

# Installation Instructions Validation and scrubber valve replacement

JT33 TDLAS gas analyzers



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# 1 Overview of spare part sets

This manual is Special Documentation and does not replace the Operating Instructions included in the scope of product. It is a part of the Operating Instructions and serves as a reference for replacing solenoid, pneumatic, and manual valves utilized for validation in the measuring device.

## 1.1 Valve overview

There are three different valve options that may be selected for TDLAS gas analyzers, depending upon the analyzer configuration:

- **Manual valves.** The manually actuated valve blocks the process gas and controls the flow of validation gas through the analyzer. When this option is selected, there is one manual valve per analyzer.
- **Electrically-actuated solenoid valves.** Two electrically-actuated solenoid valves control the flow of gas through the scrubber. If the analyzer utilizes automatic validation, a third electric solenoid valve controls the flow of validation gas into the analyzer.
- **Pneumatically-actuated valves.** In some applications, users prefer pneumatically-actuated valves. This configuration incorporates three or four pneumatic valves, depending on requirements for single or dual-point validation gases. A plant air supply must be connected to the analyzer. Electrically-actuated solenoid valves control the air supply to the pneumatic valves.

## 1.2 Designated use

The valves used in the sample conditioning system direct the process sample flow to perform critical measurement tasks. The valves can be used to switch between the process sample gas and the validation gas stream. Valves are also used to direct the process gas sample flow to the measurement cell or through the scrubber.

The designated use of the measuring device is described in the Operating Instructions specific to the device.

## 1.3 Personnel authorized to carry out repairs

### Personnel qualifications

Personnel must meet the following conditions for mounting, electrical installation, commissioning, and maintenance of the device. This includes but is not limited to:

- Suitably qualified for their role and the tasks they perform
- Understand the general principles and types of protection and markings
- Understand the aspects of equipment design which affect the protection concept
- Understand the content of certificates and relevant parts of IEC 60079-14
- General understanding of inspection and maintenance requirements of IEC 60079-17
- Familiar with the techniques used in the selection and installation of equipment referenced in IEC 60079-14
- Understand the additional importance of permit to work systems and safe isolation in relation to explosion protection
- Familiar with national and local regulations and guidelines, such as ATEX/IECEX/UKEX and cCSAus
- Familiar with lockout/tagout procedures, toxic gas monitoring protocols, and personal protective equipment (PPE) requirements

### **WARNING**

#### **Substitution of components is not permitted.**

- ▶ Substitution of components may impair intrinsic safety and alter the hazardous area rating of the assembly.

Authorization to perform repairs depends on the measuring device's approval type. The table below shows the authorized group of people in each case. The scrubber and indicator have a service authorization level of 1 and 2. A qualified specialist should be able to perform the repairs with guidance from an authorized technician by Endress+Hauser.

-  Whoever carries out the repairs has full responsibility to ensure that work is carried out safely and to the required quality standard and must guarantee the safety of the device following repair.

Measuring device approval	Personnel authorized to perform repairs
Without approval	1, 2
With approval (such as IECEx)	1, 2

1 = Qualified specialist on the customer side can perform this repair.

2 = Service technician authorized by Endress+Hauser can perform this repair.

## 1.4 Manufacturer address

Endress+Hauser  
11027 Arrow Route  
Rancho Cucamonga, CA 91730  
USA  
[www.endress.com](http://www.endress.com)

## 1.5 U.S. export compliance

The policy of Endress+Hauser is in strict compliance with U.S. export control laws as detailed on the website of the [Bureau of Industry and Security](#) at the U.S. Department of Commerce.

## 2 Safety instructions

Each analyzer shipped from the factory includes safety instructions and documentation to the responsible party or operator of the equipment for the purpose of installation and maintenance.

### WARNING

Technicians are expected to be trained and to follow all safety protocols, established by the customer in accordance with the area hazard classification, to service or operate the analyzer.

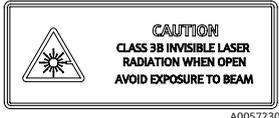
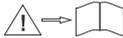
- ▶ This may include but is not limited to toxic and flammable gas monitoring protocols, lockout/tagout procedures, personal protective equipment (PPE) requirements, hot work permits, and other precautions that address safety concerns related to the use and operation of process equipment located in hazardous areas.

### 2.1.1 Symbols

#### Safety symbols

Structure of Information	Meaning
<p> <b>WARNING</b></p> <p>Causes (/consequences) Consequences of noncompliance (if applicable) ▶ Corrective action</p>	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation can result in a fatal or serious injury.
<p> <b>CAUTION</b></p> <p>Causes (/consequences) Consequences of noncompliance (if applicable) ▶ Corrective action</p>	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
<p><b>NOTICE</b></p> <p>Cause/situation Consequences of noncompliance (if applicable) ▶ Action/note</p>	This symbol alerts you to situations which may result in damage to property.

#### Symbols on the measuring device

Symbol	Description
	A warning designation indicating that the TDLAS gas analyzer contains a Class 3B laser, which can emit visible or invisible radiation hazardous to the eye under direct exposure and requires appropriate safety precautions during operation and maintenance.
	The High Voltage symbol alerts people to the presence of electric potential large enough to cause injury or damage. In certain industries, high voltage refers to voltage above a certain threshold. Equipment and conductors that carry high voltage warrant special safety requirements and procedures.
	PROTECTIVE EARTH GROUND - Symbol indicates the connection point of the ground wire from the main power source.
	This symbol refers the user to the technical documentation for more information.
	The Fuse symbol is found on the Measurement Accessory Controller (MAC) printed circuit board adjacent to the fuse holder.
	The Ex mark signals to Authorities Having Jurisdiction and end-users in Europe that the product complies with the essential ATEX Directive for explosion protection.
	The UKCA Marking indicates conformity with health, safety, and environmental protection standards for products sold within the United Kingdom.
	The FCC Mark indicates that the electromagnetic radiation from the device is below the limits specified by the Federal Communications Commission and the manufacturer has followed the requirements of the Supplier's Declaration of Conformity authorization procedures.

Symbol	Description
	The CSA Certification Mark indicates that the product was tested against and met the applicable North American standards requirements.
	The CE Marking indicates conformity with health, safety, and environmental protection standards for products sold within the European Economic Area (EEA).

### Symbols for certain types of information

Symbol	Meaning
	<b>Permitted:</b> Procedures, processes or actions that are permitted.
	<b>Forbidden:</b> Procedures, processes or actions that are forbidden.
	<b>Tip:</b> Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Notice or individual step to be observed
1., 2., 3. ...	Series of steps
	Result of a step

## 2.2 Product safety

The TDLAS gas analyzer is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition that is safe to operate.

It meets general safety standards and legal requirements. It also complies with the EU directives listed in the specific EU Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the analyzer system.

### 2.2.1 General

- Adhere to all warning labels to prevent damage to the unit.
- Do not operate the device outside the specified electrical, thermal, and mechanical parameters.
- Only use the device in media to which the wetted materials have sufficient durability.
- Modifications to the device can affect the explosion protection and must be carried out by staff authorized to perform such work by Endress+Hauser.
- Ensure foreign matter (solid, liquid, or gas) does not enter the MAC or controller enclosure during maintenance to preserve its pollution degree 2 rating.
- Only open the controller or MAC cover if the following conditions are met:
  - An explosive atmosphere is not present.
  - All device technical data is observed (see nameplate).
- In potentially explosive atmospheres:
  - Do not disconnect any electrical connections while the equipment is energized.
  - Do not open the connection compartment cover or MAC cover when energized or the area is known to be hazardous.
- Install the controller circuit wiring according to the Canadian Electrical Code (CEC) respective National Electrical Code (NEC) using threaded conduit or other wiring methods in accordance with articles 501 to 505, and/or IEC 60079-14.
- Install the device according to the manufacturer's instructions and regulations.

### 2.2.2 Turning off and purging the instrument

When performing any type of service on the JT33 sample conditioning system, disconnect all external power from both the sample conditioning system and controller and shut off all process gas going to the analyzer. When

maintenance of the JT33 TDLAS gas analyzer is required, follow the instructions below to purge the sample conditioning system before servicing the analyzer.

**⚠ WARNING**

- ▶ Always follow your site procedure to safely disconnect gas lines to the analyzer. Before opening the enclosure, purge the system with N<sub>2</sub> to ensure no poisonous gas is present.

If the gas sample line cannot be shut off:

- Close the internal **Inlet Shutoff** ball valve in the sample conditioning system filtration assembly, and
- Close the **Sample Vent** ball valve on the filtration assembly outlet

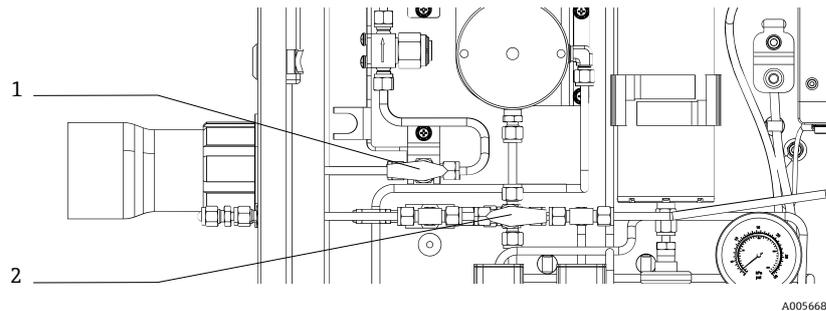


Figure 1. Inlet shutoff valve (1) and sample vent valve (2) in the JT33 sample conditioning system filtration assembly

**⚠ WARNING**

- ▶ Complete the following procedure before performing any service that requires working near the main input power or disconnecting any wiring or other electrical components.

#### To turn off and purge the analyzer for service

1. Turn off power at the main disconnect external to the analyzer. Only use tools with a safety rating for protection against accidental contact with voltage up to 1000 V (IEC 900, ASTF-F1505-04, VDE 0682/201).
2. Purge all gas lines before servicing the unit.

#### Purging the sample conditioning system gas lines

**⚠ WARNING**

- ▶ Use a sensor based on the toxic components in the process gas stream.

#### To test the enclosure with a gas sensor

1. Shut off power at the main disconnect external to the analyzer.
2. Isolate the SCS from the process gas flow.
3. Use the gas detector to determine if there is H<sub>2</sub>S at the enclosure exterior.
4. If no hazardous gas is detected, proceed with opening the enclosure door.
5. If hazardous gas is detected, follow the instructions below for purging the enclosure.

#### To purge the sample conditioning system

1. Shut off gas to the analyzer.
2. Ensure the vent line is open.
3. Switch the process gas to purge gas:
  - a. Close the valve for the process line.
  - b. Open the valve for the purge line.
4. Set the flow rate to 3 liters per minute and run the purge for at least 10 minutes.

## 2.3 Potential risks affecting personnel

This section addresses the appropriate actions to undertake when faced with hazardous situations during or before service of the analyzer. It is not possible to list all potential hazards within this document. The user is responsible for identifying and mitigating any potential hazards present when servicing the analyzer.

### NOTICE

- ▶ Technicians are expected to be trained and follow all safety protocols that have been established by the customer in accordance with the area hazard classification to service or operate the analyzer and MAC controller.
- ▶ This may include, but is not limited to, toxic and flammable gas monitoring protocols, lockout/tagout procedures, the use of PPE requirements, hot work permits and other precautions that address safety concerns related to the use and operation of process equipment located in hazardous areas.

### 2.3.1 Electrocuting hazard

#### ⚠ WARNING

- ▶ Complete this action before performing any service that requires working near the main input power or disconnecting any wiring or other electrical components.
1. Shut off power at the main disconnect external to the analyzer.
  2. Only use tools with a safety rating for protection against accidental contact with voltage up to 1000 V (IEC 900, ASTF-F1505-04, VDE 0682/201).

### 2.3.2 Laser safety

The JT33 spectrometer is a Class 1 laser product, which poses no threat to equipment operators. The laser internal to the analyzer controller is classified Class 3B and could cause eye damage if the beam is viewed directly.

#### ⚠ WARNING

- ▶ Before servicing, shut off all power to the analyzer.

### 2.3.3 Electrostatic discharge: JT33 analyzer and MAC

The powder coating and the adhesive labels are nonconducting and may generate an ignition-capable level of electrostatic discharge under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions, such as high-pressure steam, which might cause a buildup of electrostatic charges on nonconducting surfaces. To clean the equipment, use only a damp cloth.

### 2.3.4 Chemical compatibility

Never use vinyl acetate or acetone or other organic solvents to clean the analyzer housing or labels.

## 2.4 IT security

Our warranty is valid only if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the settings.

IT security measures, which provide additional protection for the device and associated data transfer, must be implemented by the operators in line with their security standards.

### 2.4.1 Device-specific IT security

The device offers a range of specific functions to support protective measures on the operator's side. These functions can be configured by the user and guarantee greater operational safety if used correctly. An overview of the most important functions is provided in the following section.

## 3 Scope of delivery

### 3.1 Electrical solenoid valve kit components

To select the electrical valve and related components, refer to the configuration string to determine which kit to order:

- When a Canadian Registration Number (CRN) is required, the configuration string includes the letters *LS* at the end of the string. Use kit part number 71656821.
- For all other instruments, select kit part number 71656820.

If fittings need to be repaired or replaced, a separate kit is required. Electrical valve kits do not come with fittings. Please see *Fitting kit components* →  for selection.

 In addition to the specific solenoid kit needed, Service recommends ordering a solenoid valve barrier kit (part number 71656791) and a MAC union conduit and plugs kit (part number 71656795) at the time of repair.

#### 3.1.1 Electrical solenoid valve kit, Bifold (part number 71656820)

When the analyzer does not have Canadian Registration Number (CRN) approval (feature 590, option *LS* is not included), use the Bifold solenoid kit.

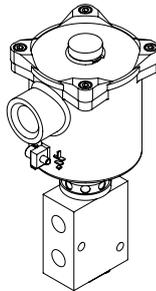


Figure 2. Bifold valve

#	Part number	Description
1	71656820	Solenoid valve, 5.7 W, 24 V, ¼ FNPT, 90 C NM

#### 3.1.2 Electrical solenoid valve kit, Versa (part number 71656821)

When the analyzer has CRN approval (feature 590, option *LS*), use the Versa solenoid kit.

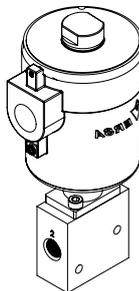


Figure 3. Versa valve

#	Part number	Description
1	71656821	Solenoid valve, 3 W, 24 V, ¼ FNPT, 90 C

### 3.2 Pneumatic air valve kit components (part number 71656824)

When the analyzer utilizes air-operated, 1-point auto validation (feature 180, option 4), or air-operated, 2-point auto validation (feature 180, option 5), use the pneumatic air valve kit. The pneumatic valve listed below is used in all pneumatic builds. One kit must be ordered for every valve that needs to be repaired. Valves are not issued according to analyzer configurations.

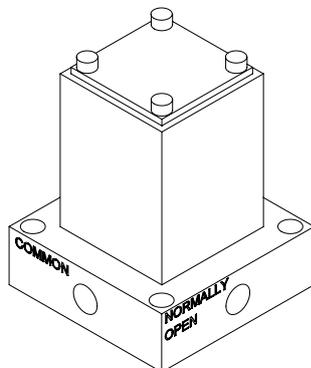


Figure 4. Pneumatic valve

Part number	Description
71656824	Air-operated valve (3-way), 1/8" FNPT, NMC

### 3.3 Manual valve kit (part number 7165682)

When the analyzer utilizes manual validation (feature 180, option 1), use the manual valve kit. The manual valve assembly listed below is used in all manual validation analyzer configurations.

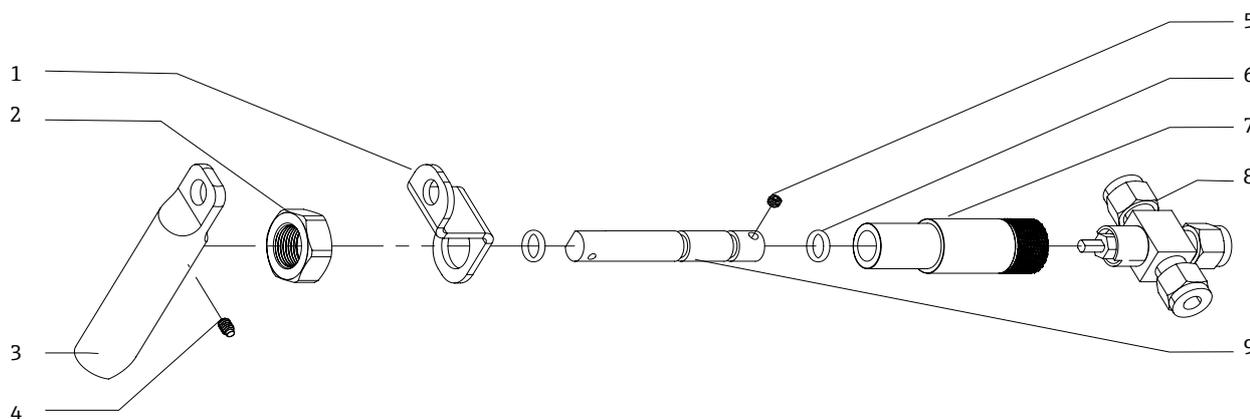


Figure 5. Manual valve assembly

#	Description	#	Description
1	Locking bracket, manual valve, 316 SS	6	O-ring, HBNR, 0.441" x 0.070", #011, 70 SH
2	Nut, 5/8" - 24, 316 SS	7	Extension housing, manual valve
3	Handle, manual valve extension, 316 SS	8	Ball valve, 3-way, 1/4" TF, PTFE, 316 SS, NMC
4	Exterior set screw, 8-32 X .25", 316 SS	9	Extension rod, manual valve
5	Set screw, 8-32 X .125"		

### 3.4 Fitting kit components

There are a total of three fitting kits in the Endress and Hauser’s spare parts kit catalogue:

- Two kits are used for electric solenoid valves.
- One kit is used for pneumatic valves.

A new fitting kit must be ordered for every valve that needs to be repaired as fittings are not issued per configurations.

#### 3.4.1.1 Electrical solenoid fitting kit (part number 71656823)

When the analyzer utilizes 1-point auto validation (feature 180, option 2), use the electrical solenoid fitting kit.

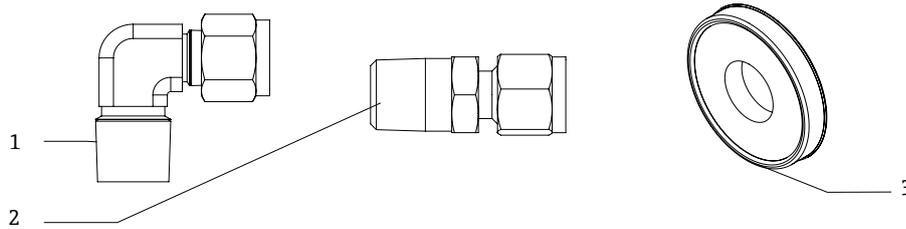


Figure 6. Electronic solenoid fitting kit

#	Description
1	Male elbow, 90 D, ¼" TF x ¼" MNPT (NMC)
2	Fitting, connector, ¼" SW x ¼" MNPT, (NMC)
3	Tape, Thread seal, TFE, gas, ¼"

#### 3.4.1.2 Electric solenoid fitting kit for pneumatic valve actuation (part number 71656822)

When the analyzer utilizes pneumatic air validation with solenoid valves (features 180, options 4 or 5) and the valve being serviced is the electric solenoid, use the electric solenoid fitting kit for pneumatic valve actuation.

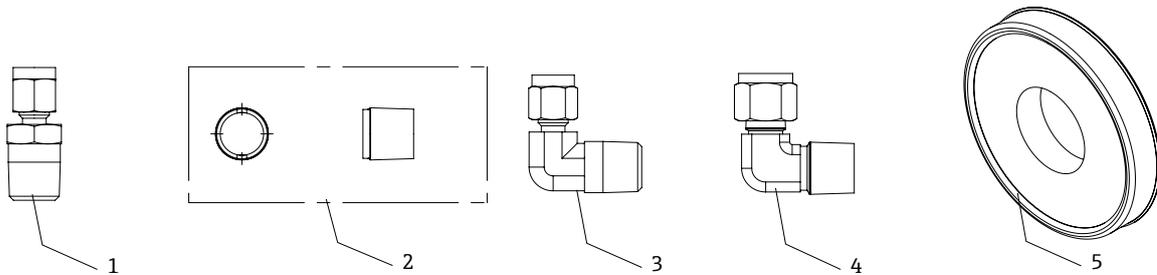


Figure 7. Electric solenoid fitting kit for pneumatic configurations

#	Description
1	Male connector, ⅛" TF x ¼" MNPT, 316 SS (NMC)
2	Exhaust muffler, ¼" MNPT (SS)
3	Elbow 90, male, ⅛" SW x ¼" NPT, SS 316, (NMC)
4	Male elbow, 90 D, ¼" TF x ¼" MNPT (NMC)
5	Tape, Thread seal, TFE, gas, ¼"

### 3.4.1.3 Pneumatic valve fitting kit (part number 71656825)

When the analyzer utilizes pneumatic air validation with solenoid valves (feature 180, options 4 or 5) and the valve being serviced is the pneumatic valve, use the pneumatic valve fitting kit.

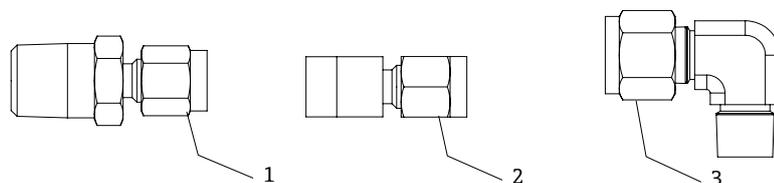


Figure 8. Pneumatic fitting kit for pneumatic valves

#	Description
1	Male connector, 1/8" TF x 1/4" MNPT, 316 SS (NMC)
2	Elbow 90, male, 1/8" TF x 1/8" MNPT, 316 SS (NMC)
3	Elbow 90, male, 1/4" TF x 1/8" MNPT (NMC)

## 3.5 Documentation

All documentation is available:

- On the media device supplied (not included in the delivery for all device versions)
- On the Endress+Hauser mobile app: [www.endress.com/supporting-tools](http://www.endress.com/supporting-tools)
- In the Downloads area of the Endress+Hauser website: [www.endress.com/downloads](http://www.endress.com/downloads)

This document is an integral part of the document package, which includes:

Part Number	Document Type	Description
GP01198C	Description of device parameters	Reference for parameters, providing a detailed explanation of each individual parameter of the operating menu
BA02297C	Operating Instructions	A complete overview of the operations required to install, commission, and maintain the device
KA01655C	Brief Operating Instructions	Short instructions for standard installation and commissioning of the device
SD02912C	Special Documentation Heartbeat Technology	Reference for using the Heartbeat Technology function integrated in the measuring device
SD03032C	Special Documentation Web server	Reference for using the web server integrated in the measuring device
SD03286C	Validation of TDLAS gas analyzers	Reference for proper procedures for validation of TDLAS gas analyzers
TI01722C	Technical Information	Technical data for the device with an overview of associated models available
XA03137C	Safety Instructions	Requirements for installing or operating the analyzer as it relates to personnel or equipment safety
EX310000056	Control drawing	Drawings and requirements for JT33 field interface connections

## 4 Removal

### WARNING

- ▶ Complete this action before performing any service that requires working near the main input power or disconnecting any wiring or other electrical components.
1. Shut off power at the main disconnect external to the analyzer.
  2. Only use tools with a safety rating for protection against accidental contact with voltage up to 1000 V (IEC 900, ASTF-F1505-04, VDE 0682/201).

### 4.1 Tools list

#### 4.1.1 Service tools (part number 71656073)

- T10 Torx screwdriver, 3"
- 3 mm hex driver
- 4 mm hex driver
- Flex driver

#### 4.1.2 Solenoid valve tools

- 1 5/8" adjustable wrench
- 9/16" open ended wrench
- 7/8" wrench
- Pipe wrench or a rigid strap wrench for 1/2" conduit
- T&B ferrule crimper (manufacturer P/N: T3 or equivalent)
- 20 awg wire stripper
- 3 mm hex key
- 7 mm open end wrench, socket or adjustable wrench
- 3 mm flat head screwdriver

#### 4.1.3 Pneumatic valve tools

- 3 mm hex key
- 5 mm hex key
- 9/16" open ended wrench
- 7/16" open ended wrench

#### 4.1.4 Manual valve tools

- 5/64" hex key
- 5/8" open-ended wrench
- 9/16" open-ended wrench
- 15/16" open-ended wrench
- Pipe wrench or a rigid strap wrench for 1/2" conduit

## 4.2 Electrical solenoid removal

If a solenoid valve is leaking or contaminated, remove it using the steps described in this section:

- Disconnect the electrical solenoid from the measurement accessory controller (MAC).
- Remove the electrical solenoid valve.
- Remove the barrier and union from the solenoid valve.

**WARNING**

- ▶ All electrical signals must be terminated before opening the explosion-proof enclosure.

To disconnect the electrical solenoid from the measurement accessory controller (MAC)

1. Turn off, isolate, and purge the SCS following the procedure described in *section 2.2.2* → .
2. Locate the MAC at the bottom of the enclosure.

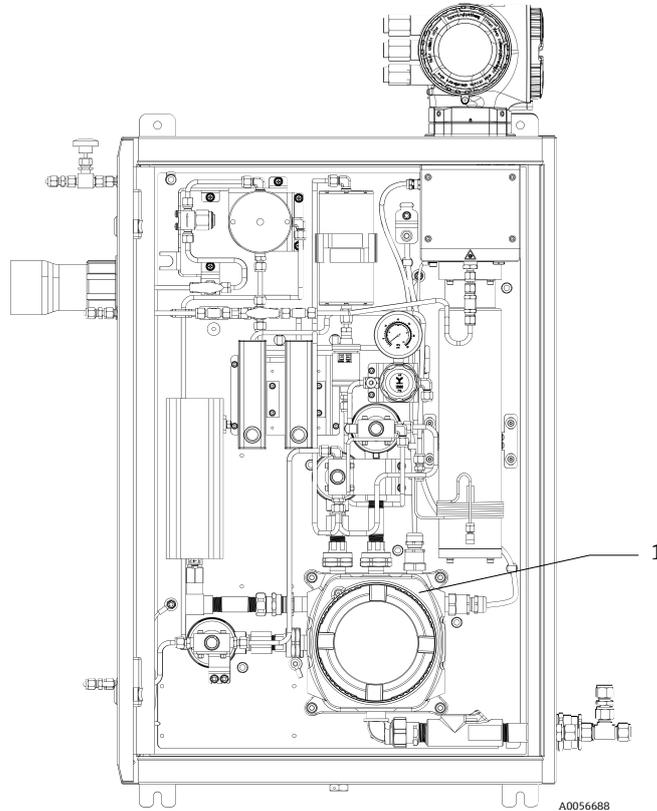


Figure 9. 1- point validation system with electrical solenoid valves and MAC (1)

3. On the MAC cover, use a 2.5 mm hex to rotate the locking screw clockwise.
4. After the locking screw is disengaged, remove the cover by rotating counterclockwise by hand. Refer to the figure below.

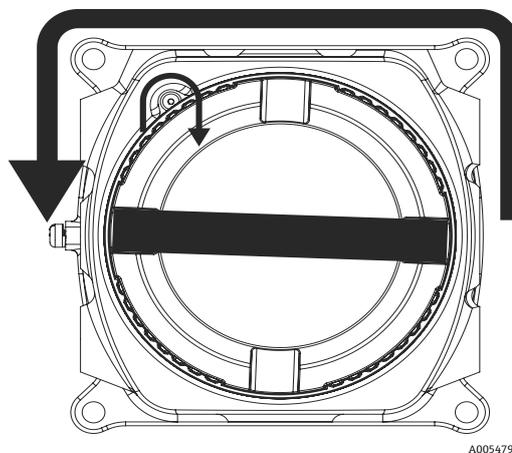


Figure 10. Removing the cover

- i** Alternatively, use a 20 x 20 x 165 mm square bar (not issued by Endress+Hauser) to help remove the cover.

- Unplug the solenoid conductors from their junction points by pressing the orange tab on the left of the electrical connector.

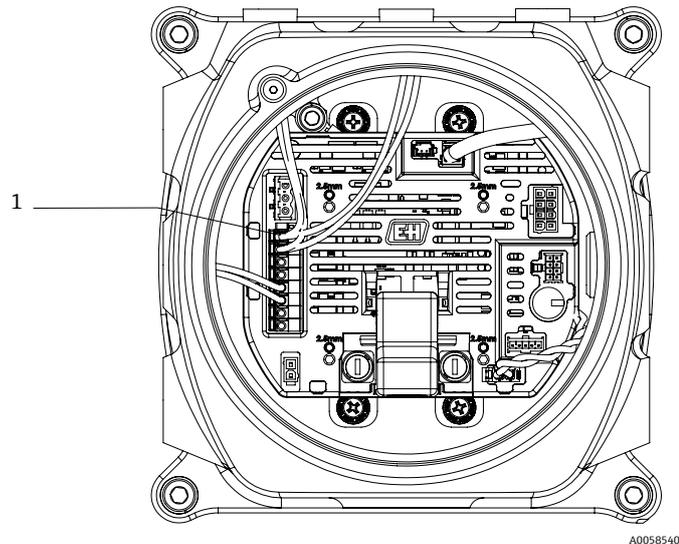


Figure 11. Mac internal view with solenoid connectors and disengagement tabs (1)

- i** If needed, use a 3 mm flathead screwdriver to press down on the tab.
  - i** On one-point auto or manual validation configurations, both solenoids are paired together in terminals 1 and 2, as shown in Figure 11. They are installed into the same terminal so both solenoids operate at the same time.
- (For one-point auto or manual validation configurations only.) Cut off the ferrules joining the two solenoid valves. This allows you to remove one solenoid from the enclosure.
  - When the ferrule releases from the connector, pull the wire to disconnect the solenoid valve.

#### To remove the electrical solenoid valve from the bracket

- i** When removing the solenoid valve from the enclosure, reserve all hardware including brackets, screws, and nuts. Additional hardware is not shipped with the kit.
- Remove the solenoid valve from the bracket with a 3 mm hex key.
  - Remove the M4 keps nut securing the valve to the bracket using a 7 mm socket or 7 mm open-ended wrench.
  - Uninstall the union using an adjustable wrench with a minimum jaw width of 1 5/8". Rotate the top nut counterclockwise to release union.

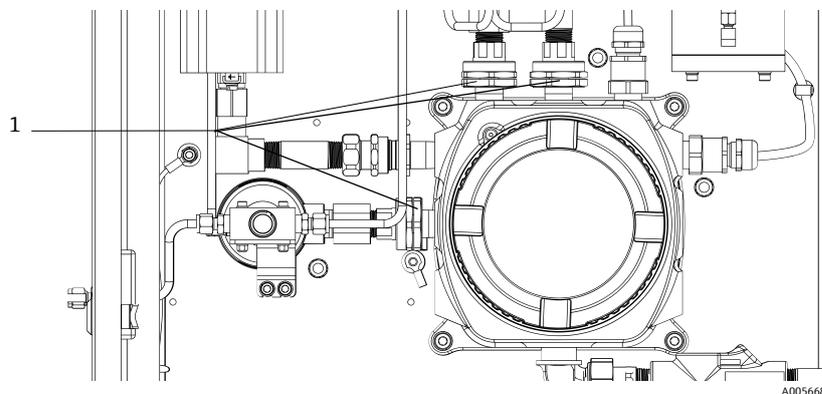


Figure 12. Disengagement nut location for the solenoid union (1)

- Pull the solenoid valve, barrier, and upper end of the union out of the sample conditioning system (refer to Figure 13 and Figure 14).

**NOTICE**

**Wiring that is potted into the barrier can snag and be damaged or cut.**

- ▶ Exercise caution when removing the solenoid valve.

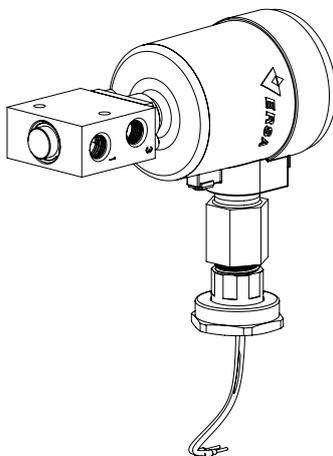


Figure 13. Removed solenoid valve

The following items are not included in the valve replacement kit and must be ordered separately if damaged:

- If the conductors are cut or damaged, order kit# 71656791 to replace the barrier.
- If the union or any conduit is damaged during the removal process, order kit# 71656795 to replace them.

**To remove the barrier and union from the solenoid valve**

1. Access the junction box located on the back of the solenoid.
  - a. For a Bifold-branded valve: Remove the cover using a 3mm hex key on the four M4 socket head cap screws. Retain the screws.

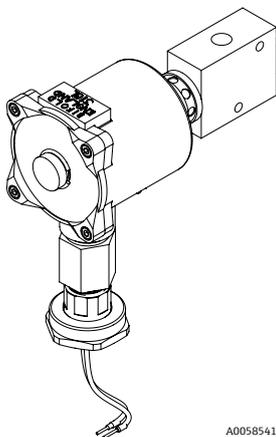


Figure 14. Bifold valve assembly

- b. For a Versa-branded valve: Remove the set screw on the side of the cover, then remove the cover using a 7/8" wrench on the knob on the top of the cover and rotate counterclockwise. Retain the set screw.

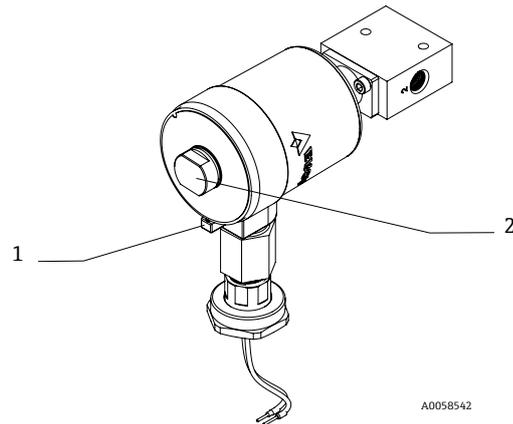


Figure 15. Versa valve assembly with set screw (1) and 7/8" cover knob (2)

The small terminal inside the junction box is accessible once the covers are removed.

2. Using a 3 mm flathead screwdriver, loosen the ferrules from the terminal.

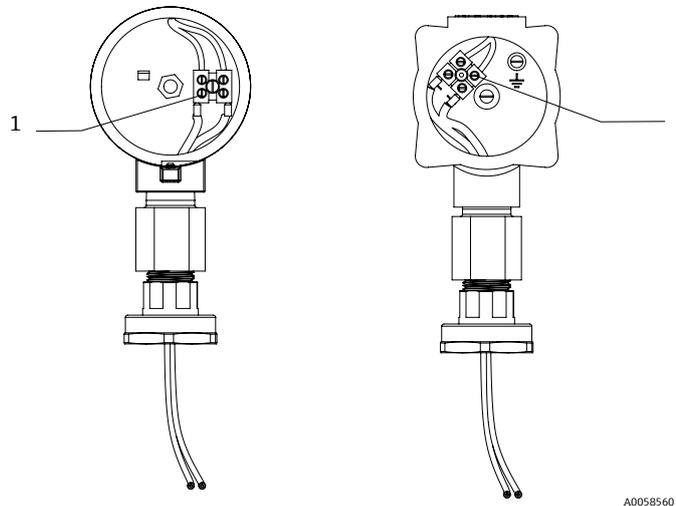


Figure 16. Solenoid terminals (1)

3. Remove the barrier conductors from the terminals.
4. Remove the barrier, union, and nipple from the valve. Retain these parts. They will be reused when the new solenoid valve is installed.
  - i** If the threads on the barrier are galled or damaged, use a new barrier (order part number 71656791). If the nipple or union threads are damaged when removed, use a new union or plug (order part number 71656795).
5. Replace the solenoid valve covers:
  - For Bifold valves, secure the cover using the four M4 socket head cap screws and a 3mm hex key.
  - For Versa valves, secure the cover using a 7/8" wrench on the knob on the top of the cover, then replace the set screw on the side.

### 4.3 Pneumatic valve removal

If a pneumatic valve is leaking or contaminated, remove it using the following steps. During removal, note which valve is being serviced and the orientation of valve connectors. Each specific valve can only be reinstalled the way it was originally oriented.

- i** If both pneumatic valves need to be replaced, remove the entire valve assembly. It is easier to remove and install the replacement valve while the valve assembly is out of the enclosure.

**WARNING**

- ▶ All electrical signals must be terminated before opening any explosion-proof enclosure.

### 4.3.1 Removing a single pneumatic valve

#### To remove a pneumatic valve

1. Turn off, isolate, and purge the SCS following the procedure described in *section 2.2.2* → .
  2. Using 9/16" and 7/16" open-ended wrenches, disconnect the tubing connected to the valve by rotating the nut counterclockwise until the tubing can be pulled from the connectors. The following may be applicable:
    - Remove all tubing directly connected to the valve being serviced.
- i** Disconnecting all tubing from the other components connected to the valve ensures the tubing is not damaged when the valve is removed from the enclosure.

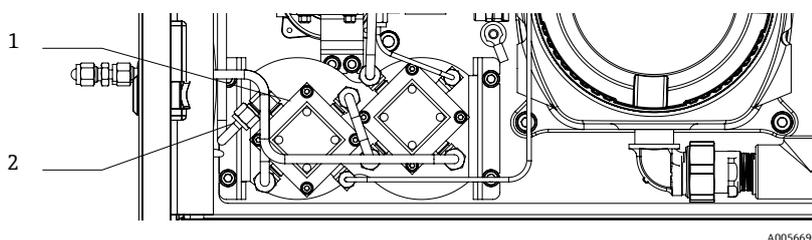


Figure 17. Pneumatic valves (1) with fittings (2)

3. Remove the M4-0.7x25 mm socket head cap screws connecting the valve to its bracket using a 3 mm hex key.
4. Remove the pneumatic valve from the enclosure.

### 4.3.2 Removing the pneumatic valve assembly

Two possible pneumatic valve assemblies can be serviced in the JT33 TDLAS gas analyzer: the pneumatic assembly controlling validation gas, and the pneumatic assembly controlling sample to the scrubber or measurement cell. Refer to the instructions related to your requirements below.

Before removing a pneumatic valve assembly from the sample conditioning system, remove the tubing connected to the assembly to prevent possible damage. Refer to Figure 28, Figure 29, and Figure 30 for an overview of the pneumatic valves in the JT33 TDLAS gas analyzer.

#### To remove the validation pneumatic assembly

1. Turn off, isolate, and purge the SCS following the procedure described in *section 2.2.2* → .
  2. Using 9/16" and 7/16" open-ended wrenches, disconnect the tubing connected to the valve by rotating the nut counterclockwise until the tubing can be pulled from the connectors. The following tubes must be removed:
    - The tube connected to the membrane separator. The tube end installed on the membrane separator side can remain installed.
    - The tube connecting the validation pneumatic assembly to the measurement cell and scrubber pneumatic assembly. Disconnect this tube from both ends.
    - The 1/4" tubes connecting the validation bulkheads to the validation assembly. Disconnect these two tubes from both the valves and the bulkheads connected to the wall. If left in place, they will restrict the pneumatic assembly during removal.
    - The 1/8" air lines connected to the electric solenoids. Disconnect these tubes from both the pneumatic side and the solenoid side to ensure they are not damaged when the pneumatic valve assembly is pulled in or out.
- i** Disconnecting all tubing from the other components connected to the pneumatic assembly ensures the tubing is not damaged when the pneumatic assembly is removed from the unit.

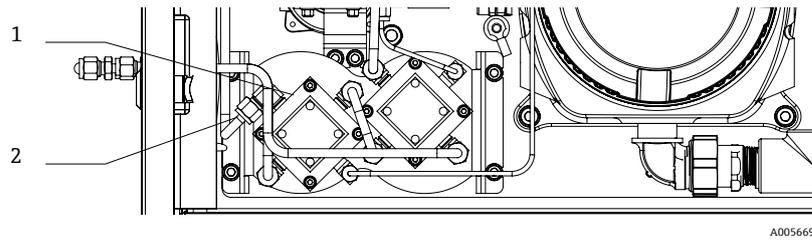


Figure 18. Pneumatic valves for validation control (1) with fittings (2)

3. Remove the four M6-1.0 x 12 mm socket head cap screws that secure the pneumatic assembly bracket onto the panel using the 5 mm hex key.
4. Remove the assembly from the enclosure.

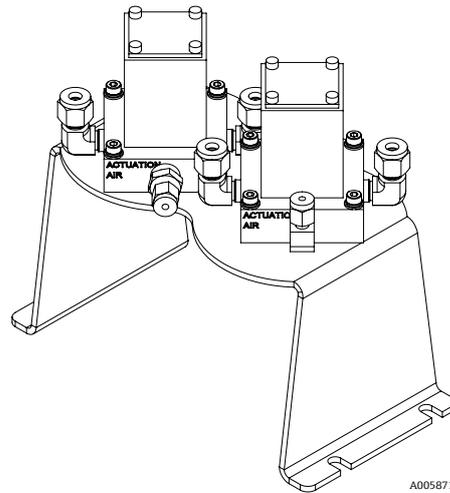
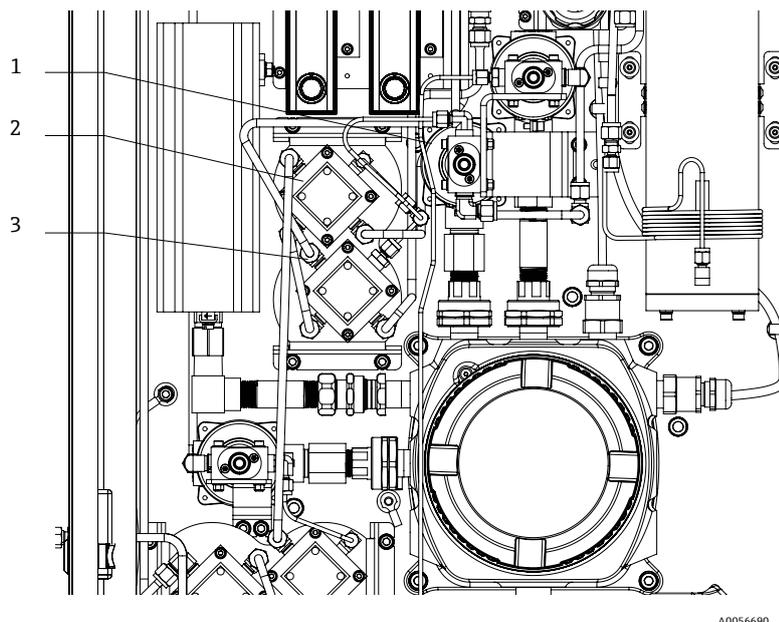


Figure 19. Pneumatic valve assembly

#### To remove the scrubber pneumatic assembly

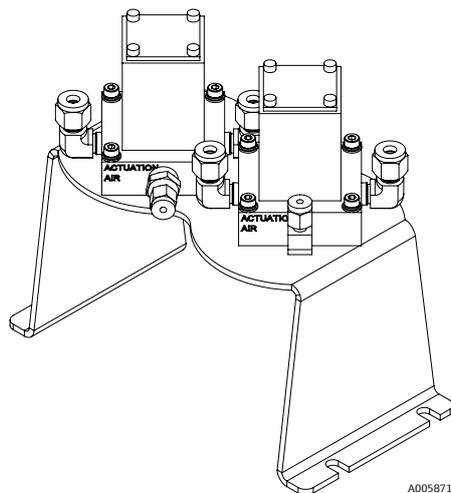
1. Turn off, isolate, and purge the SCS following the procedure described in [section 2.2.2](#) → .
  2. Using 9/16" and 7/16" open-ended wrenches, disconnect the tubing connected to the valve by rotating the nut counterclockwise until the tubing can be pulled from the connectors. The following tubes must be removed:
    - Disconnect the tube connecting the validation pneumatic assembly to the measurement cell and scrubber pneumatic assembly. Disconnect this tube on both ends.
    - Disconnect the 1/8" air line between the pneumatic valves and solenoid valve 2 (see figure below, also refer to [Figure 24. Solenoid valve locations](#) → ). Disconnect this tube on both ends.
    - Disconnect the tube routed to the top of the scrubber and the pneumatic valve assembly. Disconnect this tube on both ends.
    - Disconnect the tube routed from the scrubber indicator to the pneumatic valve assembly. Disconnect this tube on both ends.
-  Disconnecting all tubing from the other components connected to the pneumatic assembly ensures the tubing is not damaged when the pneumatic assembly is removed from the unit.



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Figure 20. Solenoid valve 2 (1) and pneumatic valves for scrubber control (2) with fittings (3)

3. Remove the four M6-1.0 x 12 mm socket head cap screws that secure the pneumatic assembly bracket onto the panel using the 5 mm hex key.
4. Remove the assembly from the enclosure.



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Figure 21. Pneumatic valve assembly

## 4.4 Manual valve removal

If a manual valve is leaking or contaminated, remove it using the following steps.

### **⚠ WARNING**

- ▶ All electrical signals must be terminated before opening any explosion-proof enclosure. The MAC does not need to be accessed for this procedure.

#### To remove a manual valve

1. Turn off, isolate, and purge the SCS following the procedure described in *section 2.2.2* → .
2. Remove the fittings on the three-way ball valve using the 9/16" open-ended wrench.

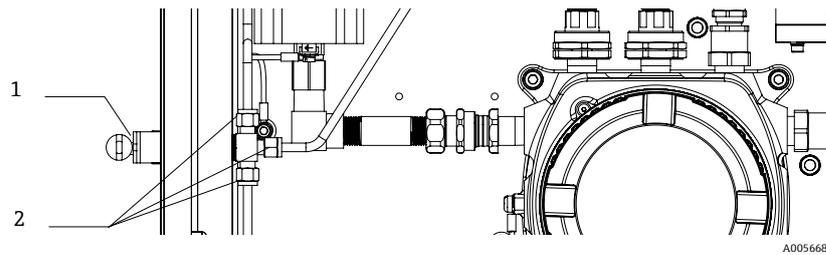


Figure 22 . Manual 1-point validation with ball valve (1) and fittings (2)

3. Using a 5/64" hex key, loosen the set screw on the valve handle on the exterior of the SCS.
4. Remove the valve handle.  
The enclosure nut that secures the valve assembly onto the enclosure is now accessible.
5. Remove the enclosure nut with a 15/16" open-ended wrench.
6. Pull the assembly out of the enclosure from the inside of the cabinet.

## 5 Installing

When the old valve or valves have been removed, the analyzer is ready for reassembly and installation of the new valve.

### 5.1 Electric solenoid installation

This section covers the following instructions related to installing the new solenoid valve:

- Assembling the solenoid valve wiring and barrier
- Orienting the fittings to the valve and MAC
- Installing the electric solenoid valve assembly

#### 5.1.1 Assembling the solenoid valve wiring and barrier

To assemble the solenoid valve wiring and barrier

1. Remove the cover from the new solenoid's explosion-proof housing:
  - a. For a Bifold valve, use a 3 mm hex key.
  - b. For a Versa valve, use the 7/8" wrench.
2. Install the barrier directly onto the new solenoid.
3. Route the wires to the terminal inside the solenoid valve and secure the conductors.
 

**i** The wire can be placed into either terminal. Polarity does not impact the operation of the device.
4. Re-attach the explosion-proof cover.
5. Install the close nipple into the barrier, followed by the union that was removed from the unit's old valve assembly.

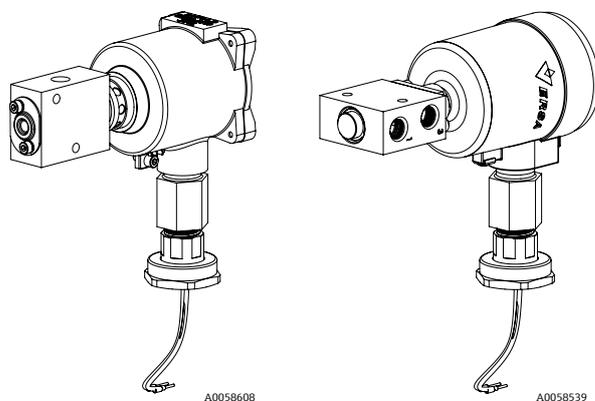


Figure 23. Completed solenoid valve assembly

#### 5.1.2 Orienting the solenoid valves

This section provides valve and fitting orientations for all configurations of the JT33 TDLAS gas analyzer sample conditioning system. Each valve assembly must be correctly oriented before installation. Valve assembly orientation is dependent on the placement of fittings and valve connections inside the analyzer.

Refer to the illustrations of valve connector placement and orientation below. Follow the configuration that matches the build for your specific analyzer.

- i** The orientation of valve connections depends on the type of valve built into the analyzer. If a valve is not replaced with the exact type, the piping within the enclosure will not work.
- i** Ensure the fittings have the correct orientation before attempting to install the valve.

5.1.2.1 Valve and fitting orientation for systems with solenoid electrical and manual valves

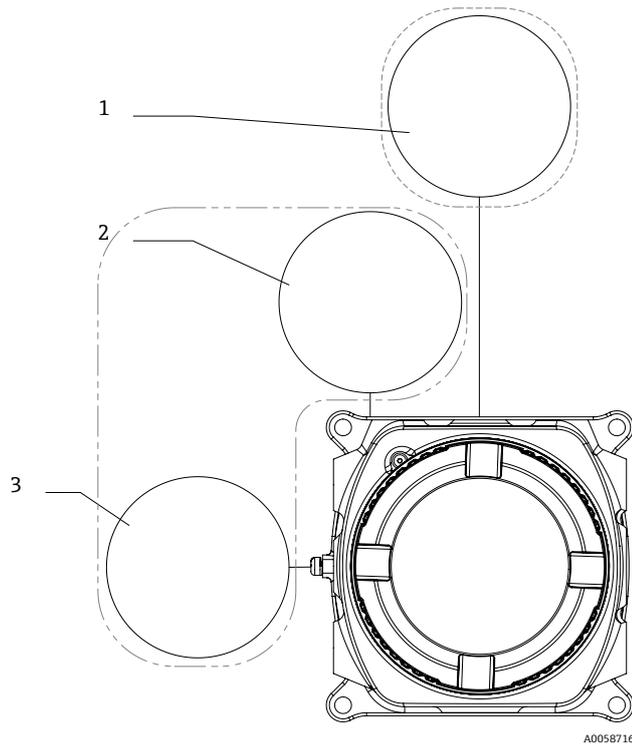
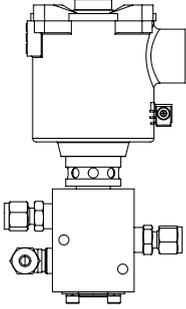
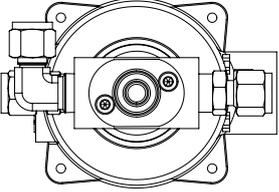


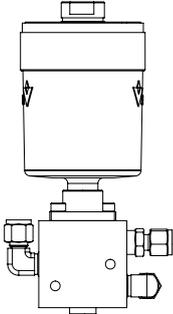
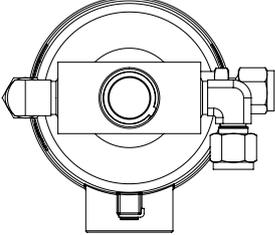
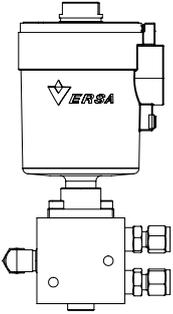
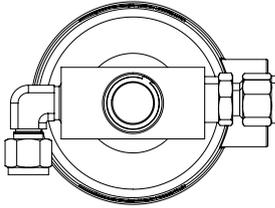
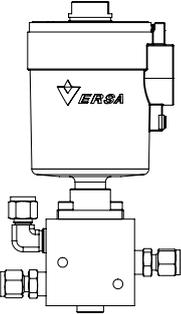
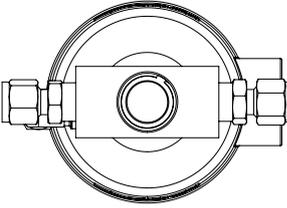
Figure 24. Solenoid valve locations

For electrical solenoid and manual valve systems utilizing Bifold valves

#	Description	Valve orientation	
		Top view	Front view
1	SOV 1		
2	SOV 2		

#	Description	Valve orientation	
		Top view	Front view
3	SOV 3		

For electrical solenoid and manual valve systems utilizing Versa valves

#	Description	Valve orientation	
		Top view	Front view
1	SOV 1		
2	SOV 2		
3	SOV 3		

5.1.2.2 Valve and fitting orientation for systems with pneumatic valves

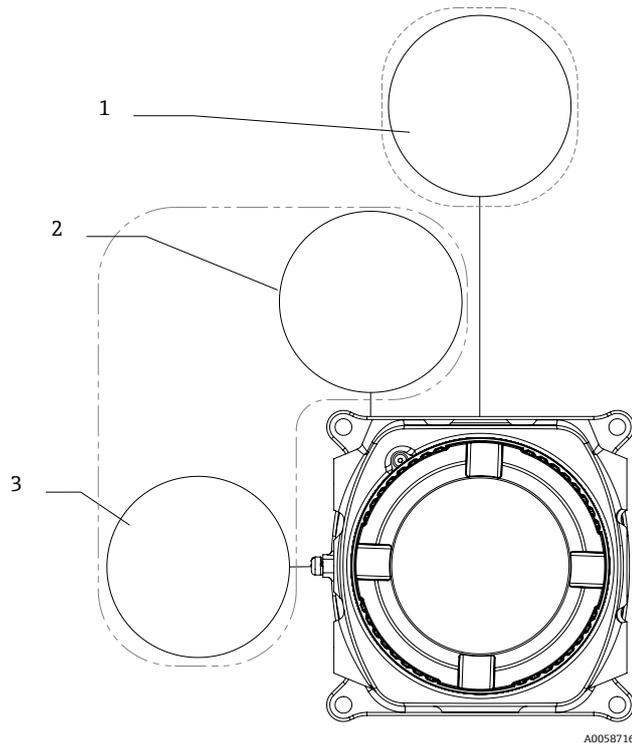
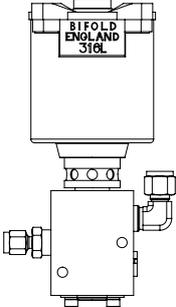
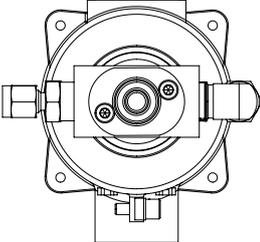
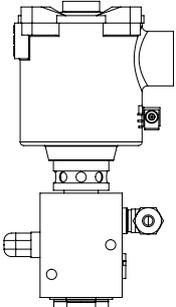
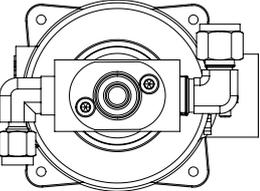
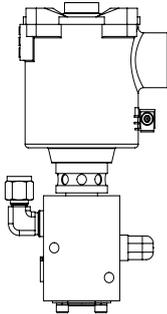
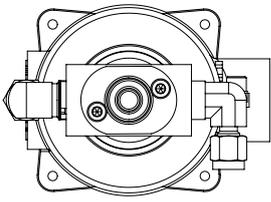


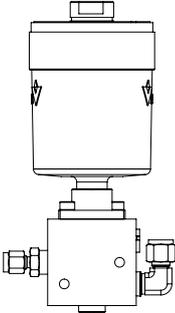
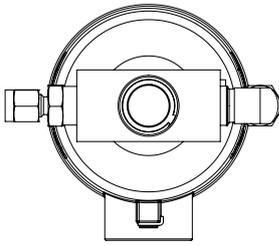
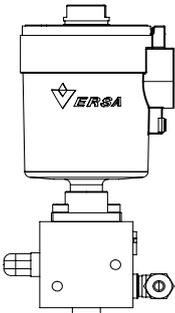
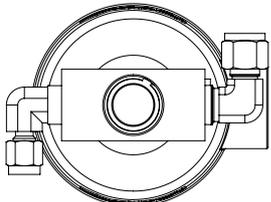
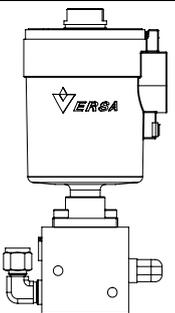
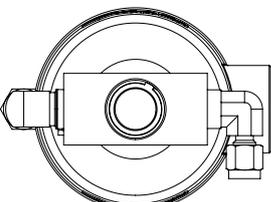
Figure 25. Pneumatic valve locations

For pneumatic valve systems utilizing Bifold valves

#	Description	Valve orientation	
		Top view	Front view
1	Pneumatic valve: SOV 1		
2	Pneumatic valve: SOV 2		

#	Description	Valve orientation	
		Top view	Front view
3	Pneumatic valve: SOV 3		

For pneumatic valve systems utilizing Versa valves

#	Description	Valve orientation	
		Top view	Front view
1	Pneumatic valve: SOV 1		
2	Pneumatic valve: SOV 2		
3	Pneumatic valve: SOV 3		

When the connectors are secured in the correct orientation, the assembly can be installed.

### 5.1.3 Installing the electric solenoid valve assembly

To install the electric solenoid assembly

1. Route the conductors through the union that is connected to the MAC and into the MAC interior.
2. Secure the union in place.
3. Attach the rear of the valve assembly to the bracket using the two M4 x 0.7-35 mm socket head screws, washers, and lock nuts as shown below.

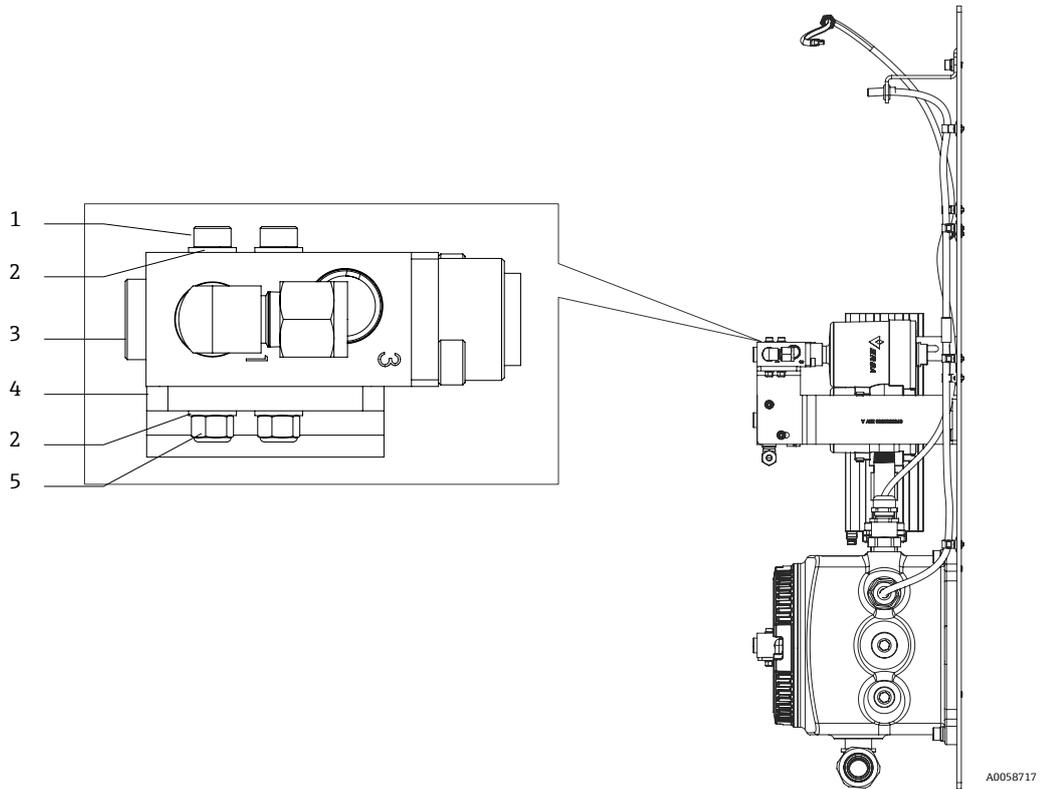


Figure 26. Side view of solenoid valve installed into MAC with detailed view of the valve installation

#	Description	#	Description
1	M4 x 0.7-35 mm socket head screws	4	Bracket
2	Washer	5	Nylon lock nut
3	Solenoid valve		

4. Inside the MAC, connect the valve wiring to the appropriate MAC terminals.
  - i** Refer to the wiring connection schematic inside the MAC cover for electrical and pneumatic wiring specific to your analyzer.

## 5.2 Pneumatic valve installation

There are two pneumatic valve assemblies installed in the JT33 TDLAS gas analyzer sample conditioning system:

- A validation assembly that can be assembled in a one- or two-point configuration (*lower left*).
- A cell scrubber assembly that can only be assembled into one configuration or layout (*right of heater*).

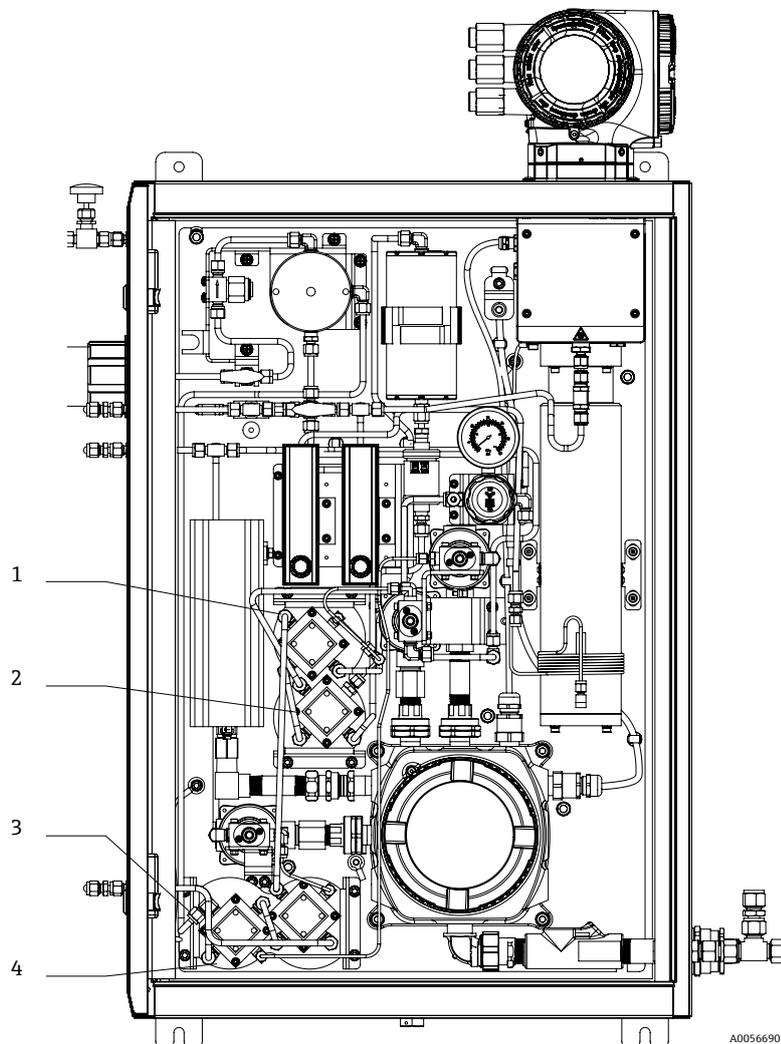


Figure 27. Pneumatic valves in the JT33 gas analyzer sample conditioning system

#	Description	#	Description
1	Common port (process gas inlet)	3	Common port (process gas inlet)
2	Valve for measurement cell or scrubber	4	Two-point validation valves

Pneumatic valve installation is described in two sections: installing a valve onto the bracket and installing the valve assembly into the system. Follow the section that applies to your repair.

### 5.2.1 Orienting the pneumatic valves

This section provides pneumatic valve and fitting orientations. Ensure that the port orientation is correct when installing a pneumatic valve or assembly.

The ports on the Parker pneumatic valves are marked to assist that this is done correctly. Refer to Figure 27 for fittings placement and installation orientation of the valves into the cabinet.

5.2.1.1 Assembly of pneumatic valves for measuring cell and scrubber

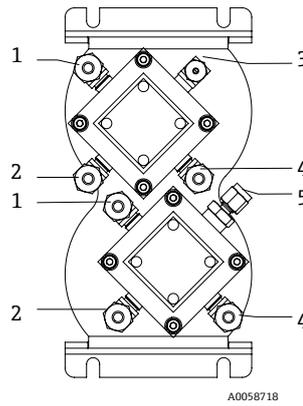


Figure 28. Orientation of pneumatic valves for measuring cell and scrubber

#	Description	#	Description
1	Common port	4	Normally closed
2	Normally open	5	Air 1/8" TF straight connector
3	Air 1/8" TF, 90 D connector pointed upward		

5.2.1.2 Assembly of pneumatic valve for 1-point validation

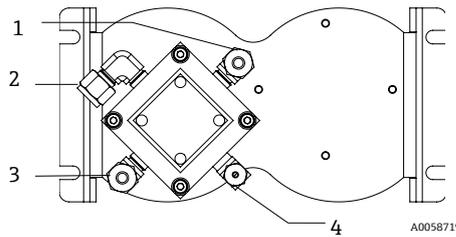


Figure 29. Orientation of pneumatic valve for 1-point validation

#	Description	#	Description
1	Common port	3	Normally closed
2	Normally open	4	Air 1/8" TF, 90 D connector pointed upward

5.2.1.3 Assembly of pneumatic valves for 2-point validation

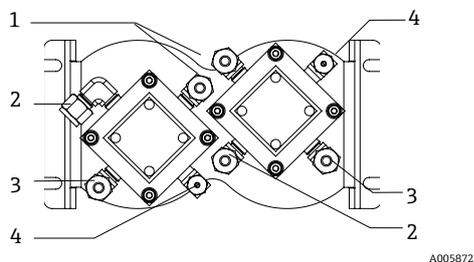


Figure 30. Orientation of pneumatic valves for 2-point validation

#	Description	#	Description
1	Common port	3	Normally closed
2	Normally open	4	Air 1/8" TF, 90 D connector pointed upward

### 5.2.2 Installing a valve onto the assembly bracket

Once the pneumatic valve is correctly oriented, the valve can be installed onto the bracket.

To install a single pneumatic valve

- Using the 3 mm hex key, connect the valve to the bracket with a flat washer, a lock washer, and a M4-0.7 x 25 mm socket head cap screw.

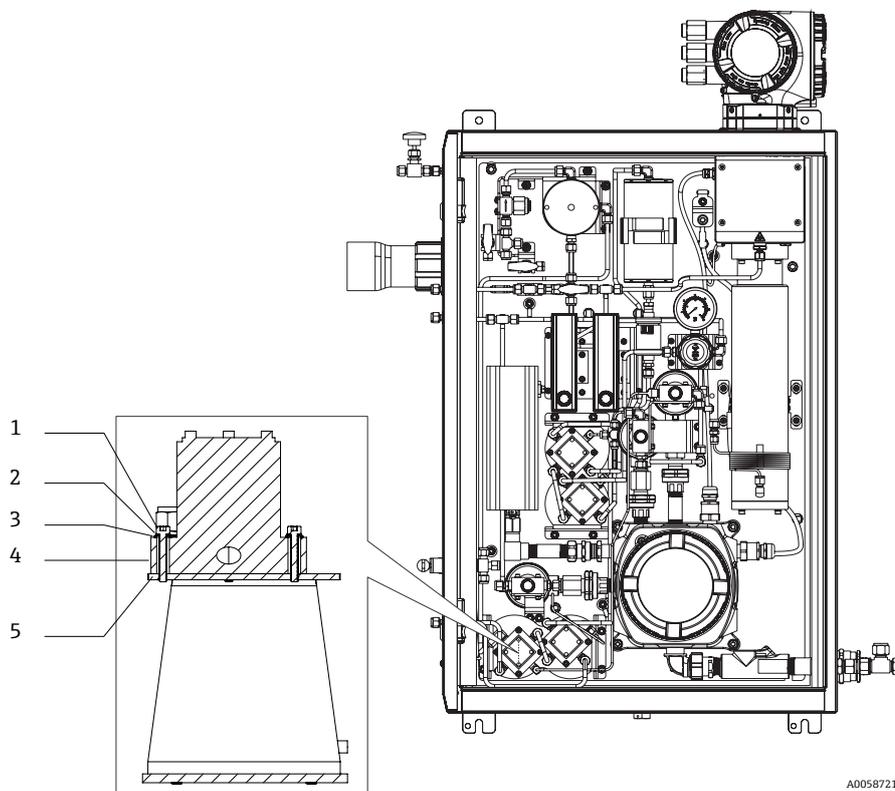


Figure 31. Cross-section of pneumatic valve assembly

#	Description	#	Description
1	M4-0.7 x 25 mm screw	4	Pneumatic valve
2	Lock washer	5	Bracket
3	Flat washer		

- Torque the screws to 2.6 Nm (23 lbf-in).
- Repeat steps 1 and 2 for each corner of the valve (4 total).
- Re-connect all tubing previously disconnected. Refer to *Removing the pneumatic valve assembly* →
- Test the valve is correctly installed:
  - Close the bypass flowmeter.
  - Open all the valves and regulators in the assembly.
  - Apply compressor air into the sample inlet and monitor the flowrate indicator on the flowmeter.  
The flowrate indicator will rise and fall if the ports are in the correct orientation.

### 5.2.3 Installing the pneumatic valve assembly

Refer to Figure 28, Figure 29, and Figure 30 for connector and port orientation.

- Complete steps 1 and 2 in *Installing a valve onto the assembly bracket* → .
- Using the 5 mm hex key, connect the valve assembly to the rear panel with a flat washer, a lock washer, and a M6-1.0x12 mm screw.

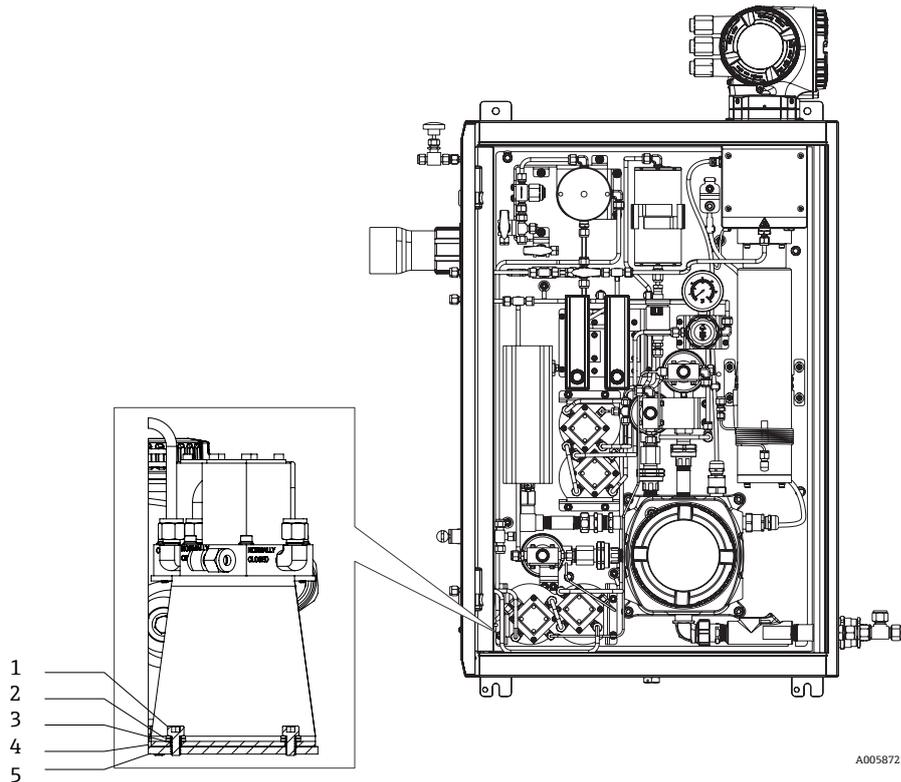


Figure 32. Pneumatic valve bracket installation

#	Description	#	Description
1	M6-1.0x12 mm screw	4	Bracket
2	Lock washer	5	Rear of enclosure or panel
3	Flat washer		

3. Torque hardware to 8.7 Nm (77 lbf-in).
4. Repeat steps 1 and 2 for each corner of the assembly bracket (4 total).
5. Re-connect all tubing previously disconnected. Refer to *Removing the pneumatic valve assembly* → .
6. Test the valve is correctly installed:
  - a. Close the bypass flowmeter.
  - b. Open all the valves and regulators in the assembly.
  - c. Apply compressor air into the sample inlet and monitor the flowrate indicator on the flowmeter.  
The flowrate indicator will rise and fall if the ports are in the correct orientation.

### 5.3 Manual valve assembly and installation

The manual valve assembly is shipped unassembled and requires assembly before installation. Refer to the figure below for assembly of the manual valve parts.

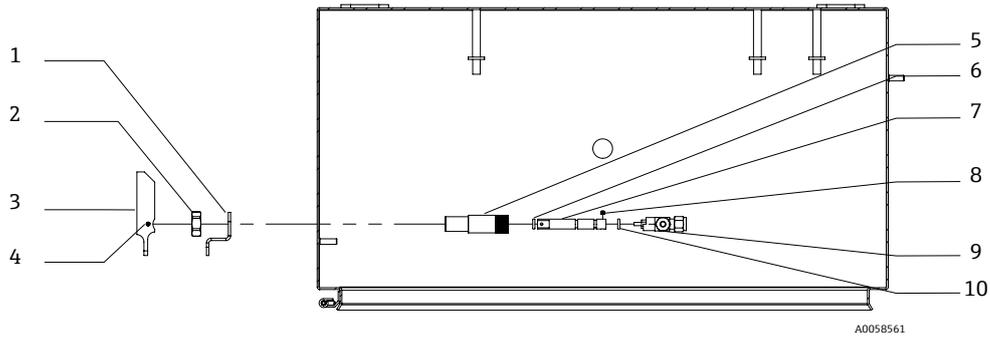


Figure 33. Manual valve assembly (top view)

#	Description	#	Description
1	Locking bracket	6	O-ring
2	Enclosure nut	7	Extension rod
3	Handle	8	Set screw 1
4	Set screw 2	9	Ball valve
5	Extension housing	10	O-ring

**To assemble the O-rings, extension rod, ball valve, and extension housing**

1. Lightly coat both O-rings Synethso glep 1 grease or equivalent.
2. On the extension rod, slide both O-rings into their respective grooves.

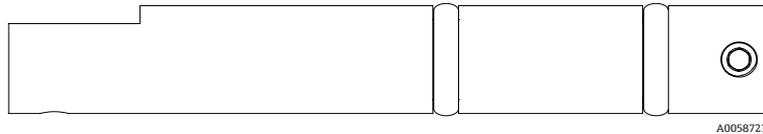


Figure 34. O-rings installed on extension rod

**i** The ball valve is shipped with a handle that is pointing at the normally open port.

3. Note the direction of the handle. Using a 5/64" hex key, remove and discard the handle.
4. Insert the extension rod onto the ball valve in place of the removed handle, aligning the flat portion on the top of the extension rod with the normally open port.

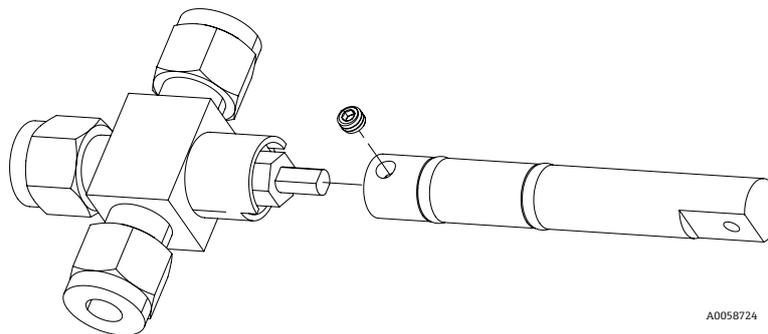


Figure 35. Extension rod assembly onto ball valve

5. Add Loctite to the setscrew.
6. Using a 5/64" hex key, tighten the extension rod onto the ball valve. Torque to 3.4 Nm (30 lbf-in).
7. Secure the extension housing over the extension rod. The housing only needs to be installed hand-tight.

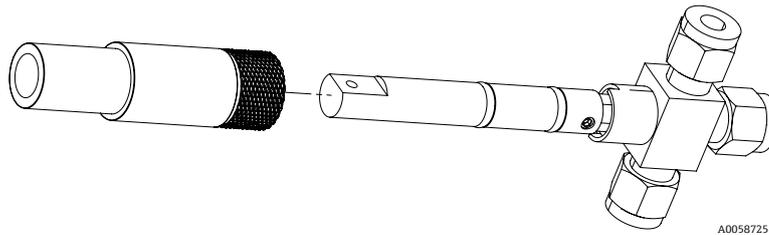
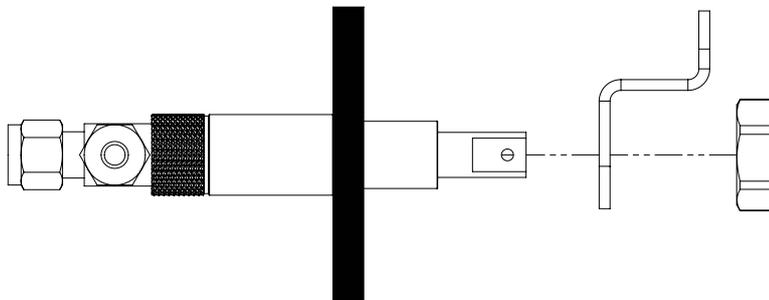


Figure 36. Extension housing assembly

**To install the manual valve in the enclosure**

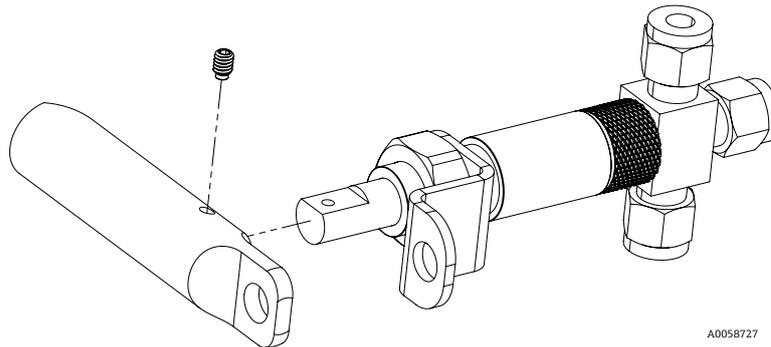
1. Insert the assembly through the manual valve opening in the enclosure. The ball valve remains inside the enclosure and the extension rod extends to the exterior of the enclosure.
2. Rotate the ball valve so the normally open port is facing the top of the enclosure, and the normally closed port is facing the bottom.
3. Attach the locking bracket and panel nut to the extension rod on the exterior of the enclosure. Torque the panel nut to 11 Nm (97.35 lbf-in).



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Figure 37. Locking bracket and panel nut assembly with nut and bracket on enclosure exterior

4. Apply Loctite on the 8-32 x .25" set screw and insert into the thread on the handle.
5. Place the handle onto the extension rod. Ensure the set screw faces the flat surface on the extension rod as shown below.



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Figure 38. Manual valve handle assembly

When aligned correctly, the set screw tip will insert itself into the extension rod.

6. Torque the set screw to 3.4 Nm (30 lbf-in).  
The manual valve is now installed.
7. Test the valve to ensure installation was completed with the correct orientation. When the handle is directed to the validation stream orientation, the validation input is not restricted.

## 6 Disposal



As required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), if the product is marked with the depicted symbol do not dispose of as unsorted waste. Instead, send them to separate collection facilities for recovery and recycling.

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