



OPERATING MANUAL



LCV



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1. Introduction

1.1. General information

In order to ensure successful and safe operation of our valves the entire operating manual must have been read through and understood prior to installation. The operating manual covers the areas of installation, maintenance, repair, storage and transport.

As the user, you are responsible for complying with the following information provided in the user instructions. Furthermore, the operator is responsible for adhering to local safety regulations also with regard of the assembly personnel employed.

The manufacturer reserves all rights of technical changes and improvements at any time.



Attention

Not follow of the caution and warning notices may lead to hazards, which in turn may cause the warranty to become invalid.



Notes

Please keep this instruction manual in a safe place for future reference.

1.2. Intended use

The cryogenic ball valves LCV series from m-tech have been designed to operate at extremely low temperatures, transporting supercooled liquids such as nitrogen, argon, oxygen and liquid natural gas (LNG). The LCV valves can be operated manually or automated with pneumatic or electrical rotary actuators, within the permitted pressure and temperature ranges.



Attention

The LCV series are not recommended for media with solid particulates.



1.3. Manufacturer's contact address

Should difficulties or questions arise that cannot be solved with the help of the Operating Manual, please contact the manufacturer.

Our technical team and customer service officers are pleased to assist you with any question you may have.

m-tech gmbh
Teslastr. 6
74670 Forchtenberg
Germany
Phone: +49 7947 939-0
Telefax: +49 7947 939-010
E-mail: info@m-tech-gmbh.com
www.m-tech-gmbh.com

2. Safety instructions

2.1. General safety instructions

The valves comply with the state of the art and the recognized rules of technical safety, but dangers can still arise. Operate the valves only in perfect condition taking into account the entire operating manual.



Warning

Use of material-incompatible media, exceeding the limit values of medium pressure and temperature and mechanical additional loads can result in failure of the valve material and bursting of the valve.

2.2. Safety instructions for the operator

The persons entrusted with the installation, maintenance or repair must be qualified in accordance with their activities and functions.

Based on their technical training, their knowledge, experience and their knowledge of the applicable standards, the personnel must be able to evaluate the work entrusted to them, understand the interactions between valve and system and recognize possible dangers.



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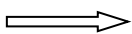
They must also have knowledge of applicable accident prevention regulations, generally recognized safety regulations, EC guidelines and country-specific standards and regulations and all application-based regional and company-internal regulations and requirements.

3. Technical Data

3.1. Marking



Each LCV is engraved on the front side of the valve with following data:

	Marking	Comment
Manufacturer	m-tech	Logo
Flow direction		Marking of the flow direction
Type	LCV	Liquid Cryogenic Valve
Nominal diameter	DNXX	Numerical value in mm, e.g. DN25
Pressure range	PN40	Pressure in bar
Serial Number	e.g. S/N: XXXXX	number assigned to identify a specific valve and its associated information, very important for the whole traceability
Temperature	-196°C	Lower temperature limit of the usage



Attention

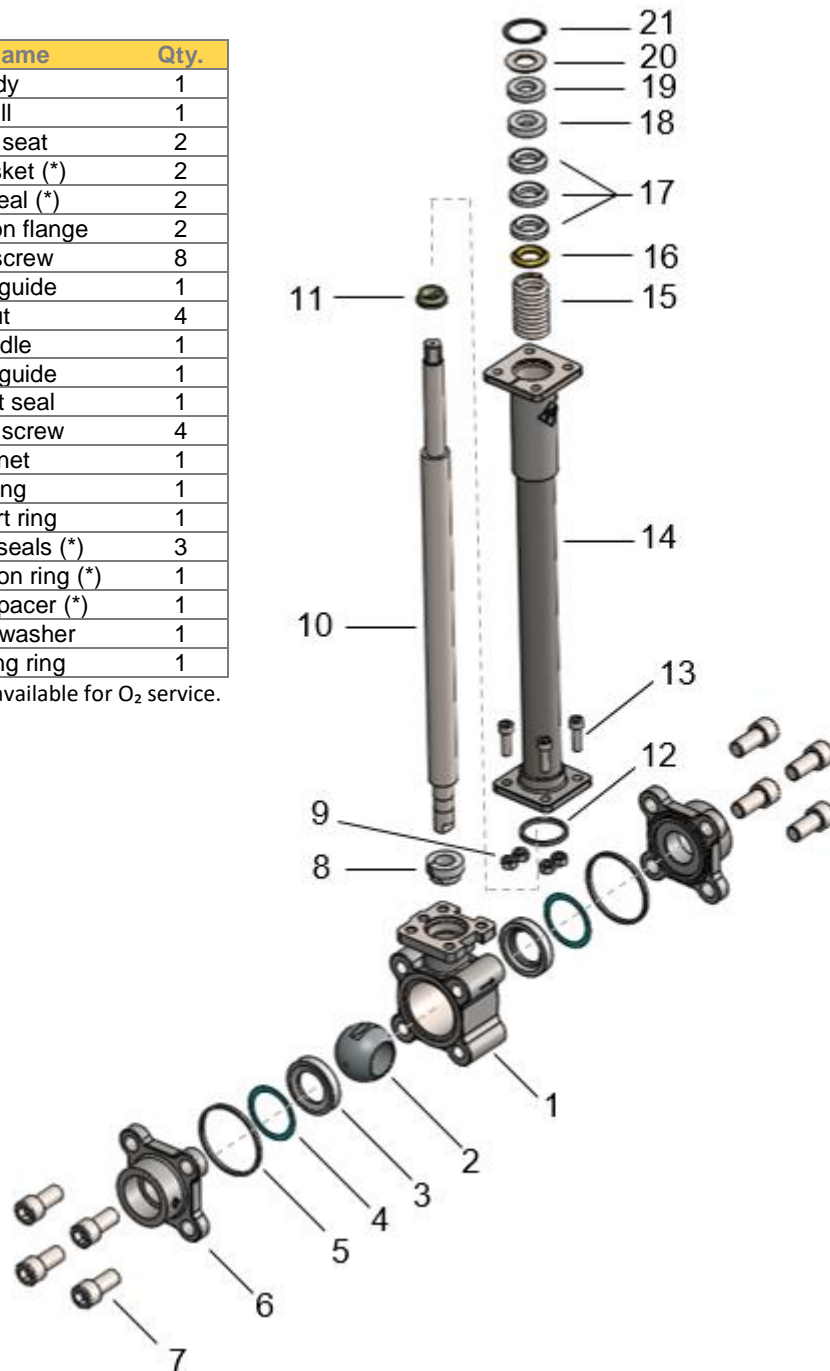
In order to be able to identify a valve, the engraving may not be damaged.



3.2. Part list and exploded view of the valve

Pos.	Part name	Qty.
1	Body	1
2	Ball	1
3	Valve seat	2
4	Flat gasket (*)	2
5	Body seal (*)	2
6	Connection flange	2
7	Body screw	8
8	Lower guide	1
9	Nut	4
10	Spindle	1
11	Upper guide	1
12	Bonnet seal	1
13	Bonnet screw	4
14	Bonnet	1
15	Spring	1
16	Support ring	1
17	Chevron seals (*)	3
18	Compression ring (*)	1
19	Guiding spacer (*)	1
20	Support washer	1
21	Retaining ring	1

(*) BAM conformity is available for O₂ service.





3.3. Tightening torque

The following table shows the required tightening torque for the screws of the valve.

Valve size	Body		Bonnet	
	ISO Metric Threads	Torque (Nm)	ISO Metric Threads	Torque (Nm)
DN15 - DN20				
DN25 - DN32	M12x25	40	M6x20	10
DN40 - DN50				



Attention

**Lower torques may lead to malfunction or leakages.
Do not exceed tightening torques.**



Attention

Body and bonnet screws should be re-checked and re-adjusted if necessary after putting the valve into cryogenic service. Due to the change of temperature these may become loose.

4. Transport and storage

Valves have to be handled, transported and stored with care:

- The valve is to be kept in its original packaging and/or with the protection caps on the end connections. The valve should be stored and transported (also to the installation site) on a pallet (or supported in a similar way).
- If stored prior to installation, the valve is to be stored in a closed room and to be protected against harmful influences such as dirt or moisture.
- Especially the end connections must not be damaged by mechanical or any other influences.
- Valves must be stored in the same way they were delivered. The drive may not be activated.

**Caution**

The valve must be transported carefully to avoid damage of the valve and operator.

5. Installation

5.1. Preparation

Prior to installation the LCV, confirm that it is appropriate for the intended use and ensure that the pipeline is thoroughly cleaned of any contamination, especially of hard foreign substances.

If installation on existing pipeline, verify the distance between pipeline ends to be equal to face to face valve dimension. The gap, however, must not be larger than necessary so that no additional stress is generated in the pipeline during installation.

**Caution**

Before starting the installation must be the pipeline fully depressurized and ensure that no pressure is trapped inside the valve.

**Caution**

The valve must be carefully transport to the installation site and unpack it only there.

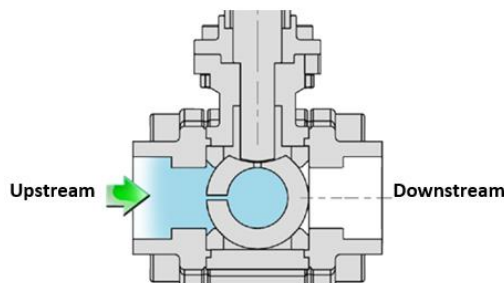
5.2. Installation

The LCV is designed according to cryogenic standard BS 6364 for non-cold-box applications and must be installed with the bonnet in vertical position or within 45° from the vertical axis.

**Caution**

Not follow of the recommended installation position will allow cryogenic liquids to reach the stem packing and leakage to outside the valve.

The LCV is a uni-directional valve and must be installed with the relief hole on the upstream side of the pipe system and at the same time, the directional flow arrow on the valve must be pointing in the downstream side.

**Attention**

The directional flow arrow is marked on the front side and backside of the valve.

Please follow the next working steps to ensure a properly installation:

1. Transport valve in the protective packaging to the installation site and unpack it only there.
2. Inspect the valve and actuator for any damages that may have occurred during transport. Damaged valves or actuators may not be installed.



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3. At the beginning of installation, a function inspection must be performed: The valve must open and close properly. Discernible malfunctions must be remedied prior to commissioning.
4. Ensure that only valves are installed with the pressure class, the connection type and connection dimensions which meet the application requirements. Observe the marking on the body valve.

Please consider the following recommendations for the installation depending on the type of end connection:

a) Conical nipple (Threaded)

- To install these valves it is not necessary to remove the end connections from the valve body.
- Using the suitable solder nipple and nut is not required the use of sealants or gaskets, because the seal is metal to metal.
- Do not exceed tightening torques.

b) Socket Weld

- After positioning and tack welding the valve to the pipeline on both sides is necessary to remove the end connections from the valve body
- When the welding is finished, fix the ball body with the end connections again.

6. Operation

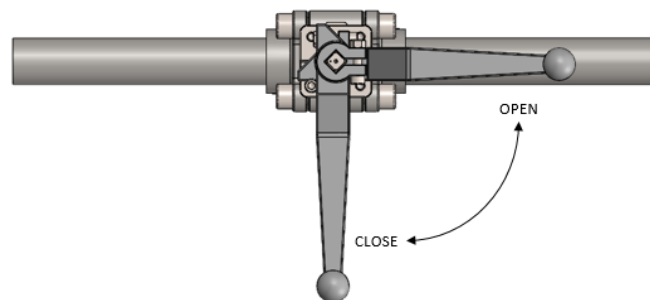
The LCV valve is a rotary valve, also known as quarter-turn valve. In order to operate the valve from the fully-closed position to the fully-open position or vice versa is required just a quarter or 90° turn of the handle or actuator.



6.1. Manual operation

The LCV valve can be operated manually by hand lever.

To operate the LCV into the open and closed position is required a quarter turn (90 degree turn) by turning the hand lever. Clockwise to close and counterclockwise to open the valve.



Manual operation

The LCV is in open position, when the hand lever in line with the pipeline is and in closed position, when the handle perpendicular to the pipeline is.



Cutaway view of a fully-open position



Cutaway view of a fully-closed position



6.2. Automated operation

The valve can be operated automated with electric and pneumatic actuator, which must be properly selected to provide required torque for a safe operation of the valve.

In order to a correct automated operation is necessary to comply with the mounting and operating instructions of the actuator.



Attention

Non-observance of these instructions may cause damage to the valve and pipe system.

If in doubt, please contact the actuator manufacturer

7. Maintenance

7.1. General

To maintenance of LCV, m-tech has available for each size valve two different kind of spare part kits: body sealing kit and bonnet sealing kit.

If other parts are required, m-tech recommends replacing the entire valve.



Caution

Before starting any maintenance must be the pipeline fully depressurized and ensure that no pressure is trapped inside the valve.



Attention

It is not recommended that the valve be unoperated for long periods. e.g.: more than one month.



Caution

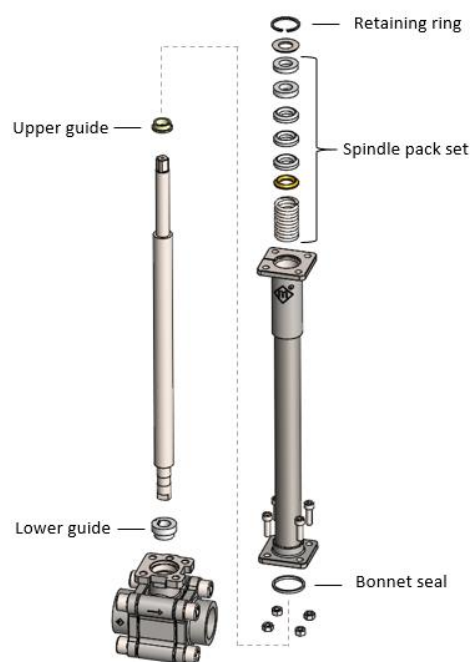
Do not interchange parts with valves from other manufacturer or from different rated valves. m-tech will not be held liable if the valve is modified in any way without consent.



7.2. Bonnet sealing replacement

In order to perform the replacement of bonnet sealing parts, the valve should be properly supported.

1. Loosen the bonnet screws (13) and corresponding nuts (9). After that, lift the bonnet from the body.
2. Remove the lower guide (8) from the spindle. Otherwise, lift it from the upper part of the body.
3. After the spindle has been removed from inside the bonnet, pull out the upper guide (11).
4. Remove carefully the bonnet seal (12) from the bottom, avoiding scratching or damaging the mating face.
5. To remove the old packing a special tool is required to attach the compressed packing. Compress a little bit more the support washer to be able to remove the retaining ring (21) and slowly stretch the spring out.
6. Place the packing (15-19) in the correct sequence and using the special tool to compress it until the retaining ring (21) can be inserted. Then remove the tool slowly ensuring that the ring was positioned correctly.
7. Replace both guides (8, 11) and insert the spindle into the bonnet. Before to place the bonnet into the body, put the its seal (12) and tighten screws (13) according to the values indicated in section 3.3.



Parts of the bonnet sealing kit

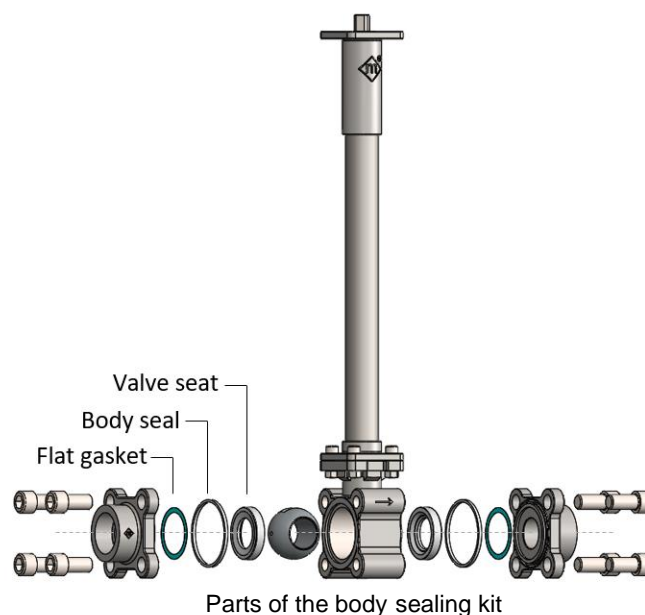
**Caution**

Do not remove the packing without the appropriate tools. The packing will be ejected from the bonnet at high velocity. Non-observance of these instructions can endanger life and limb of the operator and may cause damage to the valve.

7.3. Body sealing replacement

In order to perform the replacement of body sealing parts, the valve should be properly supported and in the open position prior beginning.

1. Choose either inlet or outlet end connection to start with maintenance.
2. Loosen the body screw (7) and remove the end connection (6). The body seal (5) should come out with end connection.
3. Remove the body seal (5) from the end connection.
4. Remove the flat gasket (4) and seat (3) from the valve body.
5. Replace interior parts using the body sealing kit and install the end connection again with the screws. Tighten screws (7) according to the values indicated in section 3.3.
6. Repeat the removal procedure for the other end connection.
7. To remove the ball (2), the valve shall be in closed position. Only then is it possible to do it.

**Caution**

The valve may trap fluids in the ball cavity when closed.



8. LCV ATEX Version

8.1. General information

This section of the operating manual contains specific information regarding the LCV ATEX version, which are intended for use in hazardous explosive atmospheres into zone 1 and 2. The assembly and operating instructions of the LCV valves and their technical data are not modified unless this section of the instructions replace or exclude them.

The valve has been evaluated and tested according to the standards DIN EN ISO 80079-36:2016 and DIN EN ISO 80079-37:2016 for explosive atmospheres.

8.2. Safety instructions for explosive atmospheres

The following requirements must be met and ensured by the owner/operator:

- For installation, setup, commissioning and maintenance of this valve can only be carried out by trained personal for explosive atmospheres.
- The operator is responsible to familiarize himself with this operating manual before starting work.
- The owner/operator is responsible to ensure that all applicable regulations, rules, standards and laws are met to their operating conditions and location.
- The operator must appropriate clothing and personal protective equipment for explosive atmospheres, which do not cause an electrostatic discharge.
- Do not use tools, which can cause sparks when they are used.



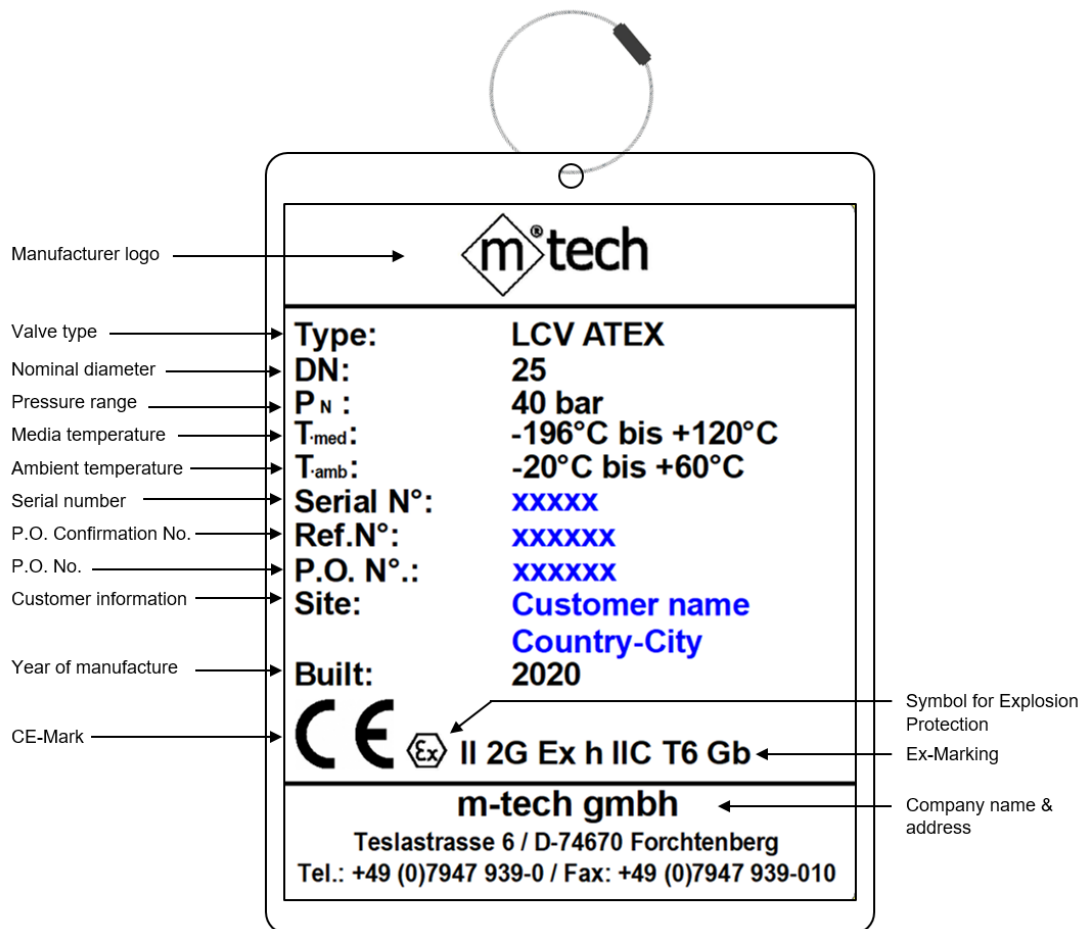
Notes

Please keep this instruction manual in a safe place for future reference



8.3. ATEX Marking

The LCV ATEX Version carry an ATEX nameplate in addition to the standard marking. The nameplate will be attached with a stainless steel wire to the body valve. The plate is made of stainless steel too. This nameplate contains following data according to ATEX Directive 2014/34/EU:




Attention

Do not remove, cover or paint over the ATEX nameplate.



The EX-marking coding as per table below.

	Symbol for Explosion Protection
II	Equipment group I: For use in underground mines II: For use in all other places
2	Equipment category Category 1: 1G suitable for zone 0, 1D suitable for zone 20 Category 2: 2G suitable for zone 1, 2D suitable for zone 21 Category 3: 3G suitable for zone 2, 3D suitable for zone 22
G	Environment G: Gas, Vapour D: Dust
Ex	Explosion protection
h	Type of protection. The code letter "h" is the symbol for non-electrical equipment.
IIC	Gas group IIC: suitable for gas group IIC, IIB and IIA IIB: suitable for gas group IIB and IIA IIA: suitable for gas group IIA Dust group IIIC: suitable for gas group IIIC, IIIB and IIIA IIIB: suitable for gas group IIIB and IIIA IIIA: suitable for gas group IIIA
T6	Temperature Class T1: 450°C, T2: 300°C, T3: 200°C, T4: 135°C, T5: 100°C, T6: 85°C
Gb	Equipment Protection Level (EPL) Ga or Da: very high protection level Gb or Db: high protection level Gc or Dc: enhanced protection level



8.4. Operation in explosive environments

The LCV ATEX version is intended for use in hazardous explosive gas atmospheres into zone 1 and 2. The usual atmospheric conditions under which it may be assumed that LCV can be operated are:

- Temperature $-20\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$
- Absolute pressure 80 kPa (0,8 bar) to 110 kPa (1,1 bar); and
- Air with normal oxygen content, typically 21 % (v/v).

In case of different environmental conditions, these must be evaluated by owner/operator.

The minimum and maximum operating temperature of the valve in explosive atmospheres can be restricted depending on the mounted parts or accessories. The **most unfavorable** values should always be selected.



Attention

The owner/operator must check the Ex-marking on the add-on components before start of operation in order to ensure they are designed for explosive atmospheres.

In explosive atmospheres, ignitions caused by friction or impact sparks must be avoided. Possible ignition sources such as hot surfaces and mechanically generated sparks can be avoided, if the valve do not exceed the impact velocity of 1 m/s.

The operating temperature depends on the operating conditions of the medium and ambient temperature. The resulting temperature classification must be determined accordingly by the operator.



Attention

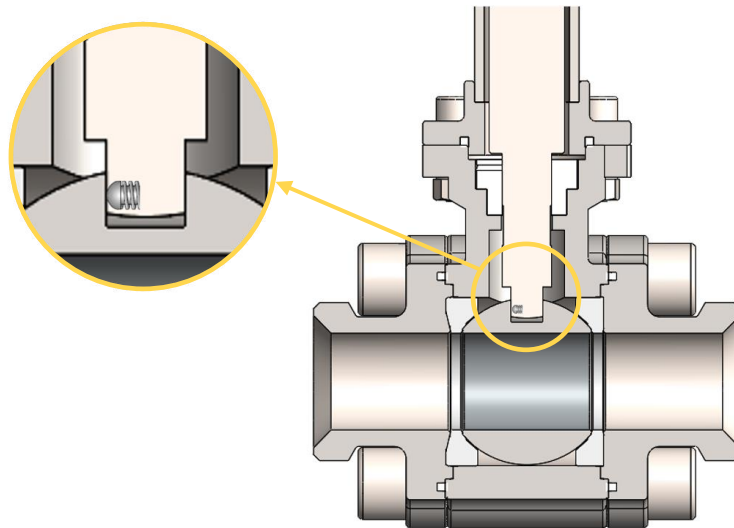
To avoid exothermic reactions (including self-ignition of dusts) do not transport or dose self-reactive substance



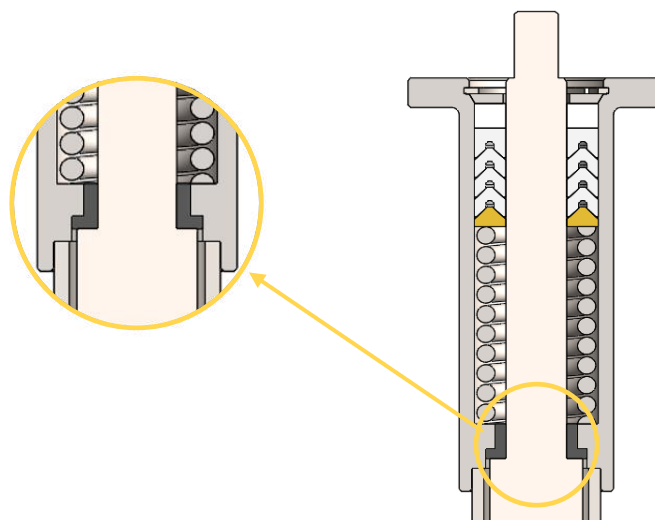
8.5. Anti-static design

The LCV is designed to meet the demanding static dissipative requirements prescribed in the ATEX directive (surface resistance $<10^9 \Omega$). The antistatic devices ensure that electrostatic charges will be conducted away from the inside of the valve. This conforms to the British Standard 5351 for the electrical continuity between the ball, stem and body.

1. A spring loaded ball made of stainless steel ensures metallic contact between the ball and stem.



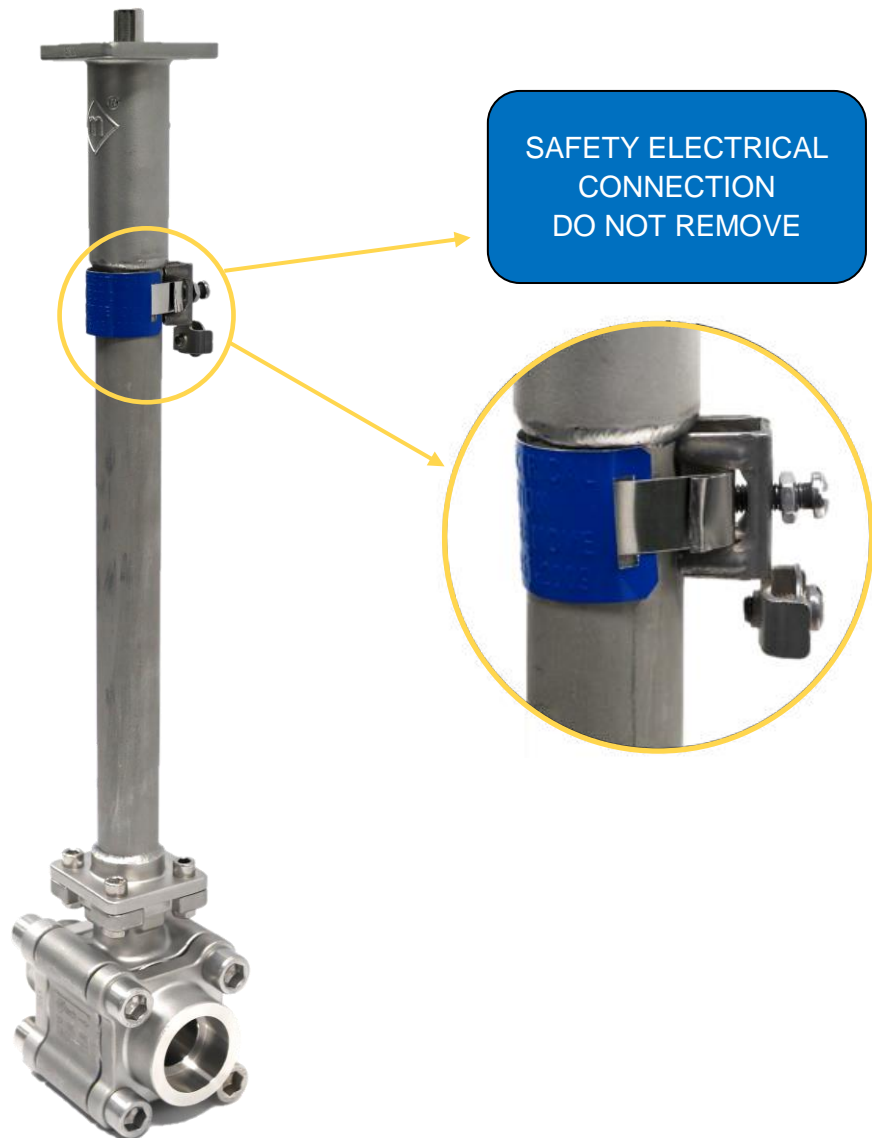
2. A conductive stem seal (Carbon filled PTFE) ensures the contact between the stem and bonnet/body.





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3. A earth clamp is fixed to the bonnet, which conducts an electrostatic charge out of the valve.



Attention

The friction of fluid through the piping system can generate an electrostatic charge and can cause a hazard. The valve must be permanently earthed.



Attention

For outdoor installations, the valve must be permanently connected to equipotential bonding system as a lightning protection. This system will discharge lightning current and distribute them in the ground.