



Manufacturer

TLV. CO., LTD.

Kakogawa, Japan

is approved by LRQA LTD. to ISO 9001/14001



Instruction Manual

Control Valve
CV5

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Introduction

Thank you for purchasing the **TLV** Control Valve

This product has been thoroughly inspected before being shipped from the factory. When the product is delivered, before doing anything else, check the specifications and external appearance to make sure nothing is out of the ordinary. Also be sure to read this manual carefully before use and follow the instructions to be sure of using the product properly.

For products with special order specifications or options, if detailed instructions for the special order specifications or options are not contained in this manual, please contact **TLV** for full details.

This instruction manual is intended for use with the model(s) listed on the front cover. It is necessary not only for installation but for subsequent maintenance, disassembly/reassembly and troubleshooting. Please keep it in a safe place for future reference.





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Safety Considerations


- Read this section carefully before use and be sure to follow the instructions.
- Installation, inspection, maintenance, repairs, disassembly, adjustment, and valve opening/closing should be carried out only by trained maintenance personnel.
- The precautions listed in this manual are designed to ensure safety and prevent equipment damage and personal injury. For situations that may occur as a result of erroneous handling, three different types of cautionary items are used to indicate the degree of urgency and the scale of potential damage and danger: DANGER, WARNING and CAUTION.
- The three types of cautionary items above are very important for safety: be sure to observe all of them as they relate to installation, use, maintenance, and repair. Furthermore, TLV accepts no responsibility for any accidents or damage occurring as a result of failure to observe these precautions.

Symbols

	Indicates a DANGER, WARNING or CAUTION item.
 DANGER	Indicates an urgent situation which poses a threat of death or serious injury
 WARNING	Indicates that there is a potential threat of death or serious injury
 CAUTION	Indicates that there is a possibility of injury or equipment / product damage

 CAUTION	<p>DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.</p> <p>Use hoisting equipment for heavy objects (weighing approximately 20 kg or more). Failure to do so may result in back strain or other injury if the object should fall.</p> <p>Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.</p> <p>When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.</p>
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Safety considerations continued on next page.

 CAUTION	Be sure to use only the recommended components when repairing the product, and NEVER attempt to modify the product in any way. Failure to observe these precautions may result in damage to the product and burns or other injury due to malfunction or the discharge of fluids.
	Do not use excessive force when connecting threaded pipes to the product. Over-tightening may cause breakage leading to fluid discharge, which may cause burns or other injury.
	Use only under conditions in which no freeze-up will occur. Freezing may damage the product, leading to fluid discharge, which may cause burns or other injury.
	Use only under conditions in which no water hammer will occur. The impact of water hammer may damage the product, leading to fluid discharge, which may cause burns or other injury.

Specifications



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CAUTION

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Valve

Model	CV5												
Body material	Cast Iron						Cast Steel						
Connection	Flange												
Size	15	20	25	32	40	50	15	20	25	32	40	50	
PMO (MPaG)	1.3					1.0	2.5					1.7	1.0
TMO (MPaG)	200						220						
Seat Plug Sealing	Metal Sealing												
Characteristic	Equal Percentage												
Rangeability	50 : 1												
Leakage Class (IEC534-4)	Class												

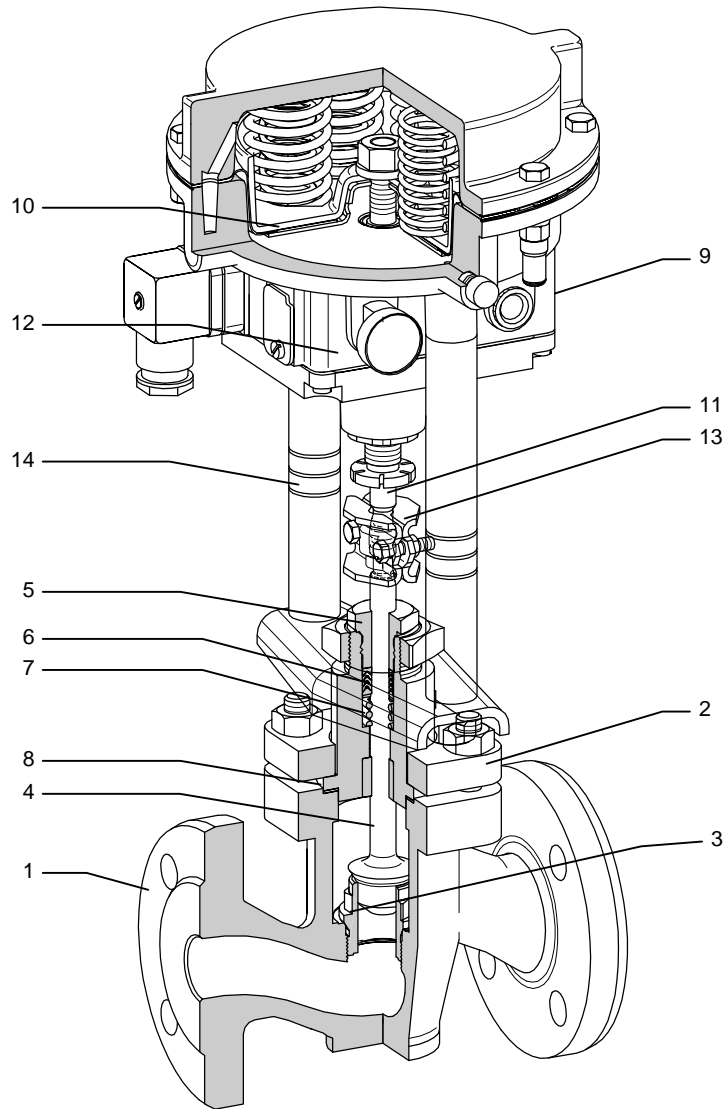
Actuator

Actuator Area (cm ²)	120	
Fail-safe Position	Air to open	Air to close
Bench Range (MPa)	0.04 – 0.14	0.21 – 0.33
Electrical Input Signal (mA)	4 – 20	
Air Supply Press. (MPaG)	MAX. 0.6	
Transit Time for Rated Travel	Approx. 3 seconds	
Hysteresis (%)	<1	
Protection Class	IP54	
Ambient Temp. Range	-30 – 70	
Motive Medium	Oil-free air, filtered 5 μ m	

* Maximum allowable pressure (PMA) and maximum allowable temperature (TMA) are PRESSURE SHELL DESIGN CONDITIONS, **NOT** OPERATING CONDITIONS.

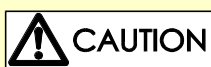
Configuration

Fig. 1

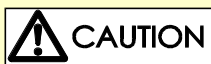


No.	Parts Name	No.	Parts Name
1	Valve body	8	Body Gasket
2	Valve Bonnet	9	Actuator Body
3	Valve Seat	10	Diaphragm
4	Plug and Stem	11	Actuator Stem
5	Guide Bushing	12	Positioner Case
6	Stuffing Box V-ring	13	Stem Bracket
7	Stuffing Box Spring	14	Yoke

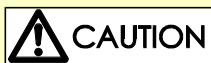
Installation



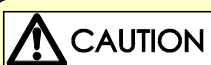
DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions which may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.



Use hoisting equipment for heavy objects (weighing approximately 20 kg or more). Failure to do so may result in back strain or other injury if the object should fall.



Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.



Do not use excessive force when connecting threaded pipes to the product. Over-tightening may cause breakage leading to fluid discharge, which may cause burns or other injury.

Installation, inspection, maintenance, repairs, disassembly, and adjustment should be done only by trained maintenance personnel.

1. Mounting position

The valve can be mounted in any position. However, strictly observe the limitations resulting from the type of actuator used.

The valve must be installed free of stress. If necessary, support the pipelines near the connections.

Do not install supports on the valve or on the actuator!

Thoroughly flush the pipeline prior to installation of the valve!

2. Strainer, bypass

We recommend that you install a Strainer upstream of the valve. We also recommend that you install a shut-off valve both upstream of the strainer and downstream of the control valve as well as a bypass line so that the plant need not be shut down for maintenance routines.

3. Mounting preparations

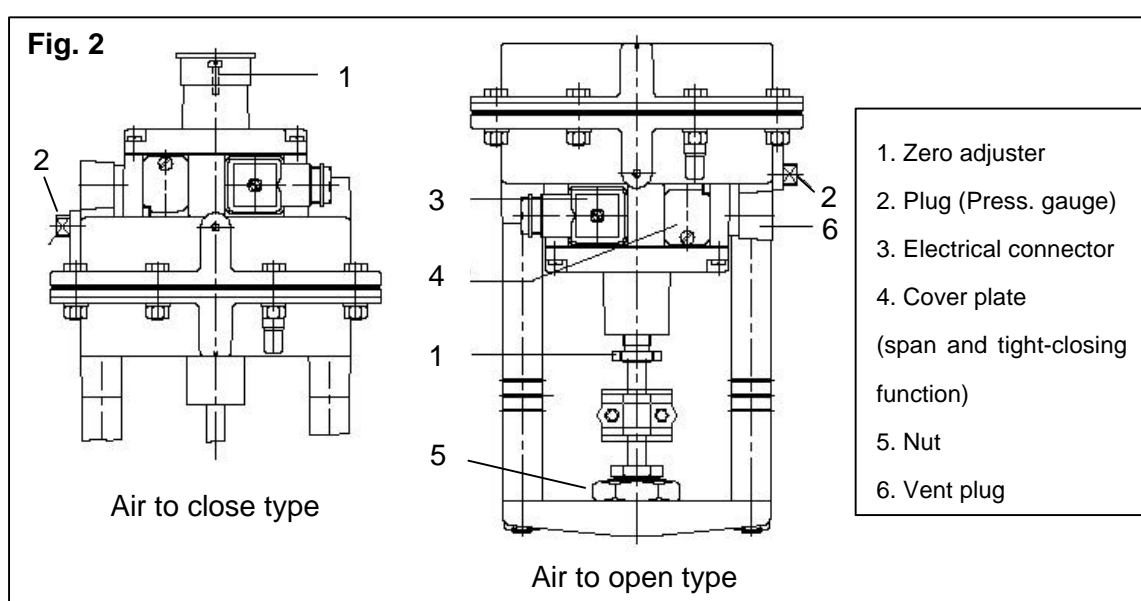
Before attaching the actuator to the valve bonnet, actuators with close fail-safe action "Air to open" must be pressurized to slightly retract the actuator stem. Should no electric control signal be available during the mounting procedure, the hexagon nut (5) must be tightened (use a hexagonal wrench SW 36) to hold the pre-tensioned springs.

Actuators with open fail-safe action "Air to close" require to be pressurized only for attaching the stem connector. The top diaphragm chamber must be pressurized to approach the plug and actuator stem until they contact one another.

For electropneumatic actuators, a signal pressure can be applied to the pressure gauge connection, however, the plug (2, Fig. 2) must be removed first.

3.1 Mounting the actuator on the valve

- 1) For the electropneumatic actuator, apply a pressure of approx. 3 bar to the connection "Supply" and additionally connect a control signal of 10 mA to retract the actuator stem.
- 2) Remove the hexagon nut (5) from the valve bonnet and place the actuator with its stem retracted on the valve bonnet.
- 3) Make sure that the actuator is in the proper position and secure with the hexagon nut (SW 36), applying a tightening torque of min.150 Nm.
- 4) Pull up the plug stem until it contacts the actuator stem.
- 5) Attach the stem connector pieces to each stem and screw tight with the fastening screws.



**CAUTION**

In case you need to deactivate the control valve action, deactivation may only be carried out by switching off the electric control signal, do not disconnect the supply air!

3.2 Pneumatic connections

The electropneumatic actuator has tapped holes with G1/4 thread.

The customary male connections for metal pipes or plastic hoses can be used.

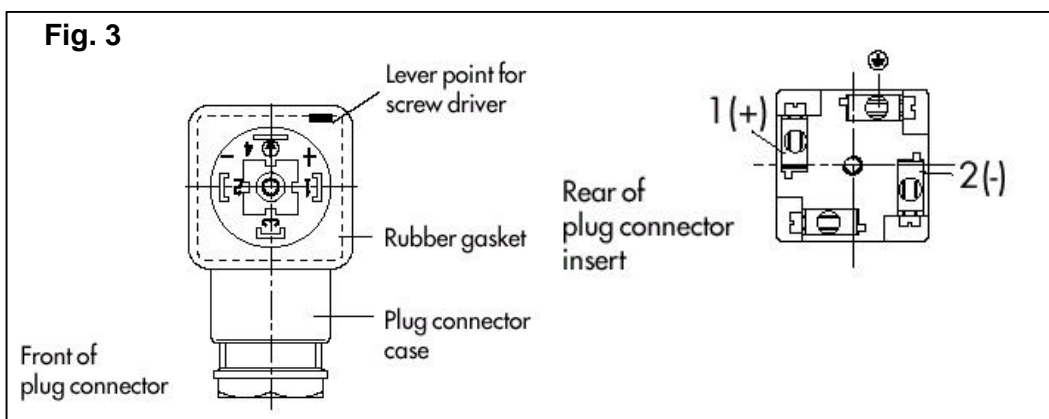
Connect the supply air to the "Supply" connection.

The required supply pressure is on the name plate.

Important: Supply air must always be dry, oil- and dust free. Thoroughly flush the air pipes prior to installation.

3.3 Electrical connection

- 1) Unthread the fastening screw of the plug connector and remove the plug connector (3, fig.2) from the female connector on the actuator housing.
- Note: Do not remove the female connector from the actuator housing. Correct ground connection can only be guaranteed when it is in its original position.
- 2) Unthread the fastening screw of the plug connector and remove the rubber gasket.
- 3) Lever the plug insert out of the plug connector case using a screw driver.
- 4) Connect the wires transmitting the control signal via the PG screw joint of the plug connector case to the terminals of the insert which are marked 1 + , 2 – and to its ground terminal. Secure them with screws.
- 5) Re-install the insert in the plug connector case. Be sure that the Pg screw joint points to the desired direction (the plug connector case can be turned by 90° around the insert to point to all four directions).
- 6) Put on the rubber gasket.
- 7) Plug the plug connector back in the actuator housing and secure with fastening screw.



Operation



CAUTION

DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions which may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.



CAUTION

Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.

Installation, inspection, maintenance, repairs, disassembly, and adjustment should be done only by trained maintenance personnel.

1. Checking and adjusting zero and span in electropneumatic actuators

Adjustment may only be carried out when the actuator is mounted on the valve! Zero and span are adjusted to determine the starting point and the upper range value of the actuator.

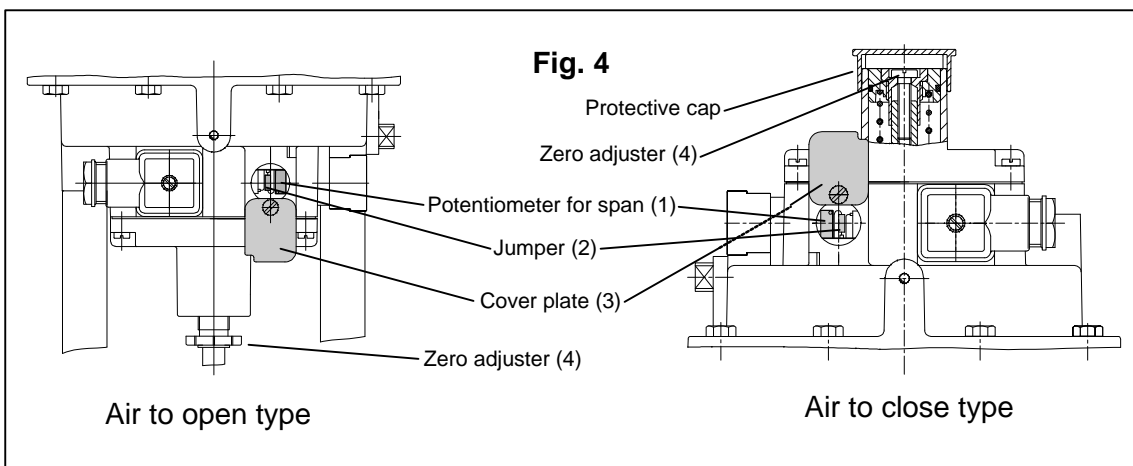
When the control signal (reference variable) changes from 4 to 20 mA, the valve must correspondingly pass through its entire travel range from 0 to 100 %.

Zero adjustment is always based on the closed position of the control valve.

Actuator with close fail-safe action "Air to open", zero (starting point) must be adjusted to 4 mA and the upper range value to 20 mA.

Whereas a globe valve assuming an open fail-safe position (Air to close), requires adjustment to be the other way round. That is, zero must be adjusted to 20 mA and the upper range value to 4 mA.

Zero and span of the electropneumatic actuator are adjusted to rated travel by the manufacturer.



We recommend, nevertheless, that you check zero after the actuator has been attached to the valve. Proceed as described below:

- 1) Connect an ammeter to the control signal input and apply compressed air to the input "Supply".
 - 2) Loosen the fastening screw and move away the cover plate (3, fig.4).
 - 3) Pull the jumper from the pins to deactivate the tight-closing function.
- Zero is adjusted via the zero adjuster (4, fig.4) and the upper range value via the potentiometer for span (1, fig.4).

Important: Each modification of span results in zero shift. Zero must therefore always be corrected after the span has been modified.

1.1 Adjusting actuators with close fail-safe action "Air to open"

Zero (starting point)

- 1) Use an ammeter to adjust the input signal to 4 mA.
 - 2) Turn the zero adjuster (4, fig.4) until the plug stem just begins to leave its rest position.
 - 3) Switch off the input signal and then slowly increase it again. Check if the plug stem begins to move at 4 (+0.1) mA.
 - 4) Correct any deviations via the zero adjuster (4, fig.4).
- Turning counterclockwise causes the valve to leave its rest position earlier, whereas turning clockwise causes the valve to delay leaving of the rest position.

Upper range value

- 5) Having completed adjustment of the starting point, use the ammeter to increase the input signal to 20 mA.
- When reaching the upper range value of 20 (-0.1) mA, the plug stem must have passed through its entire rated travel range of 100 %.
- 6) Adjust the potentiometer for span (1, fig.4) until the upper range value is correct.
- Turning clockwise increases the travel, and turning counterclockwise reduces the travel.
- 7) When the correction procedure is finished, switch off the input signal and slowly increase it again.
- First check the starting point (4 mA), afterwards the upper range value (20 mA).
- 8) Repeat the correction procedure until both values are correct.
 - 9) Plug the jumper on the pins so that the tightclosing function will be activated.

3.2 Adjusting actuators with open fail-safe action "Air to close"

Zero (starting point)

- 1) Use an ammeter to adjust the input signal to 20 mA.
- 2) Remove the cover plate and turn the zero adjuster (4, fig.4) until the plug stem just begins to leave its rest position.
- 3) Increase the input signal and slowly reduce it again to 20 mA. Check if the plug stem begins to move at 20 mA.
- 4) Correct any deviations via the zero adjuster (4, fig.4).

Turning counterclockwise causes the valve to leave its rest position with delay, whereas turning clockwise causes the valve to leave earlier.

Upper range value

- 5) Having completed adjustment of the starting point, use the ammeter to adjust the input signal to 4 mA.

When reaching the upper range value of 4 mA, the plug stem must have passed through its entire rated travel range of 100 %.

- 6) Adjust the potentiometer for span (1, fig.4) until the upper range value is correct. Turning clockwise increases the travel, and turning counterclockwise reduces the travel.
- 7) When the correction procedure is finished, increase the input signal again. First check the starting point (20 mA), afterwards the upper range value (4 mA).
- 8) Put the cover plate back over the zero adjuster.
- 9) Plug the jumper on the pins to activate the tight-closing function.

Maintenance



CAUTION

Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.



CAUTION

Be sure to use only the recommended components when repairing the product, and NEVER attempt to modify the product in any way. Failure to observe these precautions may result in damage to the product or burns or other injury due to malfunction or the discharge of fluids.



CAUTION

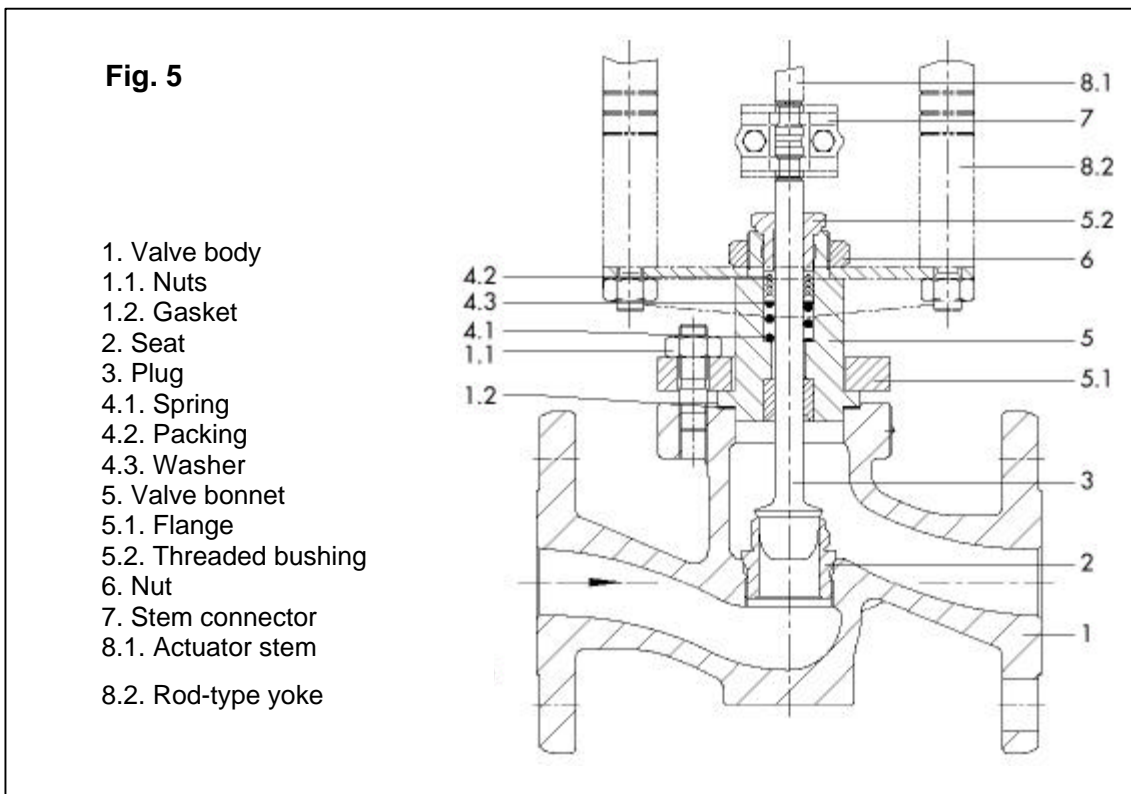
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CAUTION

When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.

Use the following procedures to remove components. Use the same procedures in reverse to reassemble. (Installation, inspection, maintenance, repairs, disassembly, and adjustment should be done only by trained maintenance personnel.)



Tightening torques

Valve Size (DN)	15-25	32-50
Seat (2) (± 10%)	M32x1.5 170 Nm	M58x1.5 500 Nm
Body nuts (1.1) (± 10%)	M10 10 Nm	M12 30 Nm

1. Replacing seat and plug

If the valve does not properly seal, dirt or damaged sealing edges could be the cause. In case of dirt, thoroughly clean the parts. In case of damaged sealing edges, replace for new ones.

1.1 Plug

When replacing the plug, you should also replace the packing (4.2, fig.5) and the gasket (1.2, fig.5). To exchange the plug, carry out the same steps as described in chapter 4.1. However, install a new plug instead of the used one. Apply lubricant to the plug stem prior to installation.

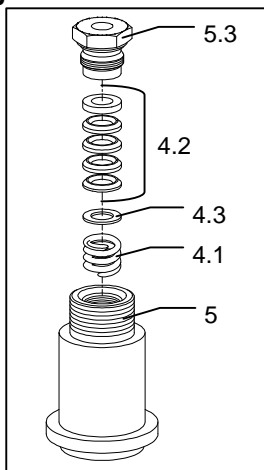
1.2 Seat

Replace the seat (2, fig.5) as described below:

- 1) Unscrew the nuts (1.1, fig.5) and lift the valve bonnet (5, fig.5) and flange (5.1, fig.5) off the valve body (1, fig.5).
- 2) Unscrew the seat (2, fig.5) using the appropriate seat wrench (see torque table).
- 3) Apply lubricant to the thread and the sealing conus of the new seat and screw in.
- 4) Place the valve bonnet with flange on the valve body and secure with nuts (1.1). Observe the tightening torques!

2. Replacing the packing

Fig. 6



If the valve leaks at the stuffing box, the packing (4.2) of the stuffing box needs to be exchanged as follows:

- 1) Unscrew the nuts (1.1) and remove the valve bonnet (5) and flange (5.1).
- 2) Check the gasket (1.2) in the valve body for damage. We recommend that you re-place the gasket.
- 3) Screw off the threaded bushing (5.2) and pull out the plug (3).
- 4) Pull out the damaged packing (4.2) using an appropriate tool. Remove the washer (4.3) and spring (4.1) and clean the packing chamber.
- 5) Apply lubricant to the individual parts of the new packing and the plug stem. Insert the plug (3) in the valve bonnet (5).
- 6) Place the valve bonnet with flange on the valve body and secure with nuts (1.1). Observe the tightening torques given in the table.
- 7) Insert the spring (4.1) and washer (4.3) and carefully slide the new packing (4.2) over the plug stem into the packing chamber. Screw in the threaded bushing (5.2) and tighten.

Troubleshooting

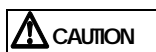


When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.

Installation, inspection, maintenance, repairs, disassembly, and adjustment should be done only by trained maintenance personnel.

When the product fails to operate properly, use the following table to locate and remedy the cause.

Problem	Cause	Remedy
Valve Leak	Air supply press. might be too high (Air to open type)	Readjust the air supply press.
	Air supply press. might be too low (Air to close type)	Readjust the air supply press.
	Zero point might be moved	Readjust the zero point
	Primary press. of control valve might be too high	Check the system
	Plug or valve seat might be worn or dirty	Clean parts or replace
	Bypass shut-off valve might be leaking	Check the shut-off valve
	Plug stem can not move smoothly	Replace parts or reassemble the bonnet
External leakage from stuffing box	V-ring or stem might be worn or dirty	Clean parts or replace
Hunting or chattering of the valve	Signal from the controller might be not good	Check the controller (especially PID)
Can not open or close form proper point	Diaphragm might be deformed or broken	Replace the parts
	Air supply press. might be too low	Readjust the air supply press.
No operate at all	Signal from the controller might be not good	Check the controller and signal line
	No air supply	Check the air supply
	Supplied air might contain dust, water, or oil	Replace the actuator unit and install better air filer and dryer



The control valve is not shut-off valve, therefore it cannot always shut-off completely.

Product Warranty

Warranty Period

One year following product delivery.

1. Warranty Coverage

TLV CO., LTD. warrants this product to the original purchaser to be free from defective materials and workmanship. Under this warranty, the product will be repaired or replaced at our option, without charge for parts or labor.

2. This product warranty will not apply to cosmetic defects, nor to any product whose exterior has been damaged or defaced; nor does it apply in the following cases:

- Malfunctions due to improper installation, use, handling, etc., by other than TLV CO., LTD. authorized service representatives.
- Malfunctions due to dirt, scale, rust, etc.
- Malfunctions due to improper disassembly and reassembly, or inadequate inspection and maintenance by other TLV CO., LTD. authorized service representatives.
- Malfunctions due to disasters or forces of nature.
- Accidents or malfunctions due to any other cause beyond the control of TLV CO., LTD.

Under no circumstances will TLV CO., LTD. be liable for consequential economic loss damage or consequential damage to property.

* * * * *

For Service or Technical Assistance:

Contact your **TLV** representative or your regional **TLV** office.

Manufacturer

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