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|---|---|-----------------------------------|
|  | INSTRUCTION FOR INSTALLATION AND SERVICE | RV/UV/HU 210 to 234 Ex |
| | CONTROL VALVE, SHUT-OFF VALVE, FAIL-SAFE ACTION VALVES | PM - 082/19/11/GB |

The instructions for installation and maintenance of valves RV/UV/HU 2x0, 2x2 and 2x4 Ex are binding for users to ensure proper function of valves. The user must keep the rules said here while installation, operation and maintenance. Technical details of individual type are specified in catalogue data sheets. If the usage of the valves is different from mentioned herein, the guarantee terms are not valid any more.

For installation and service of the valves the following is valid: CLC/TR 60079-32-1 : 08/2016
EN ISO 80079-36 : 09/2016
EN 1127-1 ed.2 : 02/2012

This instructions are valid for these products

RV/UV/HU 210Ex, RV/UV/HU 220Ex, RV/UV/HU 230Ex ... two-way control valve, straight-through
RV/HU 212Ex, RV/HU 222Ex, RV/HU 232Ex ... two-way control valve with pressure-balanced plug
RV 214Ex, RV 224Ex, RV 234Ex ... three-way control valve with mixing or flow-diverting function

This instruction does not include instructions for assembly and operating of actuators and accessories. These are mentioned in instructions issued by manufacturers of actuators and are part of delivery. In case of need it is possible to obtain them from the supplier.

The valves can be assembled with actuators approved for such using by producer of the valves and running time cannot exceed 1m/s.

1. Description and application

The valve was manufactured and tested in accordance with ISO 9001 standard (Quality management systems Requirements)

1.1 Description

Control valves and Shut-off valves and Fail-safe action valves are designed to control and/or shut off of process medium flow such as water (except of drinkable), steam, non-aggressive gases and other media compatible with material of valve body and inner parts. The valves are also designed for media such as industrial and fuel gases and inflammable liquids. Only liquids with sufficient electric conductivity ($>1000\text{pS/m}$) may be used. The temperature of flowing liquid must not exceed 80% of minimal ignition temperature of surrounding inflammable atmosphere and must be lower than maximal temperature of liquid permitted by producer.

The body material is optimally made of spheroidal cast iron, cast steel, stainless steel, inner parts are made of high quality stainless steel. Flow characteristics, Kvs values and leakage rate correspond to international standards.

Valves type Ex fulfil the requirements II1/2G IIC TX Ga/Gb resp. II1/2G IIB TX Ga/Gb acc.to EN ISO 80079-36 (9/2016) and EN 1127-1 ed.2 (1/2012)

Standard painting of the valves:

- the inner surfaces are not painted
- the outer surfaces upto temperature 400°C - colour Burcharths Aqua Air G4901
- the outer surfaces over temperature 400°C THERMODUR 600 STAN SILBR GRAU
- stainless steel valves are not painted

Thickness of colour layers for II1/2G IIB TX Ga/Gb do not exceed 2 mm.

Thickness of colour layers for II1/2G IIC TX Ga/Gb do not exceed 0,2 mm.

In case of painting repairs, the value of maximum tightness must be observed. The values must be kept on main (large) surface areas. In the vicinity of corners and edges, the value breaking is possible.

1.2 Operating conditions

Valves should be operated under the condition, which were considered during their selection (type, dimension, materials etc.) In case of different working conditions ask the manufacturer for review/confirmation of suitability. Explosive gases atmosphere (zone 1) can occasionally occur in the vicinity of packing, if the valve with graphite packing is used for flammable/explosive medium. In this case, it is necessary to periodically check the stuffing box every 3 months.

Ex type valves must be properly earthed according to CLC/TR 60079-32-1 (conduct the valves with earthed part of nearby device/structure).

Further, the prevention of highly efficient charge generating mechanisms (leading to propagation brush discharges on non-conductive layers and coatings) must be done according to EN ISO 80079-36.

For reliable function of the valves, the producer recommends to pipe strainer of mechanical impurities. Piping of the strainer before the valve is necessary for valve with micro-throttling system ($Kvs \leq 0.16$).

Recommended strainer dimensions:

| DN, Type | Recommended maximum mesh size |
|---------------------------|-------------------------------|
| DN 15-25, $Kvs \leq 0.16$ | 0,25 mm |
| DN 15-65 | 0,6 mm |
| DN 80-200 | 1,0 mm |
| DN 250-600 | 1,6 mm |

2. Installation

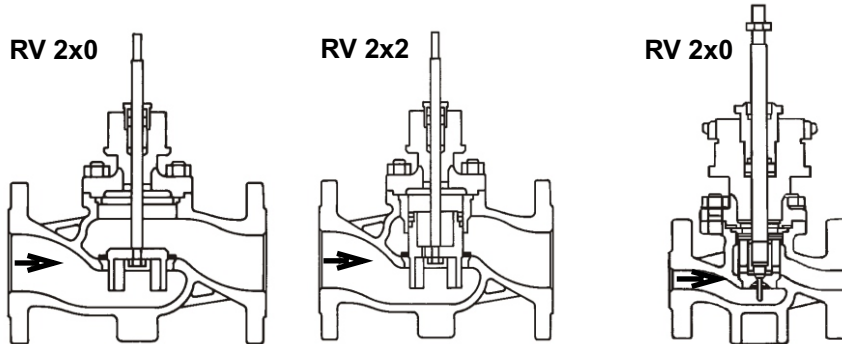
Valve has to be installed and put into operation by qualified person! Qualified person is a person acquainted with installation, putting into operation and manipulation herewith product, and which is qualified in enclosure. As well he must be for-educated about health protection and safety at work.

2.1 Preparation before installation

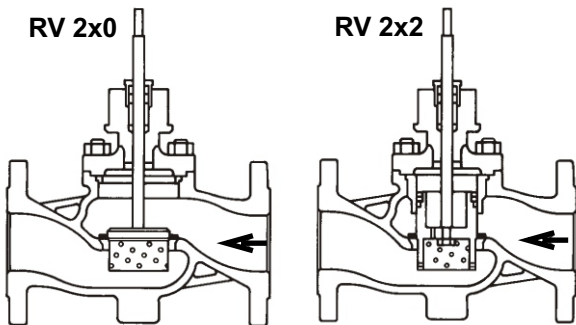
The valves are delivered completely assembled from the company, adjusted and tested. Prior to the piping of the valve, it is necessary to compare the data on the valve tag with data from accompanying documents. The protective blinds must be removed from the valve. The valves shall be inspected against mechanical damage or being stained, especially in the inner area and on sealing flanges. Also the piping system shall be cleared from all impurities that could cause damage to sealing surface and thus cause a loss of tightness of the valve.

2.2 Installation of valve into pipeline

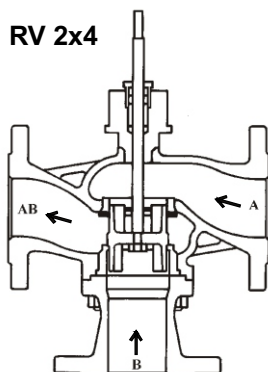
The valve must be piped in such direction, that the arrows on the valve body correspond to the process medium flow.



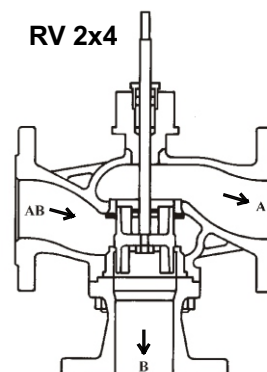
Pic.1: Flow direction for two-way valve with V-ported or contour plug
RV 2xx xxx xxxx Lx xx/xxx-xxx (Char. L; R; P; S; U)



Pic.2: Flow direction for two-way valve with perforated plug
RV 2xx xxx xxxx Dx xx/xxx-xxx (Char. D; Z; Q)



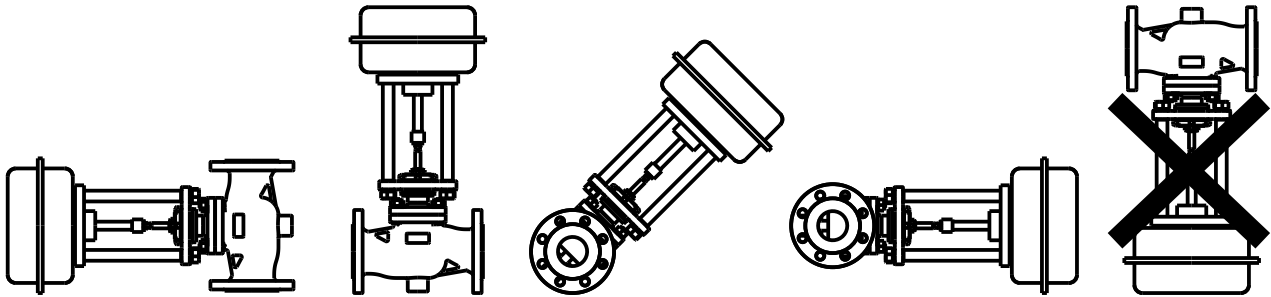
Pic.3: Flow direction for three-way valves with mixing function



Pic.4: Flow direction for three-way valves with diverting function

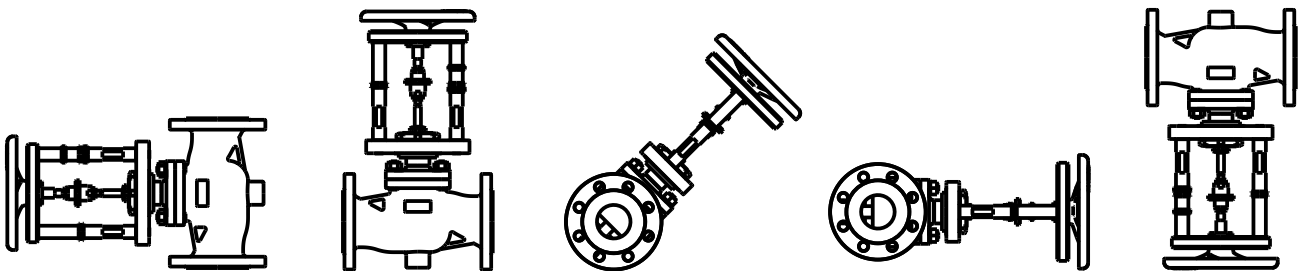
For the 3-way valve, its function is the main criterion for the piping position. The valve ports are marked by letters. If the valve serves as mixing, the ports **A** and **B** are inlets, the port **AB** is outlet. If the valve serves as diverting, the **AB** ports is inlet and **A** and **B** ports are outlet.

The valve **DN 15-150** can be piped in any way except the position, when the actuator is under the valve body. In case the stem of the valve is positioned horizontally, the actuator must be turned so that the columns of the actuator are positioned above each other. In operating the valve for high temperatures, it is necessary to protect the actuator against radiating heat, for example by tilting it from vertical direction and carefully insulate the pipeline. In case the valve is mounted in vertical or in horizontal pipeline with actuator being positioned vertically, the flexible support or hanging of the actuator is necessary, picture 8.



Pic. 5: Installation position for valves with electro- or pneumatic actuators

The valves equipped by hand-wheel any installation position is allowed/suitable.



Pic. 6: Installation position for valves with hand wheel

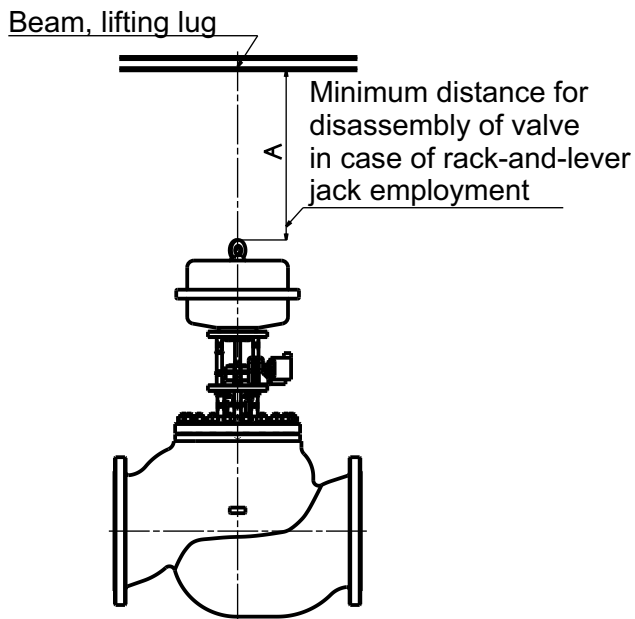
For the valves DN200 and greather, the basic working position, i.e. vertical stem and actuator above the valve, is strictly recomended, regarding the operation and maintenace purposes.

If necessary, the other positions are possible (see pic.5 and 6) but, in case of valve dismounting from the pipeline for the repairs, the additional expenses for dismounting and back installation aren't in the scope of warranty and must be paid by customer as extra money. It's necessary to support or hang the valve in all position except the basic one (see pic.8). The pipeline and valve's body must be properly insulatet, in case of high temperature medium. Opposite to it, the actuator yoke/columns and the actuator itself must be insulation free, to keep the surface/abient temperature in the limits given by actuator producer.

For the valves all DN operated with temperatures below 0°C, they must be mounted in their basic position, ie. the actuator or hand wheel is above the valve body.

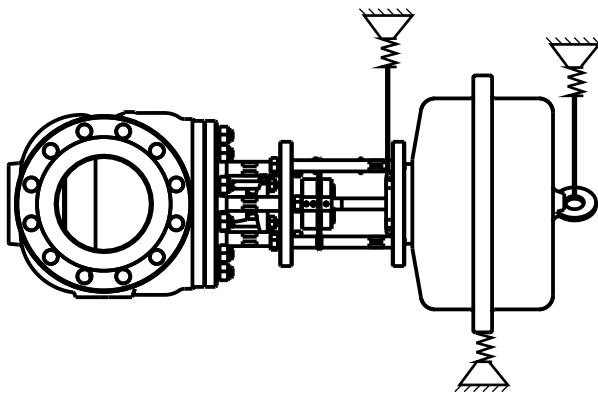
The valve must be installed with proper space around (esp. below and above), for the maintenance and other activities linked with valve operation and maintenance. For the valves DN100 and greather, the clearance above the valve and suspension for lifting device must be provided, see pic.7.

| DN | A |
|------------|--------------------------|
| DN 15-80 | 500 mm |
| DN 100-300 | 1500 mm, with suspension |
| DN 400-600 | 2000 mm, with suspension |



Pic.7: Minimum space above the valve:

In case the valve is equipped with bellows packing or the vibrations of the pipeline may occur, it is advisable to support the **actuator flexibly** in all accessible mounting positions.



Pic.8: Recommended fixing points

For proper function of control valve, below-mentioned instructions must be obeyed:

- no excessive forces can be transferred from pipeline to valve.
- the valve can not be installed just behind the bend. Pipeline should be straight min.6x DN in front of / after the valve.
- piping reduction prior and behind the valve should be smooth and gentle (recommended slope regarding the pipeline axis is from 12 to 15°) and max. two dimensions difference between the valve and pipeline is allowed.
- the flange gasket must be clean, without any damage, the internal diameter shouldn't be smaller than inner diameter of flange.
- the flange face must be clean, without any damage. For face cleaning, the brass tools (brush, scraper) should be used. The flanges (valve and pipeline) must be coaxial with parallel faces.
- the threads and contact face of nuts must be greased with suitable anti-seize grease. Type of grease must be chosen according to material of bolt and the process temperature.
- the flange bolts must be tightened gradually and evenly, always the opposite bolts, to prevent inadmissible load of bolts. The tightening is done in several steps – by hand and then 30, 60 and 100% of tightening torque. Finally, the bolts are tightened with 100% of tightening torque, round the flange

Recommended tightening forces for standard flange bolts [Nm]

| DN | PN 16 | | | | PN 25 | | | | PN 40 | | | |
|-----|------------------------------------|------|--------|-------|------------------------------------|------|--------|-------|------------------------------------|------|--------|-------|
| | Dimension and material of the bolt | | | | Dimension and material of the bolt | | | | Dimension and material of the bolt | | | |
| | M | 8.8 | 1.7711 | A2-50 | M | 8.8 | 1.7711 | A2-50 | M | 8.8 | 1.7711 | A2-50 |
| 15 | 12 | 63 | 54 | 33 | 12 | 63 | 54 | 33 | 12 | 63 | 54 | 33 |
| 20 | 12 | 63 | 54 | 33 | 12 | 63 | 54 | 33 | 12 | 63 | 54 | 33 |
| 25 | 12 | 63 | 54 | 33 | 12 | 63 | 54 | 33 | 12 | 63 | 54 | 33 |
| 32 | 16 | 150 | 130 | 80 | 16 | 150 | 130 | 80 | 16 | 150 | 130 | 80 |
| 40 | 16 | 150 | 130 | 80 | 16 | 150 | 130 | 80 | 16 | 150 | 130 | 80 |
| 50 | 16 | 150 | 130 | 80 | 16 | 150 | 130 | 80 | 16 | 150 | 130 | 80 |
| 65 | 16 | 150 | 130 | 80 | 16 | 150 | 130 | 80 | 16 | 150 | 130 | 80 |
| 80 | 16 | 150 | 130 | 80 | 16 | 150 | 130 | 80 | 16 | 150 | 130 | 80 |
| 100 | 16 | 150 | 130 | 80 | 20 | 290 | 250 | 150 | 20 | 290 | 250 | 150 |
| 125 | 16 | 150 | 130 | 80 | 24 | 500 | 435 | 270 | 24 | 500 | 435 | 270 |
| 150 | 20 | 290 | 250 | 150 | 24 | 500 | 435 | 270 | 24 | 500 | 435 | 270 |
| 200 | 20 | 290 | 250 | 150 | 24 | 500 | 435 | 270 | 27 | 740 | 630 | 390 |
| 250 | 24 | 500 | 435 | 270 | 27 | 740 | 630 | 390 | 30 | 1000 | 860 | 530 |
| 300 | 24 | 500 | 435 | 270 | 27 | 740 | 630 | 390 | 30 | 1000 | 860 | 530 |
| 400 | 27 | 740 | 632 | 390 | 33 | 1350 | 1160 | 710 | 36 | 1740 | 1500 | 910 |
| 500 | 30 | 1000 | 860 | 530 | 33 | 1350 | 1160 | 710 | 39 | 2240 | 1930 | 1180 |
| 600 | 33 | 1350 | 1160 | 710 | 36 | 1740 | 1500 | 910 | 45 | 3460 | 2980 | 1820 |

In case, the bolt material is not mentioned in the table, ask manufacturer of valves for right value of tightening torque.

In case of pipeline cleaning (flushing, outflowing) the valve must be replaced by appropriate pipe spacer!

2.3 Electric actuator or electro hydraulic actuator connection

These work may be carried out by trained personnel only. It is necessary to keep all safety rules relating to electric machines. Further it is necessary to follow installation instructions for maintenance of electric actuators issued by the producer. Resistance transmitter and signalisation switches, if part of delivery, are positioned under the actuator cover.

Before valve commissioning, the data, given in the actuator ID plate (especially supply voltage and voltage of control signal), should be checked/compared with given specification and verify, that the actuator can be connected to superordinate regulator.

As the valve is delivered with its actuator as a completed from our company, the basic adjusting is carried out. For two-way and three-way valves equipped with seat in straight way only (RV 2x5), closed position is adjusted with torque switches (straight way closed) so that the valve is tightly closed whereas in open position it is adjusted with position limit switch. For three way valves equipped with seats in both straight and angle way (RV 2x4), it is adjusted by torque switches in both directions.

In case of piping the valve or the actuator was removed from the valve, it is necessary to check this setting or check the actuator once again. In case of need, the assistance of our subsidiary LDM Service can be required.

The length of the actuator's cables shall be selected so that the actuator can be removed from the valve without disconnection from the terminal board.

WARNING: It's necessary to observe the mechanical stroke indicator placed at actuator's joke or directly at the electromotor, if the valve is operated (opened or closed) by hand wheel. The extra care must be taken near to OPEN and CLOSE position. Neither position nor torque switches are in function in such case and there is a danger of valve or actuator serious damage. It's strongly prohibited to use any mechanical tools (force boosters) for hand wheel operation.

2.4 Pneumatic actuator connection

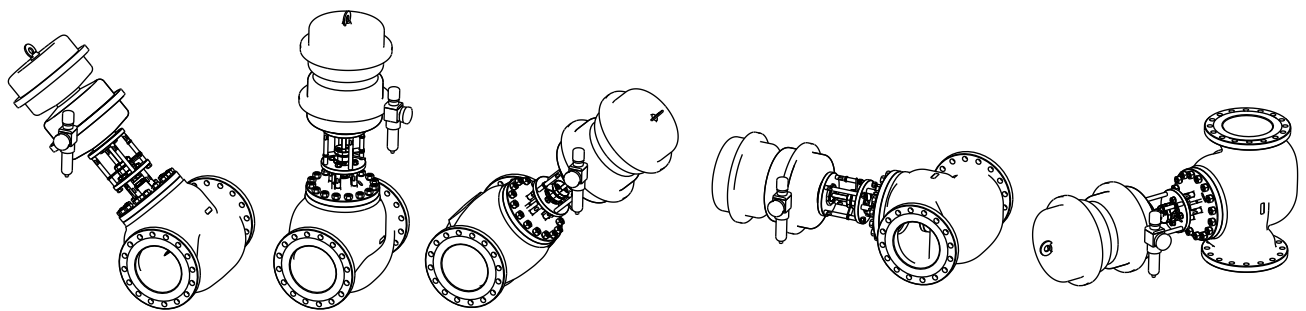
These work can be conducted with skillful personnel only. It is necessary to follow installation instructions for service and maintenance of pneumatic actuators issued by the producer of the actuator.

Connection of pneumatic actuator to air supply is done by plastic, copper or stainless-steel tubes. recommended dimension is 8x1 mm. The 12x1 mm tubes are recommended for the actuators with membrane area larger than 600 cm² or in case the length of air pipeline is too long (more than 10m).

Before valve commissioning, the data, given in the actuator and positioner ID plate (especially air supply maximum pressure), should be checked/compared with given specification. If the pressure of air supply is higher, the pressure reduction valve must be used.

As the valve is supplied with actuator as a complet, the basic setting is also carried out. In case of piping the valve or the actuator was removed from the valve, it is necessary to check this setting or set the actuator once again. The producer does not take over the damage caused by wrong setting of the actuator. In case of need, the assistance of our subsidiary LDM Service can be required.

In case of pressure air regulator (air supply to pneumatic actuator) fixed directly on the valve/actuator yoke, the regulator must be placed in vertical position (draincock/draincup down), see pic. 9. If the valve mounting position is known during the valve-actuator assembly, the right position is set on the production line/during final test.



Pic. 9: Examples of filter/regulator position

2.5 Checking after installation

Piping system should be pressured after valve installation and the checked if there is not leak. Check the packing set tightness as well. Then check the proper function of actuator by doing a few strokes.

2.6 Warming-through steam fitting

Fittings have to be filled and warmed-through by regulating the steam supply and drainage so that the trend of the temperature increase is observed (see the table). After the required temperature is reached, the operation of the steam piping is regulated depending on the need of the given appliance.

| Valve | Carbon material of body | Alloy material of body | Austenite material of body |
|---------------------|-------------------------|------------------------|----------------------------|
| DN 15-65, PN 16-40 | 8°C/min | 6°C/min | 8°C/min |
| DN 80-600, PN 16-40 | 6°C/min | 4°C/min | 6°C/min |

3. Operating and Service

The manufacturer recommends periodic visual inspections of the operational external leakage.

Recommended period controls external leakage

| Media Type | Packing set | Cover and flanged joints |
|--|----------------------|--------------------------|
| Normal fluids - water, steam, air, ... | min. 1x per 6 months | min. 1x per 12 months |
| Dangerous liquids - flammable, explosive, toxic or other dangerous | min. 1x per 3 months | min. 1x per 6 months |

3.1 Packing set

In case the valves are equipped with sealings made of PTFE or O-rings EPDM, the packing does not require any maintenance and packing screw cannot be tightened or loosened. If the leakage occurs, the complete packing shall be replaced. If the packing rings are made of graphite, the sealing material gets worn and in case of any leakage it is necessary to tighten the whole screw, possibly add new sealing ring. Graphite packing shall be tightened successively by 1/4 of turn only to achieving the tightness again. The bellows does not require any maintenance and in case of damage to the bellows, the trained personnel shall be required.

3.2 Exchange of packing set

If there is need to exchange the packing set because of high leakage, first the actuator must be dismantled and then the gland bolt must be screwed out. **The pipeline may not be under pressure during changing of packing set.** After this, there is need to check the state of spindle surface and clean the inside of the packing box. The surface of spindle must be smooth and not damaged. If necessary, the spindle must be exchanged. Packing set is filled, by the producer, with a special lubricant acc. to the type of used packing. Such lubricant ensures the proper function of the packing rings within their service life. **The spindle may not be greased during the operation!**

After exchange of packing set, the gland bolt must be tightened:

- firm till the bottom of gland box when PTFE or O-ring is used
- to press the packing set about 10% of the height when graphite rings are used

After installation of actuator, there is necessary to make test as in 2.5.

3.3 Maintenance of actuators

During operating and maintenance of the actuators, it is necessary to follow the instructions issued by the producer of the actuators. If a defect is detected, follow the mounting instructions or require assistance of trained personnel from LDM service. The temperature of the actuator surface cannot exceed the value specified by the producer of actuator.

3.4 Elimination of defects and malfunction

If a defect is detected on the valve (leakage, leakage of packing or bonnet sealing, etc.), it is necessary to ensure its repair immediately otherwise a permanent damage may occur to sealing surfaces and other parts exposed to effects of leaking medium. **Prior to any repair work on the valve, make sure that piping system is free of pressure!**

| Defect | Possible cause | Elimination of defect |
|-------------------------------|--|---|
| Valve leakage | - higher Δp_{max} than recommended for given type of the valve | - lower the diff. pressure value on the valve - use stronger actuator - use pressure-balanced valve |
| | - insufficient linear force of the actuator | - check the function and setting of the actuator possibly positioner |
| | - seizure of impurity in seat area | - open and close the valve fully |
| | - damaged sealing surfaces of the plug and seat | - it is necessary to lap plug and seat or replace damaged parts - requires trained personnel |
| Packing leakage | - sealing force of graphite packing is too low | - tighten the graphite packing or add another sealing ring (see 3.1) |
| | - packing is worn or damaged | - change the whole packing complet (see 3.2) |
| | - damaged stem | - replace packing and stem - requires trained personnel |
| Leakage of bonnet / extension | - low adherence pressure to gasket - damaged gasket | - tighten screws - to change gasket |
| Leakage of body | - damage caused by aggressiveness, abrasion, or erosion of media | - it is need to change of body - trained personnel required |

| Defect | Possible cause | Elimination of defect |
|--|--|--|
| Stem won't move | - no supply to actuator (electric or pneumatic) | - electric actuators: check supply and feeding voltage - pneumatic actuators: check supply and feeding pressure |
| | - actuator control signal failure | - measure the value of input control signal |
| | - the defect of actuator or its accessories | - follow the instructions for actuator or require trained personnel |
| | - graphite packing tightened too much | - loosen the packing and retighten it just to ensure tightness |
| | - seizure inside the valve due to impurities | - it is necessary to dismantle the valve and replace damaged parts - trained personnel required |
| Stem bounces | - insufficient actuator force | - compare parameters of the product with the real parameters - if OK, ensure responsible service personnel |
| | - damaged positioner | - follow the instructions issued by its producer, possibly ensure trained service personnel |
| Valve won't move in full range of its stroke | - wrong setting of end position switches | - check the setting of the switches |
| | - pneumatic and electrohydraulic actuators: hand wheel got stuck in wrong position | - adjust the hand wheel into its basic position |
| | - pneumatic actuators: feeding pressure is too low | - ensure the required pressure of supply air |
| | - pneumatic actuators wrongly adjusted or defected positioner | - readjust the positioner acc. to instructions issued by its producer |
| | - impurities inside the valve | - close and open the valve fully, possibly ensure trained service personnel |

If the valve is in guarantee period, it is necessary to ensure trained service personnel for all service except tightening of graphite packing!

In case of Ex type valves, the surface dirt (e.g. rust from connecting parts) must be removed immediately after repairs, to secure the conductive connection of all valve parts.

3.5 Spare parts

Spare parts are not part of valve delivery. They must be ordered separately. When the spare parts are ordered, following data must be written: type of a valve, nominal diameter DN, registration valve's number, name of a spare part.

Recommend spare parts for 3 and 5 years of operation:

| | Parts for 3 years of operation | Additional parts for 5years of operation *) |
|-----------------|---|---|
| RV 2x0Ex | - packing set (stuffing box complete) in case of bellows valve also bellows gasket and safety packing set - cover gasket | - stem (in case of bellows valve complete subassembly stem-bellows) - seat - plug |
| RV 2x2Ex | - packing set (stuffing box complete) in case of bellows valve also bellows gasket and safety packing set - cover gasket | <u>valve with pressure-balanced plug to 315°C</u> - stem (in case of bellows valve complete subassembly stem-bellows) - seat - plug with wiping and safety ring - plug guide |
| | | <u>valve with pressure-balanced plug over 315°C</u> - stem (in case of bellows valve complete subassembly stem-bellows) - seat - plug with wiping rings - plug guide |
| RV 2x4Ex | - packing set (stuffing box complete) in case of bellows valve also bellows gasket and safety packing set - extension gasket | - stem (in case of bellows valve complete subassembly stem-bellows) - upper seat - lower seat - plug |

*) It's recommended for 5-years spare parts ordering to order 2 sets for 3-years operation and 1 set of additional parts for 5-years operation

4. Guarantee conditions

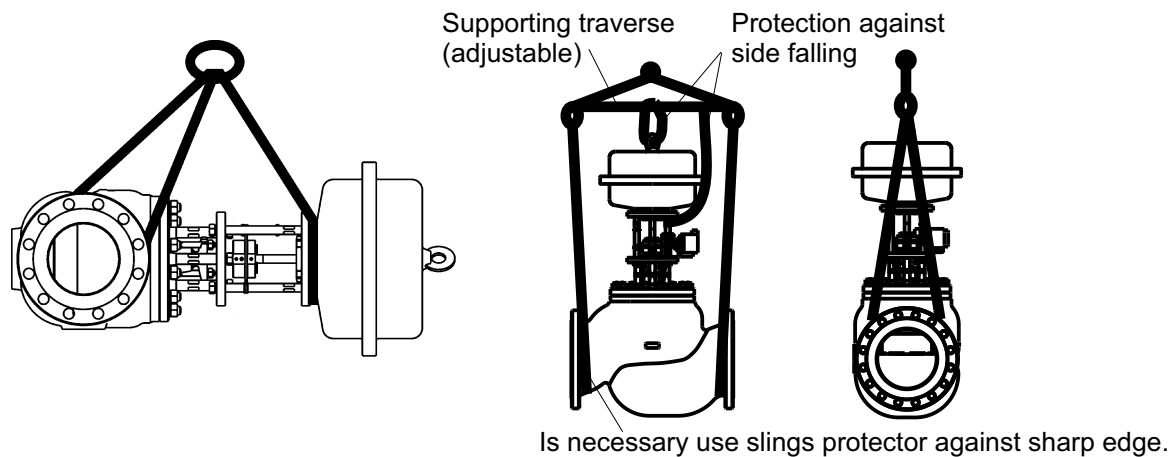
The producer does not guarantee the service and safety of the product under conditions different from this instructions and catalogue data sheet. Any using of the valve under different conditions shall be consulted with the producer. Defects of the valve caused by impurities in process medium shall be considered as out of guarantee terms. The producer does not take over the guarantee if any change was made by the user without prior written consent from the producer (except the packing tightening).

5. Transportation and storage

During transport and storage, the valve must not be exposed to water or placed in environment with relative humidity exceeding 90 %.

With respect to used actuators, the temperature during transport and storing shall be within the range of -20 to 55°C. Inlet flanges must be protected with blinds (these are part of delivery).

Suitable tools/devices should be used for valve lifting during the transport and installation (e.g. lifting harness entwined around flanges, actuator yoke etc.). **Never lift the valve by the lifting device fixed on the actuator only!**



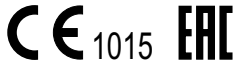
Pic. 10: Example of lifting device usage.

It is necessary to make sure the valve can not be damaged during transport. **Special attention shall be paid to the valve stem, stroke indicator and outside accessories fixed to the actuator.** If the valves are stored for more than 3 years under these conditions, the producer recommends to carry out professional inspection of the valves.

6. Waste disposal

Packaging material and the valves shall be disposed of in the common way such as by handing over to a specialized enterprise for disposal of (body and metal parts - metal waste, other non-metal parts - communal waste).

7. Maxim. permissible working overpressure acc. to EN 1092-2 (EN-JS 1025) and EN 12516-1+A1



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