

6 GENERAL INFORMATION

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GENERAL INFORMATION

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Table X010-0/E

Basics for electrohydraulics in hazardous environments

1 HAZARDOUS ENVIRONMENTS

"Hazardous Environments" are areas where flammable liquids, gases, vapors or combustible dust exist in sufficient quantities to produce explosions or fire.

Oil & gas, chemical, mining and power plants are highly-sensitive environments where the presence of a potentially explosive atmosphere can accidentally or permanently occur.

In these environments an accidental failure or a wrong operation could cause the ignition of the surrounding explosive atmosphere with fatal consequences for human and goods safety, therefore all electrohydraulic equipment operating in these areas must be suitable for hazardous environments and must be certified according to international standards.

The purpose of this document is to provide general information about worldwide certifications for hazardous environments and relevant classifications

Typical hazardous environments can be found in the following sectors:

Presence of Gas and Vapors		Presence of Combustible Dust	
	Oil & Gas Offshore drilling		Feed industry Grain handling and storage
	Oil refineries Power plants		Chemical & fertilizers Pharmaceutical
	Petroleum & LNG vessels		Wood & paper
	Aerospace industry		Metal processing
	Coal mines		Recycling operations

2 CERTIFICATIONS

Equipment with electrical parts designed for hazardous environments must be certified by third parties (notified bodies) in compliance with international standards for explosion protection.

There are several certifications concerning explosive environments and they are governed by local laws of the countries where they are applied.

In all certifications the basic principles for explosion protection are strictly regulated by severe international standards for explosion protection, as European norms EN60079 or North American NEC500 and 505.

These norms impose specific construction criteria and protection methods for the machinery and components to be used in potentially explosive areas.

WORLDWIDE CERTIFICATIONS

The following map shows the main certifications with the relative countries where they are most widely applied. International certification IECEx is recognized worldwide even in countries where local certifications exist.

ATOS CERTIFICATIONS
see section 3 for details

 ATEX Europe	 IECEx international
 EAC Russia	 UL LISTED North America
 PESO India	 MA China



3 CERTIFICATIONS FOR ATOS EX PROOF AND INTRINSICALLY SAFE COMPONENTS

Atos ex-proof and Intrinsically safe components are certified with major international certifications, as listed in the following.

Note: see technical table of each specific Atos component to verify the available certifications

MULTICERTIFICATION

Multicertifications is a great plus offered by Atos, where the same component is provided with the following certifications:

**ATEX Directive 2014/34/EU, equipment and protective system intended for use in potentially explosive atmosphere**

It defines the manufacturing criteria and the safety requirements of the equipment used in potentially explosive environments for presence of gas or flammable dusts, within the European Union.

The Directive provides the classification and marking of components to EN 60079 harmonized norms.

**IECEX International Electrotechnical Commission Explosive**

International program for the safety of the equipment installed in a potentially explosive atmosphere, required to access international markets. IECEX provides certification of conformity for electrical equipment and machinery to be used in potential explosive environments and it is based on IEC 60079 standards. The objective of the IECEX is to facilitate international trade of equipment for use in explosive atmospheres.

**EAC Eurasian Certification**

It is applicable to the Customs Union Territory Including Russia, Kazakhstan, Belarus, Armenia and Kyrgyzstan

It indicates the compliance with the Customs Union Technical Regulation TP TC 012/2011 "safety of equipment intended for use in explosive atmospheres" and it acknowledges the whole ATEX Directive 2014/34/EU.

**PESO Petroleum and Explosive Safety Organization** (earlier known as CCoE)

It approves products distributed within Indian territory for suitability in usage at petroleum or in any place with potentially explosive atmosphere. It is based on harmonized norms and international standards under ATEX and IECEX.

Atos multicertified ex-proof valves for gas group II are also certified Peso.

**cULus North American Certification**

It is a widely recognized certification across North America (US and Canada).

It provides certification of conformity for equipment and machinery installed in locations where explosion or fire hazards exist due to the presence of flammable gases, combustible dust, or ignitable fibers. It is based on NEC standards

**MA safety certificate of approval for mining products**

Chinese authority for certification of components operating in chinese coal mines.

It acknowledges the harmonized norms and international standards under ATEX and IECEX.

The following sections describe the various classifications related to hazardous environments according to certifications available for Atos components.

The classification is marked on the nameplate of each certified component to state its conformity to the specific hazardous environment and explosive atmosphere.



See section 4 for classifications to **ATEX, IECEX, EAC, PESO**



See section 5 for classifications to **cULus**



4 CLASSIFICATIONS TO ATEX, IECEx, EAC, PESO

The classifications reported in the following sections are those established by the EN and IEC standards related to ATEX and IECEx. EAC and PESO certifications acknowledge the same classification system of ATEX and IECEx. An example of classification present on the component nameplate is shown in the following:

environment					atmosphere		environment
II	2 G	Ex	d	IIC	T6/T5/T4	Gb	
Group see sect. 4.1	Category see sect. 4.3	Mark of Explosion Proof	Protection Method see sect. 4.7	Gas Group see sect. 4.4	Temperature Class see sect. 4.6	Equipment Protection Level (EPL) see sect. 4.3	

Once the user has classified the area in which the component is intended to be placed, he will be able to define the level of protection of the component.

The evaluation of the risk and consequentially the level of protection required by the equipment passes through two main classifications:

A- Environment: the classification is referred to the location in which the product is intended to be placed. Environment is further classified in **Group** and **Zone**.

B- Atmosphere: the classification is referred to the type of explosive substance present in the atmosphere. Atmosphere is further classified in **Gas Group**, **Dust Group** and **Temperature**.

A- ENVIRONMENT

4.1 Group classification

Explosive environments are classified into **Group I** for underground mines, and **Group II** for surface areas

4.2 Zone classification - The Zone classification is not reported on the component nameplate

Explosive environments are classified into **Zone**, identified **0, 1, 2** for **Gas**, and **20, 21, 22** for **Dust**, depending on the time and frequency the explosive substance is present: Zone 2 and 22 are less dangerous than 0, 1 or 20, 21. Components certified for Zone 0 (or 20) may also be used in Zone 1, 2 (or 21, 22).

4.3 Safety level required: Category and EPL

The Zone is directly linked with the safety level required; a zone with higher risk requires a higher safety level. There are two different classifications: **Category** and **EPL**

Category: ATEX classifies the safety required level into **Category 1, 2, 3** accompanied with letter **G** for gas and letter **D** for Dust: Category 1G (or 1D) are safer than 2G, 3G (or 2D, 3D).

Components certified for Category 1 may also be used where Category 2 or 3 is needed.

For Group I the classification is **Category M1** or **M2** with M1 safer than M2.

EPL: IECEx classifies the safety level required into **Equipment Protection Level (EPL) a, b, c** anticipated by letter **G** for gas and **D** for dust depending on the safety level required: Category Ga (or Da) are safer than Gb, Gc (or Db, Dc).

Components certified for EPL Ga (or Da) may also be used where EPL Gb, Gc (or Db, Dc) is needed.

Environment classification

Explosive Atmosphere	Group see 4.1	Zone see 4.2	Safety level required see 4.3		Atos component
			Category	EPL	
Gas (mining)	I	-	M1	-	① ③
	I	-	M2		
Gas (surface)	II	0	1G	Ga	④
		1	2G	Gb	② ⑤
		2	3G	Gc	② ⑤
Dust	II	20	1D	Da	② ⑤
		21	2D	Db	
	II	22	3D	Dc	② ⑤



- ① Atos ex-proof (mining)
- ② Atos ex-proof (gas & dust)
- ③ Atos intrinsically safe (mining)
- ④ Atos intrinsically safe (gas)
- ⑤ Pumps and cylinders

B- ATMOSPHERE



4.4 Gas Group classification

The classification is based on the minimum ignition energy of the explosive atmosphere in which a component may be installed. The **Gas Groups** are identified **IIA, IIB, IIC** depending on the dangerousness of the substances: group IIA is less dangerous than group IIB and IIC. Components certified for Gas Group IIC may also be used in less dangerous Groups IIB and IIA

4.5 Dust group classification

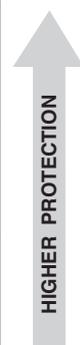
The classification is based on nominal dimensions and electrical resistivity of particles. The **Dust Groups** are identified **IIIA, IIIB** and **IIIC**, depending on the dangerousness of the substances: group IIIC contains smaller and less electrically resistive substances than group IIIB and IIIA. Components certified for Dust Group IIIC may also be used in less dangerous Groups IIIB and IIIA.

4.6 Temperature class

Based on their maximum surface temperature, the components are classified into **Temperature Classes T1 to T6** for Gas, whereas for Dust the max surface temperature is directly reported in °C. The maximum surface temperature of the component must be lower than the ignition temperature of the surrounding explosive atmosphere. Components certified with Temperature Class T6 may also be used in lower Classes T5 to T1

Atmosphere and Temperature class

Gas Group	Gas type					
IIC	Hydrogen	Acetylene				Carbon disulphide
IIB	City gas Acrylic Nitrile	Ethylene	Ethyl glycol Carbon hydrogen	Ethyl ether		
IIA	Ammonia Methane Ethane Propane	Ethanol n-Butane	Petrol Diesel fuel Fuel oil n-Hexane	Acetal-dehyde		
Temperature class	T1 < 450°C	T2 < 300°C	T3 < 200°C	T4 < 135°C	T5 < 100°C	T6 < 85°C



Note: the Temperature class may change depending on the max ambient temperature where the component is installed. In this case two or three different T are reported on the components nameplate (i.e. T6/T5/T4). See technical table of each specific Atos component for Temperature class.

Dust Group	Dust type
IIIC	Conductive dust
IIIB	Non conductive dust
IIIA	Flammable fibers



For dust explosion proof, the max surface temperature is directly shown (e.g. T85°C)



4.7 Protection method

The ignition of the surrounding explosive atmosphere can be prevented adopting for the component a proper protection method. The protection method is directly linked to the design and manufacturing characteristics of the component. The table below reports the **Code** related to the protection method adopted along with the relative **Zone** of application.

Protection principle	Protection method	Code	Zone						Atos component	
			Gas			Dust				
			0	1	2	20	21	22		
Prevents transmission of the explosion outside	Flameproof enclosure	Ex d	da	X	X	X	X	X	X	① ②
			db		X	X				
			dc			X				
Dust explosion proof	Protection by enclosure	Ex t	ta				X	X	X	②
			tb					X	X	
			tc						X	
Low current / voltage supply	Intrinsically safe	Ex i	ia	X	X	X				③ ④
			ib		X	X				
			tc			X				
Non-electrical	Construction safety Control of ignition sources Protection by liquid immersion	Ex h	c b k		X	X		X	X	⑤

- ① Atos ex-proof (mining)
- ② Atos ex-proof (gas & dust)
- ③ Atos intrinsically safe (mining)
- ④ Atos intrinsically safe (gas)
- ⑤ Pumps and cylinders

4.8 Painting

According to EN60079-0 the valves can be coated with a non-metallic material (i.e. painting), observing the maximum thickness:

Group IIC < 0,2 mm max

Group IIB < 0,3 mm max

Group IIA < 0,3 mm max



5 CLASSIFICATIONS TO cULus

The classification of explosive environments in cULus certification is regulated by NEC Standards (National Electric Code) and it is based on NEC 500 and NEC 505 articles.

NEC 500 covers the requirements for the classification system in Classes I, II, III and Divisions 1 and 2.

NEC 505 covers the requirements for the classification system in Zones (Zone 0, 1, and 2) as alternative to the NEC 500.

An example of classification present on the component nameplate is shown in the following:

NEC 500

Class I	Division I	Groups C & D	T6/T5
see sect. 5.1	see sect. 5.3	Gas Groups see sect. 5.2	Temperature Class see sect. 5.5

NEC 505

Class I	Zone I	Groups IIA & IIB	T6/T5
see sect. 5.1	see sect. 5.4	Gas Groups see sect. 5.2	Temperature Class see sect. 5.5

5.1 Class classification - NEC 500 and NEC 505

Location where explosive substances are present in the atmosphere are classified as:

Class I where flammable vapors and gases may be present

Class II and **Class III** where combustible dust and easily ignitable fibers may be present

5.2 Group classification

NEC 500: based on the ignition temperatures and explosion pressure, NEC 500 classifies gases and dust into Groups, identifying **Group A, B, C, D for Gases** and **Group E, F, G for Dusts**. Group D (or G) is less dangerous than Groups A, B, C (or E, F).

Components certified with Group A (or E) may also be used in lower Group B to D (or F to G).

NEC 505: the Gas Groups have the same classifications as per IECEx, as reported in the following table for comparison with NEC 500.

Explosive atmosphere	Typical hazard material	Class	Group		Atos component
			NEC 500	NEC 505	
Gases, vapors and liquids	Acetylene	Class I	A	IIC	①
	Hydrogen, Butadiene, Ethylene Oxide, Propylene Oxide	Class I	B	IIC or IIB+H2	
	Ethylene, Formaldehyde, Cyclopropane, Ethyl Ether, etc	Class I	C	IIB	
	Methane, Butane, Petrol, Natural gas, Propane, Gasoline	Class I	D	IIA	
Dusts	Metallic dusts (conductive and explosive)	Class II	E	IIIC	
	Coal dusts (some are conductive and all are explosive)	Class II	F	IIIC	
	Grain dust	Class II	G	IIIB	
Solid combustible, fibres and particles	Textile products, wood, paper, cotton processing (easily flammable, but does not risk to be explosive)	Class III	-	IIIA	



① Atos ex-proof



5.3 Division classification – only for NEC 500 Standard

Each of the three Classes described in section 5.1 is further subdivided into two Divisions:

Division 1 includes explosive substances that are continuously, intermittently or periodically present in the atmosphere. The ignitable concentrations of above substances exist under normal conditions or it is caused by frequent maintenance or by equipment failure.

Division 2 includes explosive substances present under “unusual” circumstances. Above substances are normally contained into sealed containers or into closed systems from which they can only escape through accidental rupture or breakdowns of such containers.

The installation and requirements for **Division 1** are more restrictive than for **Division 2**. Components certified with Division 1 may also be used when Division 2 is required.

5.4 Zone classification – only for NEC 505 Standard

NEC 505 Standard introduces the Zone classification:

Zone 0 defines locations in which an explosive gas is present continuously or for long periods during normal operation.

Zone 1 defines locations in which ignitable concentrations of gas exist under normal operation or it is caused by frequent maintenance or equipment failure.

Zone 2 defines the area in which an explosive gas is not likely to occur or it will exist only for a short time

Component certified with Zone 0 may be used when Zone 1 is required.

The following table reports a comparison between Division classification to NEC 500 and Zone classification to NEC 505 Standards.

	Continuous Hazard	Intermittent hazard	Hazard under abnormal conditions
NEC 500	Division 1 ①		Division 2
NEC 505	Zone 0 (Zone 20 dust)	Zone 1 (Zone 21 dust) ①	Zone 2 (Zone 22 dust)

① Atos ex-proof /UL

5.5 Temperature classes

The temperature classes designate the maximum operating temperatures of the equipment surface which must not exceed the ignition temperature of the surrounding atmosphere.

The temperature class is marked on the component nameplate.

Products certified with temperature class T6 may also be used in lower classes T5 to T1

Code	Max surface Temperature		Atos component
	[°C]	[°F]	
T6	85	185	①
T5	100	212	②
T4A	120	248	
T4	135	275	③
T3C	160	320	
T3B	165	329	
T3A	180	356	
T3	200	392	④
T2D	215	419	
T2C	230	446	
T2B	260	500	
T2A	280	536	
T2	300	572	
T1	450	842	



Note:

the Temperature class may change depending on the max ambient temperature where the component is installed. In this case two different T are reported on the components nameplate (i.e. T6/T5). See technical table of each specific Atos component for Temperature Class.

① Atos ex-proof ON-OFF - Tamb up to +55°C

③ Atos ex-proof proportionals - Tamb up to +55°C

② Atos ex-proof ON-OFF - Tamb from +55°C to +70°C

④ Atos ex-proof proportionals - Tamb from +55°C to +70°C

6 ATEX vs. cULus (NEC)

The following tables report a comparison between ATEX and cULus (NEC) classification systems.

Note: due to the different nature Atex and cULus systems, the direct comparison is not fully applicable. The comparison is just to be used as a general reference for transition from one system to the other.

6.1 Comparison concerning the classification of hazardous environments due to the presence of Gas or Dust**Gas**

ATEX	Zone 0	Zone 1	Zone 2
cULus (NEC 505)	Zone 0	Zone 1	Zone 2
cULus (NEC 500)	Class I, Division I		Class I, Division 2

Dust

ATEX	Zone 20	Zone 21	Zone 22
cULus (NEC 505)	Zone 20	Zone 21	Zone 22
cULus (NEC 500)	Class II, Division I		Class II, Division 2

6.2 Comparison concerning the classification of Gas Groups

	Gas type			
	Propane	Ethylene	Hydrogen	Acetylene
ATEX	IIA	IIB	IIC	IIC
cULus (NEC 505)	IIA	IIB	IIC	IIC
cULus (NEC 500)	D	C	B	A

Note: the direct comparison concerning Dust Group is not possible since the classification criteria between ATEX and cULus are consistently different

6.3 Comparison concerning the Temperature Classes for Gas Group II

ATEX	cULus (NEC 505)	cULus (NEC 500)	Max surface temperature [°C]	Max surface temperature [°F]
T6	T6	T6	85	185
T5	T5	T5	100	212
		T4A	120	248
T4	T4	T4	135	275
		T3C	160	320
		T3B	165	329
		T3A	180	356
T3	T3	T3	200	392
		T2D	215	419
		T2C	230	446
		T2B	260	500
		T2A	280	536
T2	T2	T2	300	572
T1	T1	T1	450	842

7 ATOS COMPONENTS EXEMPTED FROM CERTIFICATION AND MARKING

Atos hydraulic components made only by mechanical parts and not equipped with electrical functions are exempted from certification because their functioning does not generate dangerous conditions for the explosive environment.

The safe application of these components in hazardous environments is justified by following analysis:

- All the internal parts of the components are separated and insulated from the external environment by means of pressure-proof seals. The internal volumes are filled by the hydraulic fluid, thus there are no volumes which can be saturated by the external explosive atmosphere.
- The operation of mechanical parts does not produce potential sources of ignition of the explosive gas mixture.
- The functioning of the mechanical parts does not create conditions as overheating which may cause the explosion of the surrounding atmosphere.

The following components are included in this range:

- On-off pressure control valves (without solenoid pilot) type CART-*, ARE, ARAM, AGAM, AGIR, AGIS, AGIU, REM
- Flow control valves type QV, AQFR
- Check valves type DB, DR, ADR, ADRL, AGRLE, AGRLE
- Modular valves type HMP, HM, KM, HS, KS, HG, KG, JPG, HC, KC, JPC, HQ, KQ, JPC, HR, KR, JPR (modular fast/slow valves type DHQ and pressure switch type MAP, cannot be used in potentially explosive atmosphere)
- On off Mechanical, Hydraulic, Pneumatic operated valves
- On-off ISO cartridges, type SC LI and ISO functional covers without solenoid pilot valve.

8 INGRESS PROTECTION (IP)

The "Ingress Protection" identifies the environmental protection of a device defined in IEC Standard 60529.

The IP classification system designates, by means of two digits, the degree of protection provided by a device against ingress of dust and water.

FIRST	DEGREE OF PROTECTION AGAINST SOLID OBJECTS	SECOND	DEGREE OF PROTECTION AGAINST WATER	Atos component
0	Non-protected	0	Non-protected	
1	Protected against a solid object with diameter greater than 50 mm	1	Protected against water dripping vertically, such as condensation	
2	Protected against a solid object with diameter greater than 12 mm	2	Protected against dripping water when tilted up to 15°	
3	Protected against a solid object with diameter greater than 2.5 mm	3	Protected against water spraying at an angle of up to 60°	
4	Protected against a solid object with diameter greater than 1.0 mm	4	Protected against water splashing from any direction	
5	Dust-protected. Prevents ingress of dust sufficient to cause harm	5	Protected against jets of water from any direction	
6	Dust tight. No dust ingress	6	Protection against heavy seas or powerful jets of water	① ②
		7	Protected against harmful ingress of water when immersed between a depth of 150 mm to 1 meter	①
		8	Protected against submersion. Suitable for continuous immersion in water	

① Atos ex-proof multicertification (mining / surface) = IP66/67

② Atos intrinsically safe = IP66

The ingress protection of cULus certified components is "Raintight enclosure, UL approved"

8.1 Comparison between IEC and NEMA standards

An equivalent classification of the enclosures degrees of protection, for the USA market, is defined according to NEMA Standard.

Note: the direct comparison is not possible since the classification criteria are consistently different between IEC and NEMA.

The comparison is just to be used as a general reference for transition from one system to another.

NEMA	1	2	3	3X	3R	3RX	3S	3SX	4	4X	5	6	6P	12	12K	13
IEC (IP)	20	22	55		24		55		66		53	67	68	54		



Table X020-0/E

Summary of Atos ex-proof components

multicertified to **ATEX, IECEX, EAC, PESO**



Atos ex-proof components are electrohydraulic equipment for industrial and mobile applications, designed to operate in hazardous environments in presence of flammable liquids, gases, vapors or combustible dust.

They are certified by independent notified bodies in conformity to **ATEX, IECEX, EAC** and **PESO** standards.

1 PRODUCTS RANGE

1.1 PROPORTIONAL and ON-OFF VALVES

The certification for proportional and on-off valves is relevant to solenoids, on-board electronic drivers and transducers.

These components are engineered and manufactured according to protection method **Ex-d** (code **Ex-t** for dust environments), where internal parts are sealed inside a ruggedized **flameproof enclosure**, granting high protection to the risk of explosion, see section 2

The mechanical parts likes body, spools, etc, are strictly derived from highly engineered standard components.

They are not involved in the certification since their functioning does not represent a potential risk for the explosive environment.

Product Category	Component	Driver	Environment	Multicertification				Marking
				ATEX	IECEX	EAC	PESO	
Proportional valves	Servoproportional directionals High performance directionals	on-board	Gas & Dust	X	X			see sect. 4
	Directional valves High performance pressure valves Pressure valves Flow valves	off-board	Gas & Dust	X	X	X	X (only Gas)	see sect. 5
	Mining		X	X			see sect. 7	
Axis controls	Servoproportional directionals	on-board	Gas & Dust	X	X			see sect. 4
On-off valves	Directional valves Pressure relief valves	-	Gas & Dust	X	X	X	X (only Gas)	see sect. 6
			Mining	X	X			see sect. 8

1.2 PUMPS and CYLINDERS

Hydraulic components without electrical parts are also subject to the requirements of ATEX Directive 2014/34/EU, but the certification is not mandatory (it can be performed on voluntary basis).

PVPCA variable displacement axial piston pumps, PFEA fixed displacement vane pumps and CKA hydraulic cylinders, are ATEX certified to **Ex-h** protection. The protection method Ex-h combines the characteristics of construction safety (Ex-c), control of ignition source (Ex-b) and protection by liquid immersion (Ex-k)

Product Category	Component	Environment	Certification	Marking
Pumps	PVPCA - variable displacement piston pumps PFEA - fixed displacement vane pumps	Gas & Dust	ATEX	see sect. 9
Cylinder	CKA - hydraulic cylinders CKAM - hydraulic servocylinders	Gas & Dust	ATEX	see sect. 10

2 FLAMEPROOF ENCLOSURE - Ex-d

Technical characteristics

It is characterized by a strong mechanical construction, capable of withstanding the overpressure caused by a potential internal explosion and preventing the spread of flames to the external environment. It permits to dissipate the heat generated by the solenoid and driver power, in order to limit the surface temperature within certified classes (T6, T5, etc), to avoid the self-ignition of the surrounding flammable atmosphere. The rugged design of the flameproof enclosure, combined with IP66/67 ingress protection, makes the ex-proof valves suited for application in harsh environments.

Electrical wiring

The electrical wiring to the terminal board of ex-proof solenoids, on-board digital drivers and transducers must be performed using ex-proof certified cable glands, see tech. table KX600.

Electric cables must be approved for the specific temperature class reported on the ex-proof component's nameplate, refer to specific tech. table of ex-proof valves for cable temperature.

3 NAMEPLATE MARKING

The ex-proof certified components are provided with a specific nameplate reporting the certificate number, the notified body and the classification according to the relevant certification.

The classification identifies the protection method and the compatibility of the ex-proof component for a specific hazardous environment.

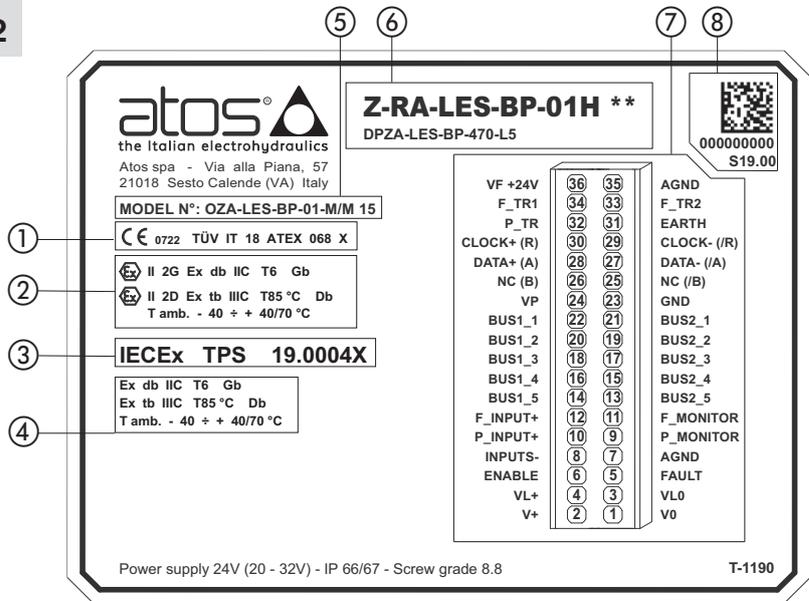
The following sections provide a detailed description of the nameplate marking for component categories.

4 PROPORTIONAL VALVES WITH ON-BOARD DIGITAL DRIVER / AXIS CONTROLLER

Driver nameplate marking to ATEX and IECEx

Gas - group II 2G - Zone 1, 2
Dust - group II 2D - Zone 21, 22

- ① ATEX notified body and certificate number
- ② Marking according to ATEX Directive
- ③ IECEx notified body and certificate number
- ④ Marking according to IECEx Scheme
- ⑤ Code of solenoid
- ⑥ Code of on-board driver and related proportional valve
- ⑦ Electronic connections
- ⑧ Qr code and driver serial number



ATEX / IECEx classification - for Gas group II

II 2 G	Ex	d	IIC	T6/T5/T4	Gb
Equipment Group II industrial Equipment Category 2 High Protection Suitable for use G Gas	Mark of Explosion Proof	Protection Method d Flameproof enclosure	Gas Group IIC Hydrogen & Acetylene	Temperature Class T6 ≤ 85°C T5 ≤ 100°C T4 ≤ 135°C	Equipment Protection Level Gb High protection (Gas, Zone1)

ATEX / IECEx classification - for Dust

II 2 D	Ex	tb	IIIC	T85/T100/T135	Db
Equipment Group II industrial Equipment Category 2 High Protection Suitable for use D Dust	Mark of Explosion Proof	Protection Method tb Protection by enclosure	Dust Group IIIC Conductive Dust	Temperature Class T85 ≤ 85°C T100 ≤ 100°C T135 ≤ 135°C	Equipment Protection Level Db High protection (Dust, Zone21)

RELATED DOCUMENTATION

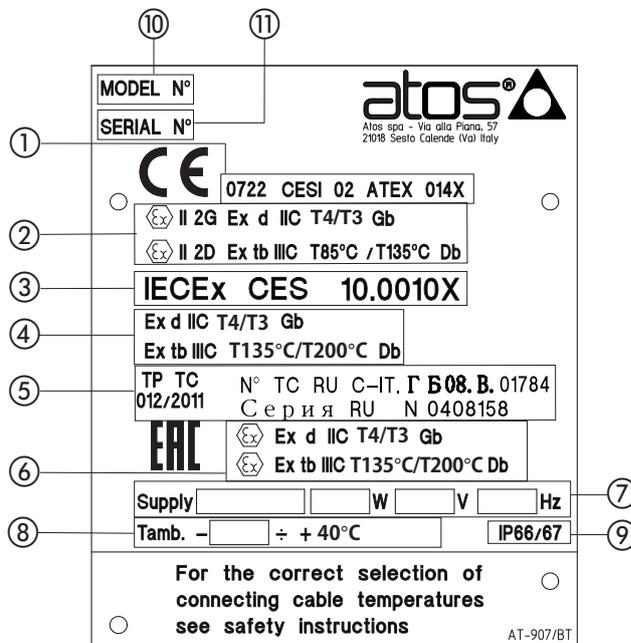
Servoproportional directional - zero overlap with LVDT transducer FX150 DLHZA-TES, DLKZA-TES - direct, sleeve execution FX135 DHZA-TES, DKZA-TES - direct FX235 DPZA-LES, piloted FX380 LIQZA-LES, 3-way cartridge High performance directional - positive overlap with LVDT transducer FX130 DHZA-TES, DKZA-TES - direct FX230 DPZA-LES - piloted FX360 LIQZA-LES, 2-way cartridge Directional valves - positive overlap without transducer FX110 DHZA-AES, DKZA-AES - direct FX210 DPZA-AES - piloted High performance pressure valves - with pressure transducer FX030 RZMA-RES, AGMZA-RES - relief FX060 RZGA-RES, AGRCZA-RES - reducing FX320 LIMZA-RES, LIRZA-RES, LICZA-RES - relief, reducing, compensator	Pressure valves - without transducer FX020 RZMA-AES, AGMZA-AES - relief FX050 RZGA-AES, AGRCZA-AES - reducing FX080 DHRZA-AES - reducing FX310 LIMZA-AES - relief LIRZA-AES - reducing LICZA-AES - compensator Flow valves, pressure compensated FX430 QVHZA-TES, QVKZA-TES - with LVDT transducer FX410 QVHZA-AES, QVKZA-AES - without transducer Servoproportional valves with on-board axis controller FX610 DLHZA-TEZ, DLKZA-TEZ - direct, sleeve execution FX620 DHZA-TEZ, DKZA-TEZ - direct FX630 DPZA-LEZ - piloted
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5 PROPORTIONAL VALVES WITH OFF-BOARD DIGITAL DRIVER

Solenoid nameplate marking to ATEX, IECEx, EAC and PESO

Gas - group II 2G - Zone 1, 2
Dust - group II 2D - Zone 21, 22

- ① ATEX notified body and certificate number
- ② Marking according to ATEX Directive
- ③ IECEx notified body and certificate number
- ④ Marking according to IECEx Scheme
- ⑤ EAC notified body and certificate number
- ⑥ Marking according to EAC
- ⑦ Power supply characteristics
- ⑧ Ambient temperature
- ⑨ Ingress protection:
 -IP66 = no dust ingress, protection against heaving seas or powerful jets of water
 -IP67 = no dust ingress, protection to water immersion
- ⑩ Solenoid model code
- ⑪ Solenoid serial number



Note: PESO certificate number is not reported on the component nameplate, it is reported in the components technical table. The certificate can be downloaded from www.atos.com

ATEX / IECEx / EAC / PESO classification - for Gas group II

II 2 G	Ex	d	IIC	T4 / T3	Gb
Equipment Group II industrial Equipment Category 2 High Protection Suitable for use G Gas	Mark of Explosion Proof	Protection Method d Flameproof enclosure	Gas Group IIC Hydrogen & Acetylene	Temperature Class T4 ≤ 135°C T3 ≤ 200°C	Equipment Protection Level Gb High protection (Gas, Zone1)

ATEX / IECEx / EAC classification - for Dust

II 2 D	Ex	tb	IIC	T135 / T200	Db
Equipment Group II industrial Equipment Category 2 High Protection Suitable for use D Dust	Mark of Explosion Proof	Protection Method tb Protection by enclosure	Dust Group IIC Conductive Dust	Temperature Class T85 ≤ 135°C T135 ≤ 200°C	Equipment Protection Level Db High protection (Dust, Zone21)

RELATED DOCUMENTATION

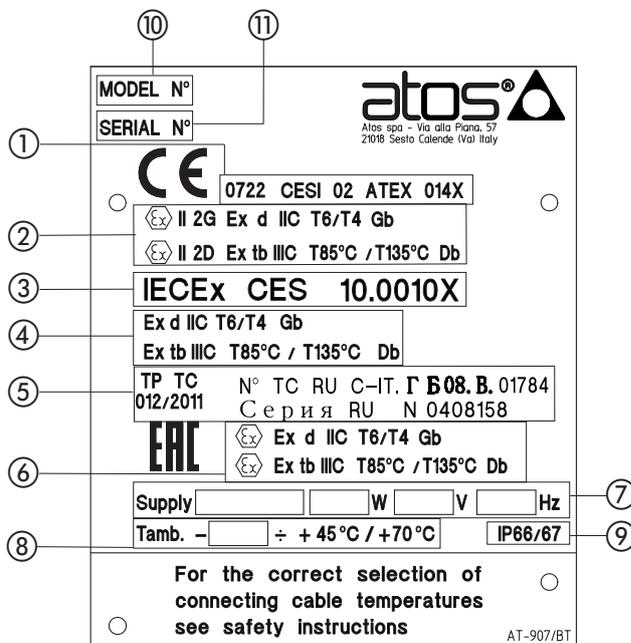
Servoproportional directional - zero overlap with LVDT transducer FX140 DLHZA-T DLKZA-T - direct, sleeve execution FX370 LIQZA-L, 3-way cartridge High performance directional - positive overlap with LVDT transducer FX120 DHZA-T, DKZA-T - direct FX220 DPZA-T - piloted FX350 LIQZA-L, 2-way cartridge Directional valves - positive overlap without transducer FX100 DHZA-A, DKZA-A - direct FX200 DPZA-A - piloted	Pressure valves - without pressure transducer FX010 RZMA-A, HZMA-A, AGMZA-A - relief FX040 RZGA-A, AGRCZA-A, HZGA-A, KZGA-A - reducing FX070 DHRZA-A - reducing FX300 LIMZA-A - relief LIRZA-A - reducing LICZA-A - compensator Flow valves, pressure compensated FX420 QVHZA-T, QVKZA-T - with LVDT transducer FX400 QVHZA-A, QVKZA-A - without transducer
---	--

6 ON-OFF VALVES

Nameplate marking to ATEX, IECEx, EAC and PESO

Gas - group II 2G - Zone 1, 2
Dust - group II 2D - Zone 21, 22

- ① ATEX notified body and certificate number
- ② Marking according to ATEX Directive
- ③ IECEx notified body and certificate number
- ④ Marking according to IECEx Scheme
- ⑤ EAC notified body and certificate number
- ⑥ Marking according to EAC
- ⑦ Power supply characteristics
- ⑧ Ambient temperature
- ⑨ Ingress protection:
 -IP66 = no dust ingress, protection against heaving seas or powerful jets of water
 -IP67 = no dust ingress, protection to water immersion
- ⑩ Solenoid model code
- ⑪ Solenoid serial number



Note: PESO certificate number is not reported on the component nameplate, it is reported in the components technical table. The certificate can be downloaded from www.atos.com

ATEX / IECEx / EAC / PESO classification - for Gas group II

II 2 G	Ex	d	IIC	T6 / T4	Gb
Equipment Group II industrial	Mark of Explosion Proof	Protection Method d Flameproof enclosure	Gas Group IIC Hydrogen & Acetylene	Temperature Class T6 ≤ 85°C T4 ≤ 135°C	Equipment Protection Level Gb High protection (Gas, Zone1)
Equipment Category 2 High Protection					
Suitable for use G Gas					

ATEX / IECEx / EAC classification - for Dust

II 2 D	Ex	tb	IIIC	T85 / T135	Db
Equipment Group II industrial	Mark of Explosion Proof	Protection Method tb Protection by enclosure	Dust Group IIIC Conductive Dust	Temperature Class T85 ≤ 85°C T135 ≤ 135°C	Equipment Protection Level Db High protection (Dust, Zone21)
Equipment Category 2 High Protection					
Suitable for use D Dust					

RELATED DOCUMENTATION

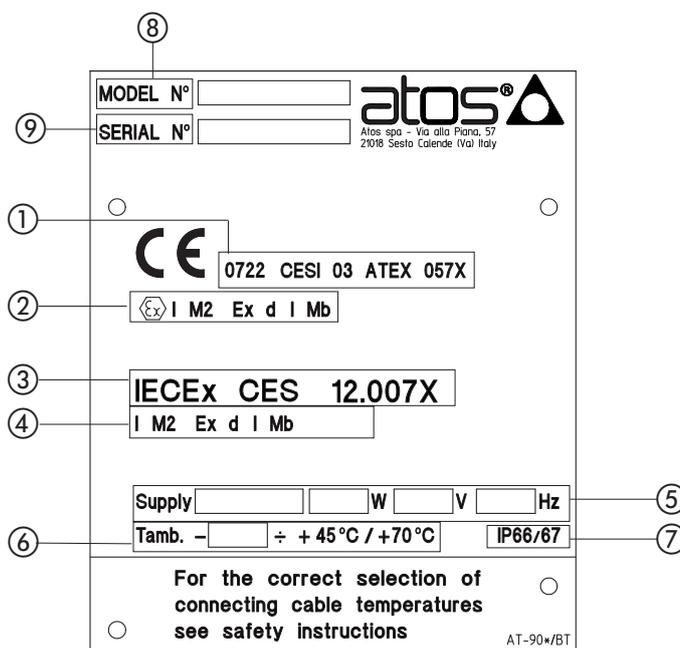
Directional valves	
EX010	DHA - direct, spool type
EX020	DLAH, DLAHM - direct, poppet type CART-LAH, CART-LAHM - cartridge screw-in, direct, poppet type
EX030	DPHA – piloted, spool type
EX050	LIDEW-AO, LIDBH-AO - piloted ISO cartridges and functional covers
Pressure relief valves	
CX070	AGAM-AO, ARAM-AO - piloted, with solenoid valve for venting

7 PROPORTIONAL VALVES WITH OFF-BOARD DIGITAL DRIVER

Nameplate marking to ATEX and IECEx

Gas - group I M2 - Mining

- ① ATEX notified body and certificate number
- ② Marking according to ATEX Directive
- ③ IECEx notified body and certificate number
- ④ Marking according to IECEx Scheme
- ⑤ Power supply characteristics
- ⑥ Ambient temperature
- ⑦ Ingress protection:
-IP66 = no dust ingress, protection against heaving seas or powerful jets of water
-IP67 = no dust ingress, protection to water immersion
- ⑧ Solenoid model code
- ⑨ Solenoid serial number



ATEX, IECEx classification - for Gas group I - Mining

I M2	Ex	d	I	Mb
Equipment Group I mines Equipment Category M2 High Protection	Mark of Explosion Proof	Protection Method d Flameproof enclosure	Gas Group I Methane	Equipment Protection Level Mb High protection (de-energized with gas presence)

RELATED DOCUMENTATION

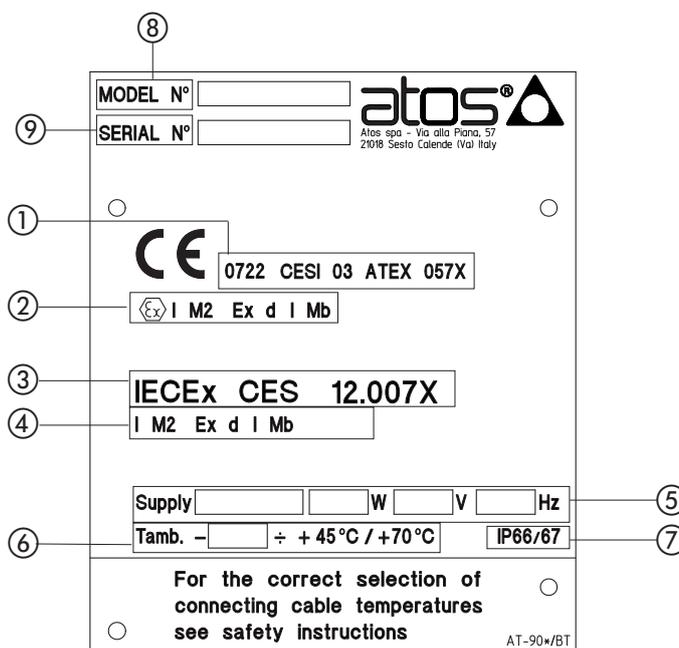
Servoproportional directional - zero overlap with LVDT transducer FX140 DLHZA/M-T DLKZA/M-T - direct, sleeve execution High performance directional - positive overlap with LVDT transducer FX120 DHZA/M-T, DKZA/M-T - direct Directional valves - positive overlap without transducer FX100 DHZA/M-A, DKZA/M-A - direct FX200 DPZA/M-A - piloted	Pressure valves - without pressure transducer FX010 RZMA/M-A, HZMA/M-A, AGMZA/M-A - relief FX040 RZGA/M-A, AGRCZA/M-A, HZGA/M-A, KZGA/M-A - reducing FX070 DHRZA/M-A - reducing FX300 LIMZA/M-A - relief LIRZA/M-A - reducing LICZA/M-A - compensator Flow valves, pressure compensated FX420 QVHZA/M-T, QVKZA/M-T - with LVDT transducer FX400 QVHZA/M-A, QVKZA/M-A - without transducer
--	--

8 ON-OFF VALVES

Nameplate marking to ATEX and IECEx

Gas - group I M2 - Mining

- ① ATEX notified body and certificate number
- ② Marking according to ATEX Directive
- ③ IECEx notified body and certificate number
- ④ Marking according to IECEx Scheme
- ⑤ Power supply characteristics
- ⑥ Ambient temperature
- ⑦ Ingress protection:
-IP66 = no dust ingress, protection against heaving seas or powerful jets of water
-IP67 = no dust ingress, protection to water immersion
- ⑧ Solenoid model code
- ⑨ Solenoid serial number



ATEX, IECEx classification - for Gas group I - Mining

I M2	Ex	d	I	Mb
Equipment Group I mines Equipment Category M2 High Protection	Mark of Explosion Proof	Protection Method d Flameproof enclosure	Gas Group I Methane	Equipment Protection Level Mb High protection (de-energized with gas presence)

RELATED DOCUMENTATION

Directional valves	
EX010	DHA/M - direct, spool type
EX020	DLAH/M, DLAHM/M - direct, poppet type CART-LAH/M, CART-LAHM/M - cartridge screw-in, direct, poppet type
EX030	DPHA/M - piloted, spool type
EX050	LIDEW-AO/M, LIDBH-AO/M - piloted ISO cartridges and functional covers
Pressure relief valves	
CX070	AGAM-AO/M, ARAM-AO/M - piloted, with solenoid valve for venting

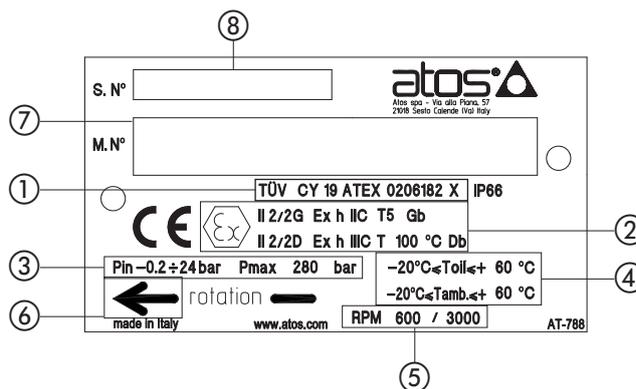
9 VARIABLE PISTON PUMPS PVPCA and FIXED VANE PUMPS PFEA

Nameplate marking to ATEX and IECEx

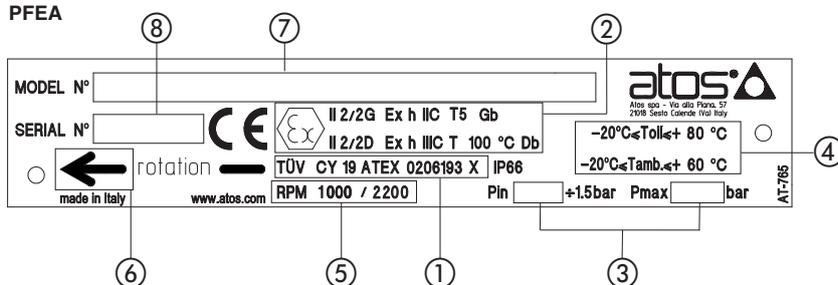
Gas - group II 2/2G - Zone 1, 2
Dust - group II 2/2D - Zone 21, 22

PVPCA

- ① ATEX notified body and certificate number
- ② Marking according to ATEX Directive
- ③ Inlet pressure and max delivery pressure
- ④ Oil and Ambient temperature range
- ⑤ Rotation speed referred to function with mineral oil for other fluid consult Atos technical office
- ⑥ Direction of rotation
- ⑦ Pump model code
- ⑧ Pump serial number



PFEA



ATEX classification - for Gas group II

II 2/2 G	Ex	h	IIC	T5	Gb
Equipment Group II industrial	Mark of Explosion Proof	Protection Method h Protection including c=constructional safety b=control of ignition source k=protection by liquid immersion	Gas Group IIC Hydrogen & Acetylene	Temperature Class T5 ≤ 100°C	Equipment Protection Level Gb High protection (Gas, Zone 1)
Equipment Category 2/2 (1)					
Suitable for use G Gas					

ATEX classification - for Dust

II 2/2 D	Ex	h	IIIC	T100	Db
Equipment Group II industrial	Mark of Explosion Proof	Protection Method h Protection including c=constructional safety b=control of ignition source k=protection by liquid immersion	Dust Group IIIC Conductive Dust	Temperature Class T100 ≤ 100°C	Equipment Protection Level Db High protection (Dust, Zone 21)
Equipment Category 2/2 (1)					
Suitable for use D Dust					

(1) Equipment of category 2 to be associated with a device (electric motor) of category 2

RELATED DOCUMENTATION

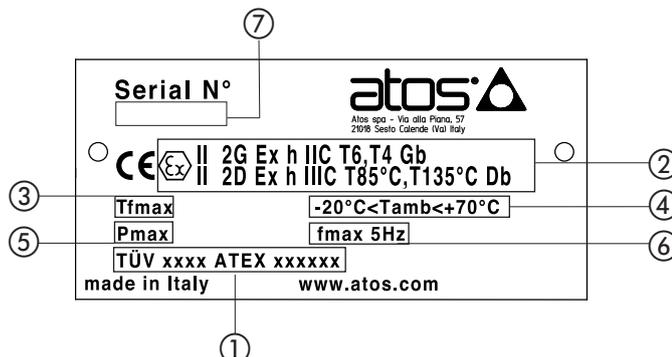
AX010	PVPCA - variable displacement axial piston pumps PFEA - fixed displacement vane pumps
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10 HYDRAULIC CYLINDERS CKA and SERVOCYLINDERS CKAM

Nameplate marking to ATEX and IECEx

Gas - group II 2G - Zone 1, 2
Dust - group II 2D - Zone 21, 22

- ① ATEX notified body and certificate number
- ② Marking according to ATEX Directive
- ③ Max fluid temperature
- ④ Ambient temperature range
- ⑤ Max working pressure
- ⑥ Max working frequency
- ⑦ Cylinder serial number



ATEX - for Gas group II

II 2 G	Ex	h	IIC	T6 / T4	Gb
Equipment Group II industrial Equipment Category 2 High protection Suitable for use G Gas	Mark of Explosion Proof	Protection Method h Protection including c=constructional safety b=control of ignition source k=protection by liquid immersion	Gas Group IIC Hydrogen & Acetylene	Temperature Class T6 ≤ 85°C T4 ≤ 135°C	Equipment Protection Level Gb High protection (Gas, Zone 1)

ATEX - for Dust

II 2 D	Ex	h	IIIC	T85 / T135	Db
Equipment Group II industrial Equipment Category 2 High protection Suitable for use D Dust	Mark of Explosion Proof	Protection Method h Protection including c=constructional safety b=control of ignition source k=protection by liquid immersion	Dust Group IIIC Conductive Dust	Temperature Class T85 ≤ 85°C T135 ≤ 135°C	Equipment Protection Level Db High protection (Dust, Zone 21)

RELATED DOCUMENTATION

BX500 CKA - cylinders CKAM - servocylinders with ex-proof digital position transducer



Table X030-0/E

Summary of Atos ex-proof components certified to cULus

Atos cULus ex-proof components are electrohydraulic equipment for industrial and mobile applications, designed to operate in hazardous environments in presence of flammable liquids, gases, vapors or combustible dust.

They are certified by **UL** Underwriters Laboratories in conformity to **UL 1203, UL429, CSA C22.2** and relevant **NEC** standards.

1 PRODUCTS RANGE

Atos cULus certified ex-proof components range includes proportional valves and on-off valves.

The **UL** certification covers all electrical parts of solenoids and LVDT transducers.

These components are engineered and manufactured according to protection method **Ex d**, where internal parts are sealed inside a ruggedized **flameproof enclosure**, granting high protection to the risk of explosion, see section 2

The mechanical parts like body, spools, etc, are strictly derived from highly engineered standard components.

They are not involved in the certification since their functioning does not represent a potential risk for the explosive environment.

Product Category	Component	Driver	Environment	cULus certification		Marking
				NEC 500	NEC 505	
Proportional valves	Servoproportional directionals High performance directionals Directional valves High performance pressure valves Pressure valves Flow valves	off-board	Gas	Class I Division I Groups C & D	Class I Zone 1 Groups IIA & IIB	see sect. 4
On-off valves	Directional valves Pressure relief valves	-	Gas			see sect. 5

2 FLAMEPROOF ENCLOSURE - Ex d

Technical characteristics

It is characterized by a strong mechanical construction, capable of withstanding the overpressure caused by a potential internal explosion and preventing the spread of flames to the external environment. It permits to dissipate the heat generated by the solenoid in order to limit the surface temperature within certified classes (T6, T5, etc), to avoid the self-ignition of the surrounding flammable atmosphere.

The rugged design of the flameproof enclosure makes the ex-proof valves suited for application in harsh environments.

Electrical wiring

The electrical wiring to the terminal board of ex-proof solenoids and LVDT transducers must be performed using **UL** certified cable glands, or conduit pipe.

Electric cables must be **UL** approved for the specific temperature class reported on the ex-proof component's nameplate, refer to specific tech. table of ex-proof valves for cable temperature.

3 NAMEPLATE MARKING

Atos cULus certified ex-proof components are provided with a specific nameplate reporting the **UL** certificate number and the classification according to the relevant **NEC 500** and **NEC 505** standards.

The classification identifies the compatibility of the ex-proof component for a specific hazardous environment.

The following sections provide a detailed description of the nameplate marking for proportional and on-off valves.

3.1 cULus Listed logo



This type of UL logo indicates compliance with both Canadian and U.S. requirements.

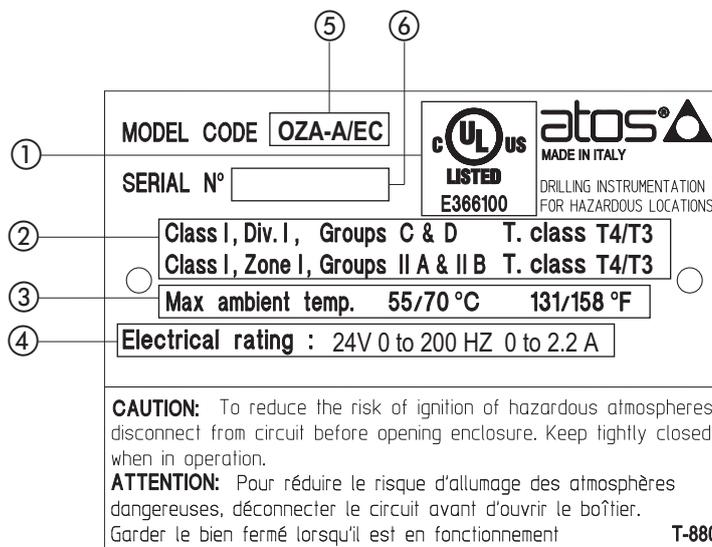
Atos ex-proof components are marked with **cULus Listed** logo stating that they have been investigated by UL Underwriters laboratory in accordance with following standards:

- UL 1203** Standard for Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for use in Hazardous (classified) locations
- UL 429** Standard for Electrically Operated valves
- CSA C22.2 No. 139-13** Electrically Operated Valves

4 PROPORTIONAL VALVES WITH OFF-BOARD DIGITAL DRIVER

Solenoid nameplate marking to NEC 500 and NEC 505

Class I, Division I, Groups C & D
Class I, Zone 1, Groups IIA & IIB



- ① cULus marking and certificate number
- ② Marking according to NEC 500 and NEC 505 standards
- ③ Ambient temperature
- ④ Power supply characteristics
- ⑤ Solenoid model code
- ⑥ Solenoid serial number

NEC 500 classification

Class I	Division I	Groups C & D	T4/T3
<p>Class I Equipment for flammable Gas and Vapors</p>	<p>Division I Explosive substances continuously or intermittently present in the atmosphere</p>	<p>Gas Group C Methane, Butane, Petrol, etc. D Ethylene, Formaldehyde, Chloropropane, etc.</p>	<p>Temperature Class T4 ≤ 135°C T3 ≤ 200°C</p>

NEC 505 classification

Class I	Zone 1	Groups IIA & IIB	T4/T3
<p>Class I Equipment for flammable Gas and Vapors</p>	<p>Zone 1 Location where explosive substance are continuously present</p>	<p>Gas Group IIA Methane, Butane, Petrol, etc. IIB Ethylene, Formaldehyde, Chloropropane, etc.</p>	<p>Temperature Class T4 ≤ 135°C T3 ≤ 200°C</p>

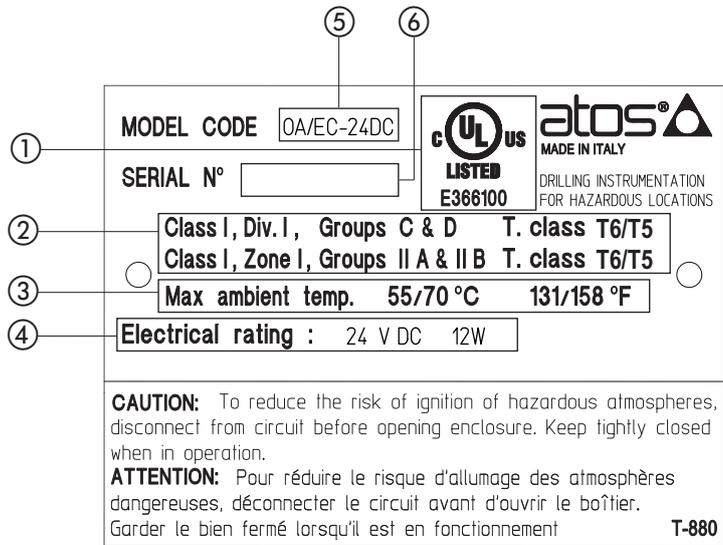
RELATED DOCUMENTATION

<p>Servoproportional directional - zero overlap with LVDT transducer FX140 DLHZA/UL-T DLKZA/UL-T - direct, sleeve execution</p> <p>High performance directional - positive overlap with LVDT transducer FX120 DHZA/UL-T, DKZA/UL-T - direct</p> <p>Directional valves - positive overlap without transducer FX100 DHZA/UL-A, DKZA/UL-A - direct FX200 DPZA/UL-A - piloted</p>	<p>Pressure valves - without pressure transducer FX010 RZMA/UL-A, HZMA/UL-A, AGMZA/UL-A - relief FX040 RZGA/UL-A, AGRCZA/UL-A, HZGA/UL-A, KZGA/UL-A - reducing FX070 DHRZA/UL-A - reducing FX300 LIMZA/UL-A - relief LIRZA/UL-A - reducing LICZA/UL-A - compensator</p> <p>Flow valves, pressure compensated FX420 QVHZA/UL-T, QVKZA/UL-T - with LVDT transducer FX400 QVHZA/UL-A, QVKZA/UL-A - without transducer</p>
--	--

5 ON-OFF VALVES

Solenoid nameplate marking to NEC 500 and NEC 505

Class I, Division I, Groups C & D
Class I, Zone 1, Groups IIA & IIB



- ① cULus marking and certificate number
- ② Marking according to NEC 500 and NEC 505 standards
- ③ Ambient temperature
- ④ Power supply characteristics
- ⑤ Solenoid model code
- ⑥ Solenoid serial number

NEC 500 classification

Class I	Division I	Groups C & D	T6/T5
Class I Equipment for flammable Gas and Vapors	Division I Explosive substances continuously or intermittently present in the atmosphere	Gas Group C Methane, Butane, Petrol, etc. D Ethylene, Formaldehyde, Chloropropane, etc.	Temperature Class T6 ≤ 85°C T5 ≤ 100°C

NEC 505 classification

Class I	Zone 1	Groups IIA & IIB	T6/T5
Class I Equipment for flammable Gas and Vapors	Zone 1 Location where explosive substance are continuously present	Gas Group IIA Methane, Butane, Petrol, etc. IIB Ethylene, Formaldehyde, Chloropropane, etc.	Temperature Class T6 ≤ 85°C T5 ≤ 100°C

RELATED DOCUMENTATION

<p>Directional valves</p> <p>EX010 DHA/UL - direct, spool type</p> <p>EX020 DLAH/UL, DLAHM/UL - direct, poppet type CART-LAH/UL, CART-LAHM/UL - cartridge screw-in, direct, poppet type</p> <p>EX030 DPHA/UL - piloted, spool type</p> <p>EX050 LIDEW-AO/UL, LIDBH-AO/UL - piloted ISO cartridges and functional covers</p> <p>Pressure relief valves</p> <p>CX010 AGAM-AO/UL, ARAM-AO/UL - piloted, with solenoid valve for venting</p>
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Table X040-0/E

Summary of Atos ex-proof components certified to

Atos MA certified ex-proof components are electrohydraulic equipment designed to operate in hazardous environments of chinese underground mines with presence of methane-air atmosphere or coal dust.

They are certified by an independent notified body in conformity to Chinese Mining Products Safety Approval and Certification Center - **MA Center**.

Official notification by MA Center states that the product under consideration meets the applicable Regulations for the Implementation of the Law of the People's Republic of China on Safety in Mines.

1 PRODUCTS RANGE

Atos MA certified ex-proof range includes on-off solenoid directional valves, direct type.

Atos Sh extended range includes on-off solenoid directional valves, direct & piloted type, plus pressure relief with solenoid pilot.

The MA certification is relevant to the on-off solenoids.

They are engineered and manufactured according to protection method **Ex d**, where internal parts are sealed inside a ruggedized **flameproof enclosure**, granting high protection to the risk of explosion, see section 2.

The mechanical parts likes body, spools, etc, are strictly derived from highly engineered standard components.

They are not involved in the certification since their functioning does not represent a potential risk for the explosive environment.

Product Category	Component	Environment	MA Certification		Marking
On-off valves	Directional valves, direct & piloted Pressure relief valves	Gas	Ex d I Mb		see sect. 4

2 FLAMEPROOF ENCLOSURE - Ex d

Technical characteristics

It is characterized by a strong mechanical construction, capable of withstanding the overpressure caused by a potential internal explosion and preventing the spread of flames to the external environment. It permits to dissipate the heat generated by the solenoid and driver power, in order to limit the surface temperature, to avoid the self-ignition of the surrounding flammable atmosphere.

The rugged design of the flameproof enclosure, makes the ex-proof valves suited for application in harsh environments.

Electrical wiring

The MA certified ex-proof solenoids are provided with a built-in cable gland for the electrical wiring to the terminal board.

3 NAMEPLATE MARKING

Atos MA certified ex-proof components are provided with a specific nameplate reporting the MA certificate number, the notified body and the classification according to the MA certification.

The classification identifies the protection method and the compatibility of the ex-proof component for mining hazardous environment.

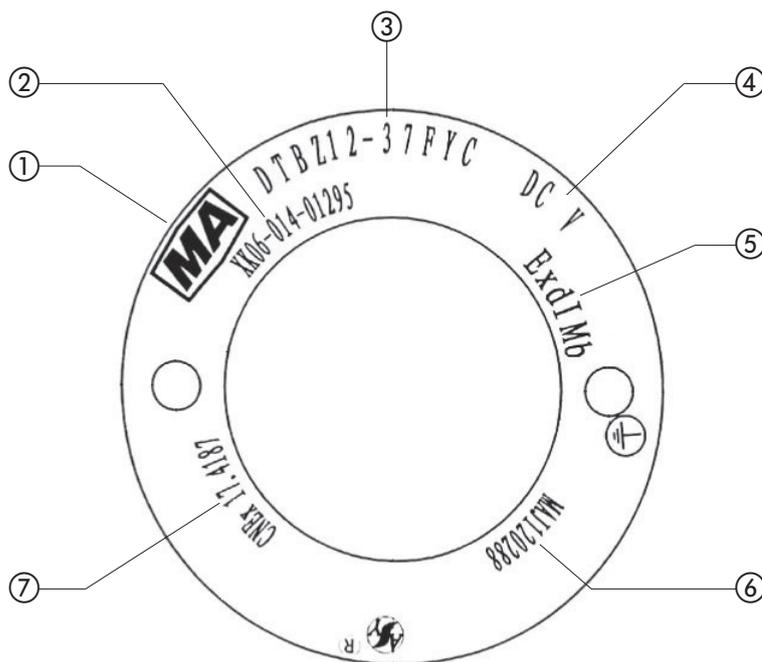
The following section provides a detailed description of the nameplate marking.

4 ON-OFF VALVES

Nameplate marking to MA

Gas - group I Mb - Mining

- ① MA logo
- ② License
- ③ Solenoid model code
- ④ Power supply characteristics
- ⑤ MA classification for Mining
- ⑥ MA certificate number
- ⑦ Notified body and certificate number



MA classification - for Gas group I - Mining

Ex	d	I	Mb
Mark of Explosion Proof	Protection Method d Flameproof enclosure	Gas Group I Methane	Equipment Protection Level Mb High protection

RELATED DOCUMENTATION

<p>Directional valves</p> <p>EX015 DHA/MA - DKA/MA direct, spool type</p> <p>Directional valves (1)</p> <p>SHX121 SDHA/MA, SDKA/MA - direct, spool type</p> <p>SHX121 DPHA/MA - piloted, spool type</p> <p>Pressure relief valves (1)</p> <p>SHX121 SAGAM/MA - piloted, with solenoid valve for venting</p>
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(1) Atos Sh products range, see www.atos.com



Table X050-0/E

Summary of Atos intrinsically safe components

certified to **ATEX** or **IECEX**

Atos intrinsically safe components are electrohydraulic equipment for industrial and mobile applications, designed to operate in hazardous environments of surface plants or underground mining with presence of flammable liquids, gases, or vapors.

They are designed to grant a very high protection, superior to ex-proof components, and suitable for hazardous environments classified **Zone 0** with high risk of explosion.

They are certified by independent notified bodies in conformity to **ATEX** or **IECEX** standards.

1 PRODUCTS RANGE

Atos intrinsically safe range includes on-off directional valves, pressure relief with solenoid pilot valve and power supply barriers.

1.1 On-off valves

The core of intrinsically safe valves is represented by the intrinsically safe solenoid.

It is engineered, manufactured and certified according to the intrinsically safe protection method **Ex i**, based on the principle of limiting the energy in the electric circuits.

The "intrinsically safe" circuit is virtually unable to produce electrical surges or thermic effects able to cause explosion in hazardous environments also in presence of break-down situations.

The Intrinsically safe equipment cannot release a sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition of a specific hazardous mixture".

The intrinsically safe solenoids are designed to operate with a very low current and they must be powered by certified intrinsically safe power supply barriers.

The mechanical parts of the valve likes body, spools, etc, are strictly derived from highly engineered standard components.

They are not involved in the certification since their functioning does not represent a potential risk for the explosive environment.

Product Category	Component	Environment	Certification				Marking
			ATEX Group II	IECEX Group II	ATEX Group I	IECEX Group I	
On-off valves	Directional valves	Gas	X				see sect. 3
				X			see sect. 4
	Pressure relief valves	Mining			X		see sect. 5
						X	see sect. 6
Electronics	Power supply barriers	Gas & Dust	X	X			see sect. 7

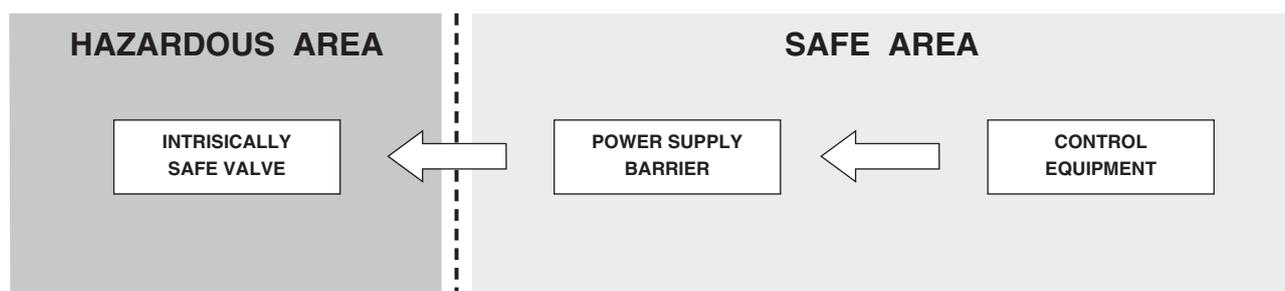
1.2 Power supply barriers

The electric power supply to the intrinsically safe valves must be operated through electronic devices, to be located outside the hazardous environment.

These devices are usually called "safety barriers" because they limit the electric current to the intrinsically safe solenoid within the classified range, also in case of short circuit.

Atos barriers type Y-BXNE 412 are galvanic isolated electronic devices, designed in compliance with European Norms EN60079-0, EN60079-11 and ATEX certified with **Ex i** protection method – see tech table **GX010**

They ensure the optimized functioning of the Atos intrinsically safe valves up to the max operating limits.



2 NAMEPLATE MARKING

Atos intrinsically safe components are provided with a specific nameplate reporting the ATEX or IECEx certificate number, the notified body and the classification according to the ATEX or IECEx certifications.

The classification identifies the protection method and the compatibility of the intrinsically safe component for a specific hazardous environment.

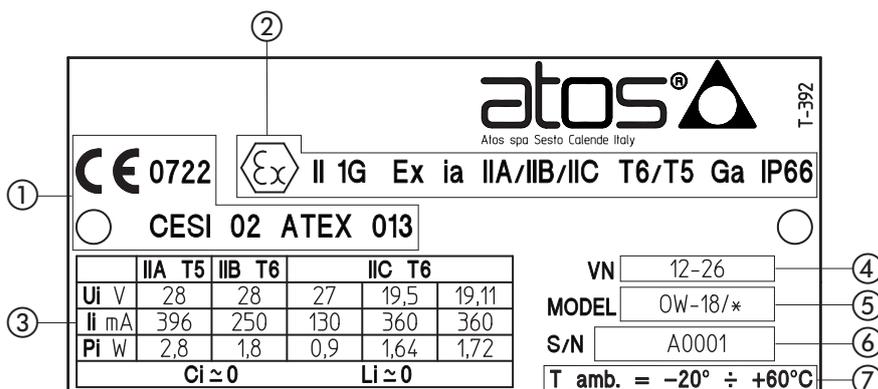
The following sections provide a detailed description of the nameplate marking for the intrinsically safe valves.

3 ON-OFF VALVES

Nameplate marking to ATEX

Gas - group II 1G - Zone 0, 1, 2

- ① ATEX notified body and certificate number
- ② Marking according to ATEX directive
- ③ Electric characteristics
- ④ Power supply characteristics
- ⑤ Solenoid model code
- ⑥ Solenoid serial number
- ⑦ Ambient temperature



ATEX classification - for Gas group II

II 1G	Ex	ia	IIA / IIB / IIC	T6 / T5	Ga
Equipment Group II Industrial Equipment Category 1 Very high protection Suitable for use G Gas	Mark of Explosion Proof	Protection Method ia Intrinsically safe (Gas Zone 0)	Gas Group IIA Ammonia, Methane, Ethane, Propane, etc. IIB Citygas, Ethylene, Ethyl glycol, etc. IIC Hydrogen & Acetylene	Temperature Class T6 ≤ 85°C T5 ≤ 100°C	Equipment Protection Level Ga Very high protection (Gas Zone 0)

RELATED DOCUMENTATION

Directional valves EX100 DHW - direct, spool type EX120 DLWH - direct, poppet type EX130 DPHW - piloted, spool type EX150 LIDEW-WO, LIDBH-WO - piloted ISO cartridges and functional covers Pressure relief valves CX030 AGAM-WO, ARAM-WO - piloted, with solenoid valve for venting

4 ON-OFF VALVES

Nameplate marking to IECEx

Gas - group II 1G - Zone 0, 1, 2

- ① IECEx notified body and certificate number
- ② Marking according to IECEx scheme
- ③ Electric characteristics
- ④ Power supply characteristics
- ⑤ Solenoid model code
- ⑥ Solenoid serial number
- ⑦ Ambient temperature

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① IECEx CES 12.0017

② Ex ia IIA/IIB/IIC T6/T5 Ga IP66

	IIA T5	IIB T6	IIC T6		
Ui V	28	28	27	19,5	19,11
Ii mA	396	250	130	360	360
Pi W	2,8	1,8	0,9	1,64	1,72
Ci ≈ 0			Li ≈ 0		

④ VN 12-26

⑤ MODEL OWI-18/*

⑥ S/N

⑦ T amb. = -20° ÷ +60°C

IECEx classification - for Gas group II

Ex	ia	IIA / IIB / IIC	T6 / T5	Ga
Mark of Explosion Proof	Protection Method ia Intrinsically safe (Gas Zone 0)	Gas Group IIA Ammonia, Methane, Ethane, Propane, etc. IIB Citygas, Ethylene, Ethyl glycol, etc. IIC Hydrogen & Acetylene	Temperature Class T6 ≤ 85°C T5 ≤ 100°C	Equipment Protection Level Ga Very high protection (Gas Zone 0)

RELATED DOCUMENTATION

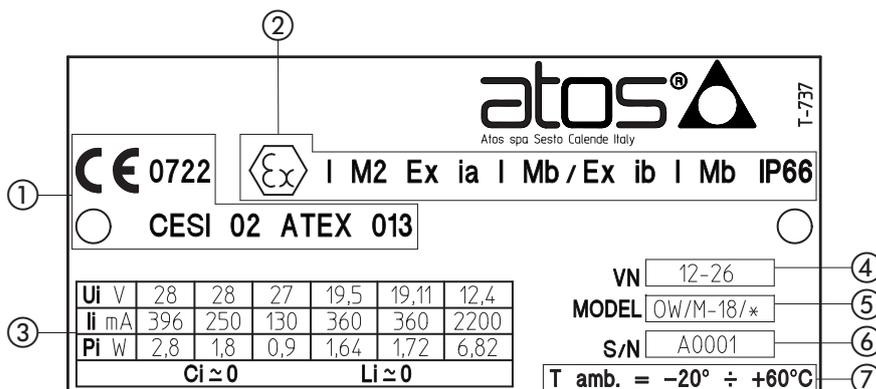
<p>Directional valves</p> <p>EX100 DHW/IE - direct, spool type</p> <p>EX120 DLWH/IE - direct, poppet type</p> <p>EX130 DPHW/IE - piloted, spool type</p> <p>EX150 LIDEW/IE-WO, LIDBH/IE-WO - piloted ISO cartridges and functional covers</p> <p>Pressure relief valves</p> <p>CX030 AGAM/IE-WO, ARAM/IE-WO - piloted, with solenoid valve for venting</p>

5 ON-OFF VALVES

Nameplate marking to ATEX

Gas - group I M2 - Mining

- ① ATEX notified body and certificate number
- ② Marking according to ATEX directive
- ③ Electric characteristics
- ④ Power supply characteristics
- ⑤ Solenoid model code
- ⑥ Solenoid serial number
- ⑦ Ambient temperature



ATEX classification - for Gas group I - Mining

I M2	Ex	ia, ib	I	Mb
Equipment Group I Mines Equipment Category M2 High protection	Mark of Explosion Proof	Protection Method ia Intrinsically safe (Gas Zone 0) ib Intrinsically safe (Gas Zone 1 and 2)	Gas Group I Methane	Equipment Protection Level Mb High protection (de-energized with gas presence)

RELATED DOCUMENTATION

<p>Directional valves</p> <p>EX100 DHW/M - direct, spool type EX120 DLWH/M - direct, poppet type EX130 DPHW/M - piloted, spool type EX150 LIDEW/M-WO, LIDBH/M-WO - piloted ISO cartridges and functional covers</p> <p>Pressure relief valves</p> <p>EX030 AGAM/M-WO, ARAM/M-WO - piloted, with solenoid valve for venting</p>
--

6 ON-OFF VALVES

Nameplate marking to IECEx

Gas - group I Mb - Mining

- ① IECEx notified body and certificate number
- ② Marking according to IECEx scheme
- ③ Electric characteristics
- ④ Power supply characteristics
- ⑤ Solenoid model code
- ⑥ Solenoid serial number
- ⑦ Ambient temperature

① IECEx CES 12.0017

② Ex ia I Mb / Ex ib I Mb IP66

Ui V	28	28	27	19,5	19,11	12,4
Ii mA	396	250	130	360	360	2200
Pi W	2,8	1,8	0,9	1,64	1,72	6,82

③

④ VN 12-26

⑤ MODEL OWI/M-18/*

⑥ S/N

⑦ T amb. = -20° ÷ +60°C

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IECEx classification - for Gas group I - Mining

Ex	ia, ib	I	Mb
Mark of Explosion Proof	Protection Method ia Intrinsically safe (Gas Zone 0) ib Intrinsically safe (Gas Zone 1 and 2)	Gas Group I Methane	Equipment Protection Level Mb High protection (de-energized with gas presence)

RELATED DOCUMENTATION

<p>Directional valves</p> <p>EX100 DHW/IEM - direct, spool type</p> <p>EX120 DLWH/IEM - direct, poppet type</p> <p>EX130 DPHW/IEM - piloted, spool type</p> <p>EX150 LIDEW/IEM-WO, LIDBH/IEM-WO - piloted ISO cartridges and functional covers</p> <p>Pressure relief valves</p> <p>EX030 AGAM/IEM-WO, ARAM/IEM-WO - piloted, with solenoid valve for venting</p>
--

7 POWER SUPPLY BARRIER

Gas - group II 1G - Zone 0, 1, 2
Dust - group II 1D - Zone 20, 21, 22

ATEX and IECEx classification - for Gas group II

II 1G	Ex	ia	IIB / IIC
<p>Equipment Group II Industrial</p> <p>Equipment Category 1 Very high protection</p> <p>Suitable for use G Gas</p>	<p>Mark of Explosion Proof</p>	<p>Protection Method ia Intrinsically safe (Gas Zone 0)</p>	<p>Gas Group</p> <p>IIB Citygas, Ethylene, Ethyl glycol, etc.</p> <p>IIC Hydrogen & Acetylene</p>

ATEX and IECEx classification - for Dust group II

II 1D	Ex	ia D
<p>Equipment Group II Industrial</p> <p>Equipment Category 1 Very high protection</p> <p>Suitable for use D Dust</p>	<p>Mark of Explosion Proof</p>	<p>Protection Method ia D Intrinsically safe (Dust Zone 20)</p>

RELATED DOCUMENTATION

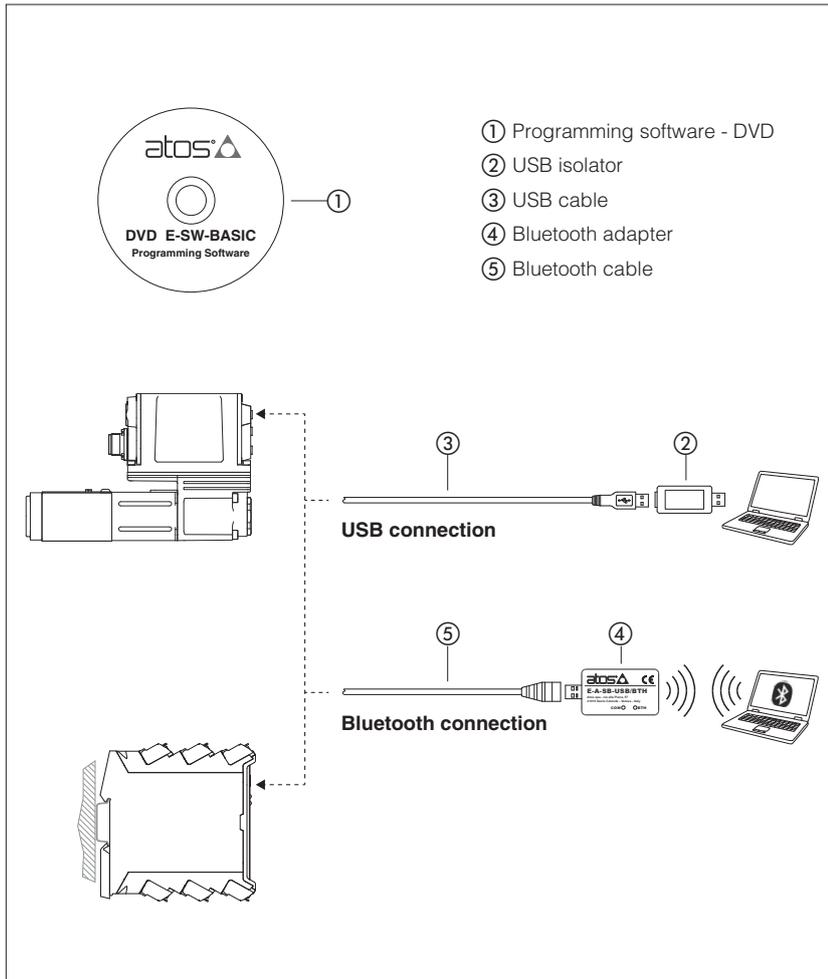
<p>GX010 Y-BXNE Power supply barrier</p>



Table **GS500-6/E**

Programming tools for digital electronics

Atos PC software, USB adapters, cables and terminators



The E-SW and Z-SW programming software are supplied in DVD format and can be easily installed on a desktop or a notebook computer. The intuitive graphic interface allows:

- set up valve's functional parameters
- verify the actual working conditions
- identify and quickly solve fault conditions
- adapt the factory preset parameters to the application requirements
- store the customized setting into the valve
- archive the customized setting into the PC

The graphic interface is organized in pages related to different specific groups of functions and parameters.

The software automatically recognizes the connected valve model and adapts the displayed parameter groups, according to the selected access level.

The software is available in different versions according to the driver and controller communication interfacing.

Fieldbus communication software includes also dedicated manuals and configuration files for user self management of the Atos electronics, using a fieldbus master.

Features:

- automatic valve recognition
- multilevel graphic interface
- numeric parameters settings (scale, bias, ramp, linearization, dither, etc.)
- real-time parameters modification
- diagnostic and monitor signals
- preset data storing into the digital driver and controller
- internal oscilloscope function
- internal database of customized preset

DVD contents:

- software installer
- user and fieldbus communication manuals
- fieldbus configuration files

1 PROGRAMMING SOFTWARE

Valve functional parameters can be easily set up with Atos E-SW / Z-SW programming software using proper connection to the digital driver/controller.

E - SW	-	BASIC	/	*	-	*
<p>E-SW = for valve drivers</p> <p>Supported valve drivers communication:</p> <p>BASIC = NP (USB) PS (Serial) IR (Infrared)</p> <p>FIELDBUS = BC (CANopen) BP (PROFIBUS DP) EH (EtherCAT)</p> <p>EW (POWERLINK) EI (EtherNet/IP) EP (PROFINET)</p>				<p>Supplies:</p> <p>- = first supply</p> <p>N = next supply</p>		
				<p>Option:</p> <p>PQ = for valve drivers with alternated P/Q controls SP, SF, SL</p>		

Note: E-SW-*/PQ software supports also valve drivers without P/Q control

Z - SW	-	FULL	-	*
<p>Z-SW = for axis controllers</p> <p>Supported axis controllers communication:</p> <p>FULL = NP (USB) PS (Serial)</p> <p>BC (CANopen) BP (PROFIBUS DP) EH (EtherCAT)</p> <p>EW (POWERLINK) EI (EtherNet/IP) EP (PROFINET)</p>				<p>Supplies:</p> <p>- = first supply</p> <p>N = next supply</p>

1.1 Programming software versions

Different software versions are available according to the valve drivers / axis controllers type to be connected and communication interface.

Note: E-SW / Z-SW software are supplied in DVD format; E-SW-BASIC software can be free downloaded from the Atos website

Free programming software, web download:

E-SW-BASIC Software can be downloaded upon web registration at www.atos.com; service and DVD not included.
Upon web registration user receive via email the Activation Code (software free license) and login data to access Atos Download Area.
The software remains active for 10 days from the installation date and then it stops until the user inputs the Activation Code.

DVD first supply of programming software, to be ordered separately:

E-SW-BASIC Software has to be activated via web registration at www.atos.com; 1 year service included.
E-SW-BASIC/PQ Upon web registration user receive via email the Activation Code (software license) and login data to access personal Atos Download Area.
E-SW-FIELDBUS
E-SW-FIELDBUS/PQ The software remains active for 10 days from the installation date
Z-SW-FULL and then it stops until the user inputs the Activation Code.

DVD next supplies of programming software, to be ordered separately:

E-SW-BASIC-N Only for supplies after the first; service not included, web registration not allowed.
E-SW-BASIC/PQ-N Software has to be activated with Activation Code received upon first supply web registration.
E-SW-FIELDBUS-N
E-SW-FIELDBUS/PQ-N
Z-SW-FULL-N

Notes: the software BASIC, FIELDBUS and FULL are NOT interchangeable and must be ordered separately;
programming software FIELDBUS and FULL can program digital electronics through USB communication port for all industrial and ex-proof versions of drivers/controllers

1.2 DVD contents

Include software installer, user manuals and fieldbus configuration files:

EDS for BC - GSD for BP - XML for EH - XDD for EW - EDS for EI - GSDML for EP

1.3 Atos Download Area

Direct access to latest releases of programming software, manuals, USB drivers and fieldbus configuration files at www.atos.com

Software and USB drivers can be easily installed following the instruction contained in the "info.txt" files.

An automatic mailing message will inform all the registered users whenever a new software upgrade is available.

1.4 E-SW / Z-SW minimum PC requirements

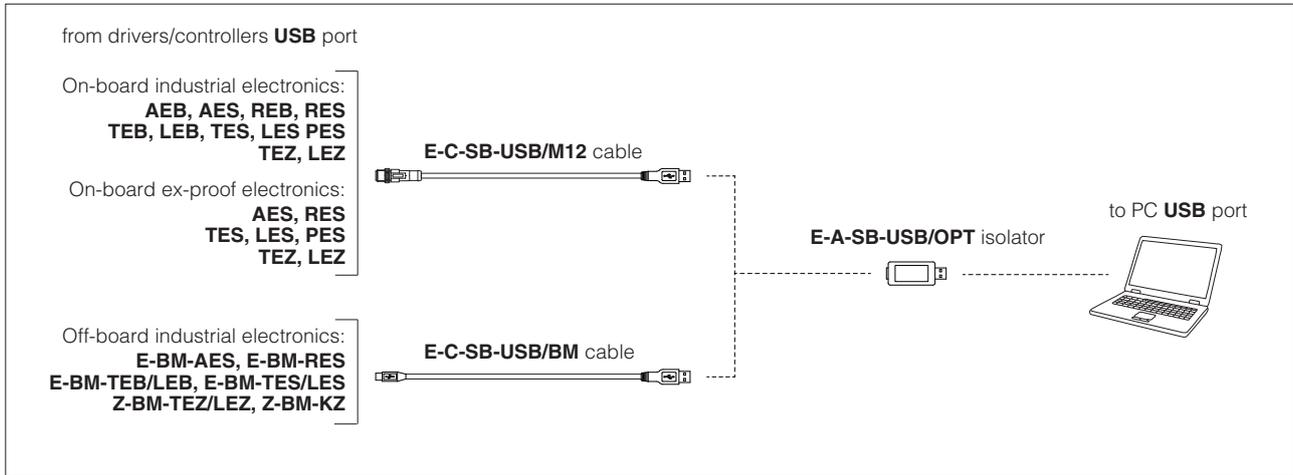
Personal Computer	Pentium® processor 1GHz or equivalent	Memory	512 MB RAM + Hard Disk with 250MB free space
Operating System	Windows XP SP3	Device	DVD reader
Monitor Resolution	1024 x 768	Interface	Serial RS232 port (only for PS) or USB port

2 USB connection - ISOLATOR AND CABLE

E-SW / Z-SW software permit valve's parameterization through USB port.

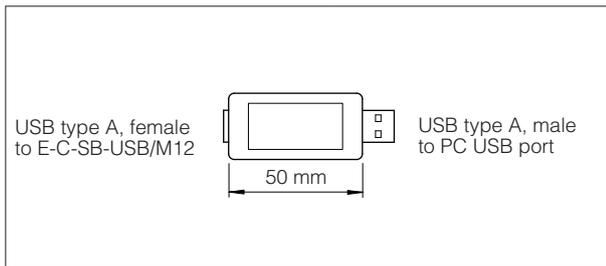
2.1 Connection tools by driver/controller type

Isolator and cables shown in the image below can be ordered individually or in a single solution purchasing a dedicated kit: **E-KIT-USB**



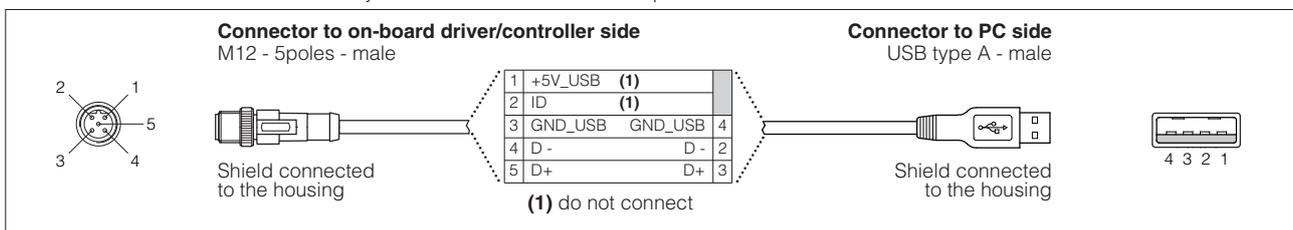
WARNING: drivers/controllers USB port is not isolated! Use of USB isolator adapter is highly recommended for PC protection: wrong earthing connections may cause high potential difference between GNDs, generating high currents that could damage the PC connected to drivers/controllers.

2.2 E-A-SB-USB/OPT - isolator adapter

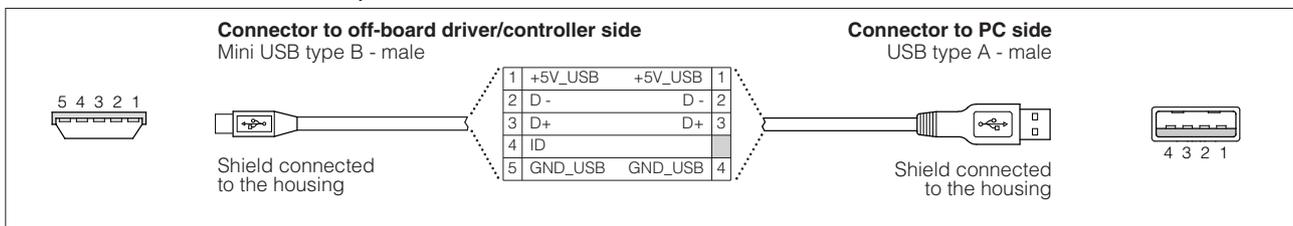


- USB 2.0 Full speed (12 MBps)
- electrical isolation 1 kV
- temperature range, -40° ÷ +50° (relative humidity 25% ÷ 75%)
- external power supply not required (power 400 mA output, 5 V ±10%)
- MTBF > 1,2 million hours (MIL standard)

2.3 E-C-SB-USB/M12 - 4 m cable - only for on-board industrial and ex-proof electronics



2.4 E-C-SB-USB/BM - 3 m cable - only for off-board industrial electronics

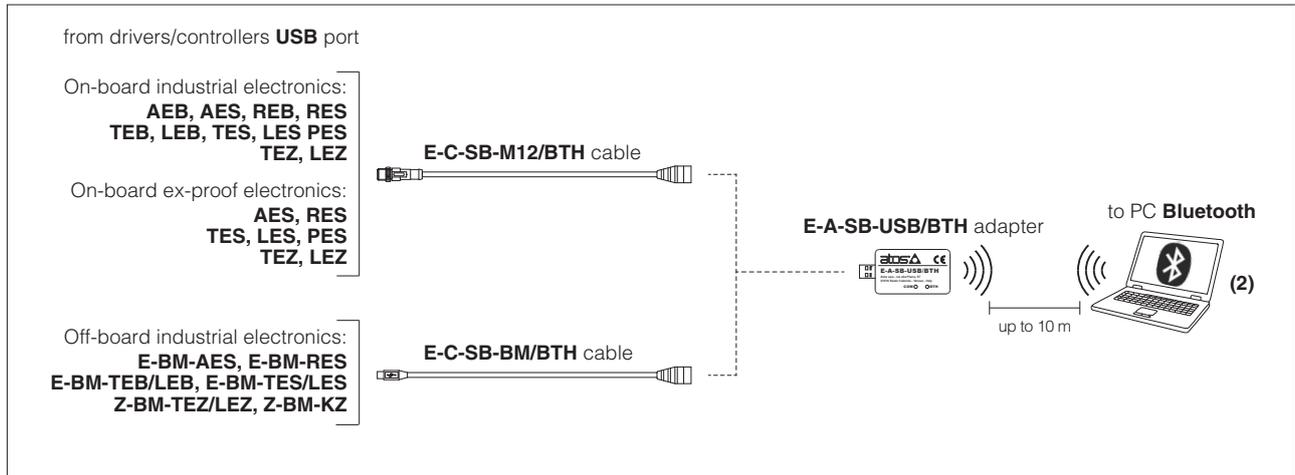


3 BLUETOOTH connection - ADAPTER AND CABLE

E-SW / Z-SW software permit valve's parameterization through Bluetooth (1).

3.1 Connection tools by driver/controller type

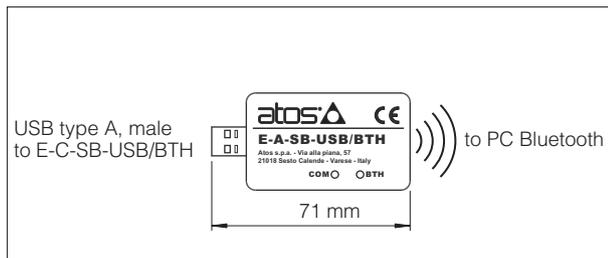
Adapter and cables shown in the image below can be ordered individually or in a single solution purchasing a dedicated kit: **E-KIT-BTH**



(1) Bluetooth adapter is not compatible with E-BM-AES and E-BM-RES drivers

(2) If PC has not built-in Bluetooth, use standard USB to Bluetooth dongle compatible with E-A-SB-USB/BTH specification (please refer to STARTUP-BTH guide)

3.2 E-A-SB-USB/BTH - Bluetooth adapter

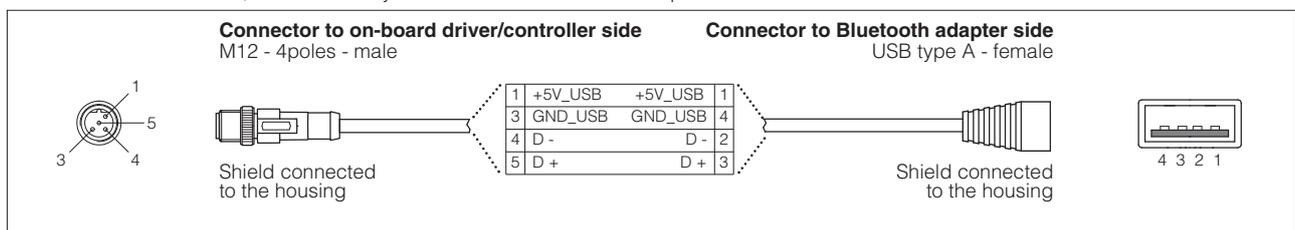


- USB male connector, type A
- type of radio interface: Bluetooth Class 2
- temperature range, -20 ÷ +70 °C (storage -40 ÷ +70 °C)
- external power supply not required (from Atos drivers/controllers only)
- protocol: Bluetooth Classic Version 2.x , 3.x supporting Serial Port Profile (SPP Profile)
- max RF transmission power: Class 2 Output Power (+1.5 dBm typical)
- frequency: 2.402 GHz to 2.480 GHz
- LEDs indicate the actual working condition
- IP20 protection degree

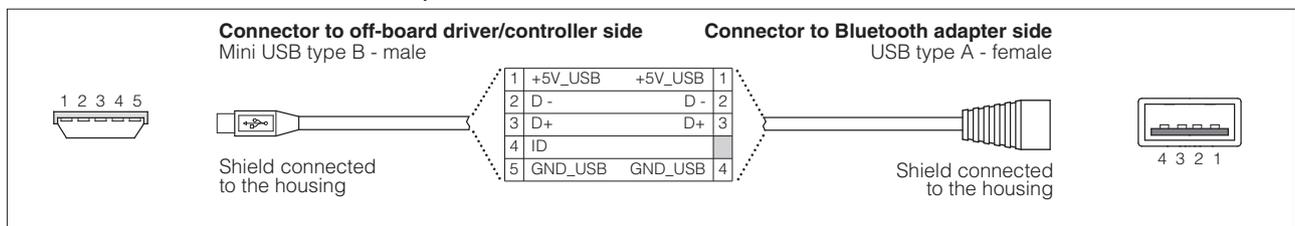
WARNING: Bluetooth adapter is available only for European, USA and Canadian markets!

Bluetooth adapter is certified according to RED (Europe), FCC (USA) and ISED (Canada) directives

3.3 E-C-SB-M12/BTH - 0,4 m cable - only for on-board industrial and ex-proof electronics



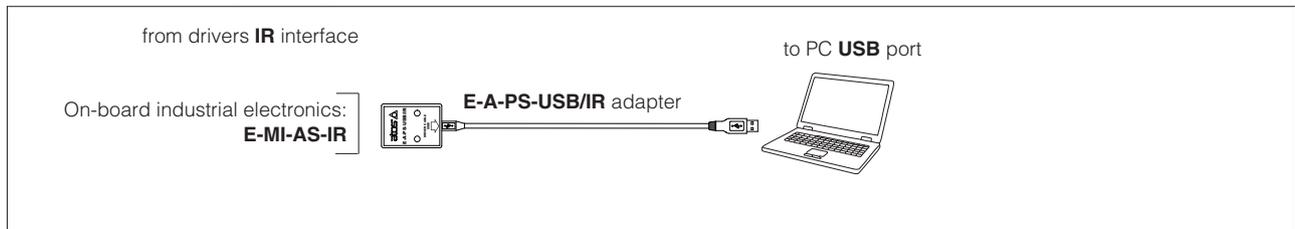
3.4 E-C-SB-BM/BTH - 0,2 m cable OTG - only for off-board industrial electronics



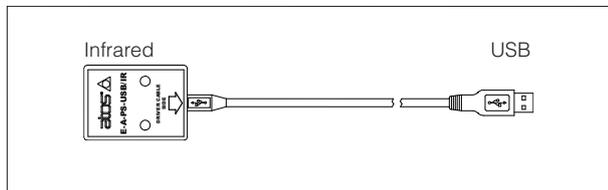
4 IR infrared - USB COMMUNICATION ADAPTER - only for **E-MI-AS-IR** drivers

The adapter have to be connected to the USB communication port of PC to activate the IR infrared communication interface towards Atos digital electrohydraulics.

4.1 Connection tools by driver type



4.2 E-A-PS-USB/IR - 3 m adapter

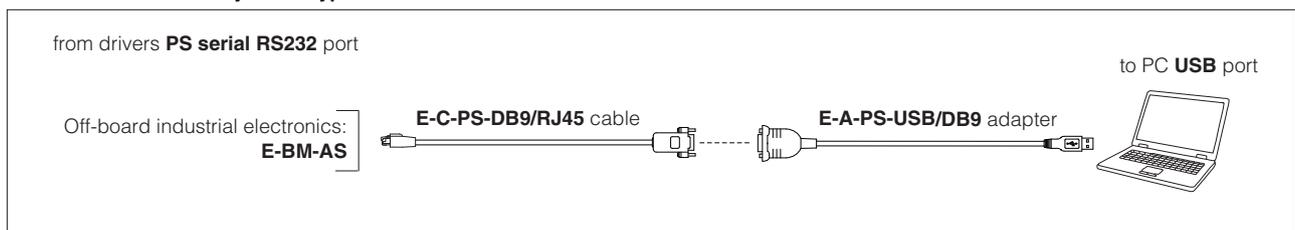


- direct infrared communication with the driver
- USB male connector, type A
- plug-in format for direct infrared connection on the driver
- transmission rate 9,6 kbit/s
- external power supply not required (USB supply)

5 PS serial RS232 - USB COMMUNICATION ADAPTER AND CROSS CABLES - only for **E-BM-AS** drivers

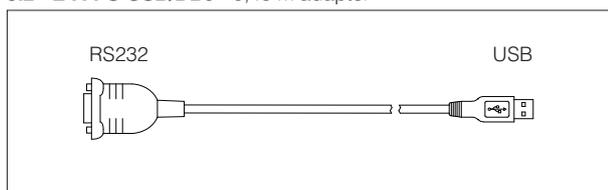
The adapter have to be connected to the USB communication port of PC to activate the PS serial RS232 communication interface towards Atos digital electrohydraulics. The cross cables connect the relevant connector of the USB adapter with the communication port of the digital drivers.

5.1 Connection tools by driver type



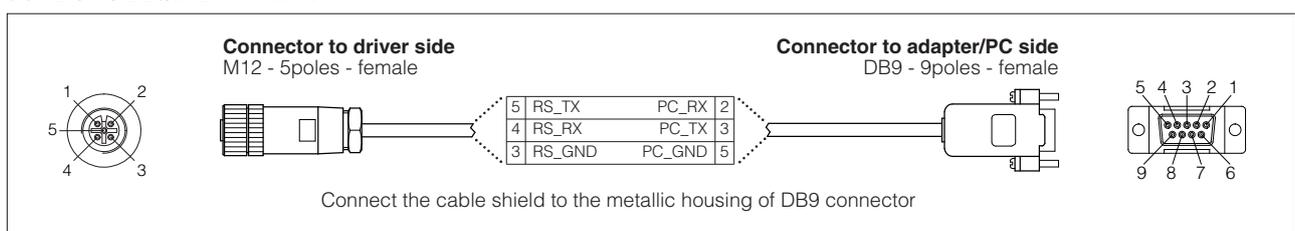
Note: the adapter is not required if PC is already equipped with a serial RS232 communication port

5.2 E-A-PS-USB/DB9 - 0,45 m adapter

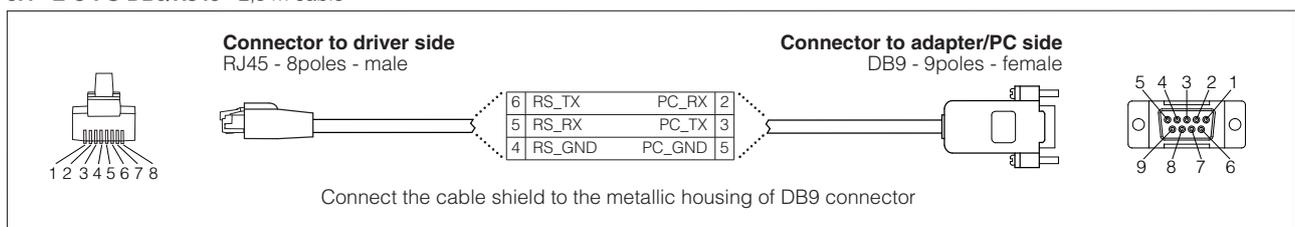


- DB9 male connector according to serial RS232 specification
- USB male connector, type A
- transmission rate from 1,6 kbit/s up to 225 kbit/s
- external power supply not required (USB supply)

5.3 E-C-PS-DB9/M12 - 4 m cable

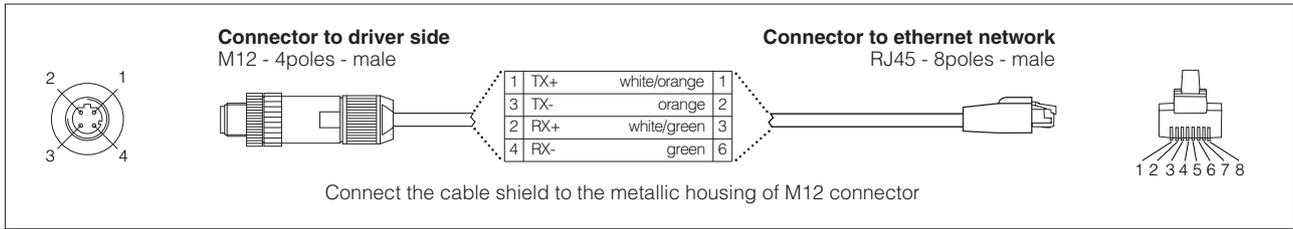


5.4 E-C-PS-DB9/RJ45 - 2,5 m cable



6 ETHERNET CABLE WIRING DIAGRAM - only for EH, EW, EI and EP

Typical ethernet cable wiring diagram from industrial M12 connectors to standard RJ45 ethernet connectors.



7 FIELDBUS TERMINATORS - only for BC and BP

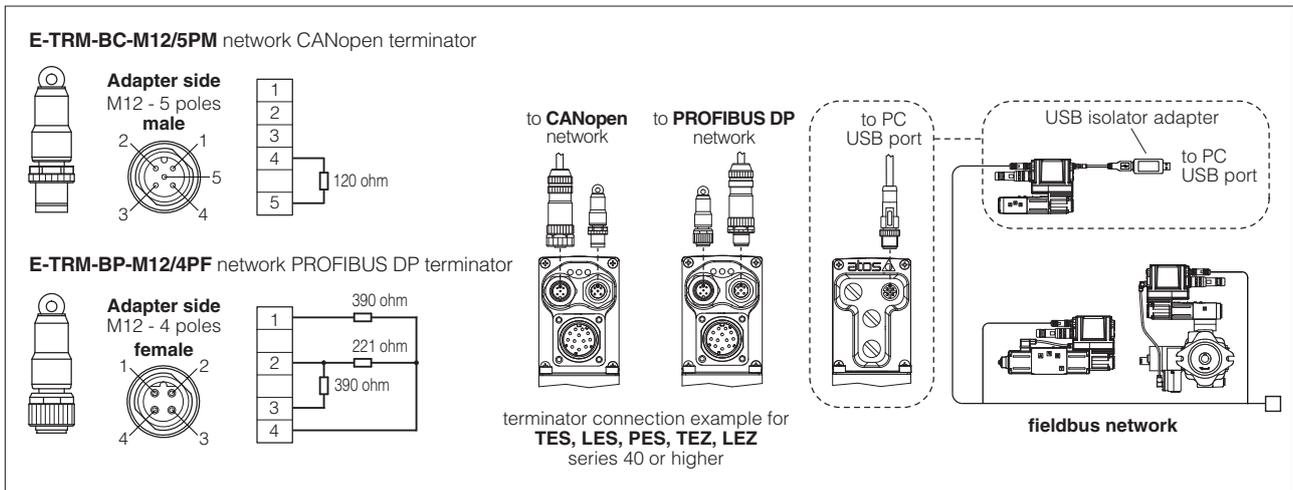
For TES, LES, PES, TEZ, LEZ series 40 or higher in BC and BP executions, the fieldbus terminator has to be used.

Note: fieldbus terminators not available for ex-proof electronics

E - TRM	-	BC	-	M12	/	5PM
Terminator						Connector: 5PM = to BC executions, drivers/controllers 4PF = to BP executions, drivers/controllers
Fieldbus interfaces: BC = CANopen BP = PROFIBUS DP				Connector: M12 = from M12 output fieldbus connector, drivers/controllers		

7.1 M12 - terminators for fieldbus network

The fieldbus terminators are required when output fieldbus connector has to be used as network end point.



8 FIRMWARE UPDATE

It is possible to update the firmware of the following digital drivers and controllers, using proper USB communication port. The firmware update is allowed starting from electronics series listed into the table or higher series:

Industrial electronics

E-RI-AEB s10	E-RI-REB s10	E-BM-AES s10	E-RI-TEB s10	E-BM-TEB s10	E-RI-TES s40	E-BM-TES s10	E-RI-TES-S s40	E-BM-TES-S s10	E-RI-PES-S s40
E-RI-AES s40	E-RI-RES s10	E-BM-RES s10	E-RI-LEB s10	E-BM-LEB s10	E-RI-LES s40	E-BM-LES s10	E-RI-LES-S s40	E-BM-LES-S s10	
Z-RI-TEZ s40	Z-BM-KZ s10	Z-BM-TEZ s10	Z-RI-LEZ s40	Z-BM-LEZ s10					

Ex-proof electronics

E-RA-AES s40	E-RA-RES s40	E-RA-TES s40	E-RA-TES-S s40
		E-RA-LES s40	E-RA-LES-S s40
Z-RA-TEZ s40	Z-RA-TEZ-S s40		
Z-RA-LEZ s40	Z-RA-LEZ-S s40		

9 RECOMMENDED TOOLS SELECTION

9.1 Industrial and ex-proof electronics

	Model Code	Series	Software	Cable	USB Adapter	Terminator
IR	E-MI-AS-IR	11			E-A-PS-USB/IR	
PS	E-BM-AS	10 or higher		E-C-PS-DB9/RJ45	E-A-PS-USB/DB9	
NP	E-BM-AES, E-BM-RES	10 or higher	E-SW-BASIC	E-C-SB-USB/BM	E-A-SB-USB/OPT	
	E-BM-TEB, E-BM-LEB, E-BM-TES, E-BM-LES (1)	10 or higher				
	AEB, REB (1)	10 or higher				
	TEB, LEB (1)	10 or higher	E-SW-BASIC/PQ	E-C-SB-USB/M12		
	TES, LES (1)	40 or higher				
	TES, LES, PES with SP, SF, SL options (1)	40 or higher	Z-SW-FULL	E-C-SB-USB/BM		
	E-BM-RES, E-BM-LES with SP, SF, SL options (1)	10 or higher				
TEZ, LEZ (1)	40 or higher					
Z-BM-KZ, Z-BM-TEZ, Z-BM-LEZ (1)	10 or higher		E-C-SB-USB/BM			
BP BC EH	E-BM-AES, E-BM-RES	10 or higher	E-SW-FIELDBUS	E-C-SB-USB/BM	E-A-SB-USB/OPT	
	RES (1)	10 or higher		E-C-SB-USB/M12		
	AES (1)	40 or higher				
BC BP EH EW EI EP	E-BM-RES, E-BM-LES (1)	10 or higher	E-SW-FIELDBUS	E-C-SB-USB/BM	E-A-SB-USB/OPT	
	TES, LES (1)	40 or higher		E-C-SB-USB/M12		
	E-BM-RES, E-BM-LES with SP, SF, SL options (1)	10 or higher	E-SW-FIELDBUS/PQ	E-C-SB-USB/BM		
	TES, LES, PES with SP, SF, SL options (1)	40 or higher		E-C-SB-USB/M12		
	TEZ, LEZ (1)	40 or higher	Z-SW-FULL	E-C-SB-USB/M12		
	Z-BM-KZ, Z-BM-TEZ, Z-BM-LEZ (1)	10 or higher		E-C-SB-USB/BM		

(1) Drivers/controllers compatible with Bluetooth adapter E-A-SB-USB/BTH (see 3.1)

9.2 Phase out industrial electronics

	Model Code	Series	Software	Cable	USB Adapter	Terminator
IR	E-MI-AS-IR	10	E-SW-IR		E-A-PS-USB/IR	
PS	AES	30	E-SW-BASIC	E-C-PS-DB9/M12	E-A-PS-USB/DB9	
	AERS, TERS, TES, LES	31				
	TES, LES, PES with SP, SF, SL options	31	E-SW-BASIC/PQ			
	TEZ, LEZ	10	Z-SW-FULL			
	Z-ME-KZ-PS	10 or higher				
BP	AES	30	E-SW-FIELDBUS	E-C-PS-DB9/M12	E-A-PS-USB/DB9	E-TRM-BP-DB9/DB9
	AERS, TERS, TES, LES	31				
	TES, LES, PES with SP, SF, SL options	31	E-SW-FIELDBUS/PQ	E-C-BP-DB9/M12		
	TEZ, LEZ	10	Z-SW-FULL	E-A-PS-USB/DB9		
	Z-ME-KZ-PS/BP	10 or higher		E-C-PS-DB9/DB9		
BC	AES	30	E-SW-FIELDBUS	E-C-PS-DB9/M12	E-A-PS-USB/DB9	E-TRM-BC-DB9/DB9
	AERS, TERS, TES, LES	31				
	TES, LES, PES with SP, SF, SL options	31	E-SW-FIELDBUS/PQ	E-C-BC-DB9/M12	E-A-BC-USB/DB9	
	TEZ, LEZ	10	Z-SW-FULL			
EH	AES	30	E-SW-FIELDBUS	E-C-PS-DB9/M12	E-A-PS-USB/DB9	

9.3 Phase out ex-proof electronics

	Model Code	Series	Software	Cable	USB Adapter	Terminator
PS	AES	30	E-SW-BASIC	E-C-PS-DB9/M8	E-A-PS-USB/DB9	
	AERS, TERS, TES, LES	31				
BP	AES	30	E-SW-FIELDBUS	E-C-PS-DB9/M8	E-A-PS-USB/DB9	E-TRM-BP-DB9/DB9
	AERS, TERS, TES, LES	31		E-C-BP-DB9/RA	E-A-BP-USB/DB9	
BC	AES	30		E-C-PS-DB9/M8	E-A-PS-USB/DB9	E-TRM-BC-DB9/DB9
	AERS, TERS, TES, LES	31		E-C-BC-DB9/RA	E-A-BC-USB/DB9	

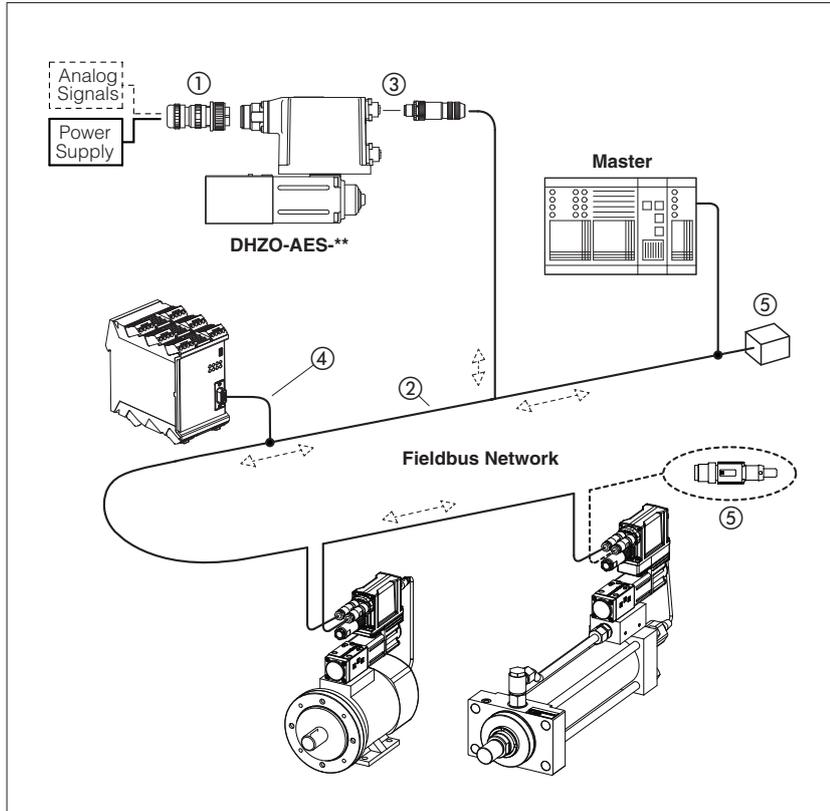


Table **GS510-5/E**

Fieldbus features

BC (CANopen), BP (PROFIBUS DP), EH (EtherCAT),
EW (POWERLINK), EI (EtherNet/IP), EP (PROFINET RT/IRT)

Typical CANopen or PROFIBUS DP fieldbus network



Fieldbus communication interfaces are available for digital proportional drivers and controllers, granting several plus:

- more information available for machine operation to enhance its performances
- improved accuracy and robustness of digital transmitted information
- costs reduction due to simpler and standardized wiring solutions
- costs reduction due to fast and simple installation and maintenance
- direct integration into machine's communication networks

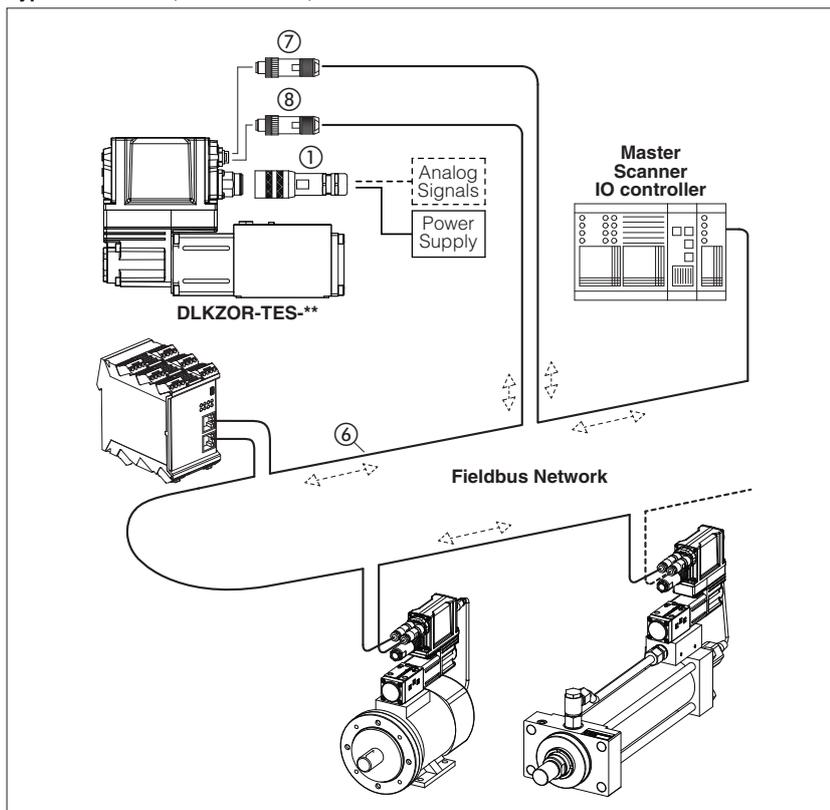
These executions allow to operate proportional valves and pumps through fieldbus or using the analog signals on main connector ①.

Fieldbus distributed-control

Fieldbus communication allows to share all the available information of the digital drivers and controllers (reference, monitor, etc).

This distributed-control design allows to implement powerful machines functionalities for tuning, diagnostic, maintenance, etc.

Typical EtherCAT, POWERLINK, EtherNet/IP or PROFINET RT/IRT fieldbus network



CANopen and PROFIBUS DP networks consist of a common cable (2 twisted wire, ②) for digital communication: several devices (node ③) can be connected to this main cable by means of short cable branches ④.

The two endpoints of the main cable must be terminated with specific devices (terminator, ⑤) to dissipate the communication signal's energy thus preventing interferences and degradations of fieldbus transmission.

EtherCAT, POWERLINK, EtherNet/IP and PROFINET RT/IRT networks consist in a Ethernet common cable (4 twisted wire, ⑥) for digital communication. All slave, adapter and IO device have always the double connector for signal input ⑦ and signal output ⑧.

The main Ethernet cable starting from the master, scanner and IO controller has to be connected to the slave, adapter and IO device input connector.

The slave, adapter and IO device output connector has to be connected to the next slave, adapter and IO device input connector.

1 CANopen features for digital drivers and controllers in BC execution**Physical**

Serial input format	Industrial field-bus with optical insulation type CAN-Bus ISO11898
Transmission rate	Transmission rates from 10 Kbit/s to 1 Mbit/s
Max node	32 per segment without repeater; 127 per segment with repeater

Communication Protocol

Data Link Layer	DS301 V4.2.0 - based on CAN standard frame with 11-bit identifier
Device Profile	DS408 - Fluid Power Technology (EN50325-4)
Device type	Slave

Startup and configuration (as per DS301+DSP305)

Boot up process	Minimum boot-up
Node setting	LSS (Layer Setting Services) SDO E-SW-FIELDBUS and Z-SW-FULL programming software
Baudrate setting	LSS (Layer Setting Services), SDO
Baudrate	10 / 20 / 50 (default) / 125 / 250 / 500 / 1000Kbit/s

Fieldbus communication diagnostic (as per DS301)

Device Error	Emergency
Network Error	Node Guarding Heartbeat

Real-time communication (as per DS301 + DS408)

RPDO	4 mappable PDOs to the drivers: AES, BM-AES, TES, BM-TES, LES, BM-LES, RES, BM-RES, PES 4 mappable PDOs to the controllers: TEZ, BM-TEZ, LEZ, BM-LEZ, BM-KZ
TPDO	4 mappable PDOs from the drivers: AES, BM-AES, TES, BM-TES, LES, BM-LES, RES, BM-RES, PES 4 mappable PDOs from the controllers: TEZ, BM-TEZ, LEZ, BM-LEZ, BM-KZ
R(T)PDO types	Event Triggered, Remotely requested, Sync(cyclic) and Sync(acyclic)

Non real-time communication (as per DS301 + DS408)

SDO	1 SDO (1 Server + 1 Client)
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Standard references**ISO 11898**

Road Vehicles – Interchange of digital information controller area network (CAN) for High-speed communication

EN50325-4

Industrial communication subsystem based on ISO 11898 (CAN) for controller device interfaces

CiA DS301

CANopen – Application Layer and Communication Profile for Industrial Systems

CiA DR303-1

Cabling and connector pin assignment

CiA DSP305

CANopen – Layer Setting Services and Protocol

CiA DS408

CANopen – Device Profile for Proportional Hydraulic Valves v 1.5.2

Programming interface

E-SW-FIELDBUS and Z-SW-FULL software using proper cable/adaptor (see tech table **GS500**) or CANopen master device

Configuration file

EDS (Electronic Data Sheet), enclosed in programming software DVD E-SW-FIELDBUS and Z-SW-FULL

Manuals

E-MAN-S-BC and STARTUP-FIELDBUS, enclosed in programming software DVD E-SW-FIELDBUS
Z-MAN-S-BC and STARTUP-FULL, enclosed in programming software DVD Z-SW-FULL

2 PROFIBUS DP features for digital drivers and controllers in BP execution**Physical**

Serial input format	Industrial field-bus with optical insulation type PROFIBUS-DP RS485 European fieldbus standard (lev.1 – EN50170-part 2)
Transmission rate	Transmission rates from 9,6 Kbit/s to 12 Mbit/s
Max node	32 per segment without repeater; 126 node with repeater

Communication Protocol

Data Link Layer	PROFIBUS DPV0 - IEC 61158 (type 3)
Device Profile	PROFIBUS-DP Profile for Fluid Power Technology
Device type	Slave

Startup and configuration

Boot up process	SAP 61 for sending parameter setting data SAP 62 for checking configuration data
Node setting	SAP 55 E-SW-FIELDBUS and Z-SW-FULL programming software
Baudrate setting	Automatic
Baudrate	9,6 / 19,2 / 45,45 / 93,75 / 187,5 / 500 / 1500 / 3000 / 6000 / 12000 Kbit/s

Fieldbus communication diagnostic

Device error	SAP 60
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Real-time communication

PZD	Process data area of PPO telegram by Data Exchange, default SAP: cyclic transmission of standard Profibus frame
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Standard electronics - drivers

PPO type 3, 113, 213, 230 for:

AES, BM-AES, TES, BM-TES, LES, BM-LES, RES, BM-RES

PPO type 5, 115, 214, 240 for:

TES, BM-TES, LES, BM-LES, PES with alternated P/Q control

Note: PPO type 213, 230, 214, 240 are customizable by user

Standard electronics - controllers

PPO type 1, 111, 121, 123 for:

TEZ, BM-TEZ, LEZ, BM-LEZ, BM-KZ

PPO type 1, 101, 103, 111, 121, 123, 223, 227 for:

TEZ, BM-TEZ, LEZ, BM-LEZ, BM-KZ with alternated P/Q control

Note: PPO type 223, 227 are customizable by user

Cyclic mode	standard, sync and freeze
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Non real-time communication

PKW	Parameter data area of PPO telegram by Data Exchange, default SAP: acyclic transmission of standard Profibus frame
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Standard references

PROFIBUS profile

PROFIBUS Profile,
Fluid Power Technology,
Edition Oct. 2001

VDMA profile

Fluid Power Technology,
Proportional Valves and
Hydrostatic Transmissions, ver 1.1

Programming interface

E-SW-FIELDBUS and Z-SW-FULL software using proper cable/adaptor (see tech table **GS500**) or PROFIBUS DP master device

Configuration file

GSD (General Station Description) enclosed in programming software DVD E-SW-FIELDBUS and Z-SW-FULL

Manuals

E-MAN-S-BP and STARTUP-FIELDBUS, enclosed in programming software DVD E-SW-FIELDBUS

Z-MAN-S-BP and STARTUP-FULL, enclosed in programming software DVD Z-SW-FULL

3 EtherCAT features for digital drivers and controllers in EH execution**Physical**

Serial input format	Industrial fieldbus type Fast Ethernet galvanically insulated IEC 61158-2
Transmission rate	2 x 100 Mbit/s (Fast Ethernet, Full-Duplex)
Max node	65535 slaves
Ethernet Standard	ISO/IEC 8802-3 frame format
EtherType	0x88A4 according to IEEE 802.3
Cable length	0,2 - 100m (between two slave devices)
Cable type	CAT5 (4 wire twisted pair) according with T568B
Network topology	Line, tree and star
Termination	Device internally

Communication Protocol

Data Link Layer	EtherCAT use Standard Ethernet Frames: ISO/IEC 8802-3 + IEC 61784-2
Device Profile	CANopen over EtherCAT (CoE) DS408 - Fluid Power Technology EN 50325-4
Device type	Slave
Supported protocol	CANopen SDO Mailbox-Interface "CoE" Network Management PDO PDO Watchdog Cycle time min 1 msec

Startup and configuration (as per DS301+DSP305)

Node setting	Automatic position addressing Device node addressing
Baudrate	100 Mbit/s (Automatic)

Fieldbus communication diagnostic (as per DS301)

Device Error	Emergency
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Real-time communication (as per DS301 + DS408)

RPDO	4 PDOs messages to the driver and controller (up to 32 byte for each PDO)
TPDO	4 PDOs messages from the driver and controller (up to 32 byte for each PDO)
R(T)PDO types	Remotely requested

Non real-time communication (as per DS301 + DS408)

SDO	1 SDO (1 Server + 1 Client)
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Standard references**ISO 11898**

Road Vehicles – Interchange of digital information controller area network (CAN) for High-speed communication

EN 50325-4

Industrial communication subsystem based on ISO 11898 (CAN) for controller device interfaces

CiA DS301

CANopen – Application Layer and Communication Profile for Industrial Systems

CiA DSP305

CANopen – Layer Setting Services and Protocol

CiA DS408

CANopen – Device Profile for Proportional Hydraulic Valves v 1.5.1

IEC 61076-2-101

Connectors for electronic equipment

- Product Requirements -

Part 2-101: Circular connectors

- Detail specification for M12 connectors with screw-locking

IEC 61158-2

Industrial communication networks

- Fieldbus specification -

Part 2: Physical layer specification and service definition

IEC 61784-2

Industrial communication networks

- Profiles -

Part 2: Additional fieldbus profiles for real-time networks based on ISO/IEC 8802-3

Programming interface

E-SW-FIELDBUS and Z-SW-FULL software using proper cable/adaptor (see tech table **GS500**) or EtherCAT master device

Configuration file

XML (Extensible Markup Language) enclosed in programming software DVD E-SW-FIELDBUS and Z-SW-FULL

Manuals

E-MAN-S-EH and STARTUP-FIELDBUS, enclosed in programming software DVD E-SW-FIELDBUS

Z-MAN-S-EH and STARTUP-FULL, enclosed in programming software DVD Z-SW-FULL

4 POWERLINK features for digital drivers and controllers in EW execution**Physical**

Serial input format	Industrial fieldbus type Fast Ethernet galvanically insulated IEC 61158-2
Transmission rate	2 x 100 Mbit/s (Fast Ethernet, Half-Duplex)
Max node	239 slaves
Ethernet Standard	ISO/IEC 8802-3 frame format
EtherType	0x88AB according to IEEE 802.3
Integrated Hub	
Cable length	0,2 - 100m (between two slave devices)
Cable type	CAT5 (4 wire twisted pair) according with T568B
Network topology	Line, tree, star, daisy chain, ring structure or any combination of these topologies
Ethernet Hub	Integrated with 2 ports: - one led for Link/Activity indicator (on each port) - one bicolor led Status/Error indicator

Communication Protocol

Data Link Layer	POWERLINK use Standard Ethernet Frames: ISO/IEC 8802-3 + IEC 61784-2
Comm. Profile	EPSP DS 301 v1.2
Device Profile	CANopen over Ethernet based on DS408 - Fluid Power Technology
Device type	Slave - supported features: - Ethernet POWERLINK v2.0 - Ring Redundancy - Support PollResponse Chaining - Support Multiplexing - Cycle time min 200 µsec - SDO Multiple Parameter Read/Write

Startup and configuration (as per EPSP DS301 + EPSP DS 302-A/B/C/D/E)

Node setting	E-SW-FIELDBUS and Z-SW-FULL programming software
Baudrate	100 Mbit/s (Automatic)

Fieldbus communication diagnostic

Custom parameters mappable on TPDO for emergency diagnosis

Real-time communication (as per EPSP DS301 + DS408)

RPDO	1 PDO message to the driver (max number of of mapping parameters is Device specific)
TPDO	1 PDO message from the driver (max number of of mapping parameters is Device specific)

Standard references**EPSP DS301**

Ethernet POWERLINK
Communication Profile Specification v 1.2

EPSP DS302-A/B/C/D/E

Ethernet POWERLINK
Part A: High Availability v1.1
Part B: Multiple ASnd v1.0
Part C: PollResponse Chaining v1.0
Part D: Multiple PReq/PRes v1.0
Part E: Dynamic Node Allocation v1.0

EPSP DS311

Ethernet POWERLINK
XML Device Description v 1.0

CiA DS408

CANopen – Device Profile for Proportional
Hydraulic Valves v 1.5.1

IEC 61076-2-101

Connectors for electronic equipment
- Product Requirements -
Part 2-101: Circular connectors
- Detail specification for M12 connectors
with screw-locking

IEC 61158-2

Industrial communication networks
- Fieldbus specification -
Part 2: Physical layer specification and
service definition

IEC 61784-2

Industrial communication networks
- Profiles -
Part 2: Additional fieldbus profiles for real-
time networks based on ISO/IEC 8802-3

IEC 61784-3

Industrial communication networks
- Profiles -
Part 3: Functional safety fieldbuses -
General rules and profile definitions

IEC 61158-300/400/500/600

Industrial communication networks
- Fieldbus specifications -
Part 300: Data Link Layer service defini-
tion
Part 400: Data Link Layer protocol speci-
fication
Part 500: Application Layer service defini-
tion
Part 600: Application Layer protocol spe-
cification

ISO 15745-1

Industrial automation systems and
integration - Open systems application
integration framework -
Part 1: Generic reference description

Programming interface

E-SW-FIELDBUS and Z-SW-FULL software using proper cable/adaptor (see tech table **GS500**) or POWERLINK master device

Configuration file

XDD (XML Device Description) enclosed in programming software DVD E-SW-FIELDBUS and Z-SW-FULL

Manuals

E-MAN-S-EW and STARTUP-FIELDBUS, enclosed in programming software DVD E-SW-FIELDBUS
Z-MAN-S-EW and STARTUP-FULL, enclosed in programming software DVD Z-SW-FULL

5 EtherNet/IP features for digital drivers and controllers in EI execution**Physical**

Ethernet Standard	ISO/IEC 8802-3 frame format
EtherType	0x08E1 according to IEEE 802.3
Transmission rate	10/100 Mbit Full/Half-Duplex
Integrated	2-port switch
Cable length	max 100m
Cable type	CAT5 (4 wire twisted pair) according with T568B
Network topology	Device Level Ring (DLR), linear, star structure
Ethernet switch	integrated with two ports
Led indicator	2 led for Link/Activity indicator (on each port) and 1 bicolor led for Status/Error indicator

Communication Protocol

ODVA CIP Object Model

ODVA CIP Object library for Generic Device Profile

- Identity Object (0x01)
- Message Router Object (0x02)
- Assembly Object (0x04)
- Connection Manager Object (0x06)
- Parameter Object (0x0F)
- DLR Object (0x47)
- QoS Object (0x48h)
- Port Object (0xF4)
- TCP/IP Object (0xF5)
- Ethernet Link Object (0xF6)

Valve parameters accessible via Vendor Specific Object 0xA2

IP address setting (range 0.0.0.0 - 255.255.255.255):

- TCP/IP Object (0xF5)
- DHCP
- Auxiliary USB communication + Atos Software

I/O Adapter and Explicit Message Server device type

Cyclic data transmission via Implicit Messages (transport class 1)

- Minimum RPI for Implicit Messages 1ms
- Total number of supported class 1 connections: 4
- Up to 5 parameters and 20 bytes for each connection
- Trigger types: Cyclic CoS

Acyclic data transmission via Connected and Unconnected Explicit Messages (transport class 3)

- Minimum RPI for Explicit Messages 100ms
- No. of simultaneous Class 3 connections: 6

Standard references**IEC 61918**

Industrial communication networks
- Installation of communication networks
in industrial premises

IEC 61076-2-101

Connectors for electronic equipment
- Product Requirements -
Part 2-101: Circular connectors
- Detail specification for M12 connectors
with screw-locking

IEC 61158-1

Industrial communication networks
- Fieldbus specification -
Part 1: Overview and guidance for the
IEC 61158 and IEC 61784 series

IEC 61158-2

Industrial communication networks
- Fieldbus specification -
Part 2: Physical layer specification and
service definition

IEC 61784-1

Industrial communication networks
- Profiles -
Part 1: Fieldbus profile

IEC 61784-2

Industrial communication networks
- Profiles -
Part 2: Additional fieldbus profiles for real-
time networks based on ISO/IEC 8802-3

IEC 61784-3

Industrial communication networks
- Profiles -
Part 3: Functional safety fieldbuses -
General rules and profile definitions

IEC 61784-5-2

Industrial communication networks
- Profiles -
Part 5-2: Installation of fieldbuses -
Installation profiles for CPF 2

ISO 15745-4

Industrial automation systems and
integration - Open systems application
integration framework -
Part 4: Reference description for Ethernet-
based control systems

Programming interface

E-SW-FIELDBUS and Z-SW-FULL software using proper cable/adaptor (see tech table **GS500**) or EtherNet/IP scanner device

Configuration file

EDS (Electronic Data Sheet) enclosed in programming software DVD E-SW-FIELDBUS and Z-SW-FULL

Manuals

E-MAN-S-EI and STARTUP-FIELDBUS, enclosed in programming software DVD E-SW-FIELDBUS

Z-MAN-S-EI and STARTUP-FULL, enclosed in programming software DVD Z-SW-FULL

6 PROFINET RT/IRT features for digital drivers and controllers in EP execution**Physical**

Ethernet Standard	ISO/IEC 8802-3 frame format
EtherType	0x8892 according to IEEE 802.3
Transmission rate	100 Mbit Full-Duplex
Integrated	2-port switch
Cable length	max 100m
Cable type	CAT5 (4 wire twisted pair) according with T568B
Network topology	line, star, tree and ring structure
Ethernet switch	integrated with two ports
Led indicator	2 led for Link/Activity indicator (on each port) and 1 bicolor led for Status/Error indicator

Communication Protocol

Data Link Layer	PROFINET use Standard Ethernet Frames: ISO/IEC 8802-3 + IEC 61784-2
Device type	IO device - supported features: - complies with PROFINET IO conformance Class A, B, C - Acyclic parameter Channel - Real Time (RT) and Isochronous Real Time (IRT) communication - Up to 8 input/output parameters for real time data exchange - PROFINET specific diagnostic support - Media Redundancy Protocol (MRP) - DCP Discovery and Configuration Protocol supported - Identification & Maintenance (I&M) - Cycle time min: 1 msec [RT] , 250 µsec [IRT]

Startup and configuration

Address setting	IP Address and Station Name are assigned automatically by IO controller (e.g. Discovery and Configuration Protocol)
Baudrate	100 Mbit/s (Automatic)

Fieldbus communication diagnostic

Custom parameters mappable on real time communication for emergency diagnosis

Real-time communication

Modular config	for drivers: AES, BM-AES, TES, BM-TEZ, LES, BM-LES, RES, BM-RES, PES up to 5 input parameters for real time data exchange up to 5 output parameters for real time data exchange for controllers: TEZ, BM-TEZ, LEZ, BM-LEZ, BM-KZ up to 8 input parameters for real time data exchange up to 8 output parameters for real time data exchange
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Standard references**IEC 61918**

Industrial communication networks
- Installation of communication networks in industrial premises

IEC 61076-2-101

Connectors for electronic equipment
- Product Requirements -
Part 2-101: Circular connectors
- Detail specification for M12 connectors with screw-locking

IEC 61158-1

Industrial communication networks
- Fieldbus specification -
Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series

IEC 61158-2

Industrial communication networks
- Fieldbus specification -
Part 2: Physical layer specification and service definition

IEC 61158-5-10

Industrial communication networks
- Fieldbus specification -
Part 5-10: Application layer service definition – Type 10 elements

IEC 61784-1

Industrial communication networks
- Profiles -
Part 1: Fieldbus profile

IEC 61784-2

Industrial communication networks
- Profiles -
Part 2: Additional fieldbus profiles for real-time networks based on ISO/IEC 8802-3

IEC 61784-5-3

Industrial communication networks
- Profiles -
Part 5-3: Installation of fieldbuses -
Installation profiles for CPF 3

Programming interface

E-SW-FIELDBUS and Z-SW-FULL software using proper cable/adaptor (see tech table **GS500**) or PROFINET controller.

Configuration file

GSDML (Electronic Data Sheet) enclosed in programming software DVD E-SW-FIELDBUS and Z-SW-FULL

Manuals

E-MAN-S-EP and STARTUP-FIELDBUS, enclosed in programming software DVD E-SW-FIELDBUS
Z-MAN-S-EP and STARTUP-FULL, enclosed in programming software DVD Z-SW-FULL



Table P005-2/E

Mounting surfaces for electrohydraulic valves

ISO standard, for directional, pressure and flow control valves plus pressure switches

1 ISO 4401: 2005 - for directional, pressure and flow control valves

Mounting surfaces dimensions [mm]	ISO code / ports size [mm]	Valve type	
		industrial	ex-proof
<p>Y port only for 4401-03-03-0-05</p>	<p>4401-03-02-0-05</p> <p>P, A, B, T = Ø 7,5 max without Y port</p>	<p>DH* DLOH / DLOK DLEH / DLEHM QV-06 RZMO RZGO DHZE / DHZO DLHZO QVH* H* (modular)</p>	<p>DHA / DHW DLAH / DLWH RZMA RZGA DHZA DLHZA QVHZA</p>
	<p>4401-03-03-0-05</p> <p>P, A, B, T = Ø 7,5 max Y = Ø 3,3 max</p>	<p>DHZO / Y DLHZO / Y</p>	<p>DHZA / Y DLHZA / Y</p>
<p>X and Y port only for 4401-05-05-0-05</p>	<p>4401-05-04-0-05</p> <p>P, A, B, T = Ø 11,2 max without X and Y port</p>	<p>DKE DKZOR DLKZOR QVKZOR K* (modular)</p>	<p>DKZA DLKZA QVKZA</p>
	<p>4401-05-05-0-05</p> <p>P, A, B, T = Ø 11,2 max X, Y = Ø 6,3 max</p>	<p>DKE/Y DKZOR / Y DLKZOR / Y DP-1* DPH-1* DPZO-*1*</p>	<p>DKZA / Y DLKZA / Y DPHA-1* / DPHW-1 DPZA-*1</p>
	<p>4401-07-07-0-05</p> <p>P, A, B, T = Ø 17,5 max Y = Ø 6,3 max</p>	<p>DP-2* DPH*-2* DPZO-*2* JP*-2* (modular)</p>	<p>DPHA-2 / DPHW-2 DPZA-*2</p>

Mounting surfaces dimensions [mm]	ISO code / ports size [mm]	Valve type	
		industrial	ex-proof
	<p>4401-08-08-0-05</p> <p>P, A, B, T = Ø 25 max X, Y, L = Ø 11,2 max</p>	<p>DP-4* DPH*-4* DPZO-*-4* JP*-3* (modular)</p>	<p>DPHA-4 / DPHW-2 DPZA-*-4</p>
	<p>4401-10-09-0-05</p> <p>P, A, B, T = Ø 32 max X, Y, L = Ø 11,2 max</p>	<p>DP-6* DPH*-6* DPZO-*-6*</p>	<p>DPHA-6 DPZA-*-6</p>
	<p>4401-10-09-0-05</p> <p>P, A, B, T = Ø 50 max X, Y, L = Ø 11,2 max</p>	<p>DPZO-*-8*</p>	<p>-</p>

2 ISO 6264: 2007 - for pressure relief valves

Mounting surfaces dimensions [mm]	ISO code / ports size [mm]	Valve type	
		industrial	ex-proof
	<p>6264-06-09-1-97</p> <p>P, T = Ø 14,7 max X = Ø 4,8 max</p>	<p>AGAM-10 AGMZO-*-10</p>	<p>AGAM-10 / AO AGAM-10 / WO AGMZA-*-10</p>
	<p>6264-08-11-1-97</p> <p>P, T = Ø 23,4 max X = Ø 6,3 max</p>	<p>AGAM-20 AGMZO-*-20</p>	<p>AGAM -20 / AO AGAM-20 / WO AGMZA-*-20</p>
	<p>6264-10-17-1-97</p> <p>P, T = Ø 32 max X = Ø 6,3 max</p>	<p>AGAM-32 AGMZO-*-32</p>	<p>AGAM-32 / AO AGAM-32 / WO AGMZA-*-32</p>

3 ISO 5781: 2000 - for pressure reducing and piloted check valves

Mounting surfaces dimensions [mm]	ISO code / ports size [mm]	Valve type	
		industrial	ex-proof
	<p>5781-06-07-0-00</p> <p>A, B = Ø 14,7 max X, Y = Ø 4,8 max</p>	<p>AGIS-10 AGIR-10 AGIU-10 AGRL*-10 AGRCZO*--10</p>	<p>AGRCZA*--10</p>
	<p>5781-08-10-0-00</p> <p>A, B = Ø 23,4 max X, Y = Ø 4,8 max</p>	<p>AGIS-20 AGIR-20 AGIU-20 AGRL*-20 AGRCZO*--20</p>	<p>AGRZA*--20</p>
	<p>5781-10-13-0-00</p> <p>A, B = Ø 32 max X, Y = Ø 4,8 max</p>	<p>AGIS-32 AGIR-32 AGIU-32 AGRL*-32</p>	

4 ISO 16873: 2002 - for pressure switches

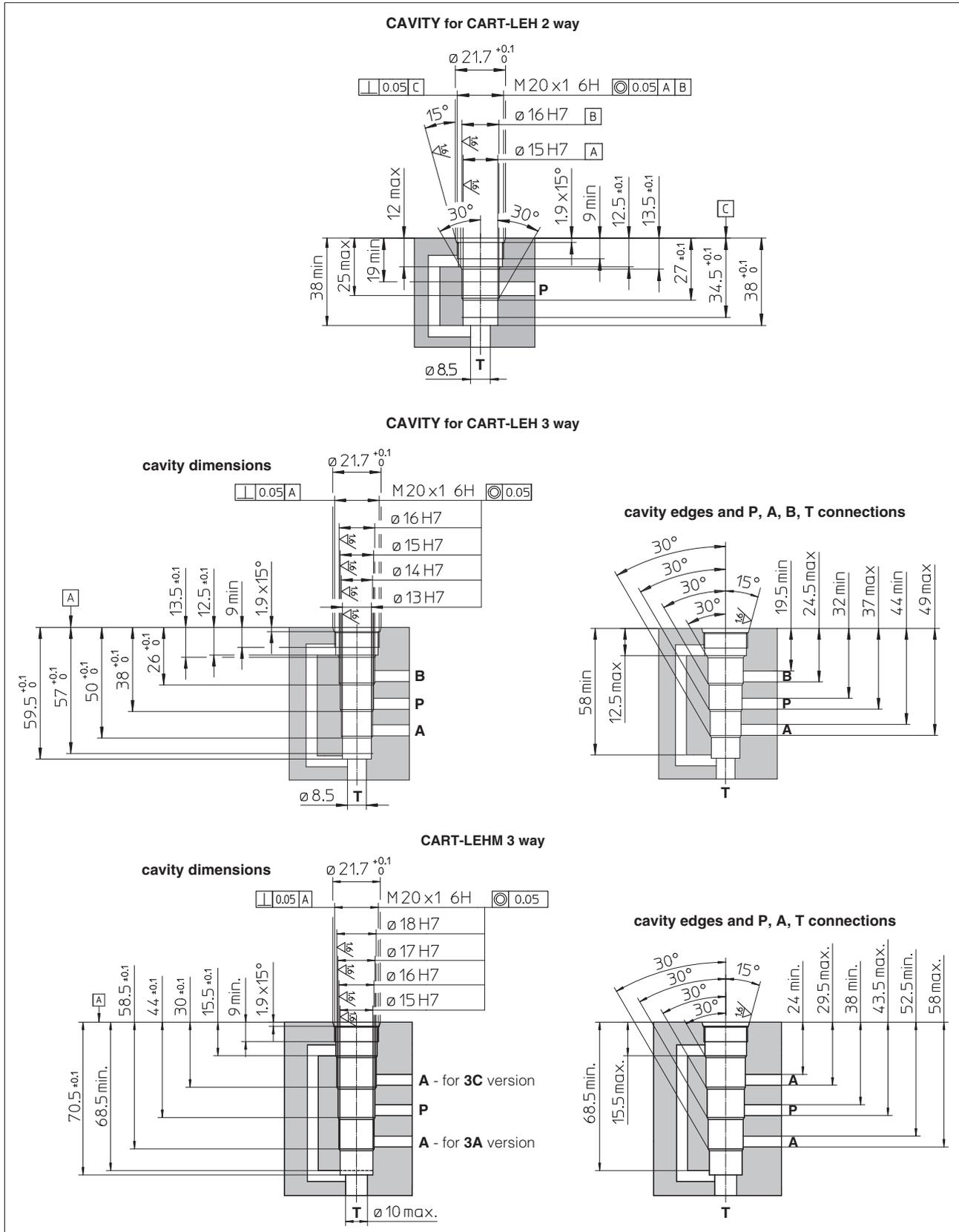
Mounting surfaces dimensions [mm]	ISO code / ports size [mm]	Valve type
	<p>16873-01-01-0-02</p> <p>P = Ø 4 max</p>	<p>MAP</p>



Table P006-3/E

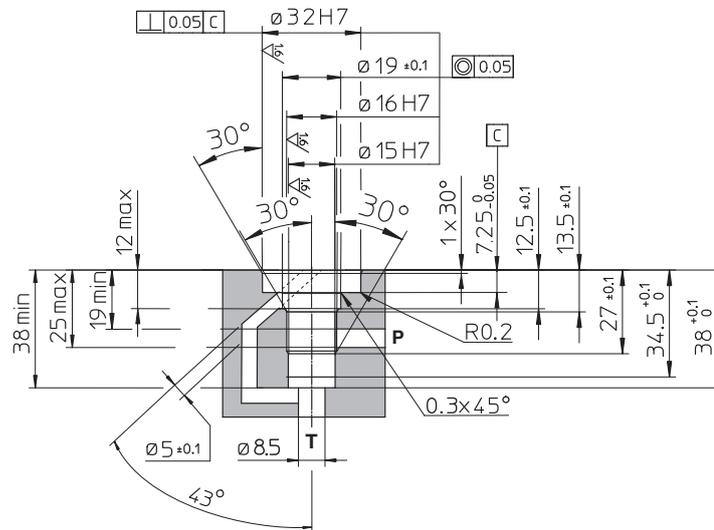
Mounting surfaces and cavities for cartridge valves

1 CAVITIES DIMENSIONS for 2 WAY and 3 WAY CARTRIDGE VALVES type CART-LEH, CART-LEHM [mm]



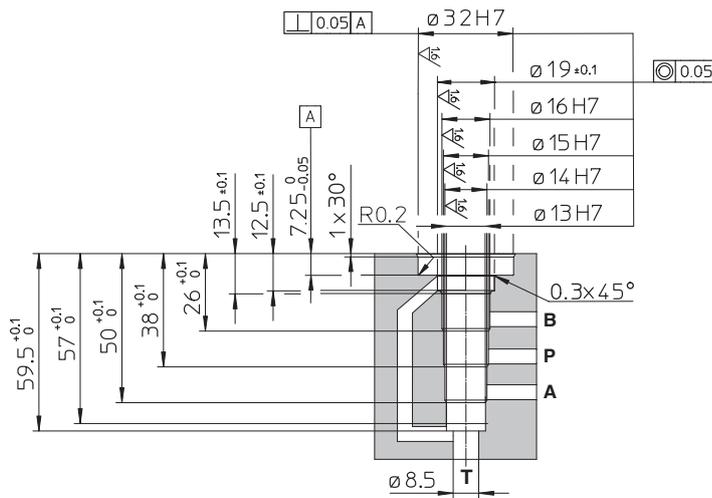
2 CAVITIES DIMENSIONS for 2 WAY and 3 WAY EX-PROOF CARTRIDGE VALVES type CART-LAH [mm]

CAVITY for CART-LAH 2 way

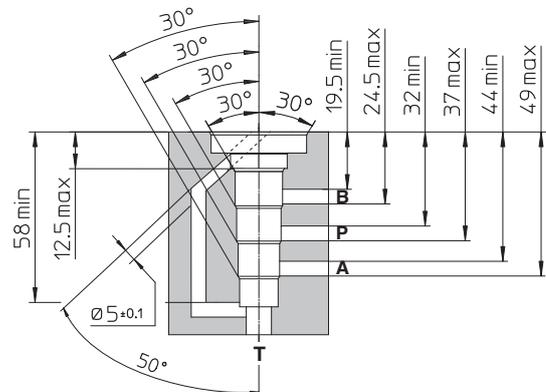


CAVITY for CART-LAH 3 way

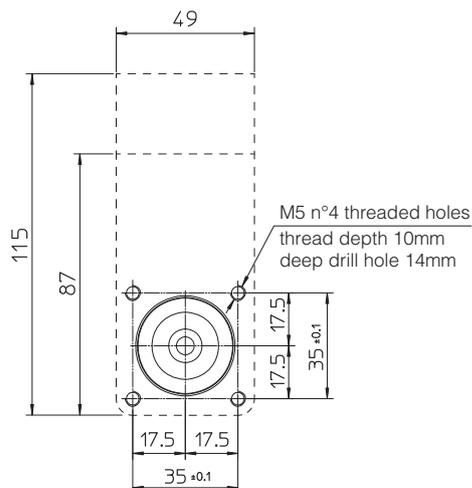
cavity dimensions



cavity edges and P, A, B, T connections



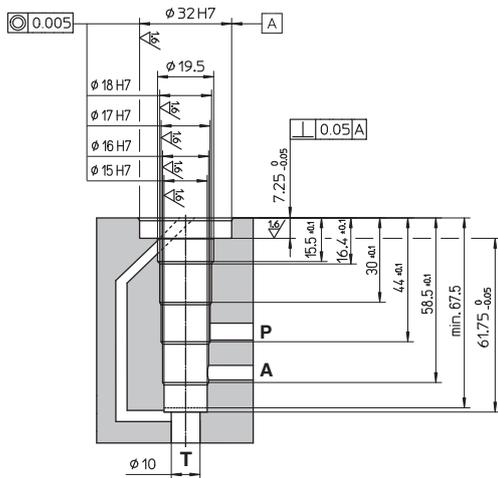
MOUNTING SURFACE for CART-LAH 2 and 3 way



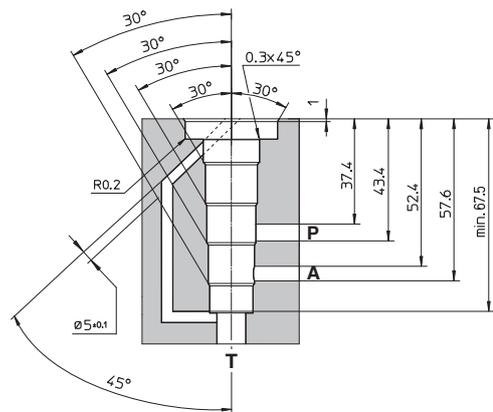
3 CAVITIES DIMENSIONS for 3 WAY EX-PROOF CARTRIDGE VALVES type CART-LAHM [mm]

CAVITY for CART-LAHM-3A

cavity dimensions

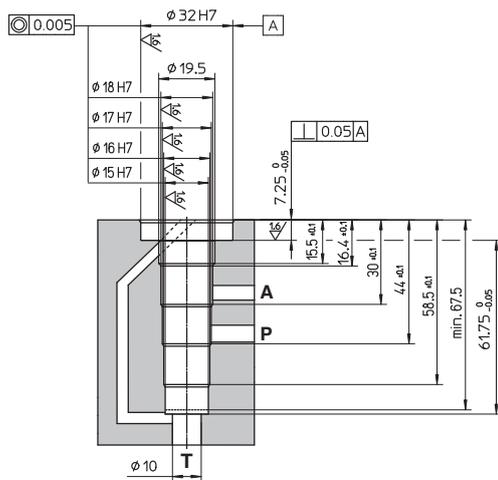


cavity edges and P, A, T connections

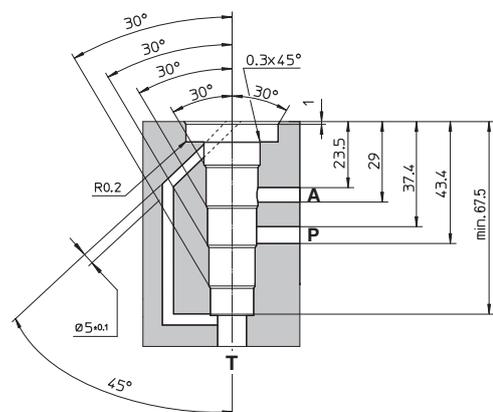


CAVITY for CART-LAHM-3C

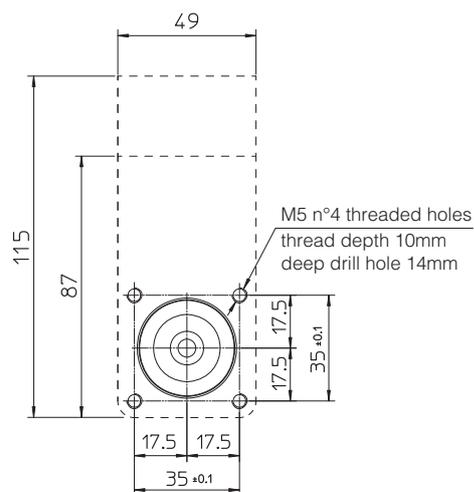
cavity dimensions



cavity edges and P, A, T connections

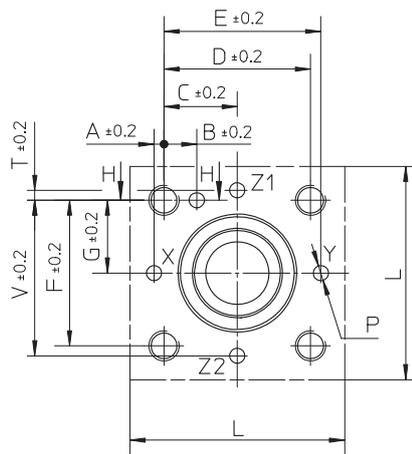


MOUNTING SURFACE for CART-LAHM 3 way



4 ISO 7368 COVER INTERFACE DIMENSIONS for 2 WAY and 3 WAY CARTRIDGE VALVES [mm]

Size from 16 to 63



VALVE TYPE

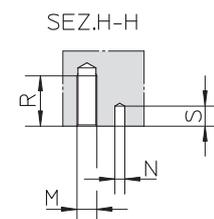
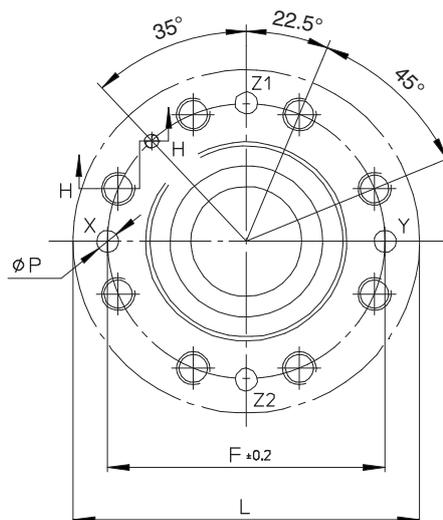
on off

- LIM
- LIR
- LIC
- LIQV
- LIDD
- LIDEW
- LIDBH
- LIDO
- LIDB
- LIDR
- LIDAS

proportional

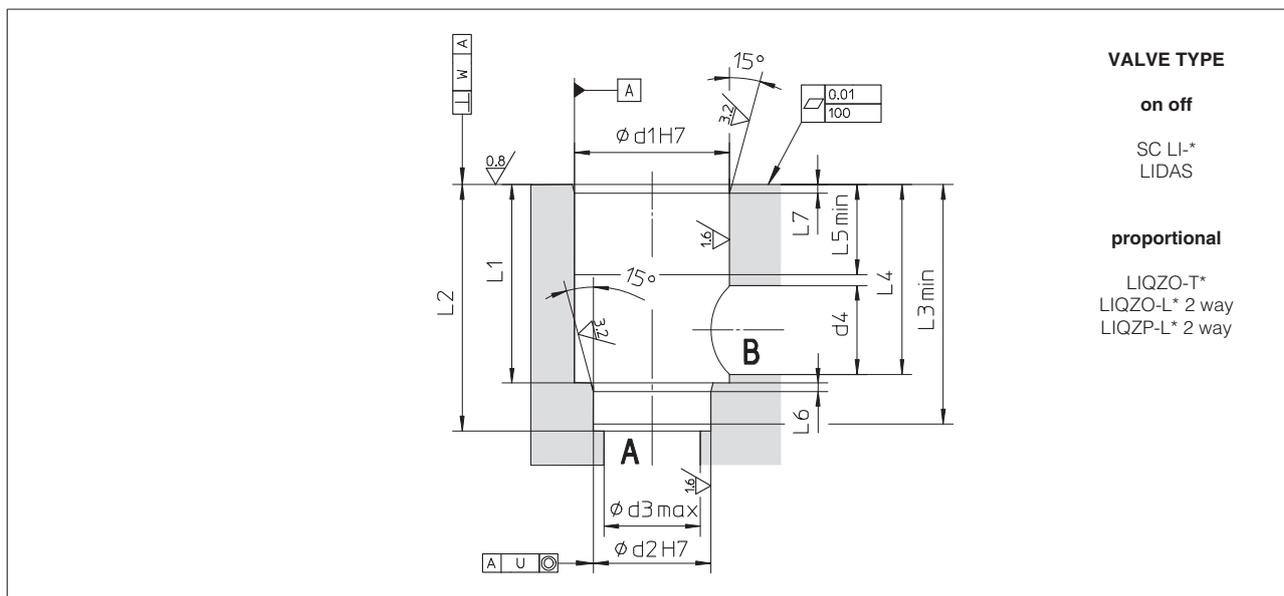
- LIQZO-T*
- LIQZO-L* 2 way
- LIQZO-L* 3 way
- LIQZP-L* 2 way
- LIQZP-L* 3 way

Size 80 and 100



Size	A	B	C	D	E	F	G	L	M	Ø N	P max	R	S min	T	V
16	2	12,5	23	46	48	46	23	65	M8	4	4	20	6	2	48
25	4	13	29	58	62	58	29	85	M12	6	6	30	8	4	62
32	6	18	35	70	76	70	35	102	M16	6	8	38	8	6	76
40	7,5	19,5	42,5	85	92,5	85	42,5	125	M20	6	10	46	8	7,5	92,5
50	8	20	50	100	108	100	50	140	M20	8	10	46	8	8	108
63	12,5	24,5	62,5	125	137,5	125	62,5	180	M30	8	12	66	8	12,5	137,5
80	-	-	-	-	-	Ø200	-	Ø250	M24	10	16	50	10	-	-
100	-	-	-	-	-	Ø245	-	Ø300	M30	10	20	63	10	-	-

5 ISO 7368 CAVITIES DIMENSIONS for 2 WAY CARTRIDGE VALVES [mm]



VALVE TYPE

on off

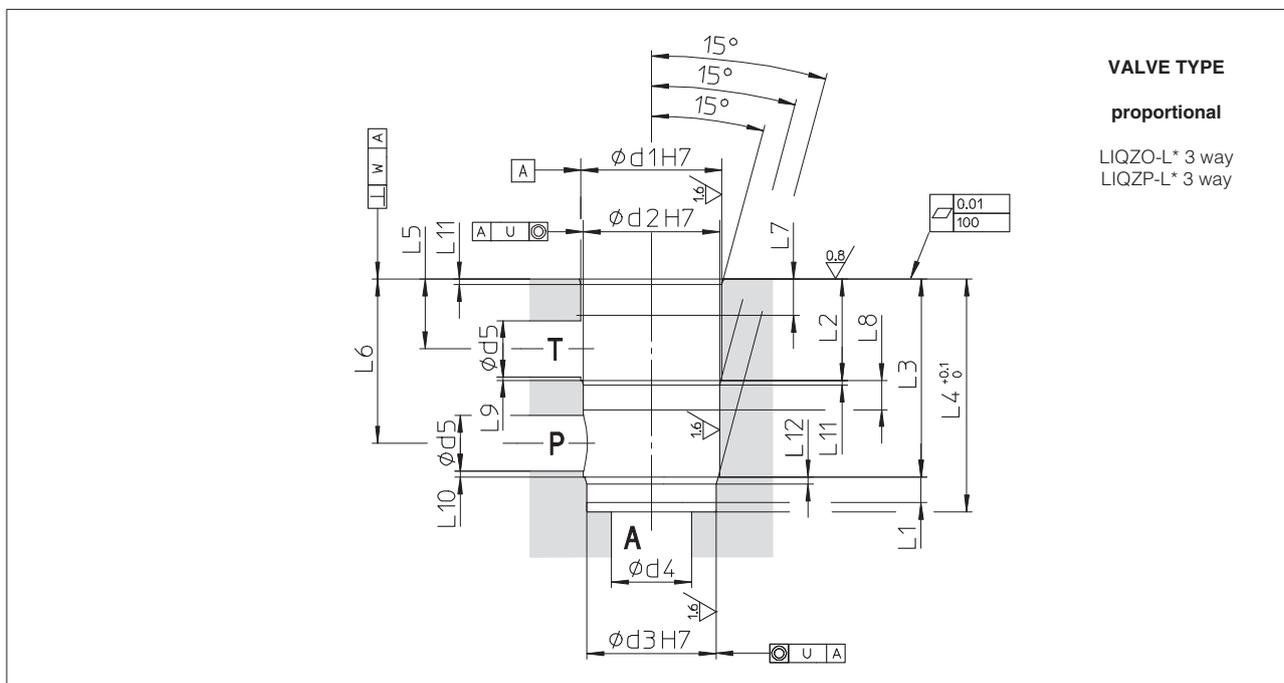
SC LI-*
LIDAS

proportional

LIQZO-T*
LIQZO-L* 2 way
LIQZP-L* 2 way

Size	ød1	ød2	ød3 max	ød4 max	L1	L2	L3	L4	L5	L6	L7	U	W
16	32	25	16	22,5	43 ^{+0.1} ₀	56 ^{+0.1} ₀	54	42,5	20	2	2	0,03	0,05
25	45	34	25	27	58 ^{+0.1} ₀	72 ^{+0.1} ₀	70	57	30	2,5	2,5	0,03	0,05
32	60	45	32	38,5	70 ^{+0.1} ₀	85 ^{+0.1} ₀	83	68,5	30	2,5	2,5	0,03	0,1
40	75	55	40	54,5	87 ^{+0.1} ₀	105 ^{+0.1} ₀	102	84,5	30	3	3	0,05	0,1
50	90	68	50	62,5	100 ^{+0.1} ₀	122 ^{+0.1} ₀	117	97,5	35	3	3	0,05	0,1
63	120	90	63	87	130 ^{+0.1} ₀	155 ^{+0.1} ₀	150	127	40	4	4	0,05	0,2
80	145	110	80	100	175 ^{+0.2} ₀	205 ^{+0.2} ₀	200	170,5	40	5	5	0,05	0,2
100	180	135	100	120	210 ^{+0.2} ₀	245 ^{+0.2} ₀	239	205,5	50	5	5	0,05	0,2

4 CAVITIES DIMENSIONS for 3 WAY CARTRIDGE VALVES [mm]



VALVE TYPE

proportional

LIQZO-L* 3 way
LIQZP-L* 3 way

Size	ød1	ød2	ød3	ød4	ød5	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	U	W
25	45	43	34	20	20	11,5	56	89	103	45	78	25	15	1	1	2,5	2,5	0,03	0,05
32	60	58	55	32	24	13	43,5	85	100	30	70,5	18	15	1,5	2,5	2,5	2,5	0,03	0,05
40	75	73	55	40	30	15	54	105	125	36	87	21	18	3	3	3	3	0,03	0,05
50	90	87	68	50	35	17	87	143	165	66	122	48	18	3,5	3,5	4	3	0,05	0,05
63	120	116	90	63	48	20	85	165	195	57	137	33	28	4	4	4	4	0,05	0,05
80	145	140	110	80	60	25	125	215	245	90	180	60	25	5	5	5	5	0,05	0,05