

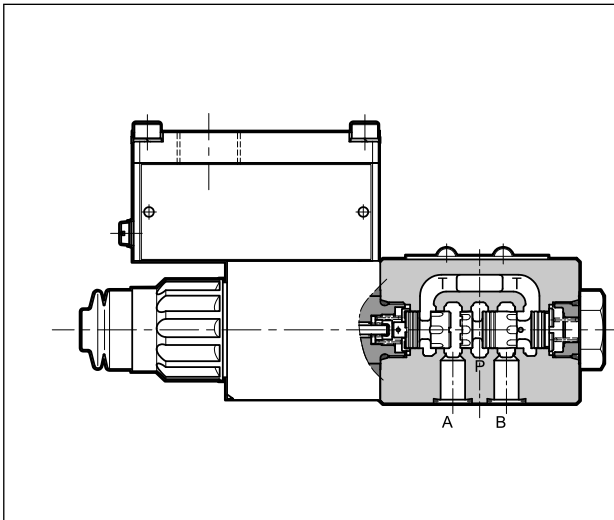
QDE3K*

PROPORTIONAL FLOW CONTROL VALVE WITH COMPENSATION ATEX, IECEx, INMETRO SERIES 10

**SUBPLATE MOUNTING
ISO 6263-03**

**p max 250 bar
Q max 40 l/min**

OPERATING PRINCIPLE



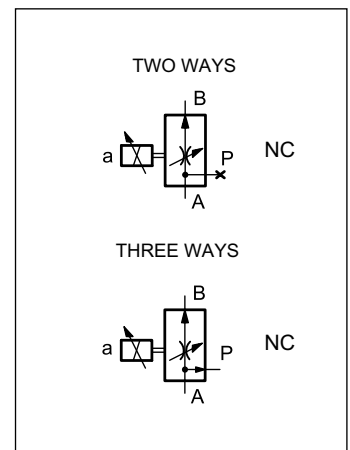
- QDE3K* are compensated flow control valves with pressure compensation and proportional electric control, with mounting surface according to ISO 6263-03, supplied with 2 or 3 way design, depending on the use of port P.
- These valves are used for the flow control, in branches of a hydraulic circuit or for the speed control of hydraulic cylinders.
- 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.
- The valve body is zinc-nickel coated.
- **Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 'Explosion proof classification'.**

PERFORMANCES

(values measured with viscosity of 36 cSt at 50°C with electronic control unit)

Maximum operating pressure	bar	250					
Controlled flow (Q _B)	l/min	6	8,5	14	20	30	40
Max input flow (Q _A) (3-way)	l/min	40	50	40	50	40	50
Spring setting in pressure compensator	bar	4	8	4	8	4	8
Minimum pressure drop A > B	bar	10	22	10	22	10	22
Hysteresis	% of Q _{max}	< 6 %					
Repeatability	% of Q _{max}	< ± 1,5 %					
Electrical characteristics	see paragraph 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	1,9					

HYDRAULIC SYMBOLS





1 - IDENTIFICATION CODE

	Q	D	E	3	-	/ 10	-	K9	/	
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Flow control valve direct operated

Electric proportional control

Size ISO 6263-03

Explosion-proof certification: **See table 1.1**

Controlled flow:

06 = 6 l/min	20 = 20 l/min
08 = 8,5 l/min	30 = 30 l/min
14 = 14 l/min	40 = 40 l/min

Series no. (from 10 to 19 sizes and mounting dimensions remains 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)

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

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
CK1 = turning knob override
CK2 = push and twist knob override
CS = screw manual override

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

Coil electrical connection: junction box

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

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 zinc-nickel standard finishing surface treatment is suitable to ensure a salt spray resistance up to 600 hours (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards)

1.1 - Names of valves per certification

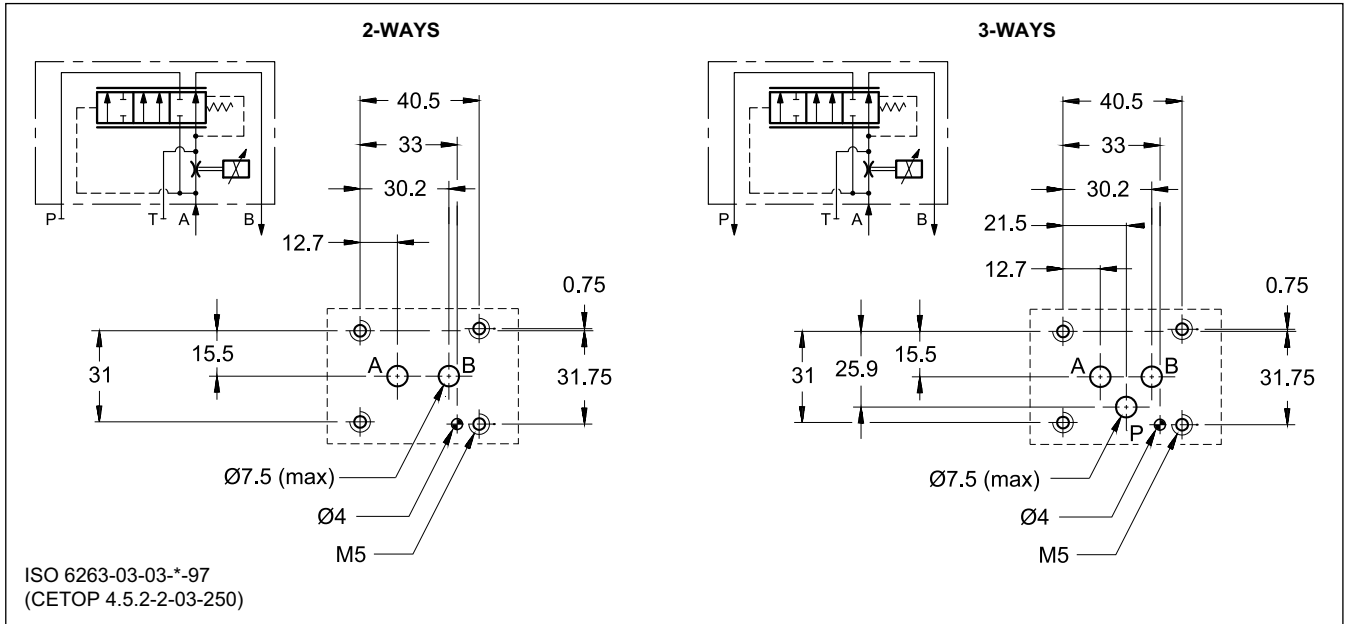
	ATEX		IECEX		INMETRO	
for gases for dusts	KD2	II 2GD	KXD2	IECEX Gb IECEX Db	KBD2	INMETRO Gb INMETRO Db
for mines	KDM2	I M2	KXDM2	IECEX Mb	KBDM2	INMETRO Mb

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

2 - CONFIGURATIONS AND MOUNTING INTERFACE

The function of two or three ways is obtained realizing the mounting interface according to ISO 6263-03, using the port P for three-ways configuration only. The port T will never be used.

To use the valve in two-ways mode is also possible interposing a subplate with plug (code 0113388 and 0530384), to be ordered separately.

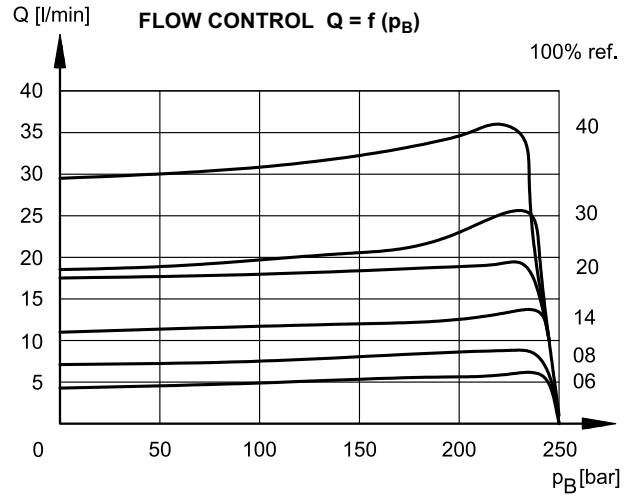
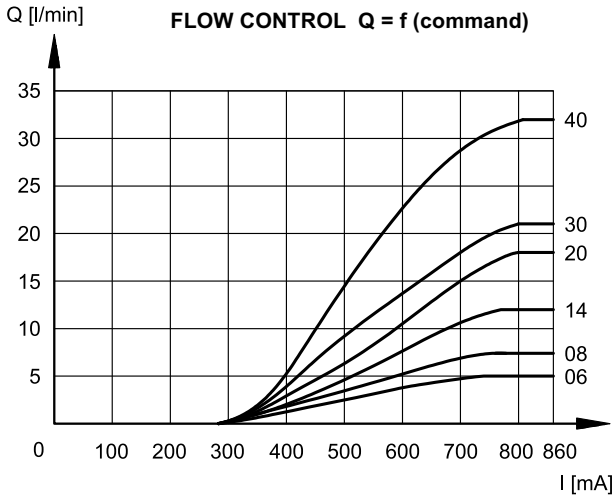




3 - CHARACTERISTIC CURVES

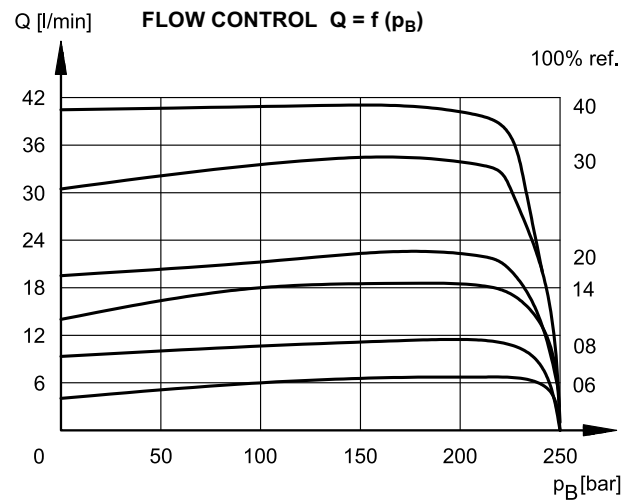
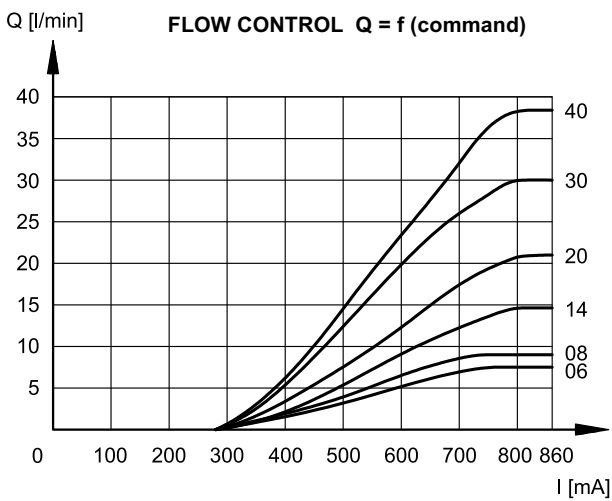
(obtained with viscosity of 36 cSt a 50°C)

3.1 - Two ways



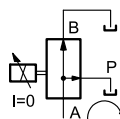
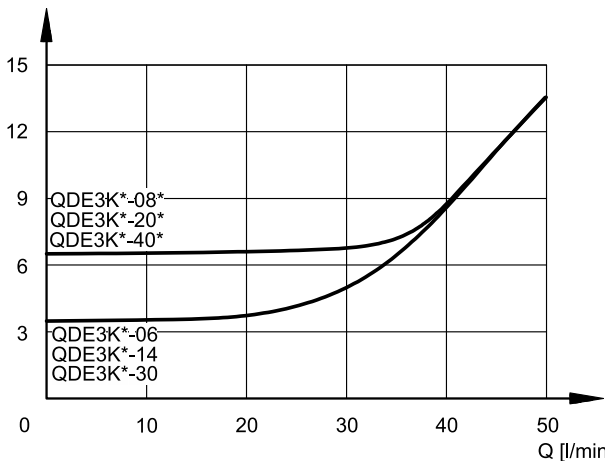
Typical flow rate characteristics A → B for controlled flow rate: 14 - 20 - 30 - 40 l/min in function of the current supplied to the solenoid (D24 version, maximum current 860 mA, PWM 100 Hz)

3.2 - Three ways



Typical flow rate characteristics A → B for controlled flow rate: 14 - 20 - 30 - 40 l/min in function of the current supplied to the solenoid (D24 version, maximum current 860 mA, PWM 100 Hz)

Δp [bar] **PRESSURE DROPS Δp A→P ($Q_B = 0$)**



Pressure drops with flow A → P.
Obtained with $Q_B = 0$ (no current)

4 - STEP RESPONSE

(values measured with viscosity of 36 cSt at 50°C with electronic control unit)

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

The table illustrates typical response times with $\Delta p = 8$ bar.

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

5 - ELECTRICAL CHARACTERISTICS

(values $\pm 5\%$)

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.

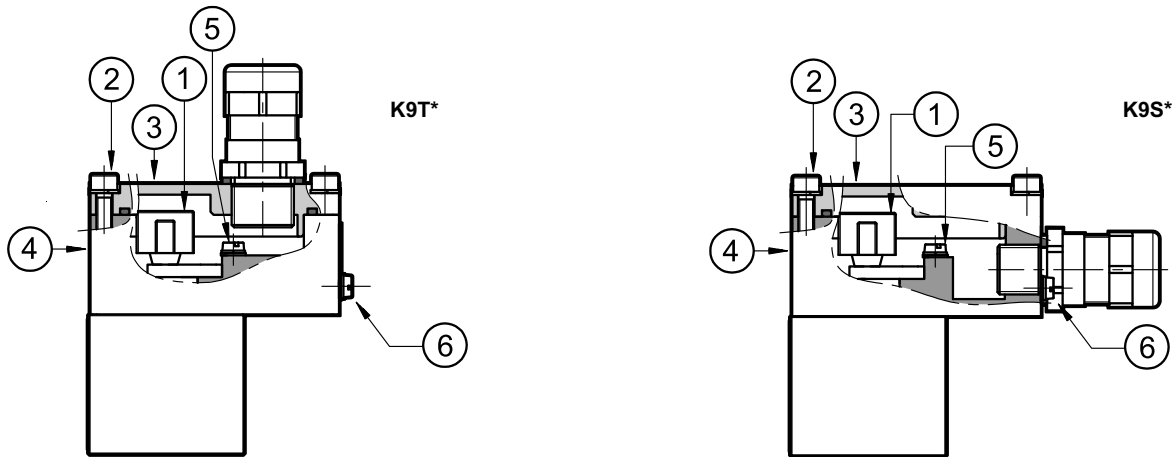
The electrical connection is polarity-independent.

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 in compliance with standards about protection against explosion hazards



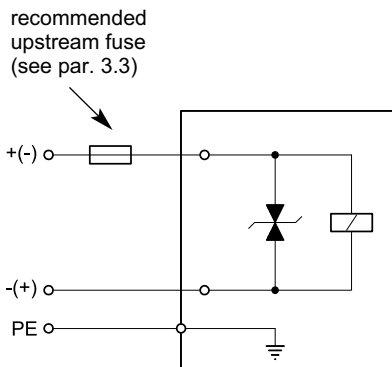
Characteristics of the cables connectable for wiring are indicated in the table below:

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

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

Cable glands (which must be ordered separately, see paragraph 19) 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 I_n according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source. The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

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

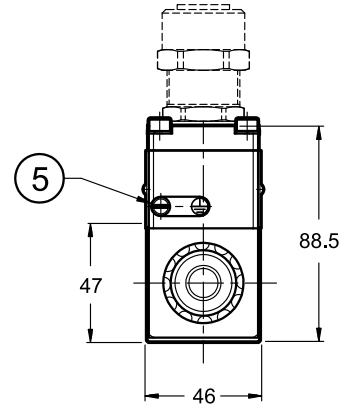
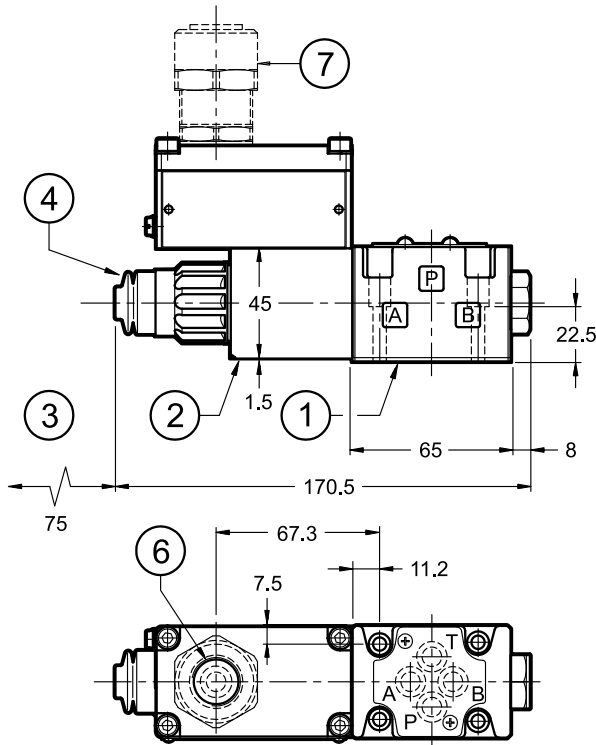
The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

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

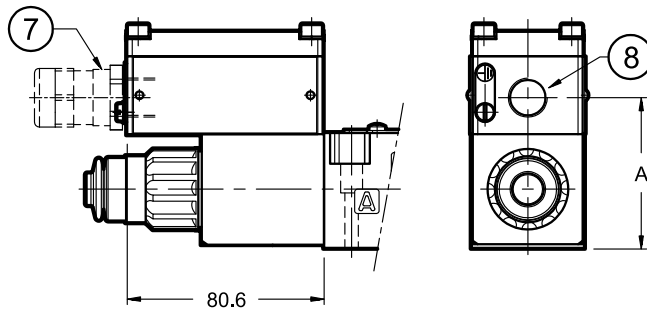
6 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

QDE3K*-/10*-*K9T*/CM



QDE3K*-/10*-*K9S*/CM



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

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 for NL seals) see par. 9
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see par. 10
8	Side port for cable gland

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



7 - 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.

8 - INSTALLATION



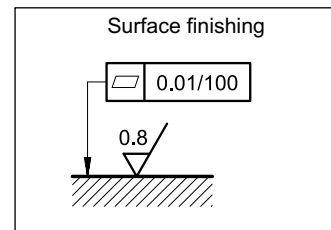
Installation must adhere to instructions reported in the *Use and Maintenance manual*, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.

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

Ensure that there is no air in the hydraulic circuit.

Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.



9 - MANUAL OVERRIDES

9.1 - 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, loosen 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.



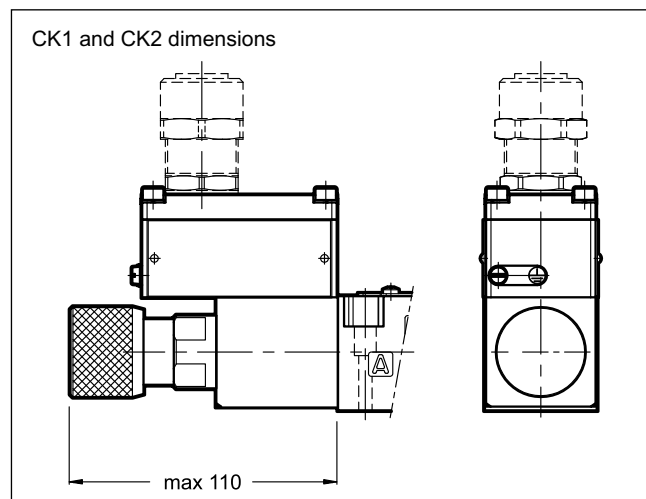
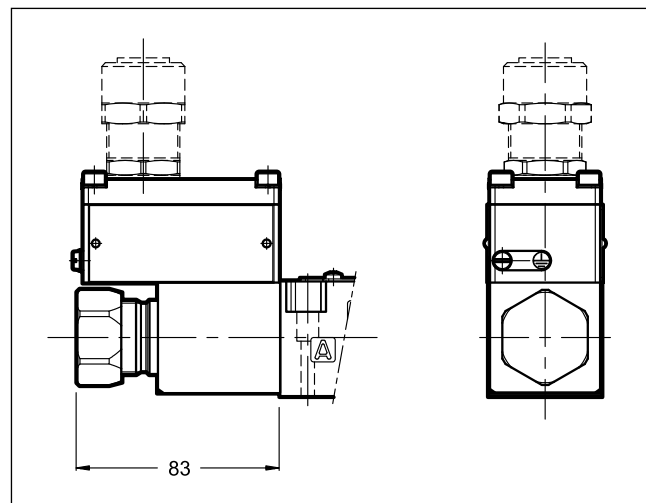
CAUTION!: The manual override use doesn't allow any proportional regulation.

9.2 - CK1 - Knob manual override

Screwing the knob activates this manual override.

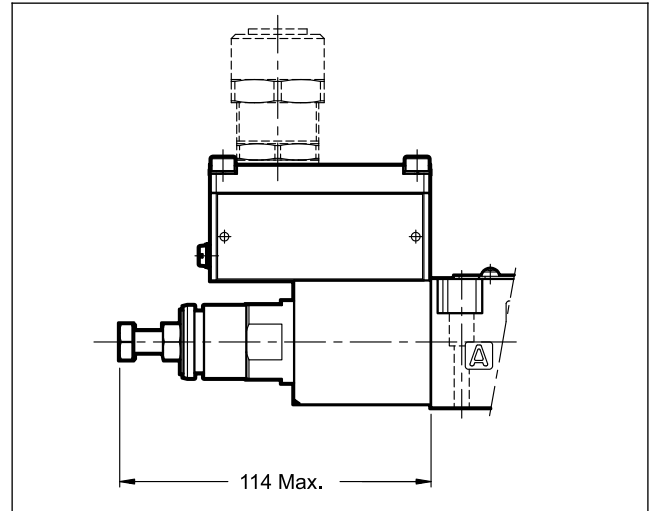
9.3 - CK2 - Push and twist manual override

Pressing and turning the knob activates this manual override.



9.3 - CS - Screw manual override

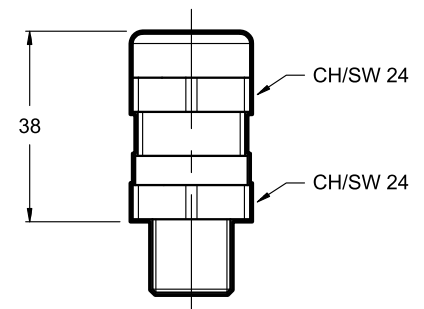
Metal ring nut provided with a M8 screw and a blocking locknut to allow the continuous mechanical operations.



10 - CABLE GLANDS

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

- version for non-armoured cable, external seal on the cable (suitable for $\text{Ø}8+10$ 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: $-70\text{ °C} + +220\text{ °C}$
- 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

11 - ELECTRONIC CONTROL UNITS

EDM-M111	24V DC solenoids	rail mounting DIN EN 50022	see catalogue 89 251
EDM-M141	12V DC solenoids		
EWM-A-PV	12V / 24V DC software config.		see catalogue 89 620

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



QDE3K*
SERIES 10

DIPLOMATIC
MOTION SOLUTIONS

DIPLOMATIC MS S.p.A.

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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
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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 together with valves.



1 - ATEX CLASSIFICATION AND TEMPERATURES

Diplomatic 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

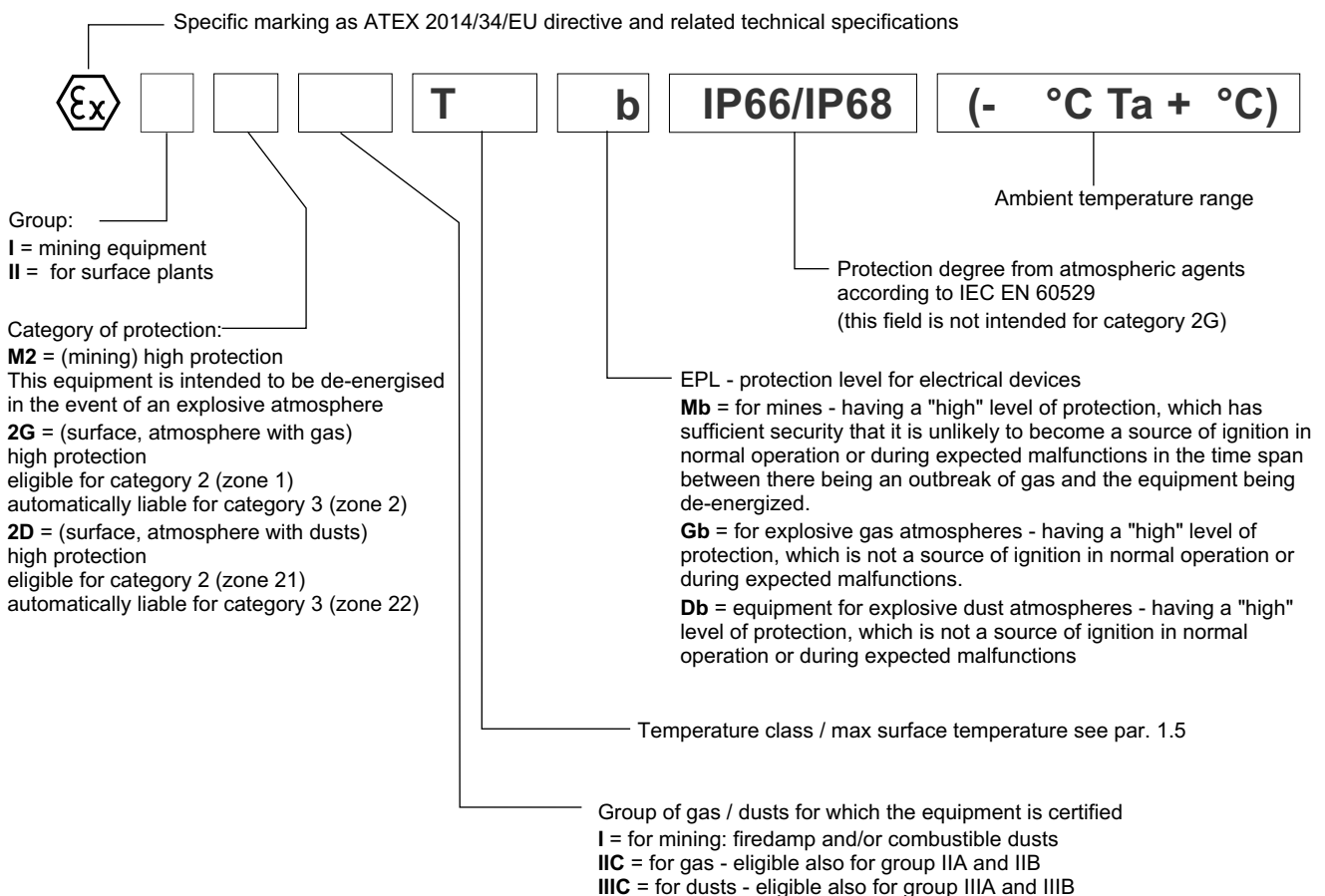
Type examination certificate: AR18ATEX055

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










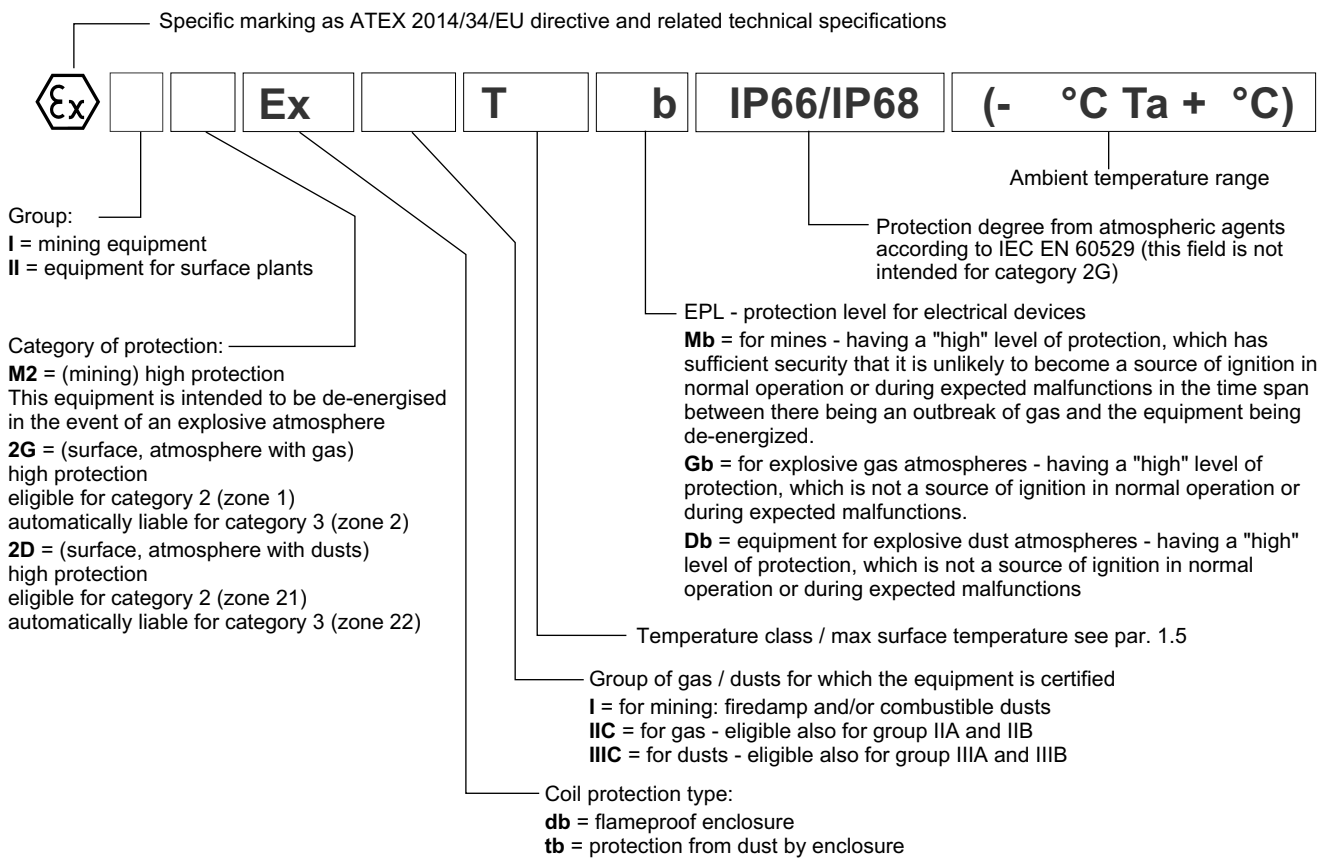
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself 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 for dusts	 II 2G Ex db IIC T4 Gb (-40°C Ta +80°C)  II 2D Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
for valve type *KD2 /T5	for gas for dusts	 II 2G Ex db IIC T5 Gb (-40°C Ta +55°C)  II 2D Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
for valve type *KDM2	mining	 I M2 Ex 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				
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.

Diplomatic 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

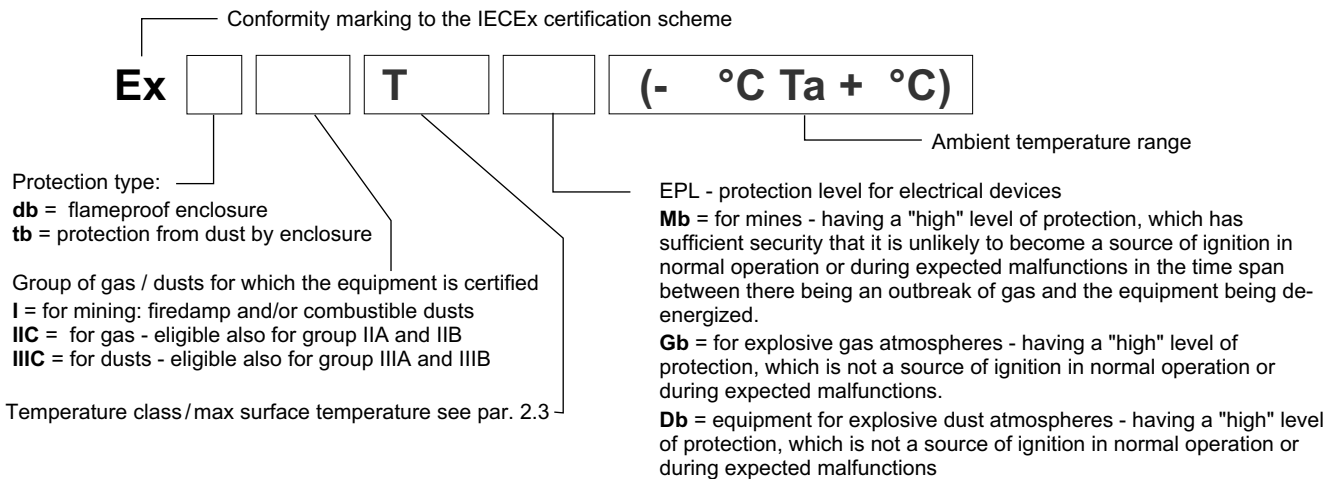
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

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 / +60 °C	-40 / +60 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid				
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.

Diplomatic 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

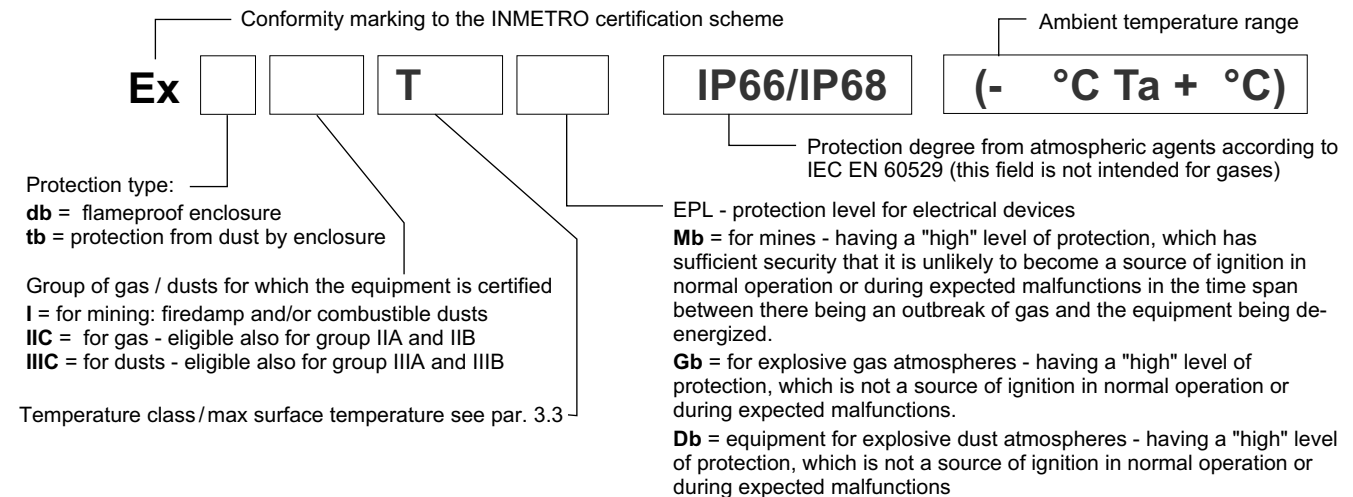
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

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				
INMETRO Gb INMETRO Db	*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				
INMETRO Mb	*KBDM2	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				



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