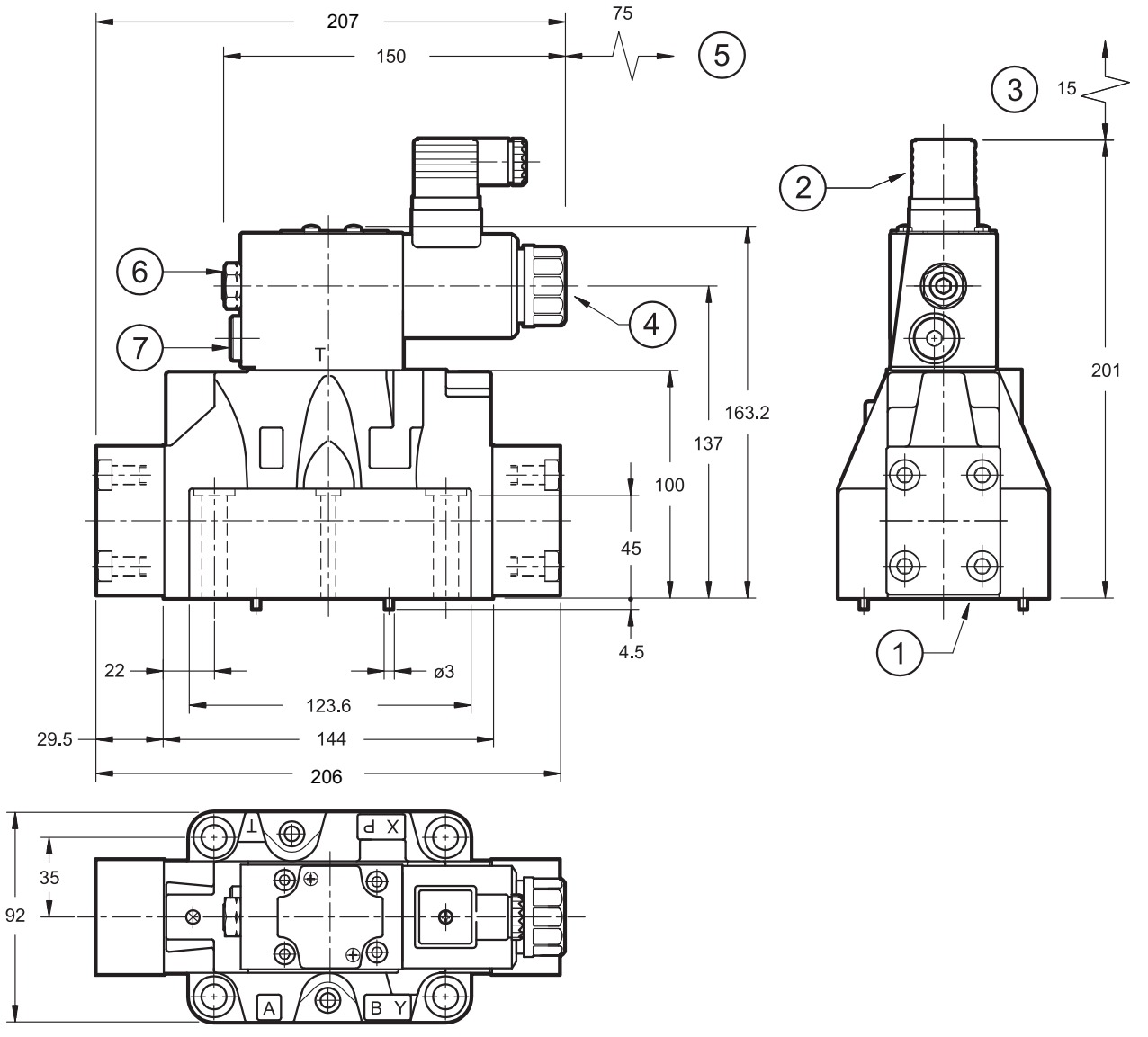
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

Valve fastening: N. 4 bolts SHC M6x35 - ISO 4762
Tightening torque: 8 Nm (A 8.8 bolts)
Thread of mounting holes: M6x10
Sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	EN 175301-803 electrical connector (included in the supply)
3	Connector removal space
4	Breather (Allen key 4)
5	Coil removal space
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP

9 - DZCE7 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



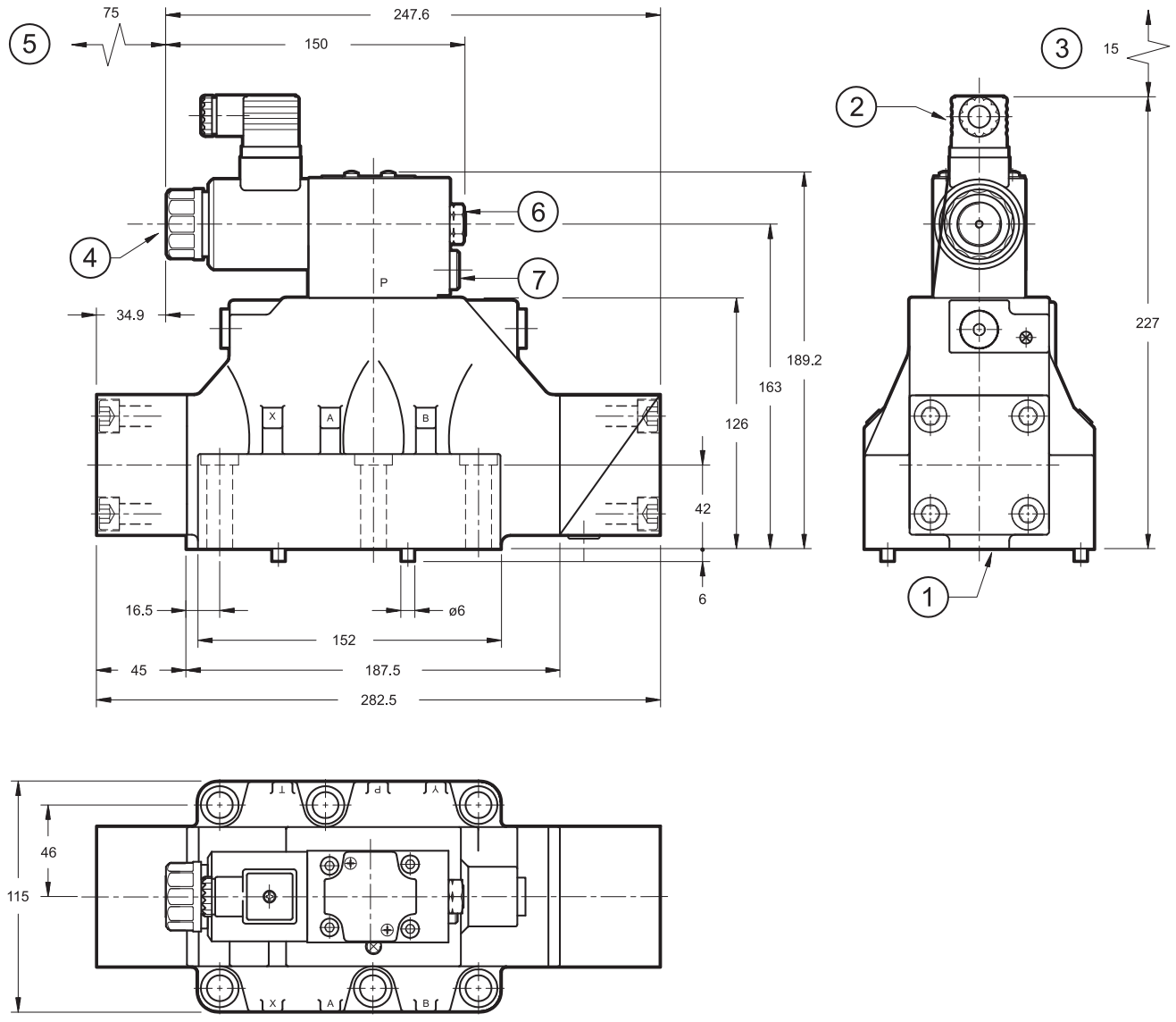
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

Single valve fastening:	N. 4 SHC M10x60 bolts - ISO 4762 N. 2 SHC M6x60 bolts - ISO 4762
Tightening torque M10x60: 40 Nm (A 8.8 bolts) M6x60: 8 Nm (A 8.8 bolts)	
Thread of mounting holes: M6x18; M10x18	
Sealing rings:	N. 4 OR type 130 (22.22x2.62) - 90 Shore N. 2 OR type 2043 (10.82x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	EN 175301-803 electrical connector (included in the supply)
3	Connector removal space
4	Breather (Allen key 4)
5	Coil removal space
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP

10 - DZCE8 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



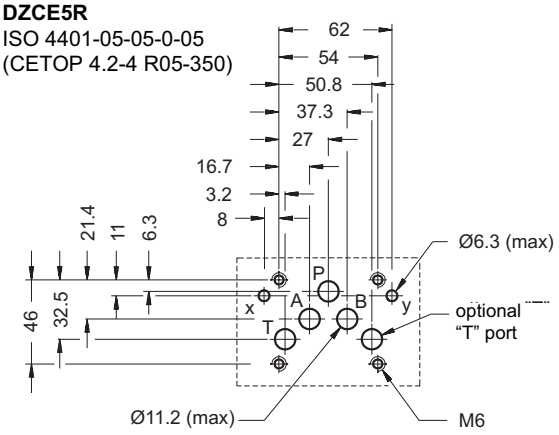
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

Valve fastening: N. 6 SHC M12x60 screws - ISO 4762
Tightening torque: 69 Nm (A 8.8 bolts)
Thread of mounting holes: M12x20
Sealing rings: N. 4 OR type 3118 (29.82x2.62) - 90 Shore N. 2 OR type 3081 (20.24x2.62) - 90 Shore

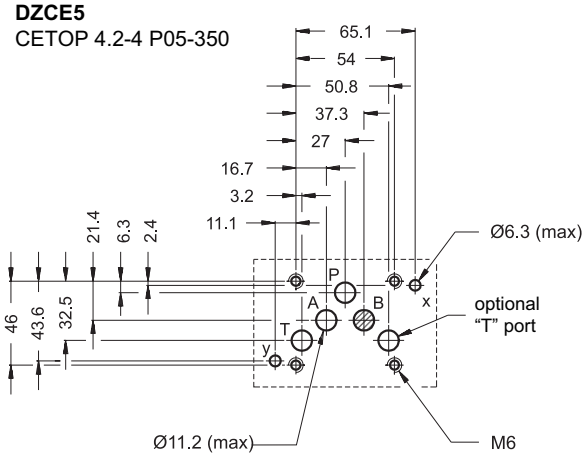
1	Mounting surface with sealing rings
2	EN 175301-803 electrical connector (included in the supply)
3	Connector removal space
4	Breather (Allen key 4)
5	Coil removal space
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP

11 - MOUNTING SURFACES

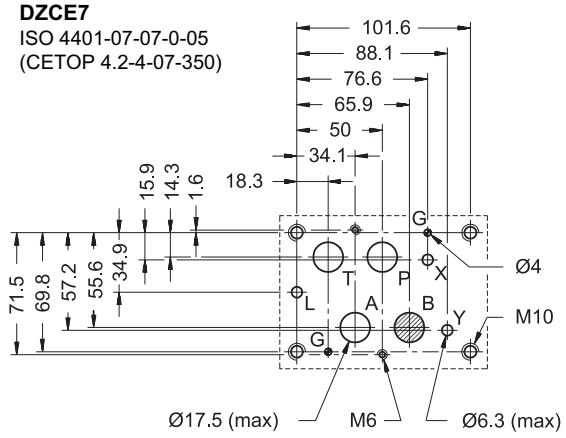
DZCE5R
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



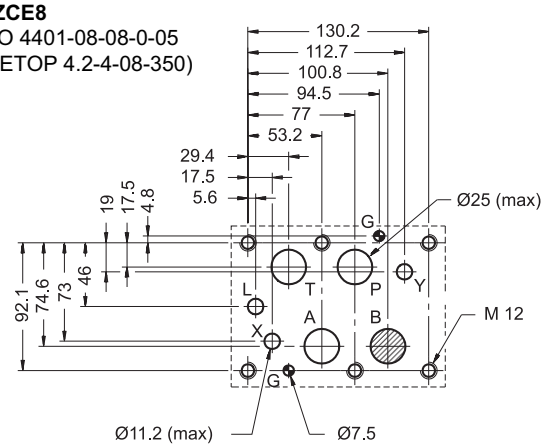
DZCE5
CETOP 4.2-4 P05-350



DZCE7
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DZCE8
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



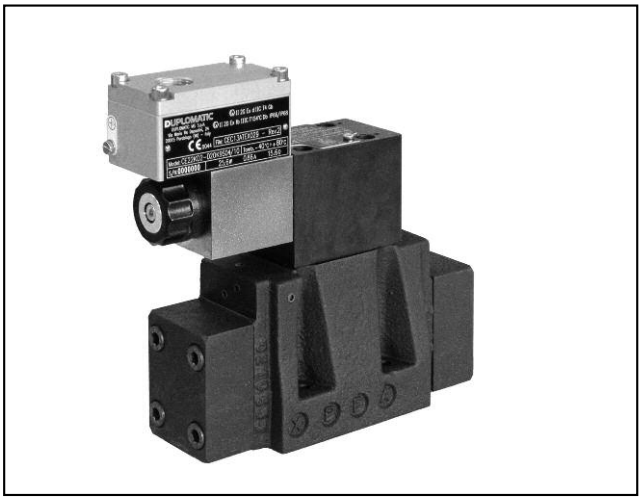
12 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		
UEIK-11	for solenoid 24V DC	Eurocard type	see cat. 89 300

13 - SUBPLATES

(see catalogue 51 000)

		DZCE5	**DZCE7**	**DZCE8**
Model with rear ports		PME4-AI5G	PME07-AI6G	-
Model with side ports		PME4-AL5G	PME07-AL6G	PME5-AL8G
Thread of ports:	P - T - A - B X - Y	3/4" BSP 1/4" BSP	1½" BSP 1/4" BSP	1" BSP 1/4" BSP



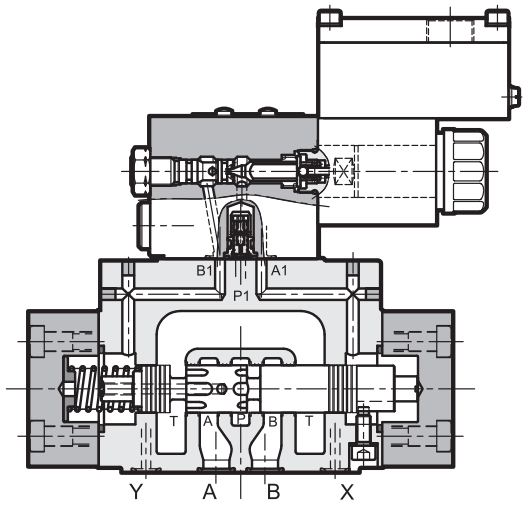
DZCE*K*

EXPLOSION-PROOF PRESSURE REDUCING VALVE WITH PROPORTIONAL CONTROL ATEX, IECEx, INMETRO

SERIES 11

DZCE5K*	**CETOP P05**
DZCE5RK*	**ISO 4401-05**
DZCE7K*	**ISO 4401-07**
DZCE8K*	**ISO 4401-08**

OPERATING PRINCIPLE



— The DZCE*K* are explosion-proof pressure reducing valves, pilot operated, with proportional control, available with CETOP P05, ISO 4401-05, ISO 4401-07 and ISO 4401-08 mounting surfaces.

— They are compliant with ATEX, IECEx and INMETRO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.

— A low temperature version (up to -40 °C) is also available.

— They can be controlled directly by a current control supply unit or by means of an electronic card to exploit valve performance to the full (see par. 14).

— Upon request, DZCE*K* valves can be supplied with a finishing surface treatment (zinc-nickel) which is suitable to ensure a salt spray resistance up to 600 hours.

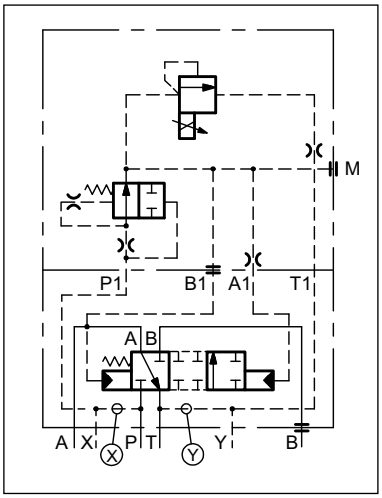
— Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 ‘Explosion proof classification’.

PERFORMANCES

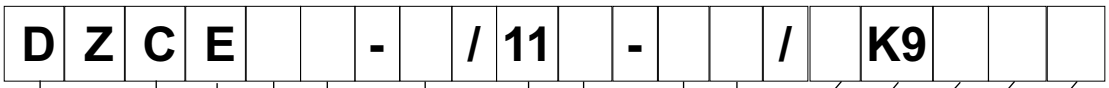
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

		DZCE5K* DZCE5RK*	DZCE7K*	DZCE8K*
Maximum operating pressure	bar	350		
Maximum flow	l/min	150	300	500
Step response		see paragraph 3		
Hysteresis (with PWM 200 Hz)	% of p_{max}	< 4%		
Repeatability	% of p_{max}	< ±2%		
Electrical characteristic		see paragraph 4		
Temperature ranges (ambient and fluid)		see data sheet 02 500		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	7,3	9,5	15,6

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



Pressure reducing valve

Electric proportional control

Nominal size:
5 = CETOP P05
5R = ISO 4401-05
7 = ISO 4401-07
8 = ISO 4401-08

Explosion-proof certification:
See table 1.1

Pressure control range
070 = 1 ÷ 70 bar
140 = 1 ÷ 140 bar
210 = 1 ÷ 210 bar
300 = 1 ÷ 300 bar

Series N. (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)

Piloting: **I** = internal
E = external

Drainage: **I** = internal
E = external

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

Coil electrical connection:
junction box

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
not available for INMETRO
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
not available for INMETRO
S03 = 1/2" NPT - ANSI B1.20.1
(ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Option: **/T5**
version in T5
temperature class.
Omit if not required.

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

Version with monobloc steel coil

Standard coils are made from zinc-nickel steel and with anodized aluminium junction box.

On request, monobloc coils **MD24K9S01** are available completely made from steel, with zinc-nickel treatment (power supply voltage D24 and cable gland connection type S01). Other variants for voltage and cable gland connection are available, always on request.

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 standard).

For zinc-nickel surface treatment add **/W7** at the end of the identification code.

1.1 - Names of valves per certification

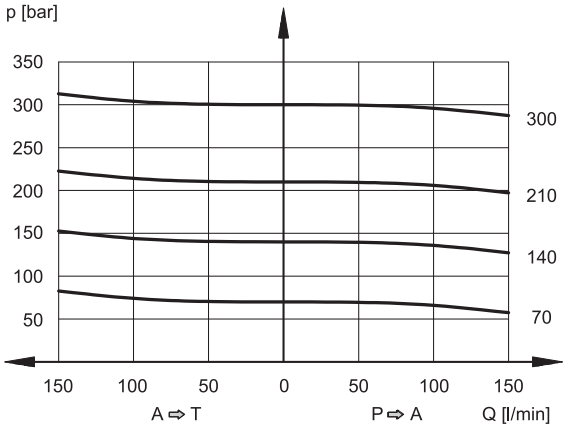
	ATEX		IECEx		INMETRO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KBD2**	INMETRO Gb INMETRO Db
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	**KBDM2**	INMETRO Mb

NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

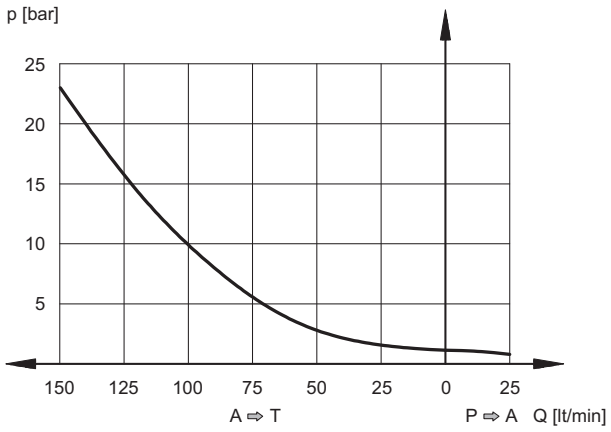
2 - CHARACTERISTIC CURVES
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

2.1 - Characteristic curves DZCE5K* and DZCE5RK*

ADJUSTMENT

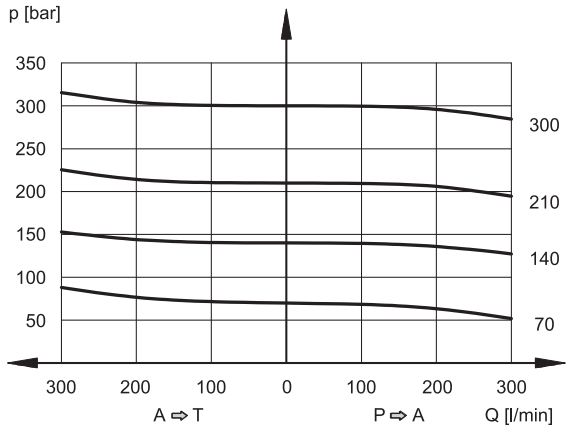


MIN. CONTROLLED PRESSURE p min = f(Q)

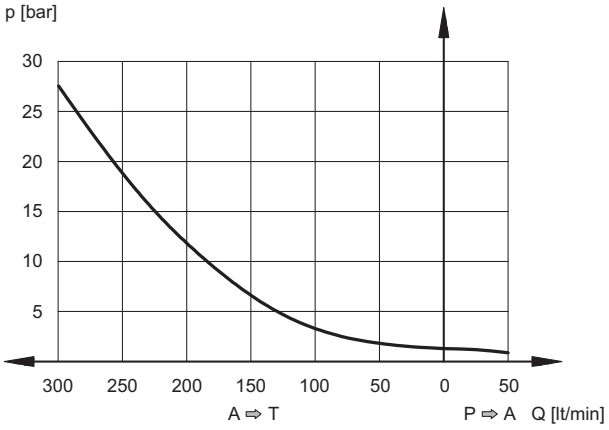


2.2 - Characteristic curves DZCE7K*

ADJUSTMENT

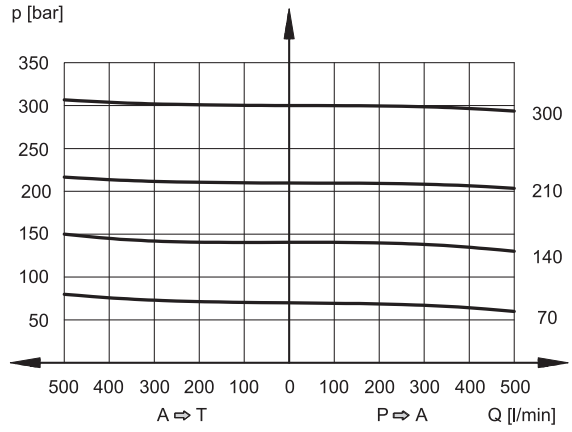


MIN. CONTROLLED PRESSURE p min = f(Q)

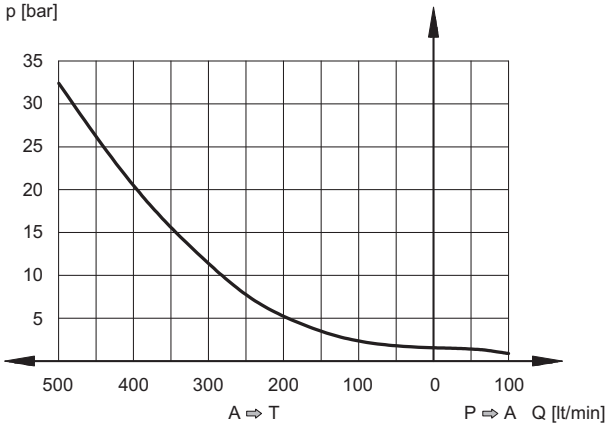


2.3 - Characteristic curves DZCE8K*

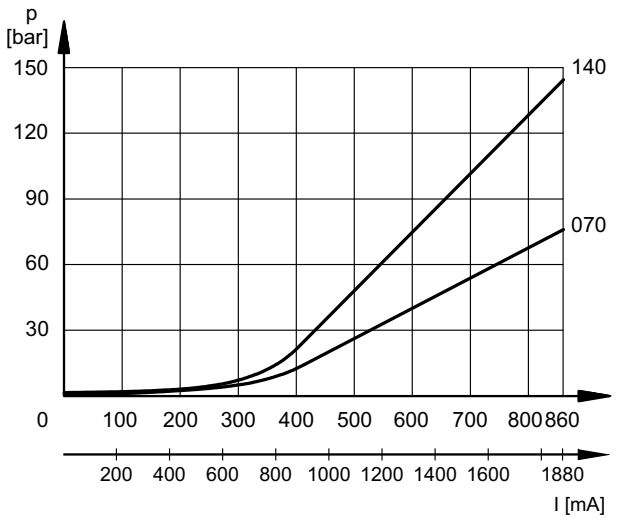
ADJUSTMENT

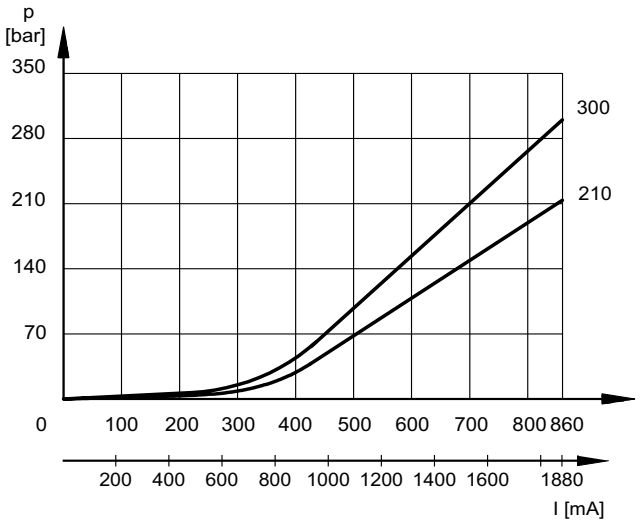


MIN. CONTROLLED PRESSURE p min = f(Q)



2.4 - Pressure control p = f(I) DZCE5K*, DZCE5RK*, DZCE7K* and DZCE8K*





3 - STEP RESPONSE

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

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

REFERENCE SIGNAL STEP	0 →100%	100 → 0%
Response times [ms]		
DZCE5K* and DZCE5RK*	100	70
DZCE7K*	100	50
DZCE8K*	100	50

4 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (AT 20°C)	Ω	3,8	15,6
NOMINAL CURRENT	A	1,88	0,86

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION: Atmospheric agents Coil insulation (VDE 0580)	 IP66/IP68 class H

4.1 - 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.

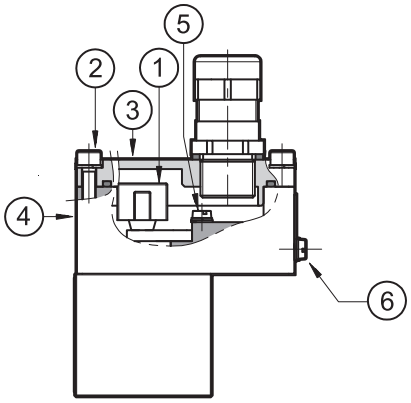
The electrical connection is polarity-independent.

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.

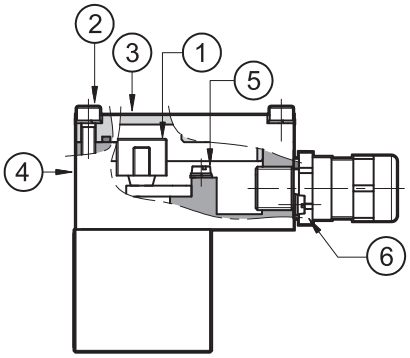
On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements 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 in compliance with standards about protection against explosion hazards.



K9T*



K9S*

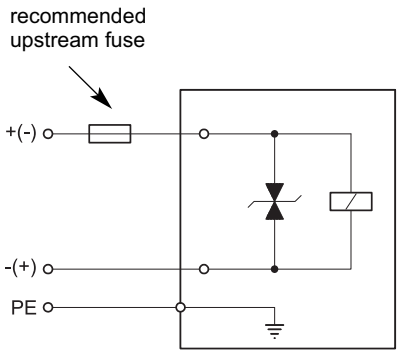
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

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 13) allow to use cables with external diameter between 8 and 10 mm.

4.2 - Electrical diagram



4.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In 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	

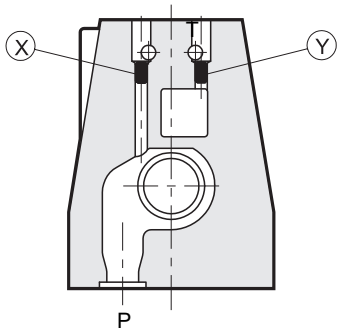
5 - PILOT AND DRAIN

The DZCE*K* valves are available with piloting and drainage, both internal and external.
We suggest to use the version with external drainage that allows a higher backpressure on the unloading.

TYPE OF VALVE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

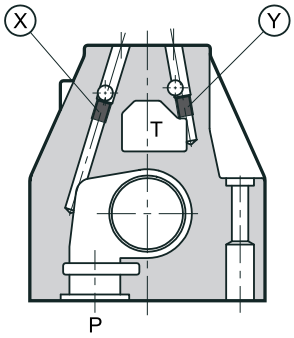
PRESSURES [bar]	MIN	MAX
Piloting pressure on X port	30	350
Pressure in T port with internal drain	-	2
Pressure in T port with external drain	-	250

DZCE5K* and DZCE5RK*



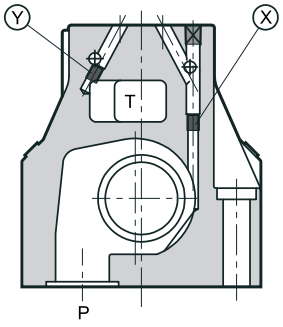
X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DZCE7K*



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

DZCE8K*

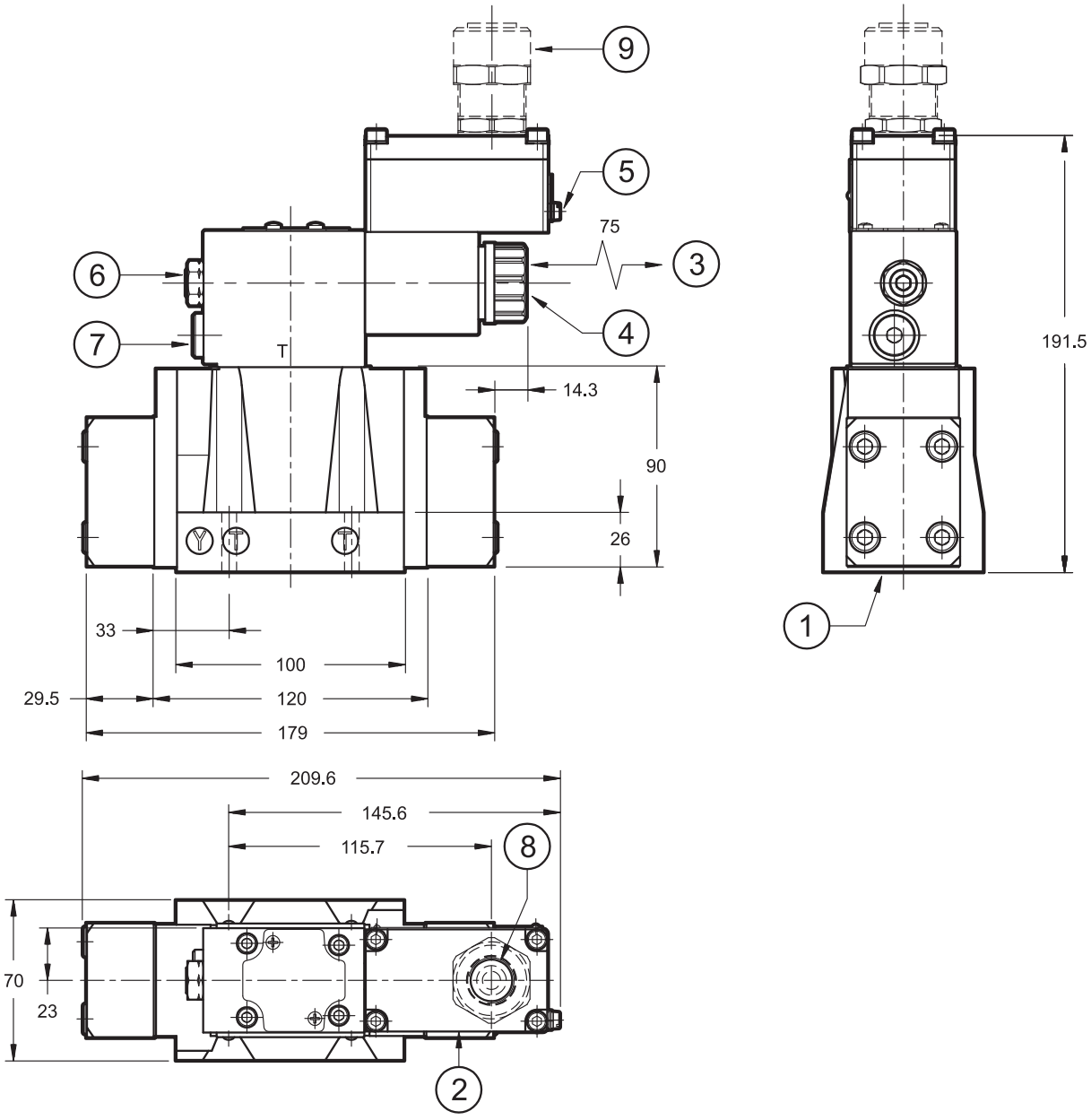


X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

6 - DZCE5K* AND DZCE5RK* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DZCE5K*-*/11*-*/*K9T*
DZCE5RK*-*/11*-*/*K9T*



1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Terminal for supplementary earth (GND) connection
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP
8	Upper port for cable gland
9	Cable gland. To be ordered separately, see paragraph 13

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.

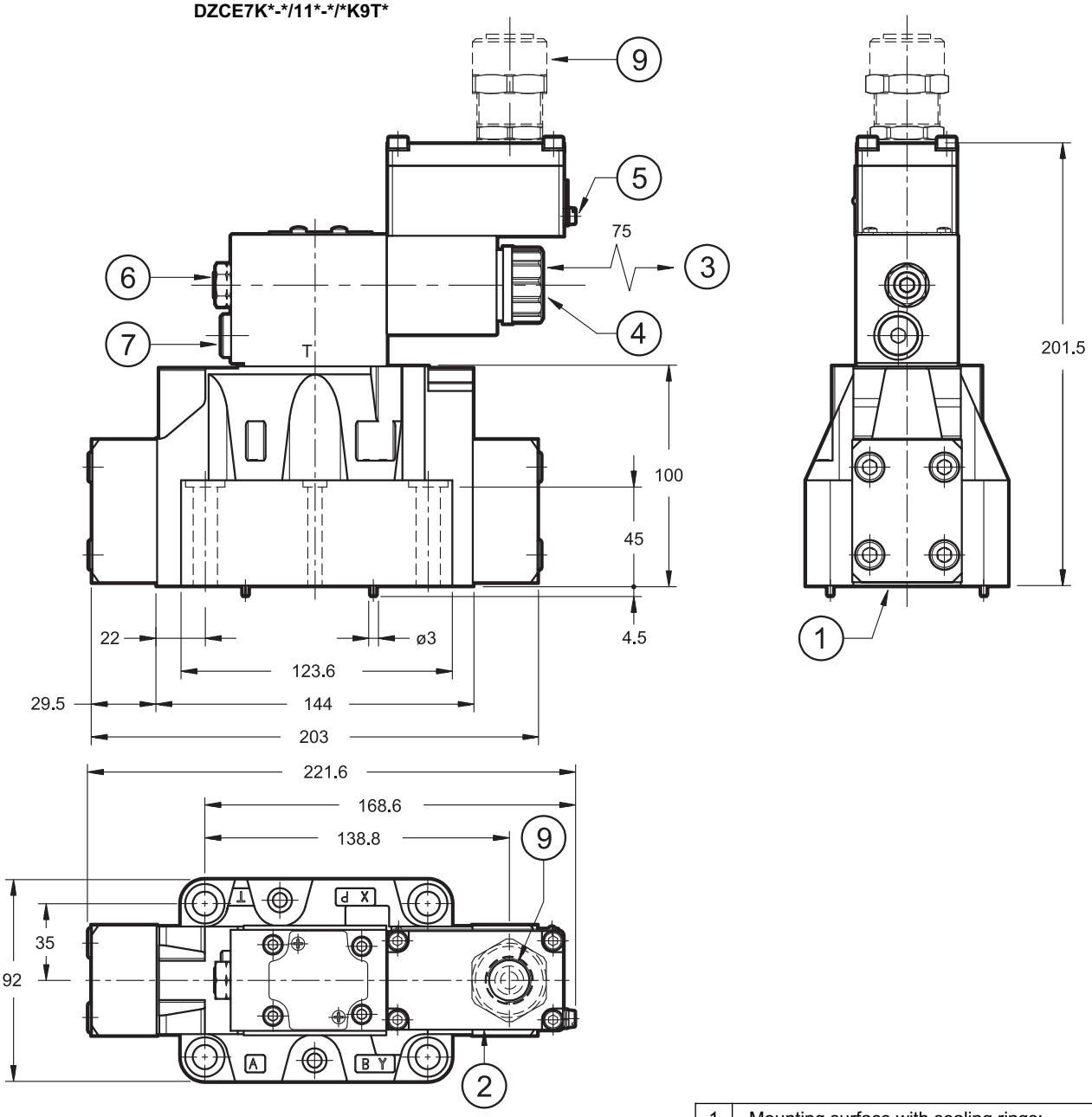
NOTE 2: for side port cable gland see paragraph 9.

Valve fastening: N. 4 SHC screws M6x35 - ISO 4762
Tightening torque: 8 Nm (A 8.8 screws)
Thread of mounting holes: M6x10

7 - DZCE7K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DZCE7K*-*/11*-*/*K9T*



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 port cable gland see paragraph 9.

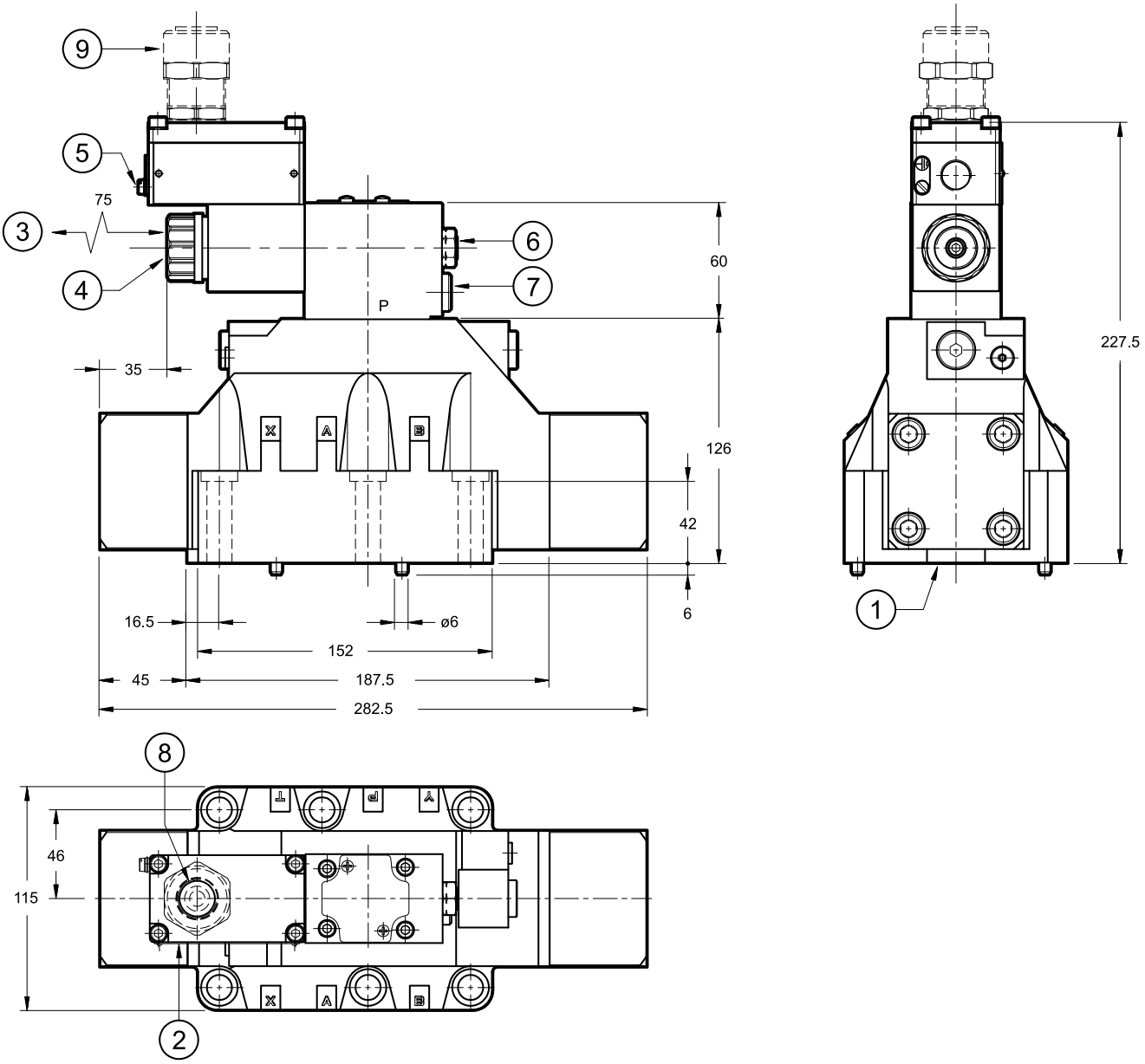
Single valve fastening:	N. 4 SHC screws M10x60 - ISO 4762 N. 2 SHC screws M6x60 - ISO 4762
Tightening torque	M10x60: 40 Nm (A 8.8 screws) M6x60: 8 Nm (A 8.8 screws)
Thread of mounting holes: M6x18; M10x18	

1	Mounting surface with sealing rings: 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Terminal for supplementary earth (GND) connection
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP
8	Upper port for cable gland
9	Cable gland. To be ordered separately, see paragraph 13

8 - DZCE8K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DZCE8K*-*/11*-*/*K9T*



1	Mounting surface with sealing rings: 4 OR type 3118 (29.82x2.62) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Terminal for supplementary earth (GND) connection
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP
8	Upper port for cable gland
9	Cable gland. To be ordered separately, see paragraph 13

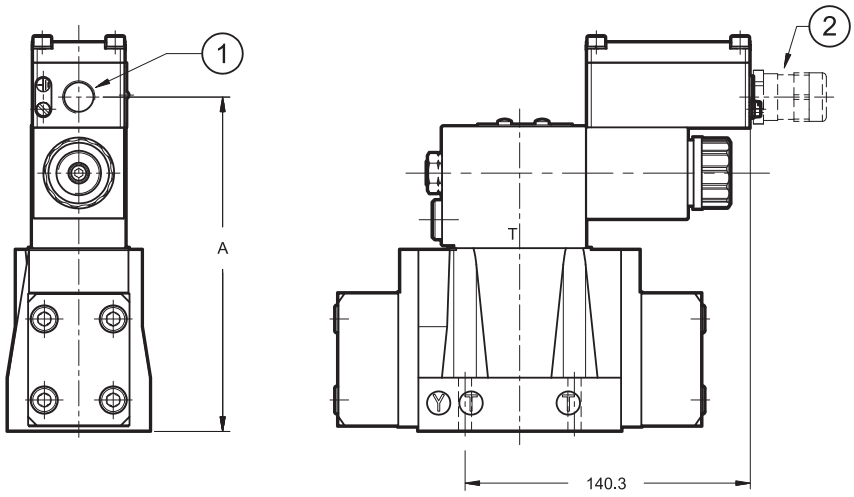
NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

NOTE 2: for side port cable gland see paragraph 9.

Valve fastening: N. 6 SHC screws M12x60 - ISO 4762
Tightening torque: 69 Nm (A 8.8 screws)
Thread of mounting holes: M12x20

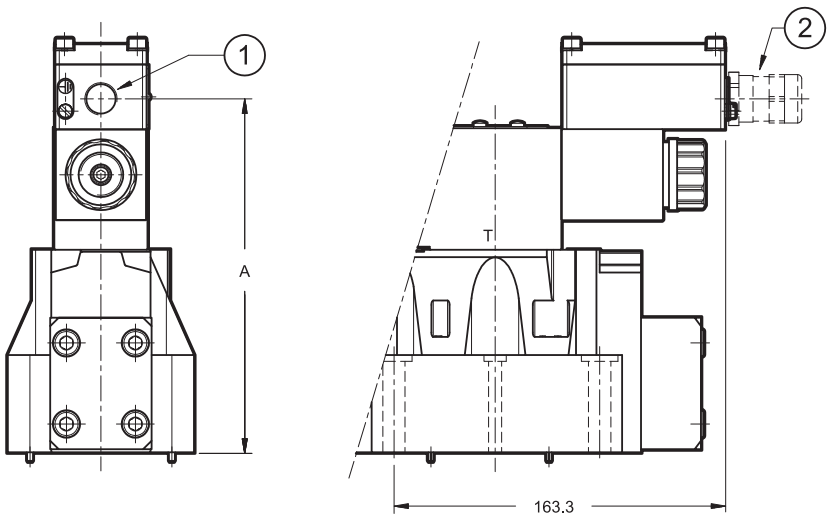
9 - DZCE*K* WITH SIDE CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



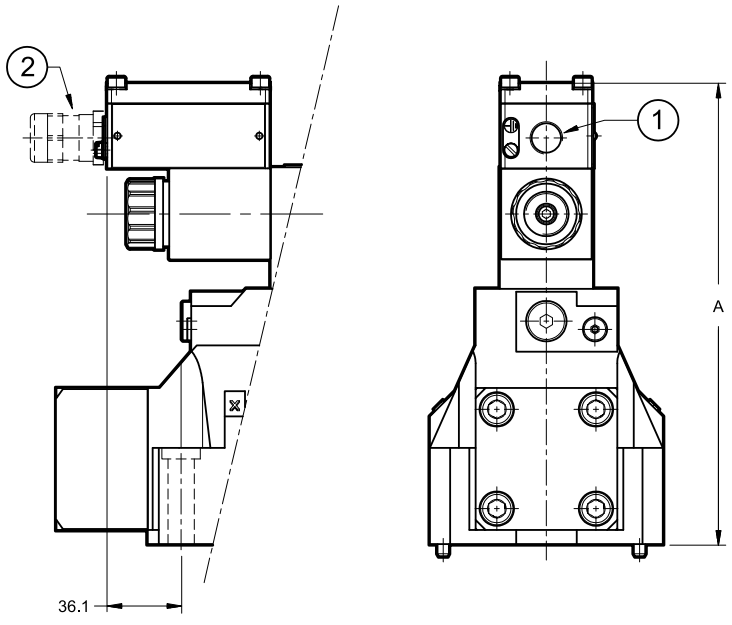
DZCE5K*-*/11*-*/*K9S*
DZCE5RK*-*/11*-*/*K9S*

Side port type	Dimension A
S01, S04	180.5
S02, S03	180



DZCE7K*-*/11*-*/*K9S*

Side port type	Dimension A
S01, S04	190.5
S02, S03	190



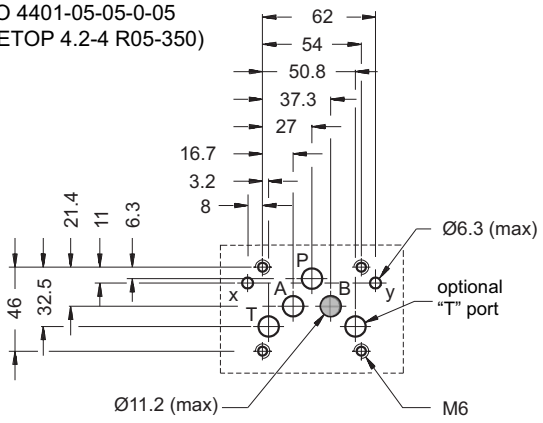
DZCE8K*-*/11*-*/*K9S*

Side port type	Dimension A
S01, S04	226.5
S02, S03	226

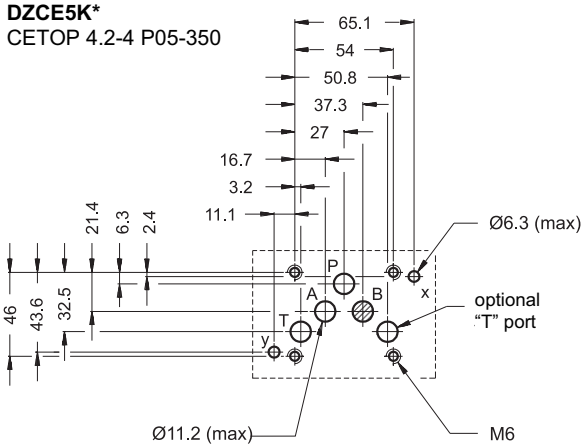
1	Side port for cable gland
2	Cable gland. To be ordered separately, see par. 13

10 - MOUNTING SURFACES

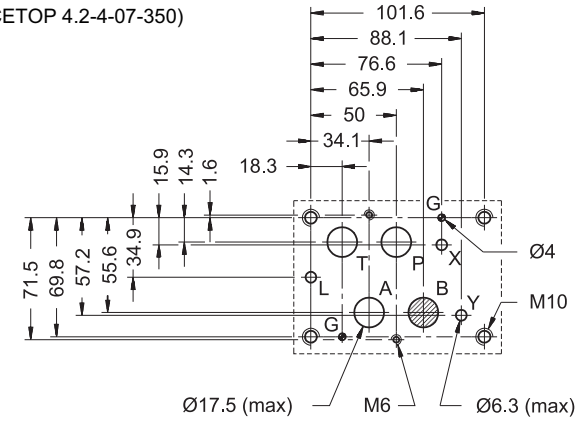
DZCE5RK*
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



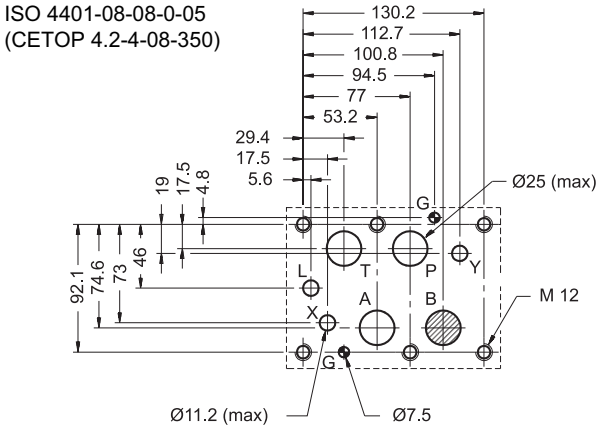
DZCE5K*
CETOP 4.2-4 P05-350



DZCE7K*
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DZCE8K*
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



11 - 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.

12 - INSTALLATION

Installation must adheres 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 potentially explosive atmospheres.

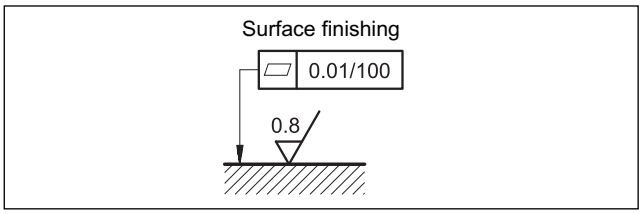
We recommend to install the DZCE*K* valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

Ensure that there is no air in the hydraulic circuit. In particulars applications,it can be necessary to vent the air entrapped in the solenoid tube, using the special drain screw and then ensure to screwed it correctly.

Connect the valve T port 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.

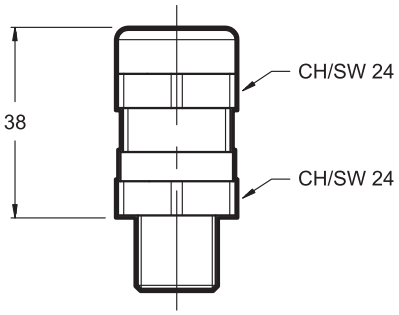
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



13 - CABLE GLANDS

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

- version for non-armoured cable, external seal on the cable (suitable for Ø 8 ÷ 10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb; INMETRO Gb, Db, Mb certified
- cable gland material: nickel brass
- rubber tip material: silicone
- ambient temperature range: -70 ºC ÷ +220 ºC
- protection degree: IP66/IP68



To order the desired cable glands, specify description, code and quantity.

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 copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

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.

Tightening torque: 20 ÷ 25 Nm

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.

Tightening torque: 20 ÷ 25 Nm

Description: CGK2/NB-04/10

Code: 3908108004

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

Tightening torque: 45 ÷ 50 Nm

14 - ELECTRONIC CONTROL UNITS

EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251
EDM-M142	for solenoid 12V DC		

NOTE: electronic control units offered are not explosion-proof certified; therefore, they must be installed outside classified areas.

15 - SUBPLATES

(see catalogue 51 000)

		DZCE5K*	**DZCE7K***	**DZCE8K***
Type with rear ports		PME4-AI5G	PME07-AI6G	-
Type with side ports		PME4-AL5G	PME07-AL6G	PME5-AL8G
Thread of ports:	P - T - A - B	3/4” BSP	1½” BSP	1” BSP
	X - Y	1/4” BSP	1/4” BSP	1/4” BSP

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

The user will bear to do the complete assessment of the ignition risk that can occur from the relative use in potentially explosive environments.

EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure control valves	
RQM*K*-P	**21 515**
P*E*K*	**81 316**
ZDE3K*	**81 515**
DZCE*K*	**81 605**
flow control valves	
QDE*K*	**82 225**
directional valves	
D*K*	**41 515**
DT3K*	**42 215**
DS(P)E*K*	**83 510**

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic MS offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
INMETRO	**Gb**	**Db**	**Mb**

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; 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.

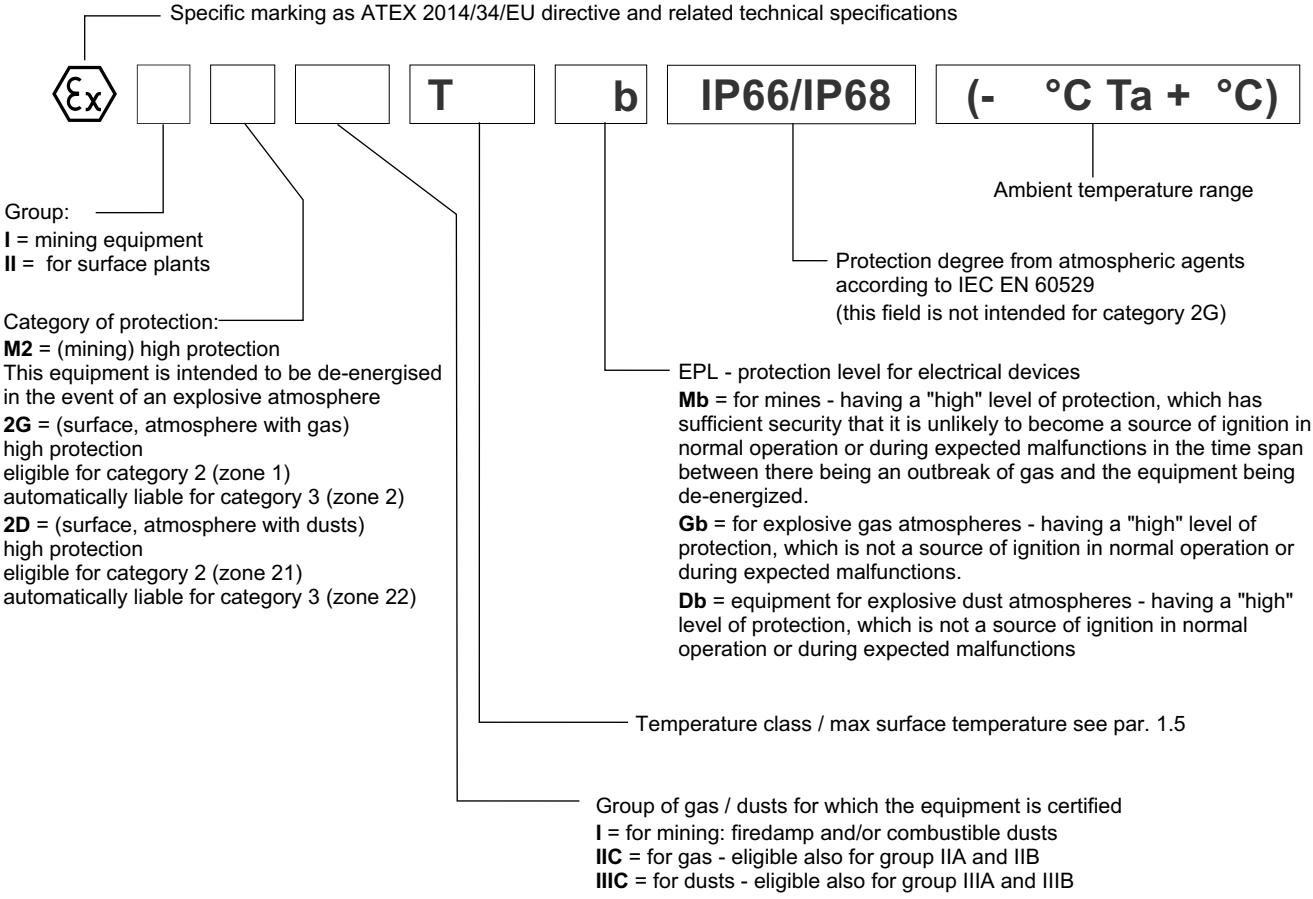
1.1 - ATEX classification for valves

Type examination certificate: AR18ATEX055
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment 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**	equipment 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.

1.2 - ATEX marking for valves

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



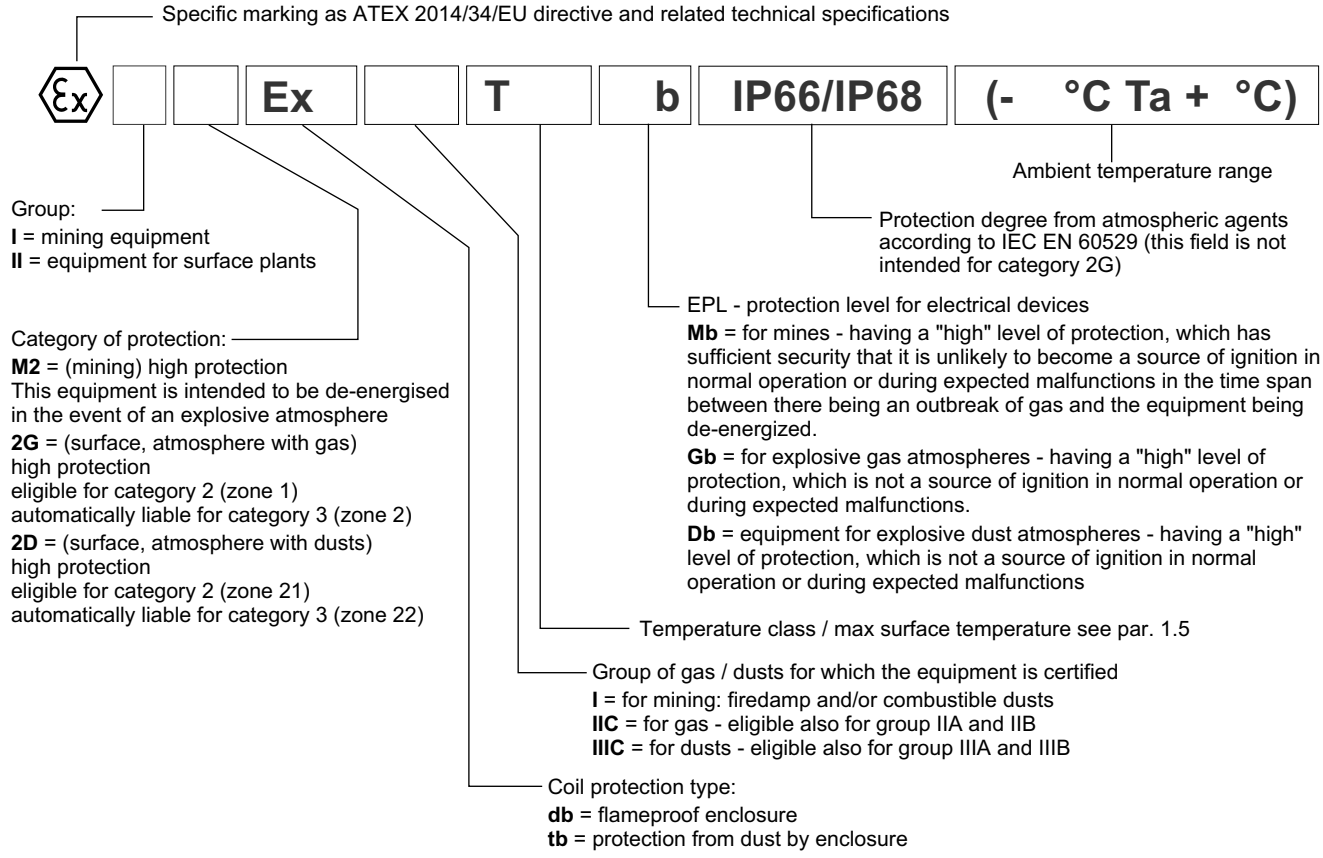
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself an as such is identified with its own tag, 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 db” type protection (explosion-proof coil).

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

1.4 - ATEX marking on coils

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



1.5 - 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) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

2 - IECEx CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. 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 db” type protection (explosion-proof coil).

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

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

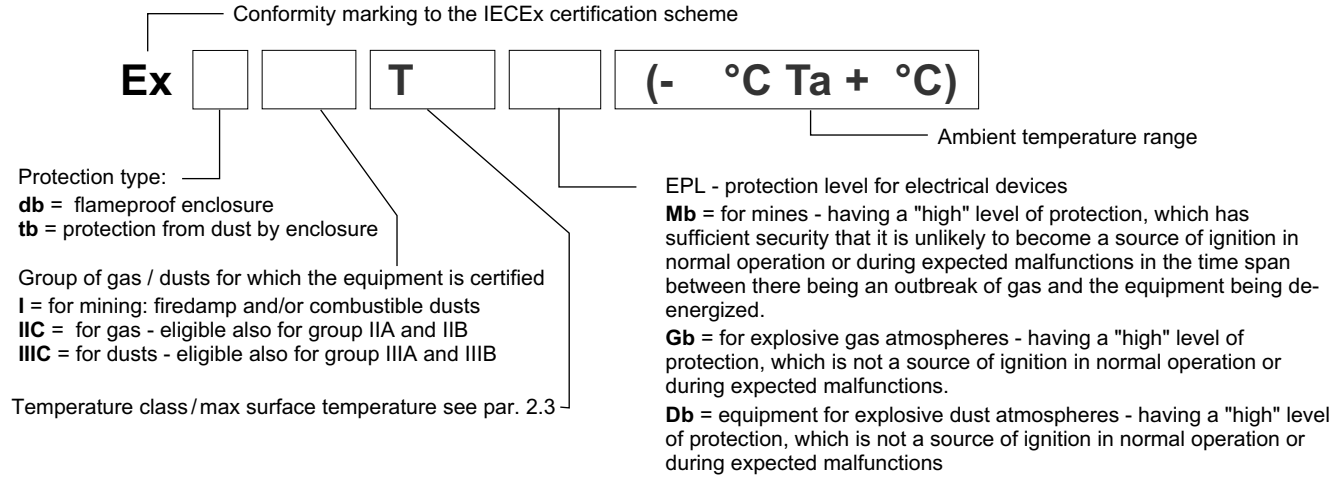
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
IECEx Mb	***KXDM2**	equipment 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.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



2.3 - 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.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

3 - INMETRO CLASSIFICATION AND TEMPERATURES

The INMETRO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with INMETRO certified coils, suitable for application and installation in potentially explosive atmospheres. 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 db” type protection (explosion-proof coil).

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

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - INMETRO classification

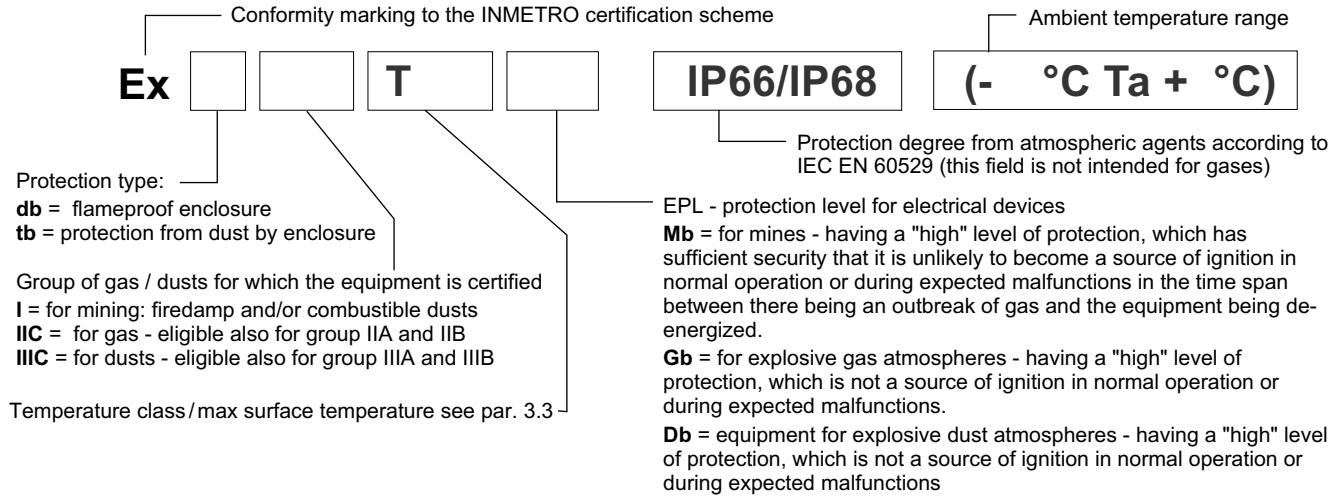
Certificate of conformity: DNV 15.0094 X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

INMETRO Gb INMETRO Db	***KBD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
INMETRO Mb	***KBDM2**	equipment 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.

3.2 - INMETRO marking

There is a plate with the INMETRO mark on each coil.

***KBD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KBD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KBDM2** valves	mining	Ex db I T150° Mb IP66/IP68 (-40°C Ta +75°C)

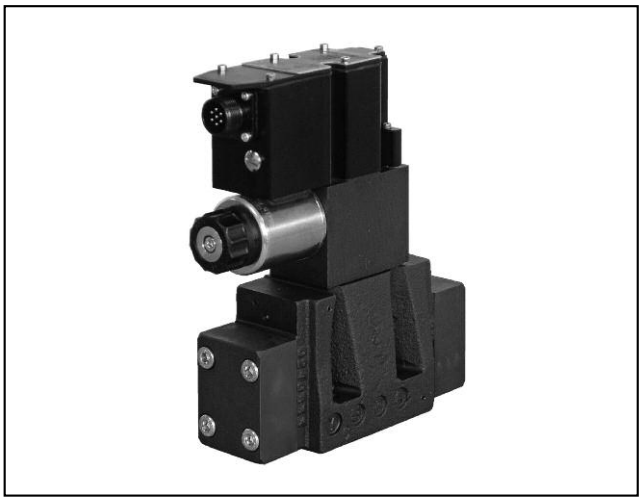


3.3 - Operating temperatures

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.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	N and V seals	NL seals	Temperature class	eligible also for
INMETRO Gb INMETRO Db	***KBD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KBD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
INMETRO Mb	***KBDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				



DZCE*G

PRESSURE REDUCING VALVES WITH PROPORTIONAL CONTROL AND INTEGRAL ELECTRONICS

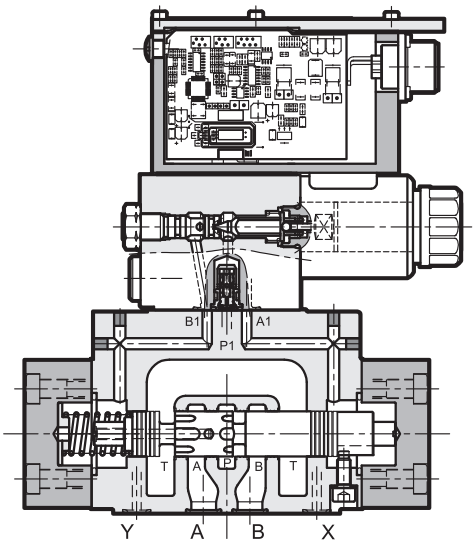
SERIES 31

DZCE5G	**CETOP P05**
DZCE5RG	**ISO 4401-05**
DZCE7G	**ISO 4401-07**
DZCE8G	**ISO 4401-08**

p max **350** bar

Q max (see performance table)

OPERATING PRINCIPLE



— The DZCE*G are pressure reducing valves with electric proportional control with integrated electronics, with mounting interface in compliance with ISO 4401 standards.

— Those valves, besides reducing the pressure from line P to working line A, allow the flow to return from the line A to the return line T when a pressure greater than the set value is generated in the downstream circuit (flow path A): a typical case of hydraulic counterweight or load balancing.

— The valves are available with command signal in voltage or current and on board electronics with internal enable, external enable or 0V monitor on pin C.

— A solenoid current monitoring signal is available.

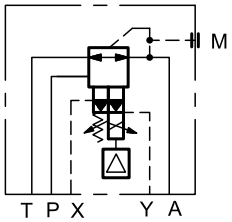
— The valves are easy to install. The driver directly manages digital settings. In the event of special applications, you can customize the settings using the optional kit (see par. 15.3)

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C p = 140 bar)

		DZCE5G DZCE5RG	DZCE7G	DZCE8G
Max operating pressure	bar	350		
Maximum flow	l/min	150	300	500
Step response		see paragraph 7		
Hysteresis	% of p_{max}	< 2%		
Repeatability	% of p_{max}	< ±2%		
Electrical characteristics		see paragraph 3		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	7,3	9,5	15,6

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

D	Z	C	E		G	-		/	31		-			/		K11	

Pressure reducing valve

Electric proportional control

Nominal size:
5 = CETOP P05
5R = ISO 4401-05
7 = ISO 4401-07
8 = ISO 4401-08

Integrated electronics for open loop

Pressure control range:
070 = 1 ÷ 70 bar
140 = 1 ÷ 140 bar
210 = 1 ÷ 210 bar
300 = 1 ÷ 300 bar

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (standard)
V = FPM seals for special fluids

Piloting: **I** = internal
E = external

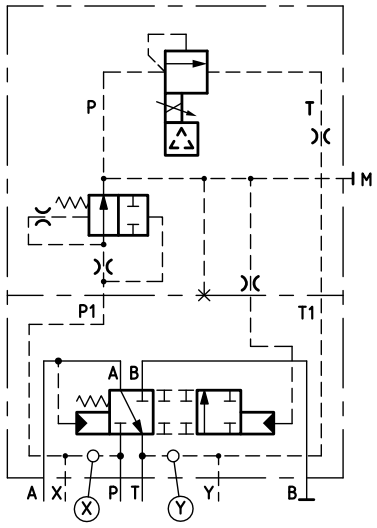
Drainage: **I** = internal
E = external

Reference signal:
E0 = voltage 0÷10 V
E1 = current 4÷20 mA

Main connector 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

2 - DETAILED SYMBOL



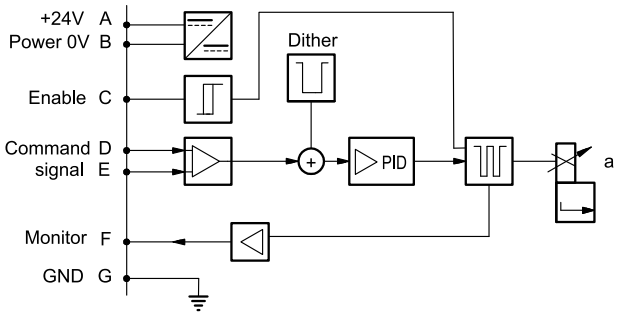
3 - ELECTRICAL CHARACTERISTICS

3.1 - Electrical on board electronics

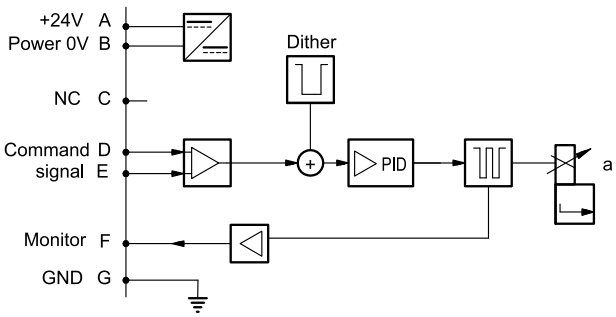
Duty cycle		100% (continuous operation)
Protection class according to IEC 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external		2A time lag
Command signals: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2014/30/EU standards

3.2 - On-board electronics diagrams

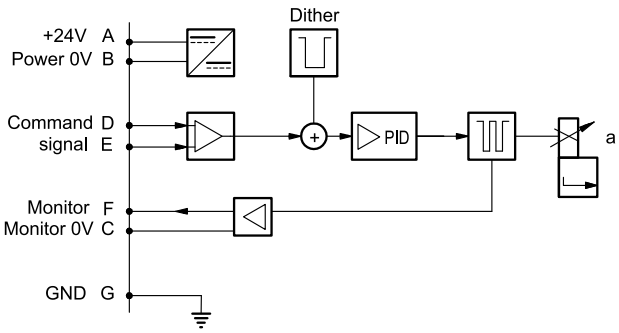
VERSION A - External Enable



VERSION B - Internal Enable

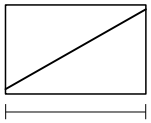


VERSION C - 0V Monitor

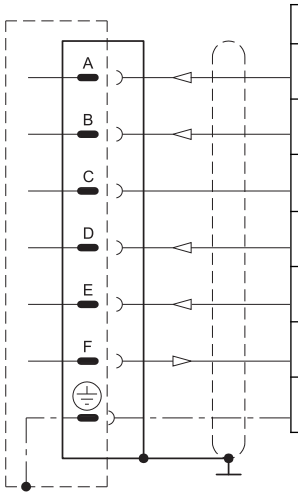


4 - VERSIONS WITH VOLTAGE COMMAND (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**

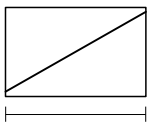


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	0 ÷ 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

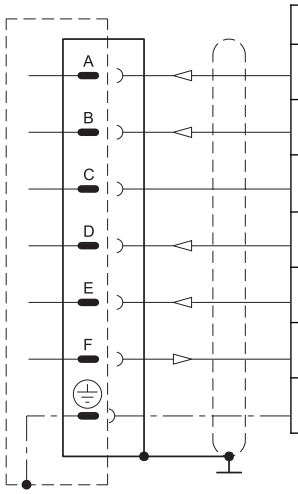
5 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**



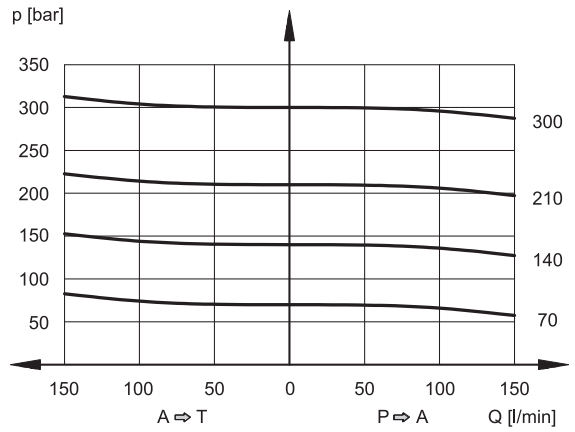
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

6 - CHARACTERISTIC CURVES

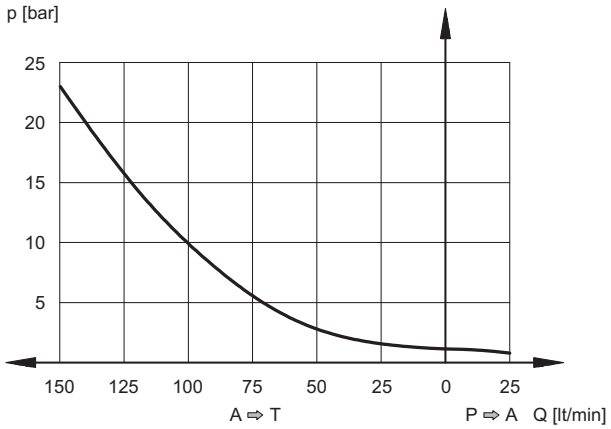
(with mineral oil with viscosity of 36 cSt at 50°C)

6.1 - Characteristic Curves of DZCE5G and DZCE5RG

ADJUSTMENT

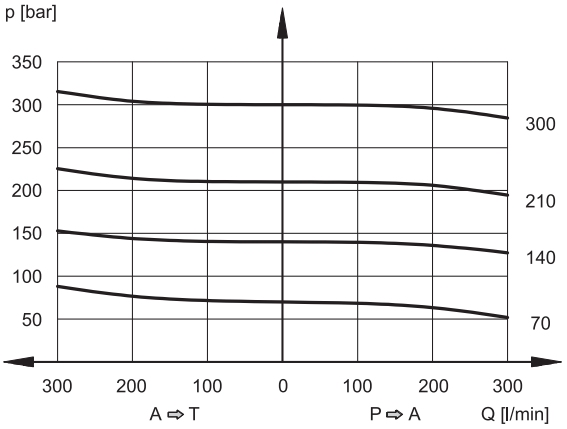


MIN. CONTROLLED PRESSURE p min = f(Q)

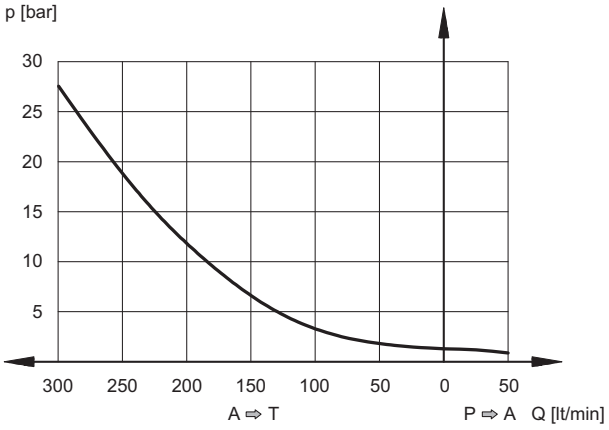


6.2 - Characteristic Curves of DZCE7G

ADJUSTMENT

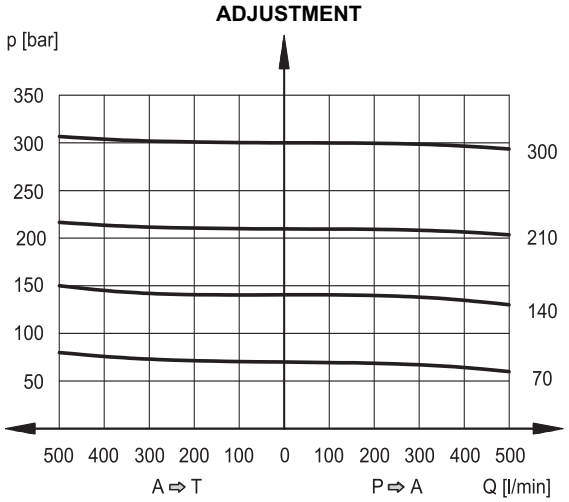


MIN. CONTROLLED PRESSURE p min = f(Q)

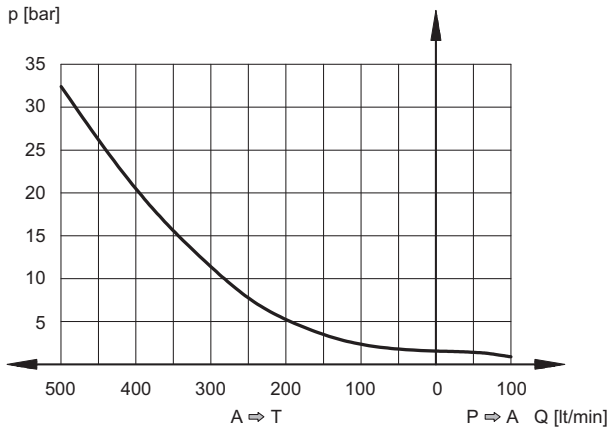


6.3 - Characteristic Curves of DZCE8G

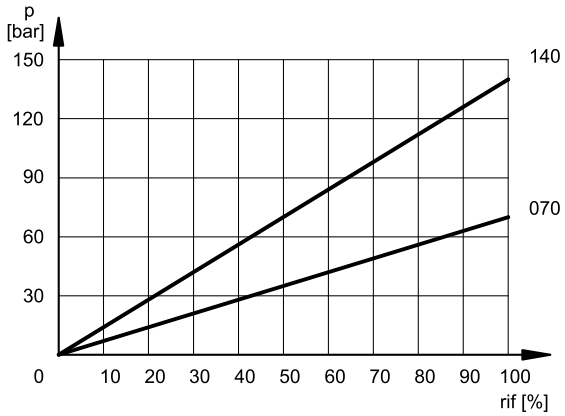
ADJUSTMENT

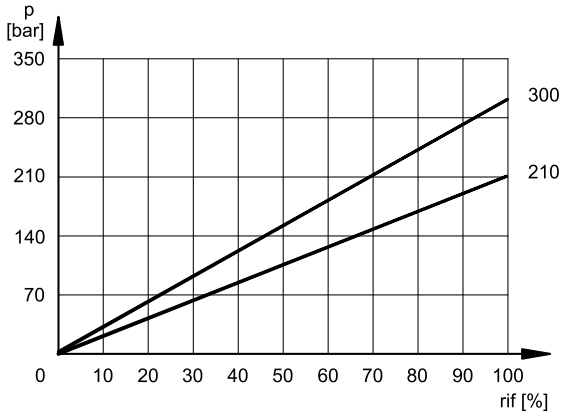


MIN. CONTROLLED PRESSURE p min = f(Q)



6.4 - CONTROLLED PRESSURE p = f(I)



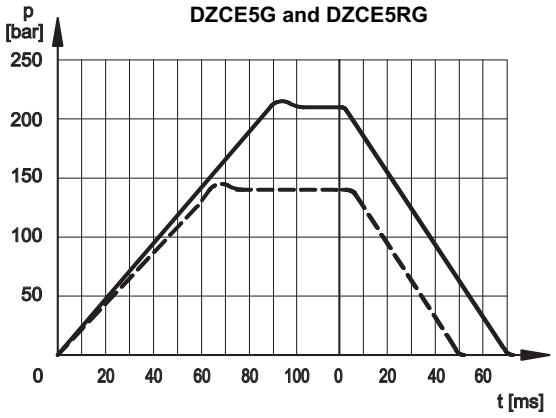


7 - STEP RESPONSE

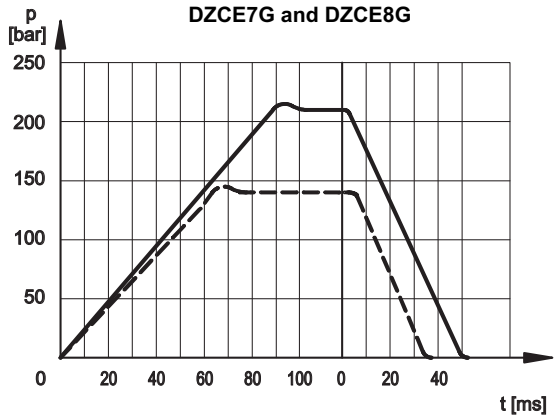
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

The graphs show the typical step response tested with static pressure 100 bar.

DZCE5G and DZCE5RG



DZCE7G and DZCE8G

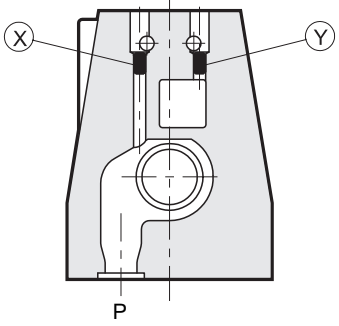


8 - PILOTING AND DRAINAGE

The valves are available with piloting and drainage, both internal and external. The version with external drainage allows a higher backpressure on the unloading.

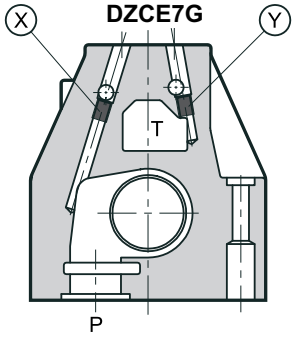
TYPE OF VALVE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

DZCE5 and DZCE5RG



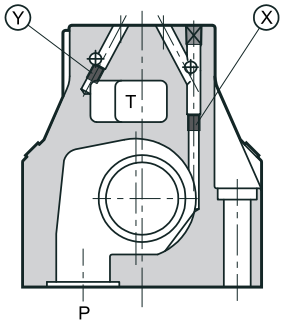
X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DZCE7G



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

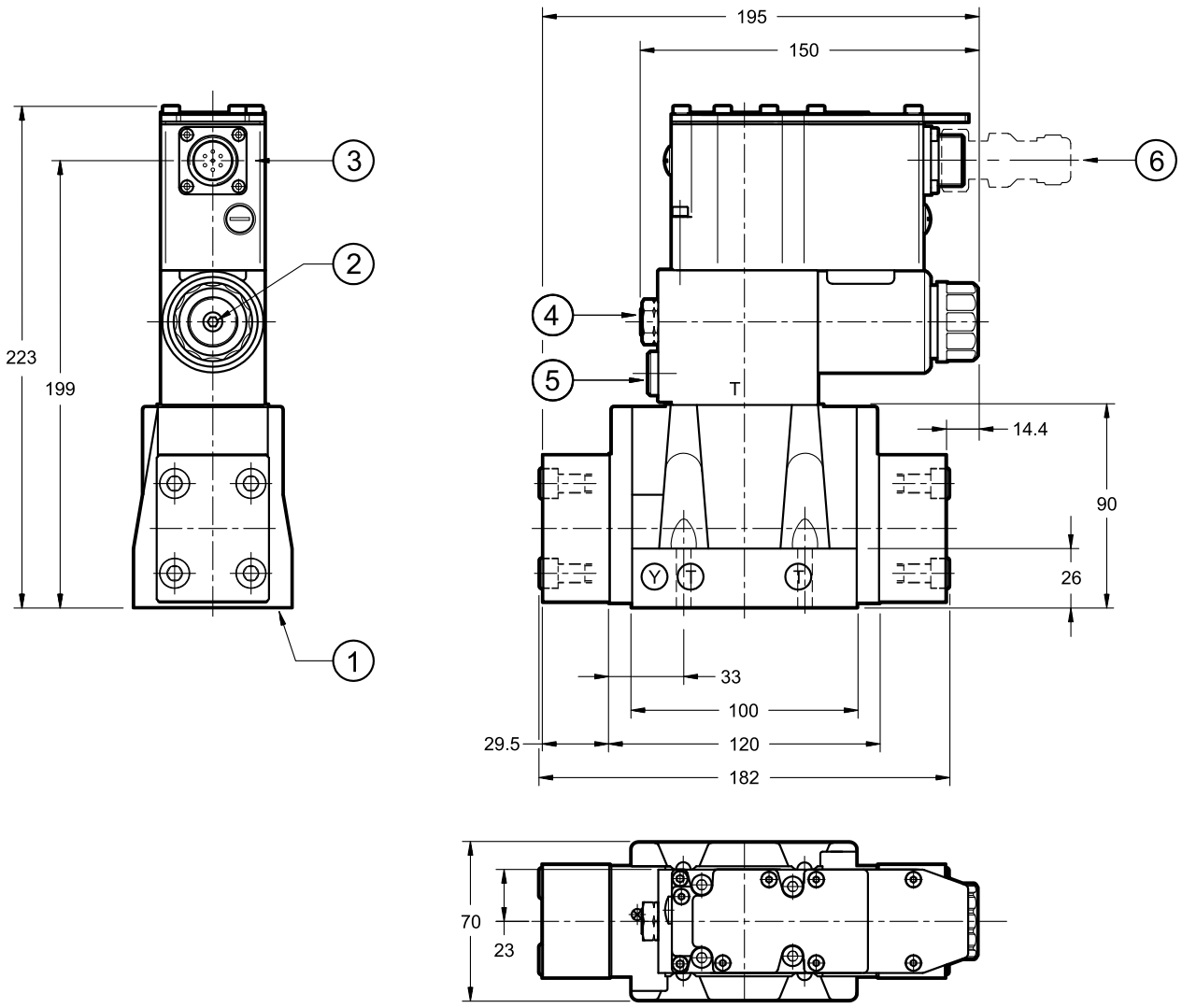
DZCE8G



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

9 - OVERALL AND MOUNTING DIMENSIONS DZCE5G AND DZCE5RG

dimensions in mm



NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

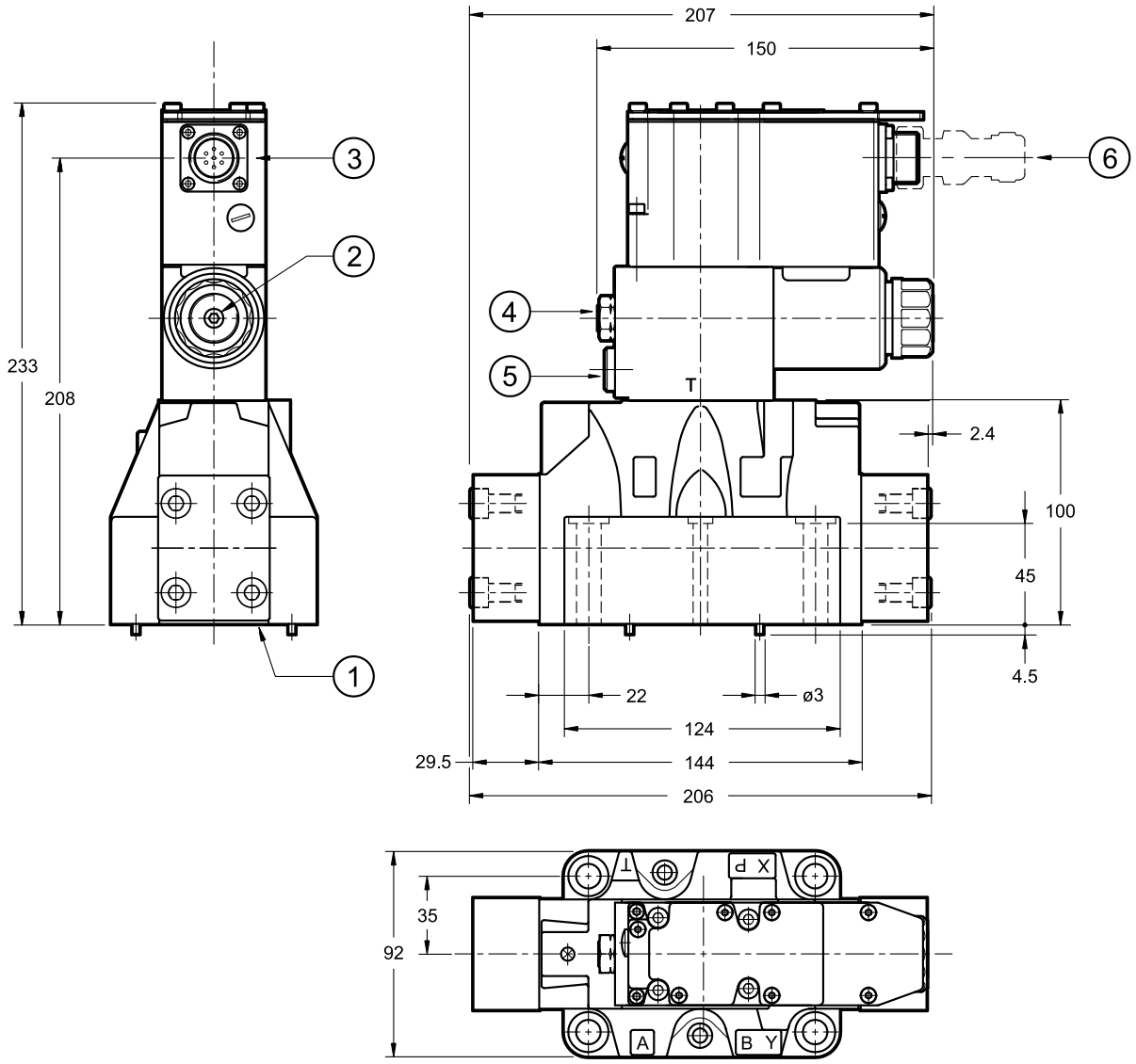
Mounting surface shown at paragraph 12.

Valve fastening: N. 4 bolts SHC M6x35 - ISO 4762	
Tightening torque: 8 Nm (bolts A 8.8)	
Thread of mounting holes: M6x10	

1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Breather (Allen key 4)
3	Main connection
4	Adjustment seal, set in factory. It is recommended not to unscrew the nut.
5	Pressure gauge port 1/4 BSP”
6	Mating electrical connector **to be ordered separately.** See at section 15

10 - OVERALL AND MOUNTING DIMENSIONS DZCE7G

dimensions in mm



NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

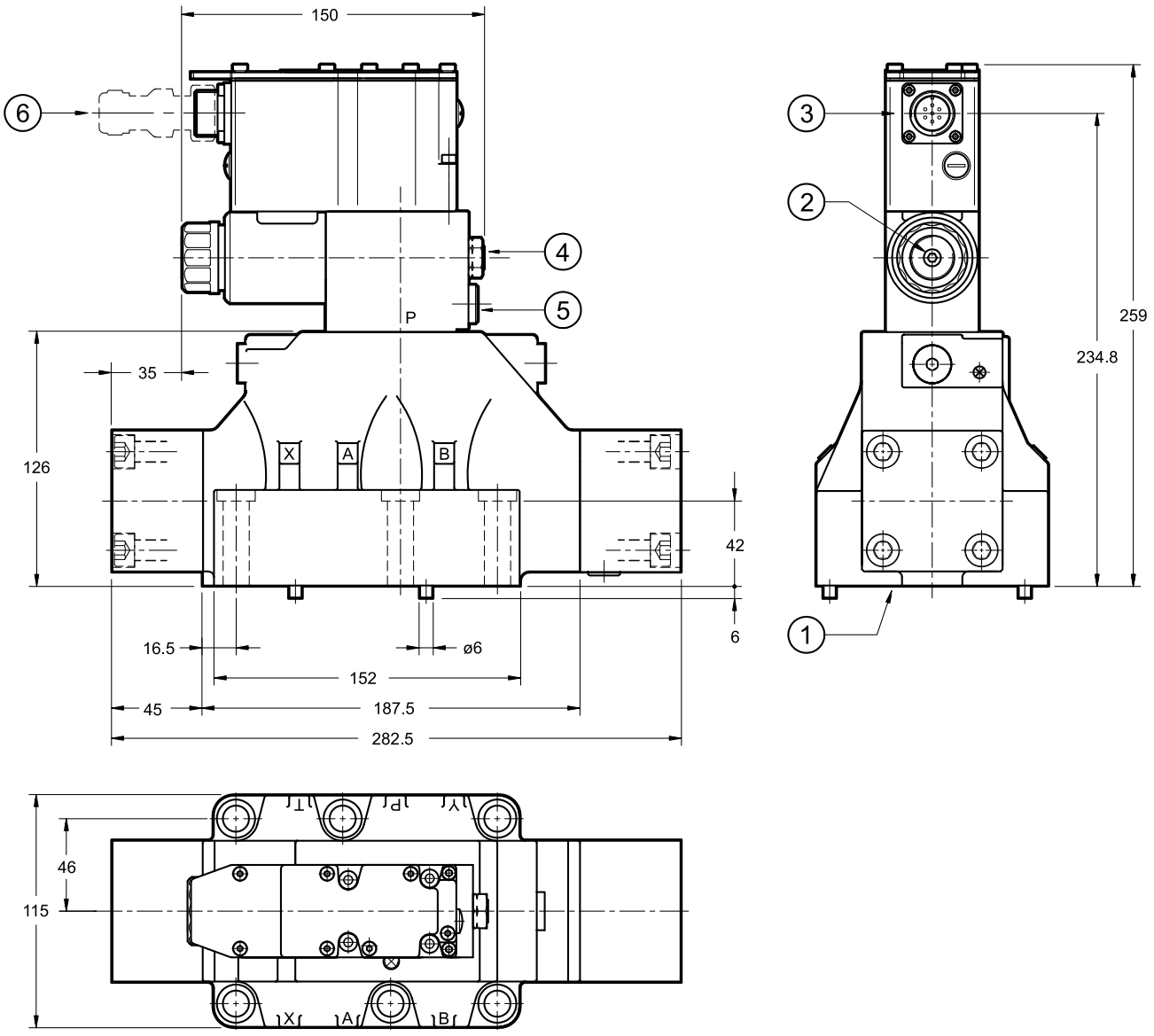
Mounting surface shown at paragraph 12.

Valve fastening:	N. 4 bolts SHC M10x60 - ISO 4762 N. 2 bolts SHC M6x60 - ISO 4762
Tightening torque:	M10x60: 40 Nm (bolts A 8.8) M6x60: 8 Nm (bolts A 8.8)
Thread of mounting holes:	M6x18; M10x18

1	Mounting surface with sealing rings: N. 4 OR type 130 (22.22x2.62) - 90 Shore N. 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Breather (Allen key 4)
3	Main connection
4	Adjustment seal, set in factory. It is recommended not to unscrew the nut.
5	Pressure gauge port 1/4 BSP”
6	Mating electrical connector **to be ordered separately.** See at section 15

11 - OVERALL AND MOUNTING DIMENSIONS DZCE8G

dimensions in mm



NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

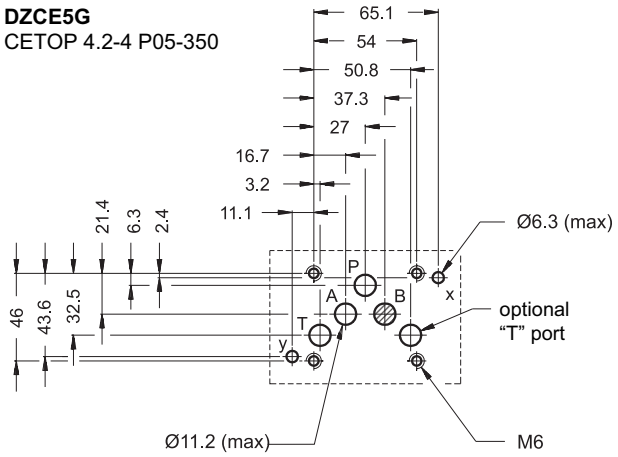
Mounting surface shown at paragraph 12.

1	Mounting surface with sealing rings: N. 4 OR type 3118 (29.82x2.62) - 90 Shore N: 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Breather (Allen key 4)
3	Main connection
4	Adjustment seal, set in factory. It is recommended not to unscrew the nut.
5	Pressure gauge port 1/4 BSP”
6	Mating electrical connector **to be ordered separately.** See at section 15

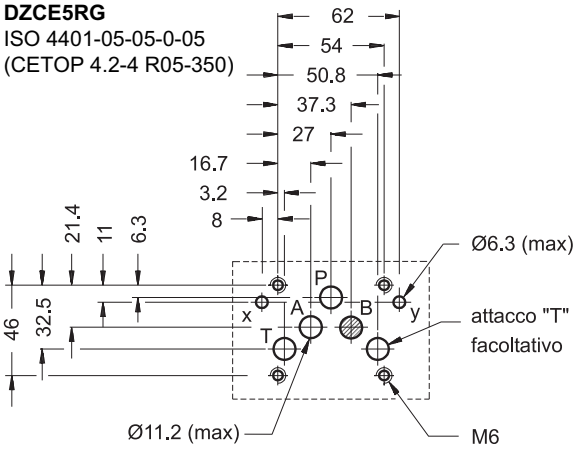
Valve fastening: N. 6 bolts SHC M12x60 - ISO 4762
Tightening torque: 69 Nm (bolts A 8.8)
Thread of mounting holes: M12x20

12 - MOUNTING SURFACES

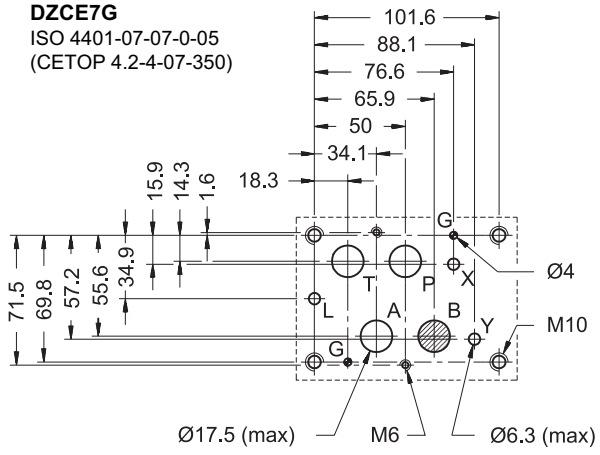
DZCE5G
CETOP 4.2-4 P05-350



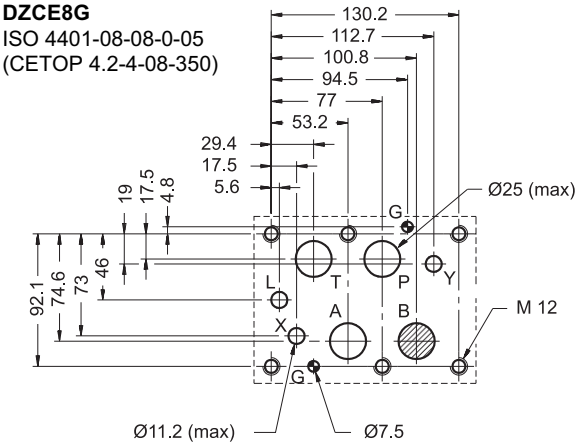
DZCE5RG
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



DZCE7G
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DZCE8G
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



13 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. 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.

14 - INSTALLATION

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 paragraph 5.

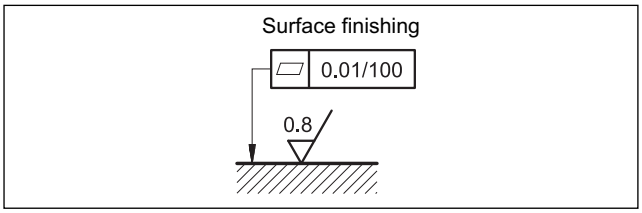
Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube.

Ensure the solenoid tube is always filled with oil. At the end of the operation, make sure of having correctly replaced the drain screw.

Connect the valve T port 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.

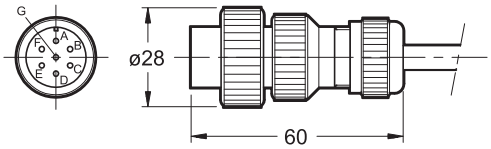
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



15 - ACCESSORIES
(to be ordered separately)

15.1 Mating connector

These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.



So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic offers a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**

15.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm²
- up to 40 m cable length : 1,5 mm²

Signal: 0,50 mm²

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

15.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

16 - SUBPLATES
(see catalogue 51 000)

		DZCE5G	DZCE7G	DZCE8G
Type with rear ports		PME4-AI5G	PME07-AI6G	-
Type with side ports		PME4-AL5G	PME07-AL6G	PME5-AL8G
Thread of ports:	P - T - A - B X - Y	3/4" BSP 1/4" BSP	1" BSP 1/4" BSP	1½" BSP 1/4" BSP