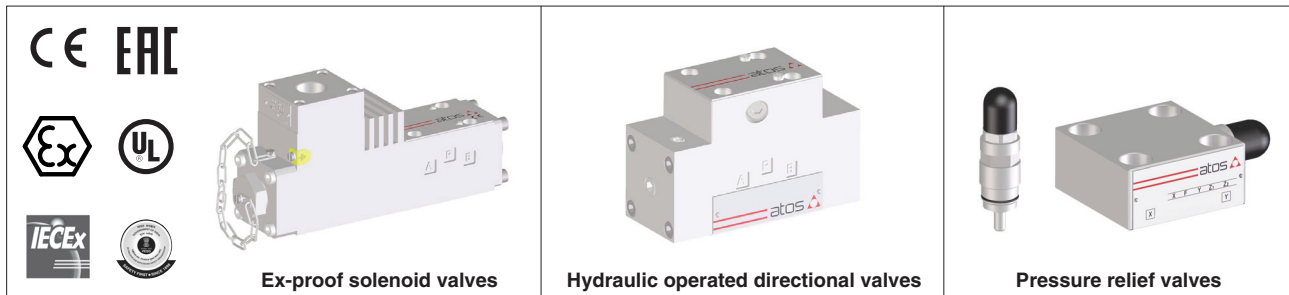


Operating and maintenance information for stainless steel on-off valves

ex-proof solenoid valves, hydraulic operated directional valves, pressure relief valves

This operating and maintenance information applies to Atos stainless steel on-off valves and is intended to provide useful guidelines to avoid risks when the valves are installed in the hydraulic system, particularly for components operating in hazardous areas with explosive or flammable environment.






The prescriptions included in this document must be strictly observed to avoid damages and injury. The respect of this operating and maintenance information grants an increased working life, trouble-free operation and thus reduced repairing costs.



1 SYMBOL CONVENTIONS

Following symbols are used in this documentation to evidence risks to be carefully avoided.

In the following are listed the symbol conventions with their meaning, in case of non-compliance with this operating and maintenance information.

| | | |
|---|---|--------------------------------------|
|  | WARNING | Death or serious injury could occur |
|  | CAUTION | Minor or moderate injury could occur |
| NOTICE | | Property damage could occur |
|  | Notes relevant to stainless steel ex-proof solenoid directional valves with Multicertification | |
|  | Notes relevant to stainless steel ex-proof solenoid directional valves with cULus Noth American certification | |
|  | Information to be observed | |

2 GENERAL NOTES

This document is relevant to the installation, use and maintenance of Stainless steel on-off directional and pressure control valves.

On-off solenoid directional valves are equipped with ex-proof solenoids type OAX(S)-* for application in explosive hazardous environments.

2.1 Warranty

All the ex-proof on-off valves have 1 year warranty; the expiration of warranty results from the following operations:

- unauthorized mechanical or electronic interventions
- the ex-proof on-off valves are not used exclusively for their intended purpose as defined in these operating and maintenance instructions



Service work performed on the valve by the end users or not qualified personnel invalidates the certification

3 CERTIFICATIONS

3.1 Ex-proof certification and protection mode

The ex-proof on-off solenoids subject of this operating and maintenance information are multicertified ATEX, IECEx, EAC, PESO or cULus. They are in compliance with following protection mode:

Multicertification Group II – ATEX, IECEx, EAC, PESO

cULus Noth American certification

 II 2 G Ex d IIC T6, T4, T3 Gb

Class I, Div. I, Groups C & D **T. class T4/T3**

 II 2 D Ex tb IIIC T85°C, T135°C, T200°C Db

Class I, Zone I, Groups II A & II B **T. class T4/T3**

3.2 SIL certification in accordance with IEC 61508

Valves DHAX, DHAXS, DLAHX, DLAHXS, DLPX and DLPXS are TUV certified in compliance with IEC EN 61508:2010 as being suitable for use in safety-related application up to SIL 3.

This manual covers all installation, maintenance and operation requirements for these applications.

4 HARMONIZED STANDARDS



The Essential Health and Safety Requirements are assured by compliance to the following standards:

ATEX

- EN 60079-0 Explosive atmospheres - Equipment: General requirements
- EN 60079-1 Explosive atmospheres - Equipment protection by flameproof enclosures "d"
- EN 60079-31 Explosive atmospheres - Equipment dust ignition protection by enclosures "t"

IECEx

- IEC 60079-0 Explosive atmospheres - Part 0: General requirements
- IEC 60079-1 Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
- IEC 60079-31 Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosures "t"

cULus

- 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

5 GENERAL CHARACTERISTICS

| | |
|---------------------------|--|
| Ambient temperature range | Standard = -40°C ÷ +60°C /PE option = -20°C ÷ +60°C /BBT option = -60°C ÷ +70°C |
| Storage temperature range | Standard = -40°C ÷ +70°C /PE option = -20°C ÷ +70°C /BBT option = -60°C ÷ +80°C |
| Compliance | Explosion proof protection (for valves with ex-proof solenoid) -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" SIL to IEC 61508: 2010, see section 3.2 RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006 |

6 HYDRAULIC CHARACTERISTICS

See technical tables relevant to the specific components, listed in section 12

7 ELECTRIC CHARACTERISTICS - for ex-proof solenoid directional valves



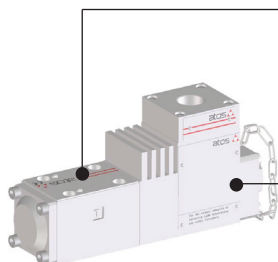
| Harmonized standard | Multicertification | cULus |
|---------------------------|--------------------|------------|
| Power consumption at 20°C | 8W or 25W | 12W or 33W |

See technical tables relevant to the specific components, listed in section 12

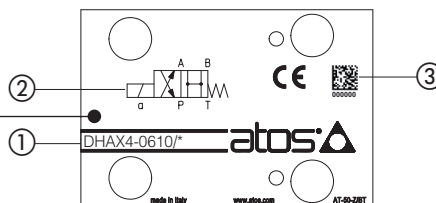
8 PRODUCT IDENTIFICATION NAMEPLATES
ATEX, IECEx, EAC and PESO multicertification



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

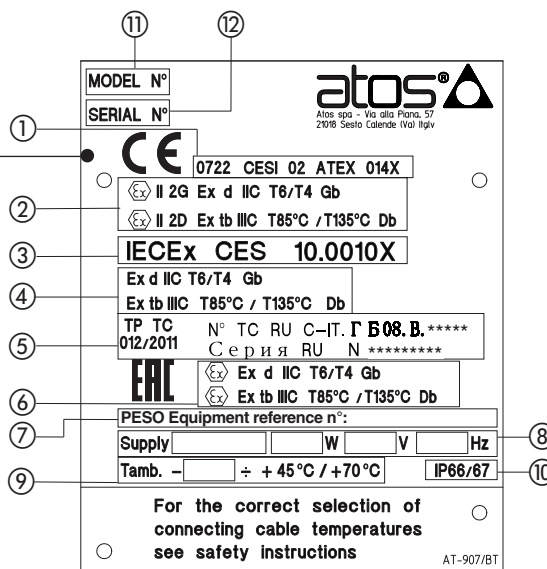


Valve nameplate



- ① Valve code
- ② Hydraulic symbol
- ③ Valve serial number

Ex-proof solenoid nameplate

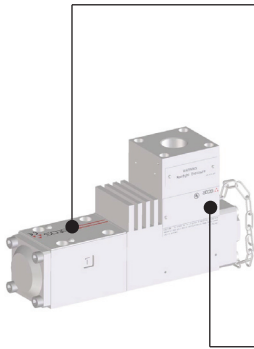


- ① ATEX notified body and certificate number
- ② Marking according to ATEX Directive
- ③ IECEx notified body and certificate number
- ④ Marking according to IECEx Scheme
- ⑤ EAC notified body and certificate number
- ⑥ Marking according to EAC
- ⑦ PESO certificate number
- ⑧ Power supply characteristics
- ⑨ Ambient temperature
- ⑩ Ingress protection:
 -IP66 = no dust ingress, protection against heaving seas or powerful jets of water
 -IP67 = no dust ingress, protection to water immersion
- ⑪ Solenoid model code
- ⑫ Solenoid serial number

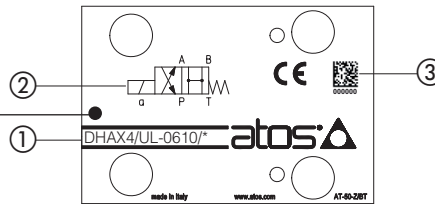
| | |
|-------------------------------|---|
| | Mark of conformity to the applicable European directives |
| | Mark of conformity to the 2014/34/UE directive and to the relevant technical norms |
| II 2 G | Equipment for surface plants with gas or vapors environment, category 2, suitable for zone 1 and 2 |
| Ex d | Explosion-proof equipment |
| II C | Group II C equipment suitable for substances (gas) for group II C |
| T6, T4, T3 | Equipment temperature class (maximum surface temperature) |
| Gb | Equipment protection level, high level protection for explosive Gas atmospheres |
| II 2 D | Equipment for surface plants with dust environment, category 2, suitable for zone 21 and zone 22 |
| Ex tb | Equipment protection by enclosure"tb" |
| IIIC | Suitable for conductive dust (applicable also IIIB and/or IIIA) |
| IP66/67 | Protection degree |
| T85°C, T135°C, T200°C, | Maximum surface temperature (Dust) |
| Db | Equipment protection level, high level protection for explosive Dust atmospheres |
| CESI 02 ATEX 014 X | Name of the laboratory responsible for the CE certification: 02 year of the certification release; 014 X certification number |
| 0722 | Number of the Notified Body authorized for the production quality system certification: 0722 = CESI |
| IECEX CES 10.0010X | Certificate number: CES laboratory name responsible for the IEC Ex certification scheme: 10 year of the certification release; 0010X number of certification |
| T amb. | Ambient temperature range |

8.2 Ex-proof solenoid directional valves

cULus certification
Class I, Division 1
Class I, Zone 1



Valve nameplate



- ① Valve code
- ② Hydraulic symbol
- ③ Valve serial number

Ex-proof solenoid nameplate

① MODEL CODE
② SERIAL N°
③ Class I, Div. I, Groups C & D T. class T6/T5
Class I, Zone I, Groups IIA & IIB T. class T6/T5
Max ambient temp. 55/70 °C 131/158 °F
④ Electrical rating : 24 V DC 12W

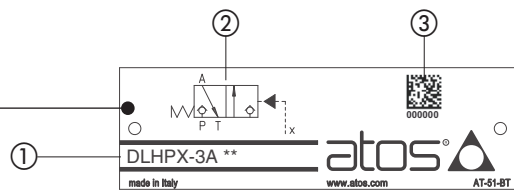
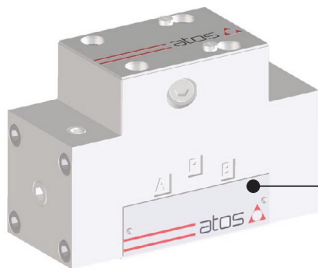
CAUTION: To reduce the risk of ignition of hazardous atmospheres, disconnect from circuit before opening enclosure. Keep tightly closed when in operation.
ATTENTION: Pour réduire le risque d'allumage des atmosphères dangereuses, déconnecter le circuit avant d'ouvrir le boîtier. Garder le bien fermé lorsqu'il est en fonctionnement

T-880

- 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

| | |
|-----------------------------|--|
| | cULus mark and certificate number |
| Class I | Equipment for flammable gas and vapours |
| Division I | Explosive substances continuously or intermittently present in the atmosphere |
| Groups C & D | Gas group C (Methane, Buthane, Petrol, etc) and D (Etylene, Formaldeyde, Cloruprophane, etc) |
| Zone I | Location where explosive substances are continuously present |
| Groups IIA & IIB | Equipment of group IIA and IIB suitable for gas of group IIA and IIB |
| Class T6/T5 | Solenoid temperature class (maximum surface temperature) |
| Max ambient temp. | Max ambient temperature range in °C and °F |

8.3 Hydraulic operated valves



- ① Valve code
- ② Hydraulic symbol
- ③ Valve serial number

8.4 Pressure relief valve



| Identification code | Max pressure (bar) | |
|---------------------|--------------------|--------------|
| | CART MX(S)-3 | CART MX(S)-6 |
| 1 | 100 | 100 |
| 2 | 210 | 210 |
| 3 | 350 | 350 |
| 4 | 50 | 420 |
| 9 | 420 | |

| Identification code | Max pressure (bar) |
|---------------------|--------------------|
| | CART AREX(S)-20 |
| 50 | 50 |
| 100 | 100 |
| 210 | 210 |
| 315 | 315 |
| 400 | 400 |



- ① Valve code
- ② Hydraulic symbol
- ③ Valve serial number



- ① Valve code
- ② Valve serial number

9 SAFETY NOTES

9.1 Intended use

Atos stainless steel valves are intended for integration in industrial systems and machines or for the assembly with other components to form a machine or a system. They may only be operated under the environmental and operating conditions described in the valves technical tables.

9.2 Improper use

Improper use of the components includes:

- Wrong installation / installation in areas not approved for the specific component (for ex-proof valves)
- Incorrect storage
- Incorrect transport
- Lack of cleanliness during storage and installation
- Incorrect installation
- Use of inappropriate or non-admissible fluids
- Operation outside the specified performance limits
- Operation outside the approved temperature range

Atos spa does not assume any liability for damage caused by improper use. The user assumes all risks involved with improper use.

9.3 Installation



The installation or use of inappropriate components in explosive hazardous environments could cause personal injuries and damage to property.

For the application in explosion hazardous environments, the compliance of the solenoid with the zone classification and with the flammable substances present in the system must be verified.

The main safety requirements against the explosion risks in the classified areas are established by the European Directives 2014/34/UE (for the components) and 99/92/CE (for the plants and safety of the workers against the risk of explosion).

The classification criteria of the area against the explosion risks are established by the norm EN60079-10.

The technical requirements of the electrical systems are established by the norm EN60079-14 (group II).

Note: the max fluid temperature controlled by the valve must not exceed + 60°C



WARNING

Ensure that no explosive atmosphere may occur during the valve installation.

Only use the valve in the intended explosion protection area.

The ignition temperature of the hydraulic fluid used must be 50°C higher than the maximum surface temperature of the valve.



WARNING: non-compliance with functional safety

In case of mechanical or electric failures, risk of death or persons injury could occur.

Functional safety prescriptions according to EN ISO 13849 must be observed in the hydraulic circuit.



WARNING: hot surface

The valve considerably heats up during operation. Allow the valve to cool down sufficiently before touching it.

During operation, touch the valve solenoid only by using protective gloves. Please also observe ISO 13732-1 and EN 982



CAUTION

Use of the valve outside the approved temperature range may lead to functional failures like overheating of the valve solenoid.

Only use the valve within the specified ambient and fluid temperature range.



WARNING: fixing bolts

For the valve mounting, use only class A4-70 stainless steel bolts, with dimensions and length reported in the valves technical tables. Observe the specified tightening torque.

Using inappropriate fixing bolts or insufficient tightening torque, can cause the valve to loosen with consequent leakage of fluid under pressure which may cause personal injury and property damage.



CAUTION: pressurized systems

When working at hydraulic systems with stored energy (accumulator or cylinders working under gravity), valves may even be pressurized after the hydraulic power supply has been switched off.

During assembly and disassembly works, serious injury may be caused by a powerful leaking of hydraulic fluid jet.

Ensure that the whole hydraulic system is depressurized, and the electrical control is de-energized.



WARNING: missing equipotential bonding

Electrostatic phenomena, an incorrect earthing or missing equipotential bonding may lead to dangerous situations in case of explosive atmosphere.

Provide for correct earthing or proper equipotential bonding.



CAUTION: penetrating water and humidity

In case of use in humid or wet environments, water or humidity may penetrate at electrical connections.

This may lead to malfunctions or electric short which may result in personal injury and damage to property:

- only use the valve within the intended IP protection class
- ensure that the cable glands are correctly installed and sealed

NOTICE:

High-pressure water jets could damage the valve seals. Do not use a high-pressure washer for the valve cleaning.

NOTICE: impact

Impact or shock may damage the valves. Never use the valves as step.

NOTICE: dirt and foreign particles

Penetrating dirt and foreign particles lead to wear and malfunctions of the valves.

During assembly, be careful to prevent foreign particles such as metal chips getting into the valve or into the hydraulic system

Do not use linting fabric for the valve cleaning.

**Environmental protection**

Hydraulic fluids are harmful to the environment.

Leaking hydraulic fluid may lead to environmental pollution.

In case of fluid leakage immediately act to contain the problem.

Dispose of the hydraulic fluid in accordance with the currently applicable national regulations in your country.

Atos components do not contain substances hazardous for the environment.

The materials contained in Atos components are mainly: stainless steel, carbon steel, rubber.

Due to the high content of reusable metals, the main components of Atos can be completely recycled after disassembling of the relevant parts.

10 HYDRAULIC AND MECHANICAL INSTALLATION

10.1 Power packs tank and tubes cleaning

The power unit tank has to be accurately cleaned, removing all the contaminants and any extraneous object.

When completely assembled an accurate washing of the piping (flushing) is requested to eliminate the contaminants.

10.2 Hydraulic connections

Flexible hoses are normally used on pressure line between powerpack and the valve and on user lines to connect the actuators. If their potential breakage may cause damages to the machine or system or can cause injure to the operator, a proper retention (as the chain locking at both the pipe-ends) or alternately a protecting carter must be provided.

10.3 Hydraulic drains and return lines

Drain lines must be connected to the tank without counter pressure. The drain pipe must end above the oil level.

Return line has to be sized in order to avoid pressure peaks caused by instantaneous flow variations.

10.4 Fluid conditioning

A high-performance system must be thermally conditioned to ensure a limited fluid temperature excursion (generically between 40 and 50°C) so that the fluid viscosity remains constant during operation.

The machine working cycle should start after the prescribed temperature has been reached.

10.5 Air bleeds

Air in the hydraulic circuits affects the hydraulic stiffness and it causes malfunctioning and vibrations.

Following precautions have to be considered:

- at the system start-up all the bleeds must be released to allow the air removal
- untight the connections of the piping
- the system must be bled at first start-up or after maintenance
- a check valve (e.g. 0,5 bar) should be installed on the return line to tank to avoid emptying of the pipes following a long stop of the system

10.6 System flushing

The whole system must be flushed for a sufficient time in order to obtain the required minimum cleanliness level.

Make sure that also external pilot lines, if present in the system, are flushed.

A decisive factor for the flushing time is the contamination level of the hydraulic fluid which can only be determined by means of a particle counter.

During the flushing procedure, perform a frequent monitor of the filters clogging indicator, replacing the filter elements when required.

10.7 Hydraulic fluids and operating viscosity range

The hydraulic fluids must be compatible with the selected seals.

The type of fluid has to be selected in consideration of the effective working temperature range, so that the fluid viscosity remains at the optimal level.

| Hydraulic fluid | Suitable seals type | Classification | Ref. Standard |
|-------------------------------|--------------------------|----------------------------|---------------|
| Mineral oils | NBR low temp., FKM, FVMQ | HL, HLP, HLPD, HVLP, HVLPD | DIN 51524 |
| Flame resistant without water | FKM, FVMQ | HF DU, HF DR | ISO 12922 |
| Flame resistant with water | NBR low temp. | HFA-E, HFA-S, HFB, HFC | |

Fluid viscosity: 15 ÷ 100 mm²/s - max allowed range 2,8 ÷ 500 mm²/s
min = 0,9 mm²/s for X full stainless steel execution with pure water

**CAUTION: easily inflammable hydraulic fluid**

In connection with fire or other hot sources, leaking hydraulic fluid may lead to fire or explosions.

10.8 Filtration

The correct fluid filtration ensures a long service life of the valves and it prevents anomalous wearing or sticking



Contamination in the hydraulic fluid may cause functional failures e.g. jamming or blocking of the valve spool / poppet. In the worst case, this may result in unexpected system movements and thus constitute a risk of injury. Ensure adequate hydraulic fluid cleanliness according to the cleanliness classes of the valve over the entire operating range.

Max fluid contamination level: ISO 4406 class 20/18/15 NAS 1638 class 9

Note: see also filter section at www.atos.comm or KTF catalog

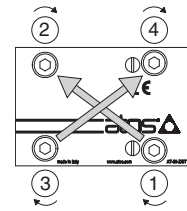
10.9 Valve fastening - for all directional valves and LIMMX(S) functional cover

Remove the protection pad located on the valve mounting surface.

Check the correct positioning of the seals on the valve ports.

Verify that the valve mounting surface is clean and free from damages and burrs.

Lock the fastening bolts in cross sequence (like in aside example) at the tightening torque specified in the valve technical table.



10.10 Tightening torque - for screw-in pressure relief cartridges

| Valve code | CART MX-3 | CART MXS-3 | CART MX-6 | CART MXS-6 | CART AREX-20 | CART AREXS-20 |
|-------------------------------|-----------|------------|-----------|------------|--------------|---------------|
| | 22 | | 27 | | 36 | |
| Tightening torque (Nm) | 60 | | 55 | | 140 | |

11 ELECTRICAL CONNECTIONS - for ex-proof solenoid directional valves



The connection to the external circuit is made with a screw clamps 2 poles + ground, installed inside the solenoid. Only for multicertified valves the eventual requirement of the additional ground connection on the solenoid housing must be made on the relative screw (M3x6 UNI-6107).

- The threaded cable entrance is provided with following connections:
- Cylindrical thread M20x1,5 UNI 4535 for Multicertified valves
- Conical thread 1/2" NPT ANSI B2.1 for cULus certified valves

The cable glands used for the cable entrance must be certified for the specific hazardous environment – see tech. table **KX800** for Atos ex-proof cable glands (only for multicertified valves).

Note: a Loctite sealant type 545, should be used on the cable gland entry threads

The electrical cables must be suitable for the working temperatures as shown in the section 11.1

Multicertification

n°4 M4 locking torque 4Nm

Standard version **Option /O**

cULus certification

n°4 M4 locking torque 4Nm

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting

② cover with threaded connection for horizontal cable gland fitting

③ terminal board for cables wiring

④ standard manual override

⑤ screw terminal for additional equipotential grounding

| | |
|--|----------|
| | 1 = Coil |
| | 2 = GND |
| | 3 = Coil |

PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14)

Pay attention to coil polarity

1 = Coil + PCB 3 poles terminal board suggested cable section up to 1,5 mm²

2 = GND

3 = Coil - (max AWG16)

alternative GND screw terminal connected to solenoid housing

11.1 Cable specification and temperature



Cable specification - Multicertification Group I and Group II

Power supply: section of coil connection wires = 2,5 mm²

Grounding: section of internal ground wire = 2,5 mm²
section of external ground wire = 4 mm²



Cable temperature - Multicertification Group I and Group II

| Solenoid code | Max ambient temperature [°C] | Temperature class | Max surface temperature [°C] | Min cable temperature |
|---------------------|------------------------------|-------------------|------------------------------|-----------------------|
| OA(B)X OA(B)XS | 45 °C | T6 | 85 °C | not prescribed |
| | 70 °C | T4 | 135 °C | 90 °C |
| OA(B)KX OA(B)KXS | 45 °C | T4 | 85 °C | 100 °C |
| | 50 °C | T3 | 200 °C | 100 °C |
| | 60 °C | T3 | 200 °C | 120 °C |
| | 70 °C | T3 | 200 °C | 130 °C |



Cable specification - cULus certification

- Suitable for use in Class I Division 1, Gas Groups C
- Armored Marine Shipboard Cable which meets UL 1309
- Tinned Stranded Copper Conductors
- Bronze braided armor
- Overall impervious sheath over the armor

Any Listed (UBVZ/UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm² (14 AWG) having a suitable service temperature range of at least -40°C to +110°C

Note 1: For Class I wiring the 3C 1,5 mm² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.



Cable temperature - cULus certification

| Solenoid code | Max ambient temperature [°C] | Temperature class | Max surface temperature [°C] | Min cable temperature |
|---------------------|------------------------------|-------------------|------------------------------|-----------------------|
| OAX/EC OAXS/EC | 55 °C | T6 | 85 °C | 100 °C |
| | 70 °C | T5 | 100 °C | 100 °C |
| OAKX/EC OAKXS/EC | 55 °C | T3 | 200 °C | 115 °C |
| | 70 °C | T3 | 200 °C | 140 °C |

10 MAINTENANCE



Maintenance must be carried out only by qualified personnel with a specific knowledge of hydraulics and electrohydraulics

10.1 Ordinary maintenance



Ex-proof solenoid must not be disassembled

For all stainless steel valves:

- The valves do not require other maintenance operations except seals replacement
- Results of maintenance and inspection must be planned and documented
- Follow the maintenance instructions of the fluid manufacturer
- Any preventive maintenance should be performed only by experienced personnel authorized by Atos.
- Cleaning the external surfaces using a wet cloth to avoid accumulation of dust layer over 5 mm
- Do not use compressed air for cleaning to avoid any dangerous dust dispersion on the surrounding atmosphere
- Any sudden increment in temperature requires the immediate stop of the system and the inspection of the relevant components

10.2 Repairing

In case of incorrect functioning or beak-down it is recommended to send the valve back to Atos or to Atos authorized service center, which will provide for the reparation.

If the reparations are not made by the manufacturer, they must be performed in accordance to the criteria of IEC 60079-19 standard for IECEx and EN 60079-19 for ATEX, and by facilities having the technical know-how about the protection modes and equipped with suitable tools for repairing and controls.



Service work performed on the ex-proof solenoid valve by end user or not qualified personnel invalidates the certification. Ex-proof solenoid must not be disassembled

Before beginning any repairing activity, the following guidelines must be observed:

- Unauthorized opening of the valves during the warranty period invalidates the warranty and invalidates the certification
- Be sure to use only original spare parts manufactured or supplied by Atos factory
- Provide all the required tools to make the repair operations safely and to don't damage the components
- Read and follow all the safety notes given in section [9](#)

11 TRANSPORT AND STORAGE

11.1 Transport

Observe the following guidelines for transportation of valves:

- Before any movement check the valve weight reported in the technical table relevant to the specific component
- Use soft lifting belts to move or lift the heavy valves to avoid damages

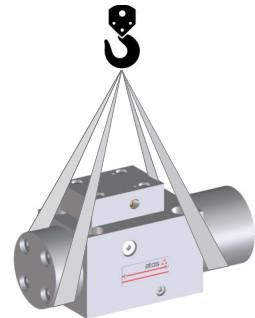


CAUTION

Danger of damage to property and personal injuries!

The valve may fall down and cause damage and injuries, if transported improperly:

- Use the original packaging for transport
- Use personal protective equipment (such as gloves, working shoes, safety goggles, working clothes, etc.)



11.2 Storage

Stainless steel valves are made with selected materials offering the best protection against oxidization.

Additionally, they are boxed using a VpCi protective packing system, offering an increased protection during sea transport or long storage in humid environments, even if the stainless valves are already free from oxidization.

For the valves transporting and storing always observe the environmental conditions specified in the relevant technical tables. Improper storage may damage the product.

The valves can be stored for up to 12 months under the following conditions:

- If there is no specific information in the components technical tables, comply with a storage temperature of $-20\text{ }^{\circ}\text{C}$ to $+50\text{ }^{\circ}\text{C}$
- Stainless steel valves factory tested with pure water (code /W) must not be stored with ambient temperature lower than $5\text{ }^{\circ}\text{C}$
- Do not store the valves outdoors
- Protect the valves against water and humidity in case of storage in open air
- Store the valves in the shelf or on a pallet
- Store the valves in the original packaging or comparable packaging in order to protect them from dust and dirt
- Remove the plastic covers from the valves mounting surface only before the assembly

In case of storage period longer than 12 months please contact our technical office

12 RELATED DOCUMENTATION

Directional valves

- EW010** DHAX, DHAXS – ex-proof solenoid, direct, spool type
- EW020** DLAHX, DLAHXS, DLAHMX, DLAHMXS – ex-proof solenoid, direct, poppet type
- EW050** DLAHPX, DLAHPXS, DLAPX, DLAPXS - ex-proof solenoid, piloted, poppet type
- EW100** DLHPX, DLHPXS, DLPX, DLPXS – hydraulic operated

Pressure relief valves

- CW010** CART MX, CART MXS, CART AREX, CART AREXS – direct, screw-in cartridges
- DW010** HMPX, HMPXS – direct, modular
- HW010** LIMMX, LIMMXS + SC LIX – piloted, ISO cartridges