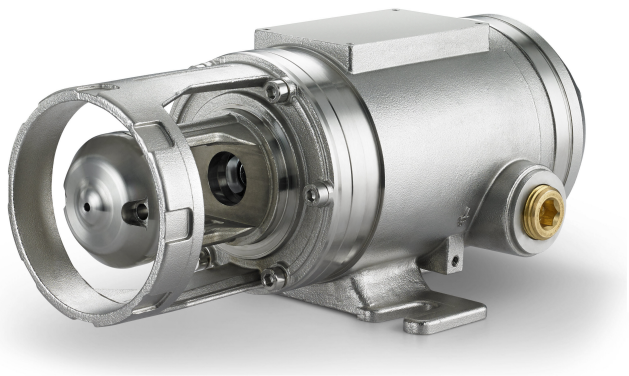
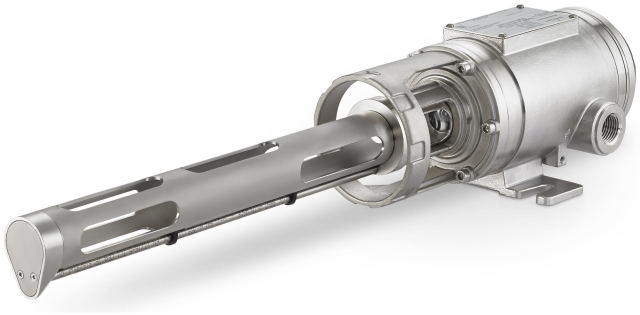
Manual
MS-00809-0100-3625, Rev AC
March 2025

Rosemount™ 625IR

Optical Infrared Gas Detector





ROSEMOUNT™

EMERSON™

Safety messages

⚠ WARNING

If the product is not used and maintained in accordance with the manufacturer's instructions, the product may not perform as intended.

Carefully read the manual in its entirety.
All those responsible for operating and maintaining this product must read and understand the manual.

⚠ WARNING

If the product is not used and maintained as described in this manual, warranties with respect to the product are voided.

Warranties are also voided if the product is used outside temperature and vibration certified ranges.

Please read the general warnings in the following chapters.

⚠ WARNING

The Rosemount 625IR Optical Gas Detector is certified for and intended for use in potentially hazardous areas. Install and use the gas detector in accordance with the appropriate local or national regulations.

⚠ WARNING

Ensure that the gas detector is properly earthed to protect against electrical shock and minimize electrical interference.

⚠ WARNING

Test gases may be combustible.

Refer to Material Safety Data Sheets for appropriate warnings.

⚠ WARNING

Only trained and qualified personnel should install and operate the detector.

⚠ WARNING

Physical access

Unauthorized personnel may potentially cause significant damage to and/or misconfiguration of end users' equipment. This could be intentional or unintentional and needs to be protected against.

Physical security is an important part of any security program and fundamental in protecting your system. Restrict physical access by unauthorized personnel to protect end users' assets. This is true for all systems used within the facility.

NOTICE

The warranty is not valid if the detector housing is opened.

Do not open the detector housing. There are no user-serviceable parts or settings inside.
Return to service point for service or repair.

Related information

Abbreviations

Warranty

- 5 (five) year limited warranty
- Infrared (IR) source warranty: 15 (fifteen) years

The Rosemount 625IR warrants for normal use within gas detection, in accordance with this manual.

Contact your supplier for further instructions on warranty and claims procedures.

Related information

Contact support

Abbreviations

Abbreviation	Definition
ATEX	Atmospheric explosives
EMC	Electromagnetic compatibility
FS	Full scale. Full gas range for the detector. For example 0 - 100% Lower Explosive Limit (LEL) or 0 - 100% volume.
HART®	Highway addressable remote transducer communication protocol
IR	Infrared light
IECEx	International Electrochemical Commission Explosion
Modbus®	Master-slave messaging structure
SIL	Safety integrity level. This is used in accordance with the standard IEC 61508.
1oo1	One out of one. Used in an SIL context, where only one detector is used to decide if the gas detection is valid.
1oo2	One out of two. Used in an SIL context. Two detectors are set up in a voting configuration, where if just one detector is detecting gas, the system will treat it as a gas incident.

Contents

1 Installation

⚠ WARNING

Ensure that the area for which the detector will be installed is in accordance with the certification of the detector and with the standards of the appropriate authority in the country concerned.

⚠ WARNING

If the service temperature of the installation may exceed +158 °F (+70 °C), ensure the following:

Cable glands are certified for the given temperature range.
Cables are suited for use at temperatures above +172 °F (+78 °C).

1.1 Install the detector

Prerequisites

Emerson recommends that the user be familiar with *IEC 60079-29-2: Explosive atmospheres gas detectors - Selection, installation, use, and maintenance of detectors for flammable gases and oxygen*.

Procedure

1. Verify that the detector is mounted in a horizontal orientation with tight bolts.
2. Verify correct wiring of the terminals.
3. Verify that the cable gland is a suitable type and has the appropriate certification.
4. Verify cable shielding has been correctly terminated.
5. Verify correct earthing to external earthing point on the detector housing.

1.2 Preparations and positioning considerations

The Rosemount 625IR is a point gas detector, and qualified personnel should carefully assess its chosen location. However, each installation is unique, and the operators must make detailed considerations locally in order to get the best coverage.

Below are some general matters to consider:

- Place the detector where maintenance, such as cleaning of optics, can be easily performed.
- Take into account the relative weight of the target gas compared to air when deciding the optimum installation height.
- The concentration of a gas cloud may quickly reduce with the distance from the leak source. Therefore, consider placing the detector as close as possible to potential leakage sources.
- Pressure building up in a duct or similar applications will change the gas reading with the same relative amplitude as the pressure changes. This applies to all optical gas detectors.

- Do not mount the detector in areas where it can be continually drenched by water.

1.3 Positioning considerations and response time

IEC 60079-29-1 mentions three methods that can be used to test response time:

- Flow (tested by manufacturer)
- Diffusion by immersion (tested by manufacturer)
- Diffusion by containment (tested by FM)

In sampling systems, the response time T90 can be as low as 1.3 seconds, but for other applications it takes more time for the gas to completely fill the sampling volume in the gas detector.

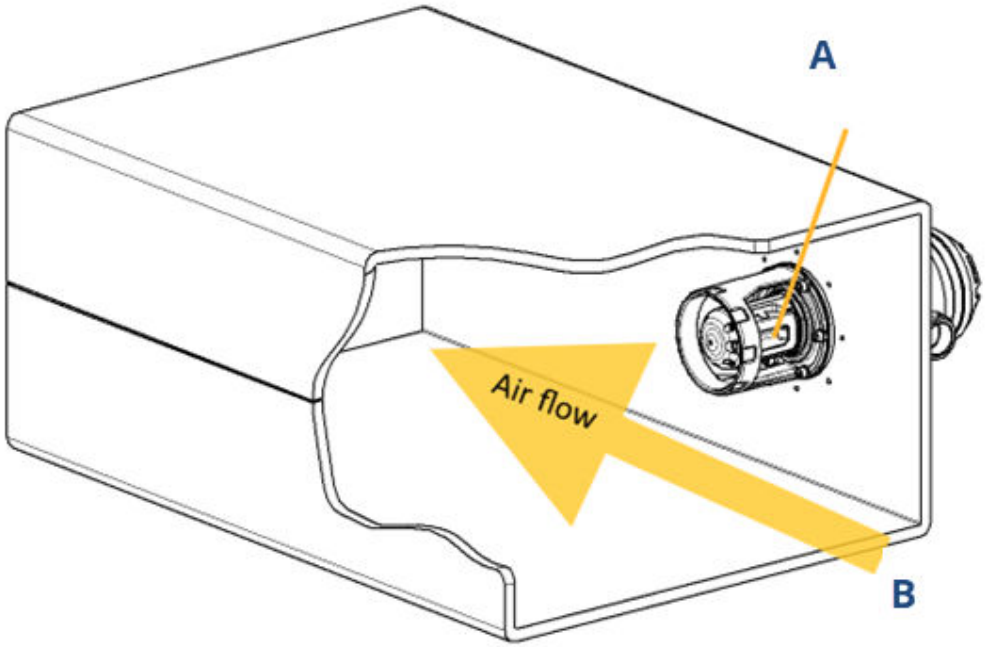
Especially for laminar flows, the response time can vary depending on how the gas detector is mounted, and this can be relevant for air intakes and ventilation systems with a laminar flow in one specific direction. The flow method is a test illustrating laminar flow. See Table 1-1 for the fastest and slowest orientations.

Table 1-1: Response Times by Test Method

Test method	Description of test method	T90 (seconds)	
		No accessories	Environment shield
Flow using the gas test kit	This is close to the fastest possible response, and is an easy method for the end user to produce. This response represents use in aspiration/gas sampling systems.	1.3 (gas flow > 5 lpm)	
Diffusion by immersion	For this method, use a chamber filled with moving gas and record the time it takes to detect gas after removing the cup. This setup emulates the detector surrounded by a gas cloud. **Note** These results are used in the ***Specifications*** sheet. The detector's orientation did not have a significant impact on the results	1.4	4
Diffusion by containment (used in FM test)	FM used this method to test the response during the performance certification tests. For this method, use water to force the gas with a specific speed and direction. With the laminar gas flow, the response time depends on the detector's orientation. The fastest and slowest orientations are indicated in parentheses.	2.1 (fast) 2.5 (slow)	4.6 (fast) 15.5 (slow)

For the shortest response time, orient the detector so the air flow is directed directly into the opening of the gas detector as illustrated in Figure 1-1.

Figure 1-1: Detector Orientation

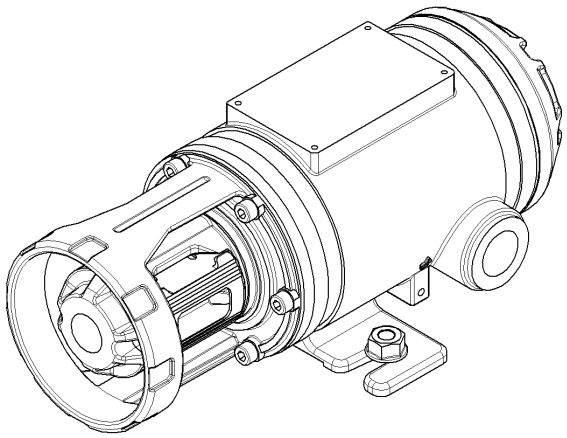


A. Recommended orientation
B. Air flow

1.4 Mounting the detector

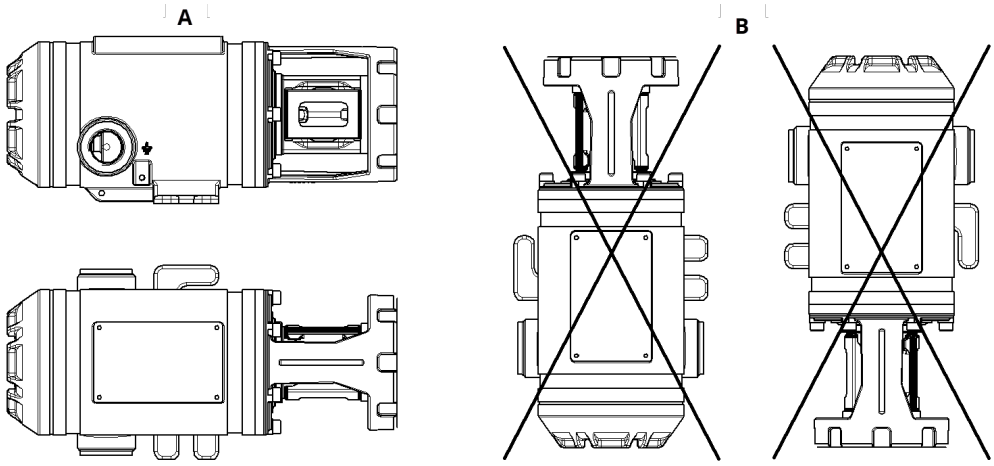
In Figure 1-2, the Rosemount 625IR is shown securely mounted.

Figure 1-2: Securely Mounted Detector



Mount the detector with the longitudinal axis in the horizontal direction as illustrated in Figure 1-3. It can be rotated in any direction along this longitudinal axis. This position reduces the accumulation of contamination on the optical parts (lens and mirror).

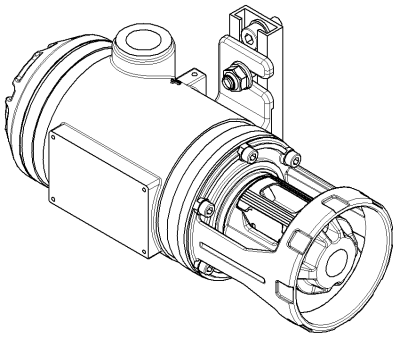
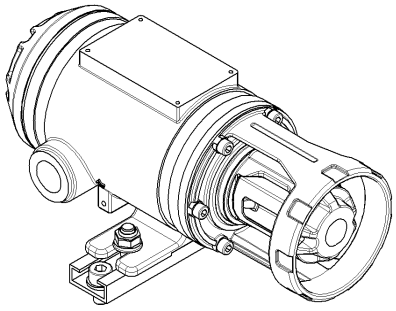
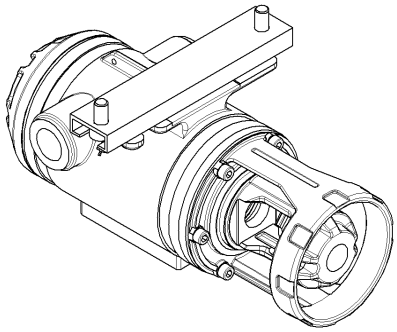
Figure 1-3: Mounting Direction



A. Correct position
B. Incorrect position

Most often, operators mount the detector on the wall, but they can also mount it flat or in the roof as illustrated in Figure 1-4.

Figure 1-4: Detector Mounting

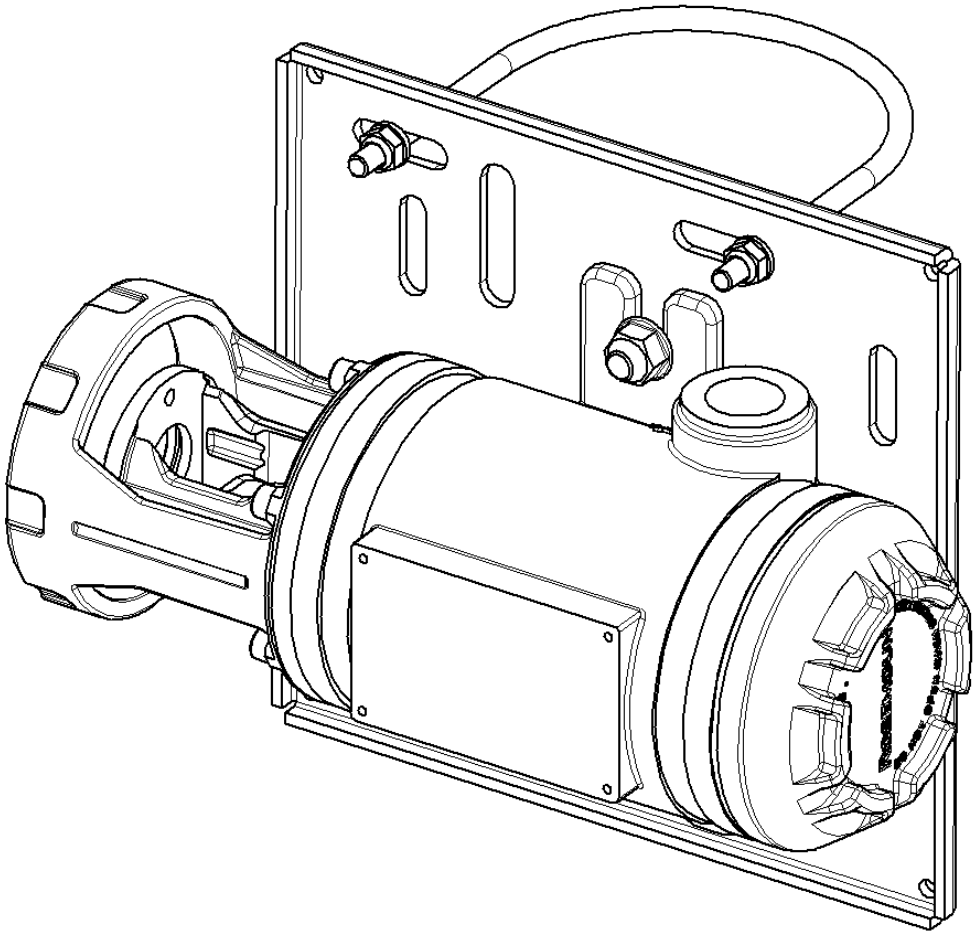
Detector mounted on the wall	Detector mounted flat	Detector mounted in roof
		

Refer to the Rosemount 625IR Manual for details of pole mounting and duct mounting.

1.4.1 Pole mounting

Figure 1-5 shows the detector with the pole mount kit. A pole with a diameter of about 3 in. (60 mm) should be sufficient.

Figure 1-5: Pole Mount Kit



2-inch pole mount kit

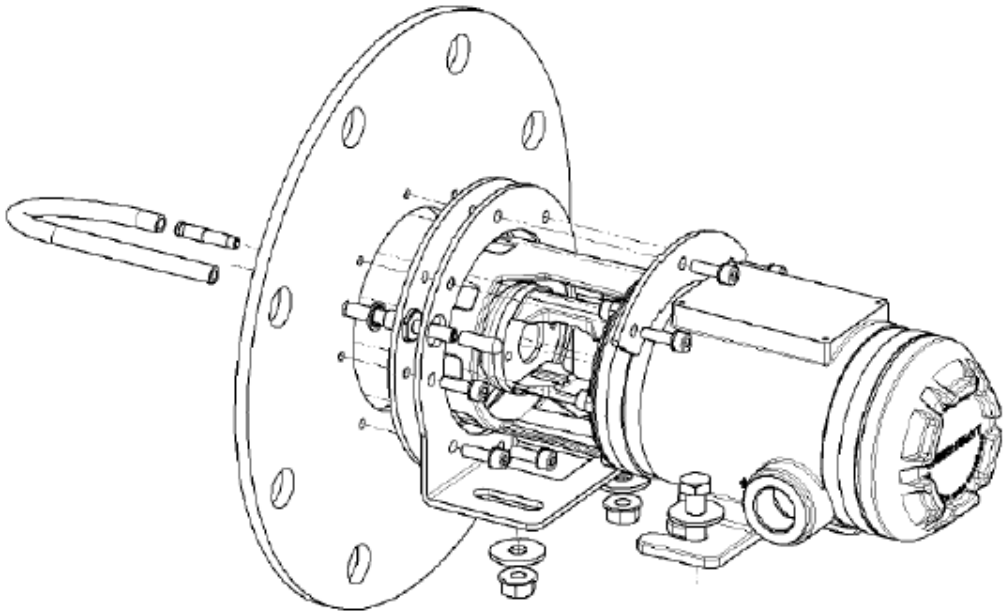
Figure 1-6 shows the detector mounted with the 2-inch pole mount kit.

Figure 1-6: Detector Mounted with 2-inch Pole Mount Kit

1.4.2 Mount to duct or pipe

If installing the detector in a ventilation duct or pipe, Emerson recommends using the mounting arrangement and accessories as shown in Figure 1-7. To get better gas coverage inside the duct, use the Rosemount 625IR Duct with extended gas sensing section as illustrated in Figure 1-7.

Figure 1-7: Detector with Longer Gas Sensing Section

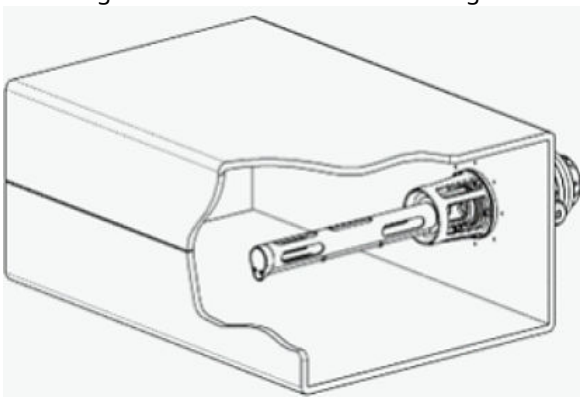


To mount the detector with the duct flange kit:

Procedure

1. Fix the plate duct flange with eight bolts to the installation.
2. Make sure the O-ring is in place and not damaged.
3. Slide the 625IR into the plate duct and fix it with the two metal brackets.

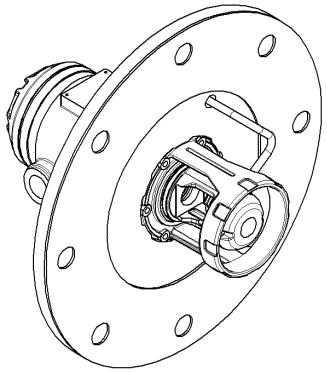
   Emerson can supply the duct flange kit with a nozzle to allow for gas testing without removing the detector from the duct flange.



1.4.3 Options for mounting detector in ducts or pipes

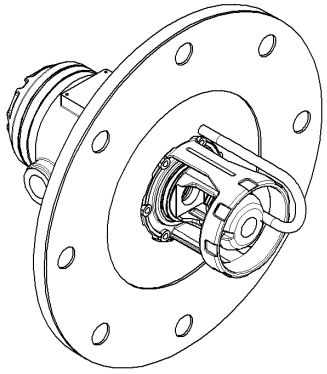
There are three possible configurations for mounting the duct flange:

Figure 1-8: Detector Mounted in the Duct Flange Kit



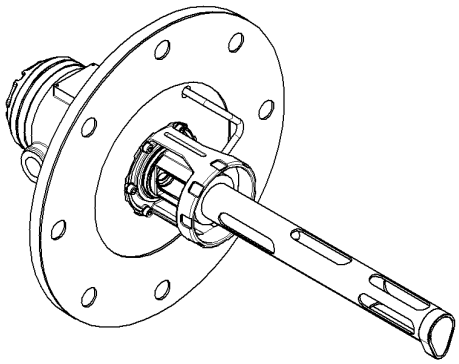
The operator can easily remove the detector from the duct to perform a gas test. The nozzle is not used for gas testing.

Figure 1-9: Detector Mounted in Duct Flange with Gas Test Line Connected to the Nozzle



Installed with the nozzle in front of the detector and a flexible tube connected from the nozzle to the duct flange. With the environment shield installed, this solution works well when the air is flowing in the duct. Without the environment shield, it is more difficult to do the gas test, since the gas dilutes more quickly and therefore requires very high flow.

Figure 1-10: Rosemount 625IR Duct Mounted in Duct Flange Kit



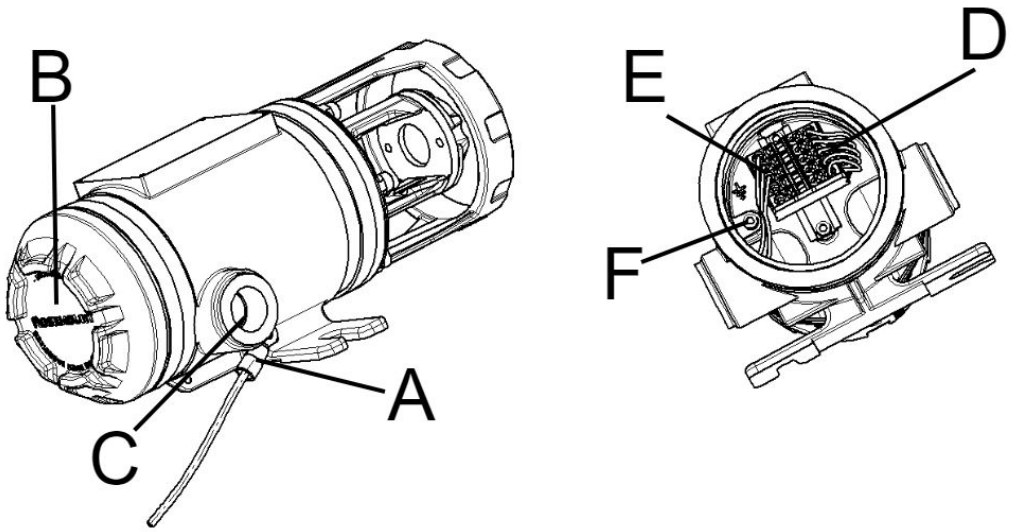
A gas test can be performed through the rigid gas pipe. It can be challenging to perform gas tests if there is air flow in the duct.

1.5 Electrical connections and earthing

Connect the detector chassis to local clean earth.

Use one of the two external earthing points illustrated in Figure 1-11 using an earthing cable ring lug.

Figure 1-11: Electrical Connections and Earthing



A. External earthing point
B. Electrical terminals inside rear lid
C. Cable entries
D. Internal wiring terminals
E. Wire terminals according to Table 1-2
F. Internal earth point for an M4 screw for connection of cable lug

The electrical terminals are located inside the rear lid. Open them by unscrewing the three screws fixing the lid to the detector. There are cable entries on both sides of the detector. The right side of the terminals are for internal wiring. On the left side are the terminals (pin 1 at the top and pin 5 at the bottom) to be wired according to Table 1-2.

Table 1-2: Terminal Specifications

Terminal (detector wire color)	Signal type	Specification	Cable requirement
1 (white)	Power, positive supply voltage	24 Vdc	Defer to site standards. Minimum cross section is 0.01 in.^{2} (0.1 mm^2), and maximum cross section is 0.1 in.^{2} (3 mm^2) (stranded) or 0.2 in.^{2} (4 mm^2) (solid).
2 (brown)	Power, supply voltage return	0 Vdc	
3 (green)	Analog safety signal	Analog 0-20 mA DC signal overlaid with a HART® signal. The HART signal does not interfere with the analog DC signal. Maximum impedance: 500 Ω	
4 (yellow)	RS-485 A	Two wires for connection to digital RS-485 serial	Industrial communication cable with shielded twisted pair. Minimum/maximum

Table 1-2: Terminal Specifications *(continued)*

Terminal (detector wire color)	Signal type	Specification	Cable requirement
5 (grey)	RS-485 B	communication, Modbus® remote terminal unit (RTU)	cross section 0.01 in.^{2} (0.1 mm)^2/0.1 in.^{2} (3 mm^2) (stranded) or maximum 0.2 in.^{2} (4 mm^2) (solid)
Earth	External earth point	Use external grounding when the detector is installed in an Ex zone.	
	Internal earth point	Normally not used. Shield of the cable is typically connected to instrument earth in the central control cabinet and is normally not terminated at the detector. If extra Radio Frequency Interference (RFI) is required, and the installation's grounding principles/regulations allow it, then the shield can be terminated to local ground via the internal earth point at the detector.	

Note
Minimum voltage to the detector is 18 Vdc.

Table 1-3: Cable Size and Maximum Length

Cable cross section	Voltage drop	Maximum cable length(1)
0.03 in.^{2} (0.8 mm^2)	~5.8 V	656 ft. (200 m)
0.04 in.^{2} (1 mm^2)		820 ft. (250 m)
0.06 in.^{2} (2 mm^2)		1312 ft. (400 m)
0.1 in.^{2} (3 mm^2)		2133 ft. (650 m)
0.2 in.^{2} (4 mm^2)		3281 ft. (1000 m)

(1) For a nominal power of 24 V. Longer cable can be used with higher supply voltage.

Related information

Light indicator
HART status flags

1.5.1 Boot up the detector

Procedure

Turn on the power to the detector.
The detector has a boot-up time of < 2 minutes when ambient temperature is above -4 °F (-20 °C). During this time, the detector runs self-diagnostics and if the indicator is configured to be active, it will be yellow.

Postrequisites

After this boot-up time, the detector is ready to detect gas. However, for a very precise and accurate test, allow the detector another 20 minutes to warm up.

1.5.2 Performing loop test

The detector can perform a loop test through the HART® or Modbus® interface. The loop test allows the analog signal output to be manually set to a selected value for a limited time.

1.6 Environmental shield

Dirt, dust, snow, and liquids gathered on the lens and mirror will reduce the amount of Infrared (IR) light used for detecting gas.

A clean detector should have about 100 percent signal strength. Over time, the optics will get dirty, and the signal strength will drop. If the signal goes below 70 percent, then the detector gives an **EARLY CLEAN OPTICS** warning. If this warning displays, then clean the optics. If the optics are not cleaned, then more dirt will accumulate on the optics. If signal strength drops below 55 percent, then the detector will go into **BEAM BLOCK FAULT**. How fast dirt accumulates on the optics depends on how dirty the environment is.

Water splash, such as from fire extinguishing systems, can also block the optics. Also, in some cases insects and other objects can block the optics. To reduce the likelihood of water or insects getting into the optical path, use an environment shield. The environment shield can also extend the time before dirt and similar substances accumulate on the optics, which can increase the cleaning intervals. Table 1-4 is an overview of the environment shield offered.

Table 1-4: Environment Shield

Type	Application examples	Performance effect
Environment shield	The standard environment shield comes with the Rosemount 625IR. It gives good protection from ingress of water and other contaminants.	Gas response time is specified with the environment shield in place. Without the environment shield, the response time is slightly faster.

For the fastest response time, use the detector without the environment shield. In most cases, Emerson recommends using the environment shield, since it makes the detector more robust against water and dirt. Even with the environment shield, the detector has a very fast response time.

The environment shield for the detector consists of one compact unit fitting into the gas sensing section. Emerson has designed the environment shield for optimum performance of the detector. Figure 1-12 shows how the environment shield slots into the sensing section of the Rosemount 625IR. Before inserting the environment shield, visually inspect the detector to verify that it is free from dirt and blocking substances. Ensure that the shield is inserted all the way.

Figure 1-12: Inserting the Environment Shield

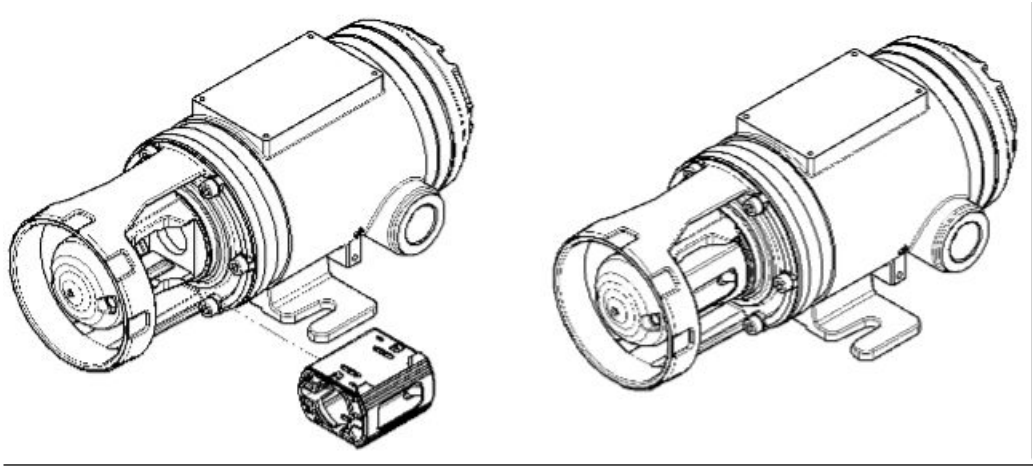
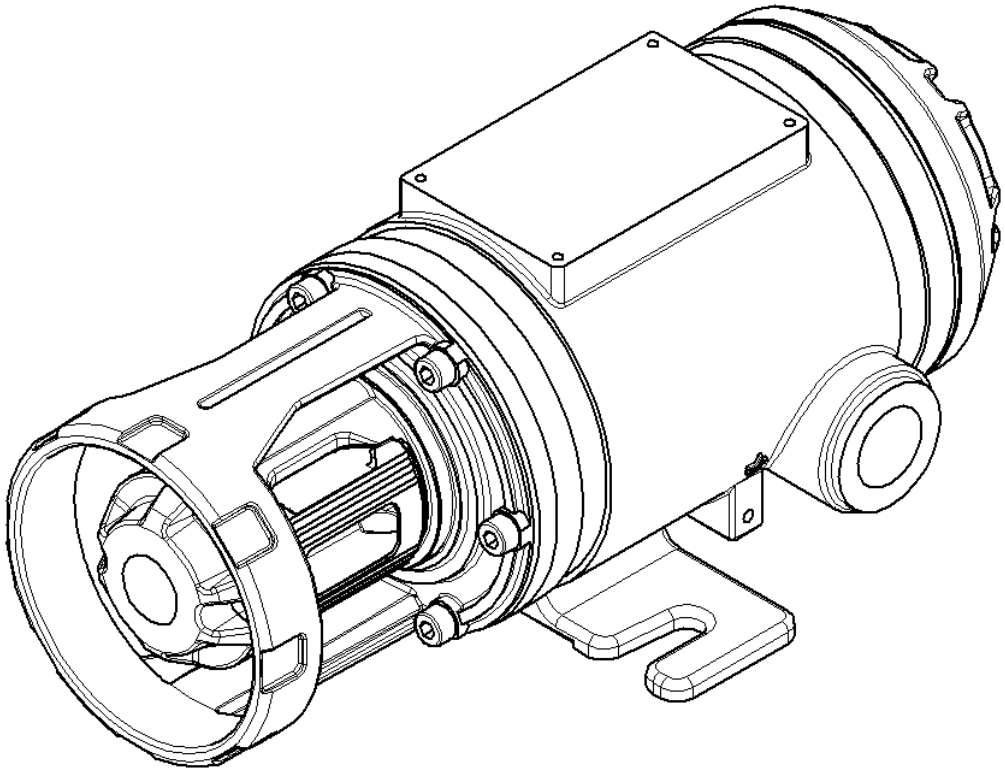


Figure 1-13: Detector with Environment Shield Inserted



Refer to the Rosemount 625IR Manual for details of all accessories.

Related information

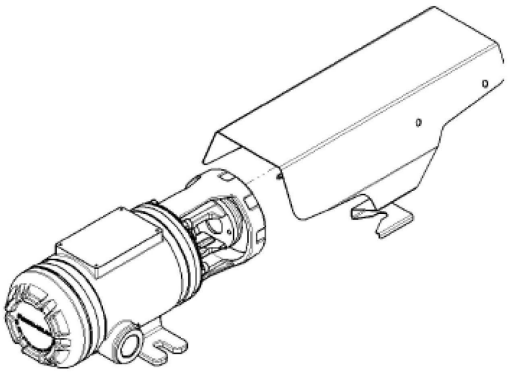
Clean optics (lens and mirror)

1.7 Sunshade

The operator can fit the detector with a sunshade, keeping it from being exposed to direct sunlight. The sunshade can also stop the accumulation of snow, sand, or other unwanted substances.

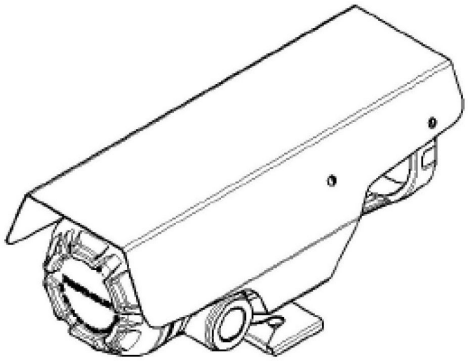
The following figures illustrate how to install the sunshade. Use the same screws as the detector to mount the sunshade.

Figure 1-14: Sunshade front



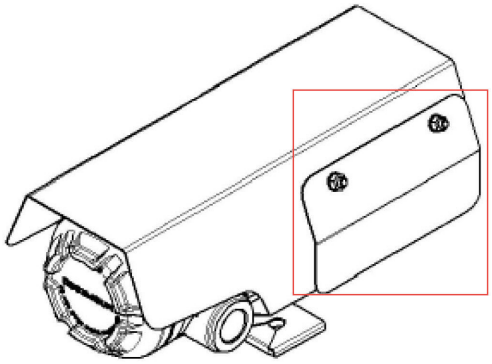
Slide the sunshade in from the front.

Figure 1-15: Secure the sunshade



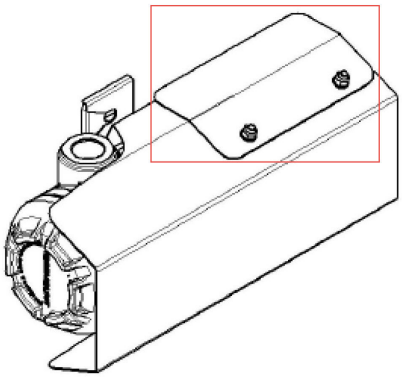
Secure the sunshade with the same screws as the detector mounting.

Figure 1-16: Extra section



The extra section of the sunshade in the sunshade kit can be used to give extra shielding in some applications, but is normally not used for horizontal mounting.

Figure 1-17: Wall or pole mounting



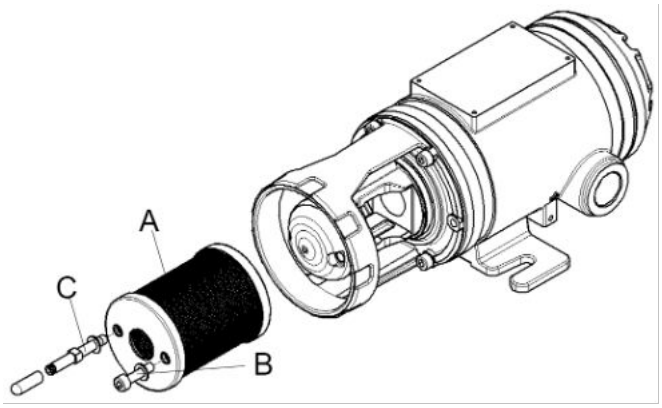
For wall or pole mounting, Emerson recommends using the sunshade and extra section to shield the detector from direct sunlight, rain, and snow.

1.8 Mosquito net

The mosquito net accessory can be fitted to the gas detector to prevent insects from blocking the optics.

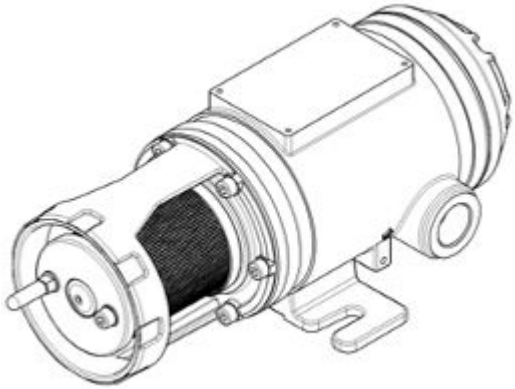
Fit the mosquito net on the outside of the detector nose and secure it with the screw and the gas nozzle. The mosquito net may also be used in combination with the environment shield for a combined splash and insect protection.

Figure 1-18: Mounting Mosquito Net



A. Mosquito net
B. Screw
C. Gas nozzle

Figure 1-19: Mosquito Net Installed on the Rosemount 625IR



1.9 Blocking kit

Site maintenance, such as sand blasting and painting, might damage the detector. To protect the detector during such work, Emerson recommends using the blocking kit accessory (part number 00625-9200-0008).

The blocking kit fits into the detector, protecting both the optics and detector from paint, sand blasting, and dirt. Inside the blocking kit, there is a protection bag that fits over the housing. The blocking kit fits on the nose section and blocks the optics, forcing the detector into sending a **Fault** signal.

2 Configure the detector

Procedure

1. Turn on power to the gas detector.
   The detector runs self-diagnostics and warms up.
2. Verify the status indicator light alarm levels and change them if necessary.
   The default settings might be different from the site alarm levels.
3. Perform the function test.
4. Verify that the site safety system is receiving the gas signal from the detector.

Related information

Boot up the detector
Function test

3 Operation

During operation, there is very little to do with the detector other than performing regular function tests and cleaning the lens and mirror if they are dirty.

3.1 Function test

To perform a function test, apply gas using one of the gas test kits or the gas free testing kit, which simulates 50 percent Lower Explosive Limit (LEL) methane. This is a simple test carried out to make sure the detector will respond when exposed to gas and is often referred to as bump testing.

Perform this test on a regular basis to verify the safety functions of the detector. Use this test to confirm that the detector is responding to gas presence and generating the correct outputs as prescribed. The operator can select from one of the methods, depending on the configuration of the detector and local preferences.

Test interval

The time between two periodical tests of the detector's safety functions is from a safety context called the test interval. The Rosemount 625IR is certified in accordance with the standard IEC 61508 with Safety Integrity Level 2 (SIL2) rating. If used in a one out of two (1oo2) configuration, the detector is rated for SIL3.

NOTICE

Gas being released from a gas cylinder will give a very small gas cloud, which dilutes very quickly. This is challenging when testing a gas detector, since the gas reaching the gas detector will have a much lower concentration compared to what is stated on the gas cylinder. If there are windy conditions, then it can be especially challenging to get any gas to the detector with a small amount coming from a gas cylinder.

For example, if a 50 percent LEL test gas is used and is injecting at 2 liters/minute into a 624IR fitted with an environment shield using the gas test kit, this can result in a gas reading as low as 20 percent LEL in windy conditions.

Take precautions when testing a detector to get valid results.

Related information

Verify detector accuracy

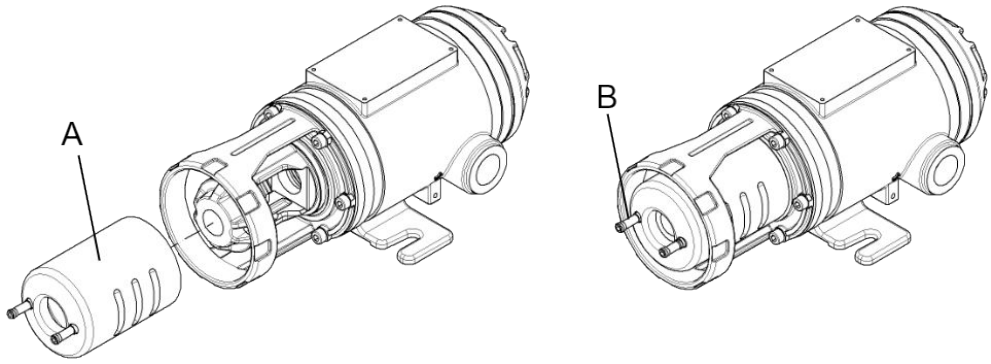
3.1.1 Perform a function check with the gas test kit

Use the gas test kit to quickly verify the functionality of the detector without having to remove the environment shield, if fitted. The gas test kit has an opening in the front between the gas nozzles that allows for the operator to see the indicator showing the detector's status.

Prerequisites

- Gas test kit

Figure 3-1: Inserting Gas Test Kit



A. Gas test kit
B. Gas test kit nozzles

- Gas cylinder with the same type of gas as the detector is rated to detect
  - Concentration of test gas recommended to 50% ±10% Full Scale (FS)
  - Flow rate minimum of one liter/minute
- Flexible gas hose

Procedure

1. Connect the tube from the gas cylinder to one of the gas test kit nozzles (see Figure 3-1).
2. Slide the gas test kit on the outside of the detector sensor section as illustrated in Figure 3-1.
3. Apply the gas from the gas cylinder with at least 1 liter/minute flow rate.
4. Observe that the detector indicator is showing a gas alarm or that a gas response is received at the control system.
   If the detector responds with more than 20% FS, then it has passed the test.

3.1.2 Perform a function check using the gas nozzle

This procedure is used for gas testing detectors that are mounted in a hard to reach location.

Prerequisites

The kit consists of a gas nozzle on the nose of the detector. In between the gas nozzle and gas test box, there is a gas pipe to allow for the gas to flow from the gas test box and into the detector through the gas nozzle.

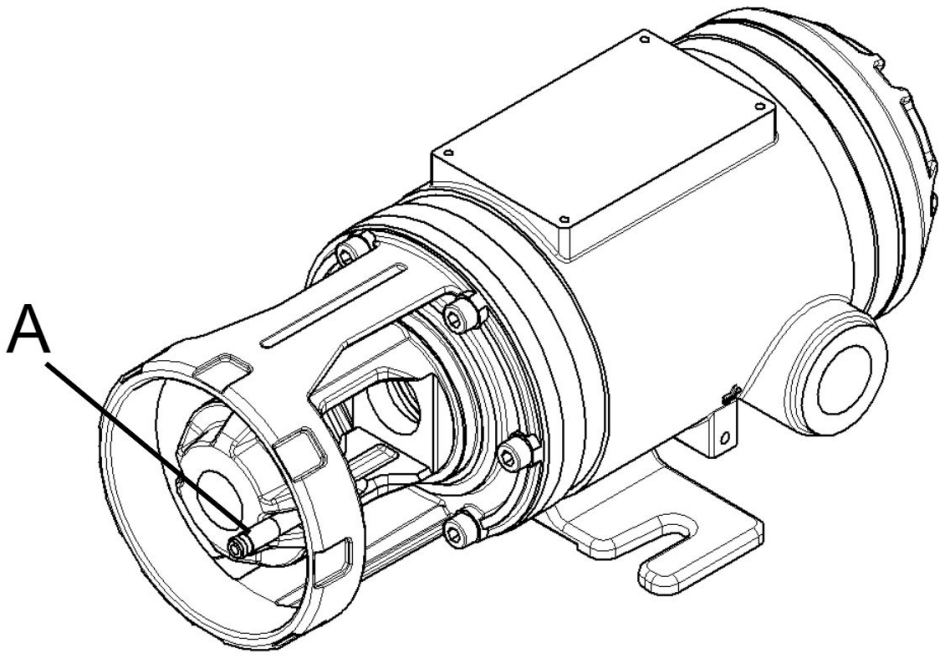
- Gas nozzle (if not already fitted)

- Rosemount 625IR fitted with environment shield, especially if there is any wind
- Gas cylinder with same type of gas as detector is rated to detect
  - Concentration of test gas recommended to 50% ± 10% Full Scale (FS)
  - Flow rate of minimum two liters/minute
- Flexible gas hose

Procedure

1. If the detector is not already fitted with a gas nozzle, then fit the nozzle to the detector as illustrated in Figure 3-2.

Figure 3-2: Gas Nozzle Fitted to Detector



A. Gas nozzle

2. Verify that the detector is fitted with an environment shield.
   Without an environment shield, the gas will dilute too quickly, giving a low gas reading, especially in windy conditions.
3. Connect the test gas cylinder to the gas nozzle as illustrated in Figure 3-2.
4. Apply the gas from the gas cylinder with a flow rate of at least two liters/minute.
5. Observe whether or not the detector is showing a gas alarm or if a gas response is received at the control system.
   If the response is more than 20% FS, then the detector has passed the test.

3.1.3 Perform a function check with the remote gas test kit

The remote gas test kit is for testing detectors in a hard to reach location. The kit consists of a gas nozzle on the nose of the detector and a gas test box to be mounted at a suitable

location. The gas pipe connects the gas nozzle and gas test box to allow the gas to flow from the test box, through the nozzle, and into the detector.

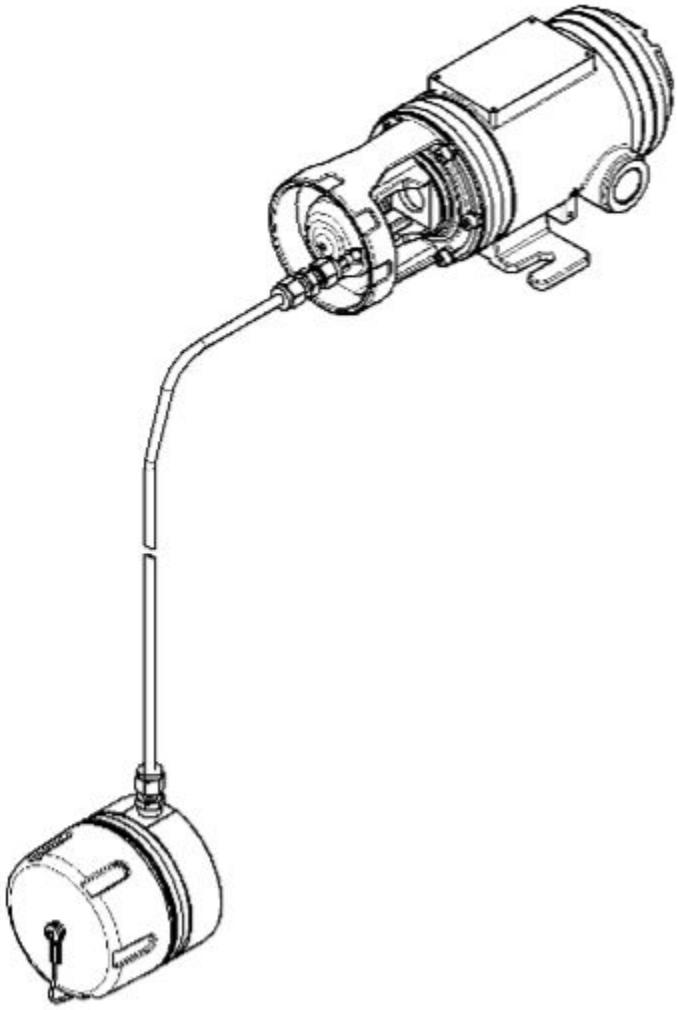
Prerequisites

- Fit the detector with the environment shield, especially if there is any wind.
- Use a gas cylinder with the same type of gas the detector is rated to detect.
  - Concentration of test gas recommended to 50% ± 10% Full Scale (FS)
  - Flow rate minimum of two liters/minute
- Use a flexible gas hose.

Procedure

1. Connect the gas cylinder to the gas test box.

Figure 3-3: Gas Cylinder Connected to Gas Test Box



2. Apply the gas from the gas cylinder.
3. Observe whether or not the detector is showing a gas alarm or if a gas response is received at the site gas detection system.

This may take several minutes depending on the gas flow and the length of the pipe.

If the response is more than 20% FS, then the detector has passed the test.

3.1.4 Perform a function check of the Rosemount 625IR Duct with the duct flange gas test kit

To perform a function check of the 625IR Duct, the operator can use either the 625IR Duct flange gas test kit or the 625IR Duct gas bump test kit.

Due to the long sensor section, the bump test can be time-consuming and require a lot of test gas. An alternative is to use the duct flange gas test kit.

Prerequisites

- 625IR Duct flange gas test kit
- Gas cylinder with the same type of gas the detector is rated to detect
  - Concentration of test gas recommended to 80% ±10% Full Scale (FS)
  - Flow rate of three liters/minute minimum
- Flexible gas hose

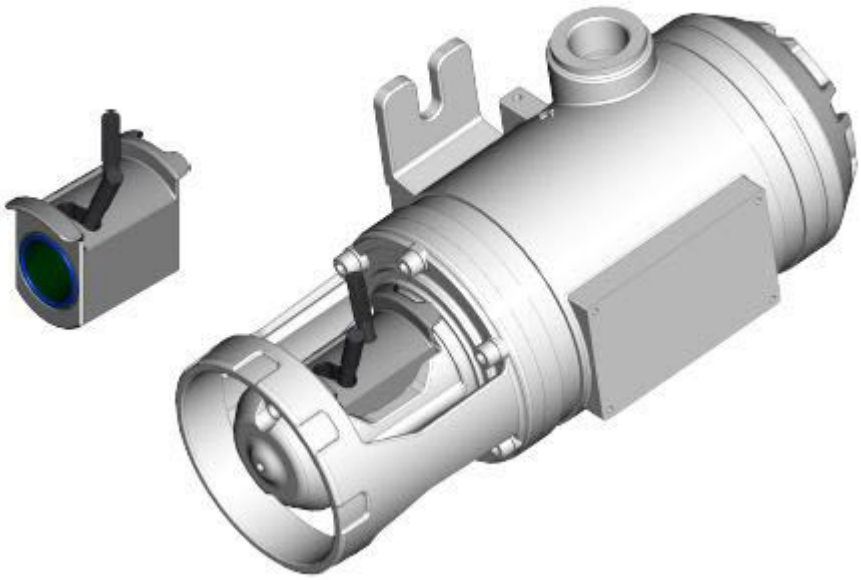
Procedure

1. Connect the tube from the gas cylinder to the gas nozzle of the gas test kit.
2. Apply the gas from the gas cylinder with a flow rate of at least three liters/minute.
3. Observe whether or not the detector indicator is showing a gas alarm or if a gas response is received at the control system.
   If the response is more than 20% FS, then the gas detector has passed the test.

Related information

Perform a function check with the gas test kit

3.1.5 Function test using the gas free tester



Procedure

1. Remove the environment shield.
2. Insert the methane gas free tester.
3. Monitor the 4-20 mA output and the **Status** LED to ensure that 50% lower explosive limit (LEL) ± 10% LEL is observed.

Note
There may be some difference in readings across devices but, on the same device, the reading should be repeatable.

3.2 Verify detector accuracy

Emerson has calibrated the Rosemount 625IR and 625IR Duct for life at the factory. They do not need to be re-calibrated. At the factory, Emerson has taken great care to account for environmental effects, such as gas concentration, gas temperature, ambient pressure, and humidity, to calibrate very precisely. In the field, it is very difficult to account for such factors, so calibrating the detector in the field would not improve its accuracy.

Prerequisites

- Gas sample kit
- Gas cylinder with calibrated test gas
  - Concentration of test gas recommended to 50% ±10% Full Scale (FS)
  - Flow rate between 0.5 and 1.1 liters/minute
- Flexible gas tube between gas cylinder and gas sample kit

Procedure

1. Power up the detector and allow it to warm up for at least 20 minutes.
2. Insert gas test kit.
3. Connect the tube from the gas cylinder to one of the nozzles on the gas test kit.
4. Apply the gas from the gas cylinder with a gas flow between 0.5 and 1.0 liters/minute.
5. Allow for gas reading to stabilize for at least one minute.
6. Start the data logger and perform logging for two minutes.
7. Calculate average gas value and standard deviation from the data logger and compare with the specifications of the detector for accuracy.

3.3 Check reaction time

The gas detector response time is about 1 second, but in practical applications it takes longer since the gas has to completely replace all the air filling the volume between the lens and mirror.

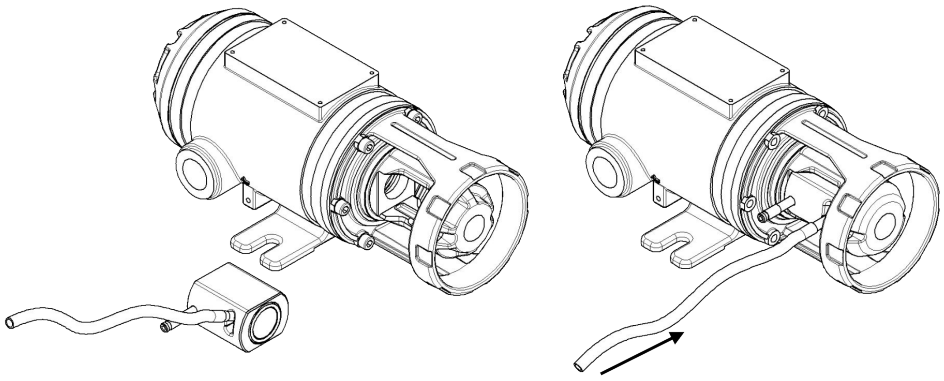
To obtain a T90 response of less than 1.3 seconds, use the gas test kit or gas sample kit to inject gas straight into the detector with a high gas flow (> 3 lpm).

If using a lower gas flow of about 1 lpm with the gas test kit, expect a T90 response time of less than 4 seconds. For instructions on how to use the gas test kit or gas sample kit, refer to Perform a function check with the gas test kit and use a short tube between the gas cylinder and detector so the time for the gas to flow through the tubes is not adding significantly to the response time.

Procedure

1. Insert the gas sample kit.

Figure 3-4: Insert gas sample kit



2. Connect the tube from the gas cylinder to one of the nozzles on the gas sample kit.
3. Insert and lock the gas sample kit in place as illustrated in Figure 3-4.
4. Apply the gas from the cylinder with a flow between 0.5 and 1.1 liters/minute.
5. Allow the gas reading to stabilize for at least one minute.

   The time for the reading to stabilize depends on the gas flow and the length of the tube.
6. Start the data logger and log for two minutes.

7. Calculate the average gas value and standard deviation from the data logger and compare it with the detector's accuracy specifications.

NOTICE

Take into account the calibration gas's accuracy when calculating the detector's accuracy.

NOTICE

The detector is calibrated for an average ambient pressure of 15 psi (1 bar). The ambient pressure can very a few percentages depending on the weather conditions and will influence the pressure of the gas leaving the cylinder. A one percent change in ambient pressure from 15 psi (1 bar) will result in a one percent change in gas reading.

Take weather conditions into account when calculating the detector's accuracy.

4 Maintenance

The Rosemount 625IR requires very little maintenance. The detector does not have any internal functions that require regular monitoring or maintenance. For regular maintenance, clean the optics and inspect the detector's exterior for damage.

The detector self diagnoses any damage to its internal parts.

4.1 Clean optics (lens and mirror)

Procedure

1. If the environmental shield is installed, then remove it.
2. Clean the lens and mirror with a soft, clean tissue.

   Both these optical parts are made of sapphire and, as such, are resistant to scratching.

⚠ CAUTION

Avoid cleaning with liquids containing hydrocarbons, such as acetone.
If hydrocarbons are used, then allow the solution to dry fully and wipe away residues before performing functional testing.

4.2 Inspect detector for damage

Procedure

Check the following:

a) Blocked sensor section

b) Any bag around the detector that may prevent gas detection

   Emerson recommends using the detector blocking kit when doing work around the detector, such as paint work and sand blasting that might pollute and damage the optics.

c) Rusted flame joints

d) Terminal compartment

- O-ring is in place and undamaged.
- Free of dirt and water.

NOTICE

The O-ring is sufficient to keep the terminal compartment dry and free of dust.

Do not add any drying bags inside the terminal compartment, as this can lead to short circuiting electrical wiring.

4.3 Keeping a stable zeroing of the detector

4.3.1 Automatic zero compensation

The detector's automatic zero function keeps the detector's maintenance requirements to a minimum by taking away the need to manually zero the detector.

This function ensures that the detector will show a zero gas value when there is no gas present. This function makes minor adjustments to the zero level over a long period of time to keep the detector stable. If there is any gas present, the automatic zero compensation will not make any adjustments.

4.3.2 Zero the detector manually

Normally, there is no need to zero the detector manually, but for some special applications, manual zeroing might be useful (for example, if the detector is used in an application requiring that the automatic zero compensation be deactivated due to a low level of background gas present at all times). Also, the automatic zero compensation can only handle a limited range, so manual zeroing might be needed in some cases.

NOTICE

If this procedure is not done properly, it may jeopardize the detector's performance.

Only trained operators should perform this procedure.

Prerequisites

- Gas sampling kit or gas test kit
- Nitrogen or clean air
- Power up the detector in a stable environment between 59 and 86 °F (15 and 30 °C) and wait for 20 minutes before starting the procedure.

Procedure

1. Clean the detector optics, both mirror and lens.
2. Connect to the detector through HART® or Modbus® remote terminal unit (RTU).
3. Connect the tube from the gas cylinder to one of the nozzles on the gas sampling kit.
4. Fit the gas sampling kit as illustrated in Figure 3-4.
5. Apply the nitrogen or clean air at a flow rate above 0.3 liters/minute.
6. Wait for one to two minutes until the reading stabilizes.
7. Start zeroing from the HART interface.
8. Wait for confirmation.

4.4 Self diagnostics

The detector monitors all safety critical electronic components and stores them in the ***Diagnostics*** log if they are outside specification. The detector also analyzes and stores temperature and optical signals in the ***Diagnostics*** log.

During any service or inspection of the detector, the technician downloads the ***Diagnostics*** log at the vendor. The customer can also download the ***Diagnostics*** log and send it to the vendor for analysis and troubleshooting.

5 Troubleshooting

5.1 HART® status flags

5.1.1 Status flags

The following sections are the status flags for the Rosemount 625IR. Not all status flags will impact the 0-20 mA safety output. The operator can access all statuses through HART®.

FAULT The 0-20 mA output goes into `FAULT` mode.

WARNING The detector is still inside specification, but the operator or vendor might be interested in this information. `WARNING` flags may or may not impact the 0-20 mA output. For example, `EARLY CLEAN OPTICS` is very useful for planning maintenance.

SERVICE The detector is in `SERVICE` mode and might not measure gas.

HART® status flags

The following sections describe the gas detector status flags that may be displayed on the HART interface. Not all of the status flags will have any impact on the 0-20 mA safety output. All statuses are available through the HART interface or the independent Modbus® digital output.

Related information

Analog safety output

Access level module CRC fault

Status type

Failure

Potential cause

Electronics issue.

Recommended action

Contact support.

ADC error

Status type

Failure

Potential cause

Electronics issue.

Recommended action

Contact support.

Adjustable gain error

Status type

Failure

Potential cause

Electronics issue.

Recommended action

Contact support.

Analog card voltage not OK

Status type

Failure

Potential cause

A voltage in the internal electronics is outside specification.

Recommended action

Contact support.

Analog error

Status type

Failure

Potential cause

Possible issue on sensor electronics.

Recommended action

Contact support.

Base voltage not OK

Status type

Failure

Potential cause

A voltage in the internal electronics is out of specification.

Recommended action

Contact support.

Beam blocked

Status type

Failure

Potential cause

The optical signal is attenuated by more than 70 percent. The detector cannot measure gas, probably due to dirt or something else blocking the optics.

Recommended actions

1. Perform service by removing weather protection and cleaning optics.
2. Inspect weather protection to verify that it doesn't contain any objects blocking the optical path.

Calibration missing

Status type

Failure

Potential cause

The detector is not calibrated or calibration settings have been cleared.

Recommended action

Contact support.

Control register fault

Status type

FAILURE

Potential cause

Electronics issue.

Recommended action

Contact support.

CPU fault

Status type

FAILURE

Potential cause

Electronics issue.

Recommended action

Contact support.

Early clean optics

Status type

Maintenance Request

Potential cause

The optical signal is attenuated by more than 55 percent, probably due to dirt on the optics. The detector still works and detects gas within accuracy, but the lens and mirror should be cleaned.

Recommended actions

1. Perform service by removing weather protection and cleaning the optics.
2. Inspect weather protection to verify that it doesn't contain any objects blocking the optical path.

EEPROM CRC fault

Status type

Failure

Potential cause

Hardware issue.

Recommended action

Contact support.

Field zero error

Status type

Maintenance Request

Potential cause

Something was done incorrectly the last time the field zero was performed.

Recommended action

Perform field zero.

Flash fault

Status type

Failure

Potential cause

Electronics issue.

Recommended action

Contact support.

Gas table error

Status type

Failure

Potential cause

Sensor input is outside the calibrated range.

Recommended action

Contact support.

Identity module CRC fault

Status type

FAILURE

Potential cause

Electronics issue.

Recommended action

Contact support.

Init timer is running

Status type

FAILURE

Potential cause

This is set during detector start-up, and the analog output is set to `FAULT` until the detector is ready.

Recommended action

Wait for start-up to finish, normally one minute.

Internal temperature sensor fault

Status type

Failure

Potential cause

Electronics issue.

Recommended action

Contact support.

Internal temperature too high

Status type

Out of Specification

Potential cause

The temperature on the electronics board is out of specification. The detector is measuring gas, but cannot guarantee accuracy and is at risk of going into `FAULT`.

NOTICE

Keeping the detector at too high of a temperature can reduce the detector's lifetime.

Recommended actions

1. Check that the detector is not exposed to an ambient temperature that is too high.
2. If the ambient temperature is inside specification, check the temperature sensor.

Internal temperature too low

Status type

Out of Specification

Potential cause

The temperature on the electronic boards is below specification. The detector is measuring gas, but cannot guarantee accuracy and is at risk of going into `FAULT`.

NOTICE

Keeping the detector at too low of a temperature can reduce the detector's lifetime.

Recommended actions

1. Check that the detector is not exposed to an ambient temperature that is too low.
2. If the ambient temperature is inside specification, check the temperature sensor.

MCU temperature sensor fault

Status type

Failure

Potential cause

Electronics issue.

Recommended action

Contact support.

Negative Gas Value

Status type

Failure

Potential cause

Negative gas reading indicates that a detector zero has been performed with gas present or pollution on the optics.

Recommended action

1. Clean optics.
2. Zero the gas detector while making sure no cross sensitive gas is present.

Output alarm 1 active

Status type

Normal Operation

Potential cause

Gas alarm.

Recommended action

Perform a gas test with clean air to verify the detector showing zero when no gas is present.

Output alarm 2 active

Status type

Normal operation

Potential cause

Gas alarm.

Recommended action

Perform a gas test with clean air to verify the detector showing zero when no gas is present.

Output current disabled

Status type

Failure

Potential cause

Issue with output.

Recommended action

Contact support.

Output current fixed

Status type

Function Check

Potential cause

Loop testing in progress.

Recommended action

Wait for test to finish.

Output module CRC fault

Status type

Failure

Potential cause

Electronics issue.

Recommended action

Contact support.

Path transmission too high

Status type

Failure

Potential cause

Detector zeroing has been performed while the optics was dirty.

Recommended actions

1. Clean optics.
2. Zero the detector.

RAM fault

Status type

Failure

Potential cause

Electronics issue.

Recommended action

Contact support.

Reference voltage not OK

Status type

Failure

Potential cause

A voltage in the internal electronics is outside of specification.

Recommended action

Contact support.

S1 current error

Status type

Failure

Potential cause

Infrared (IR) source 1 issue.

Recommended action

Contact support.

S2 current error

Status type

Failure

Potential cause

Infrared (IR) source 2 issue.

Recommended action

Contact support.

Sensor temperature sensor fault

Status type

Failure

Potential cause

Electronics issue.

Recommended action

Contact support.

Secure EEPROM bank 0 error

Status type

Failure

Potential cause

Electronics issue.

Recommended actions

Contact support.

Secure EEPROM bank 1 error

Status type

Failure

Potential cause

Electronics issue.

Recommended action

Contact support.

Secure EEPROM bank 2 error

Status type

Failure

Potential cause

Electronics issue.

Recommended action

Contact support.

Secure EEPROM bank 3 error

Status type

Failure

Potential cause

Electronics issue.

Recommended action

Contact support.

Sensor temperature too high

Status type

Out of Specification

Potential cause

The temperature inside the detector housing is above specification. The detector is measuring gas, but cannot guarantee accuracy and is at risk of going into `FAULT`.

NOTICE

Keeping the detector at too high a temperature can reduce the detector's lifetime.

Recommended actions

1. Check that the detector is not exposed to an ambient temperature that is too high.
2. If the ambient temperature is inside specification, check the temperature sensor.

Sensor temperature too low

Status type

Out of Specification

Potential cause

The temperature inside the detector housing is below specification. The detector is measuring gas, but cannot guarantee accuracy and is at risk of going into `FAULT`.

NOTICE

Keeping the temperature at too low a temperature can reduce the detector's lifetime.

Recommended actions

1. Check that the detector is not exposed to an ambient temperature that is too low.
2. If the ambient temperature is inside specification, check the temperature sensor.

Serial number is missing

Status type

FAILURE

Potential cause

Wrong settings.

Recommended action

Contact support.

Signal integrity not OK

Status type

Failure

Potential cause

Signal from the sensor is too high, indicating too much light is reflected into the lens.

Recommended action

Contact support.

Sink current loop error

Status type

Failure

Potential cause

The measured back current of the analog output is outside specification.

Recommended action

Contact support.

Source current loop error

Status type

Failure

Potential cause

The measured back current of the analog output is outside specification.

Recommended action

Contact support.

The SRC voltage not OK (30 V)

Status type

Failure

Potential cause

A voltage in the internal electronics is outside specification.

Recommended action

Contact support.

5.1.2 Light indicator

The Rosemount 625IR has a built-in multi-colored light indicator.

Table 5-1: Light indicator settings

Status type	Indicator	Description and typical applications
Normal operation	Green	Detector is measuring gas, and no issues are detected.
Maintenance request	Green blinking	The optics are getting dirty. Emerson recommends cleaning them as soon as possible. The detector is still detecting gas inside specifications.
Out of specification	Green blinking	Indicates temperature is above or below this detector's rating. The detector will measure gas, but its accuracy will be outside specification.
Function check	Yellow	Activated if the operator has the detector set to `SERVICE` mode.
Failure	Yellow blinking	No gas is detected due to one of the following: • Detector is booting up. • Beam block. • Faulty detector.
Alarm 1	Red	Gas concentration is above the first alarm set point. Default setting is 20% Full Scale (FS), non-latching.

Table 5-1: Light indicator settings *(continued)*

Status type	Indicator	Description and typical applications
Alarm 2	Red blinking	Gas concentration is above the highest gas alarm set point. Default setting is 40% FS, non-latching.

5.1.3 Analog safety output

All analog output values in Table 5-2 have a ±0.25 mA range applied and are in accordance with recommendations by NAMUR NE043 (2003) and NE107 (2017).

Table 5-2: Analog outputs

Status type	Output priority(1)	Default output setting	Configurable values(2)	Comment
Normal operation	3(3)	4 - 20 mA	Not configurable	The current loop output is configured such that 4 mA represents 0% full scale (FS). If the value is varying around 4 mA when there is no gas, the dead band filter (default on) might have been turned off or set too narrow. Consult the HART® interface on how to adjust this.
Over range	4(3)	20 mA	20 or 21 mA	Signaled if gas concentration is measured above the configured range. The default setting is 20 mA for over range. High gas concentrations do not have a negative effect on the detector.
Maintenance request	5	3 mA	0.6 - 3.5	Signals if optics are getting dirty. If this alert displays, then Emerson recommends cleaning the lens and mirror. Detector is still detecting gas inside the specifications.
Out of specification	6	2.5 mA		Signaled if temperature is outside the maximum ratings of this detector. Detector will measure gas, but the detector might be damaged if operating outside ratings. This might void the warranty.(3)
Function check	2	2 mA		This value is activated if the operator has set the detector to `SERVICE` mode (for example, if the operator is zeroing the detector).
Failure	1	1 mA		No gas detection due to one of the following: • Detector is booting up. • Beam block. • Faulty detector. Emerson recommends investigating the detector status flags through the HART interface.
< 0.5 mA	Power supply fault or not booted up. No gas detection and no HART communication.			

(1) A lower number is prioritized first.
(2) Configurable through HART or Modbus® Remote Terminal Unit (RTU).

(3) Will output gas value if detection is above 7 percent FS.

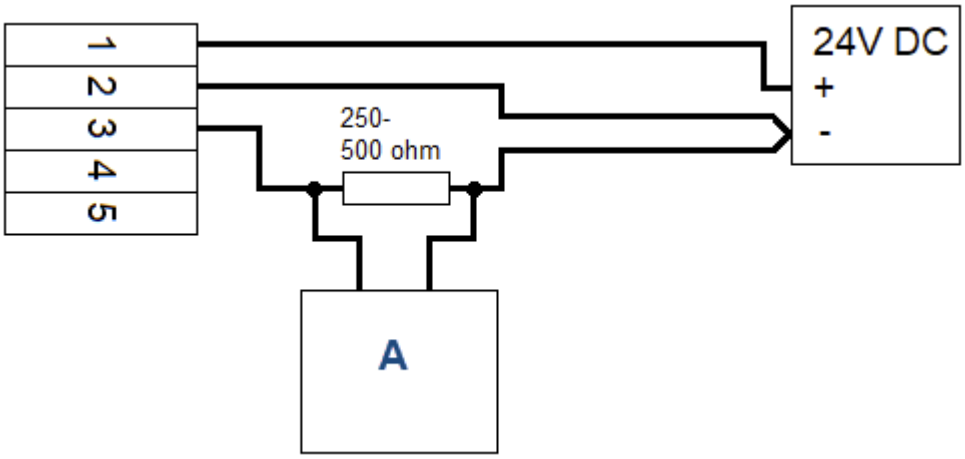
5.1.4 HART®

The Rosemount 625IR has a HART digital protocol superimposed on the current loop output.

HART® electrical connection

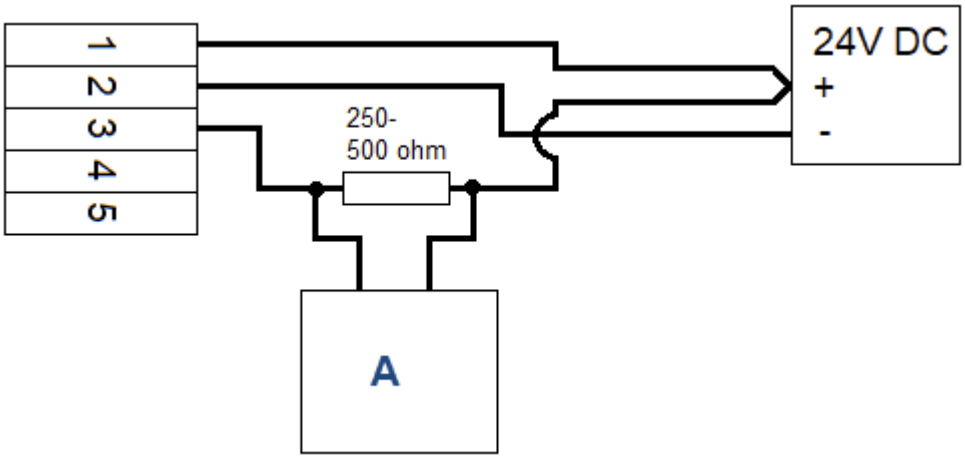
A HART master requires a minimum loop resistance of 250 ohm for communication.

Figure 5-1: HART source configuration



A. HART device

Figure 5-2: HART sink configuration



A. HART device

5.2 Potential errors

FAULT reading in control room through Frequent service list possible issues and suggestions for solutions.

Use the HART® or Modbus® interface to find error codes and follow the recommended actions.

5.2.1 FAULT reading in control room

Do not return the gas detector to the supplier for repair until after completing the following steps:

Recommended actions

1. Connect the detector to the HART® or Modbus® interface and see the recommended action for the status described in Signal through Frequent service. Complete this action. If the issue is unresolved, proceed to Step 2.
2. Ensure that the detector has not been exposed to hydrocarbon, such as volatiles from cleaning agents (acetone or isopropanol), gasoline, diesel, etc.
   - If the detector has been exposed to hydrocarbons, remove any hydrocarbon substances.
   - If the detector has not been exposed to hydrocarbons, connect the detector to the power supply with current metering.
3. Remove the environment shield and clean the lens and mirror.

   NOTICE

   The detector can detect hydrocarbons used in cleaning.

   Avoid cleaning with liquids containing hydrocarbons, such as acetone and isopropanol.

4. Power up the detector at 24 Vdc.
   - If the issue is resolved, inspect the inside of the environment shield for blocking items and clean the shield.
   - If the issue is not resolved, continue to Step 5.
5. Verify that the current consumption is approximately 100 mA.
   - If the current consumption is approximately 100 mA, wait for two minutes (20 minutes if the ambient temperature is below -4 °F (-20 °C). Then continue to Step 6.
   - If the current is not approximately 100 mA, verify that the wiring is correct and the housing is properly earthed.
     - If the wiring is incorrect, go back to Step 4.
     - If the wiring is correct, continue to Step 6.
6. Verify that the analog output is at 4 ± 0.25 mA.
   - If the analog output is now within range, troubleshooting is complete.
   - If the analog output is still out of range, see Signal, Gas reading during test, or Frequent service.

7. If the issue cannot be resolved, then contact the supplier.

5.2.2 Frequent service

The detector often requires the operator to clean the optics.

Recommended action

Verify that the detector is mounted in the correct orientation.

NOTICE

If the detector is mounted vertically, contaminants will accumulate on the optics.

Related information

Mounting the detector

5.2.3 Gas reading during test

Gas reading is too low when exposed to test gas.

Potential causes

- The weather conditions, such as wind or ambient pressure, impacted the reading.
- The flow of test gas was too low.
- The operator didn't allow enough time to let the test gas reach the detector and fill the test area.

5.2.4 Signal

Unstable detector reading.

Recommended action

Verify that the detector has sufficient local earthing.

6 Classification of gases

Different standards for the classification of explosive limits are used for different regions and markets. The gas detectors come with definitions from three standards, and the operator can configure the product to the standard it should refer to. The following is an overview of the standards:

- International Organization for Standardization (ISO) IEC 80079-20-1 (2017) Explosive atmospheres - Material characteristics for gas and vapor classification - Test methods and data
- National Fire Protection Association (NFPA) 497 (2017) Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
- PubChem open chemistry database at the National Institutes of Health (NIH): https://pubchem.ncbi.nim.nih.gov/.

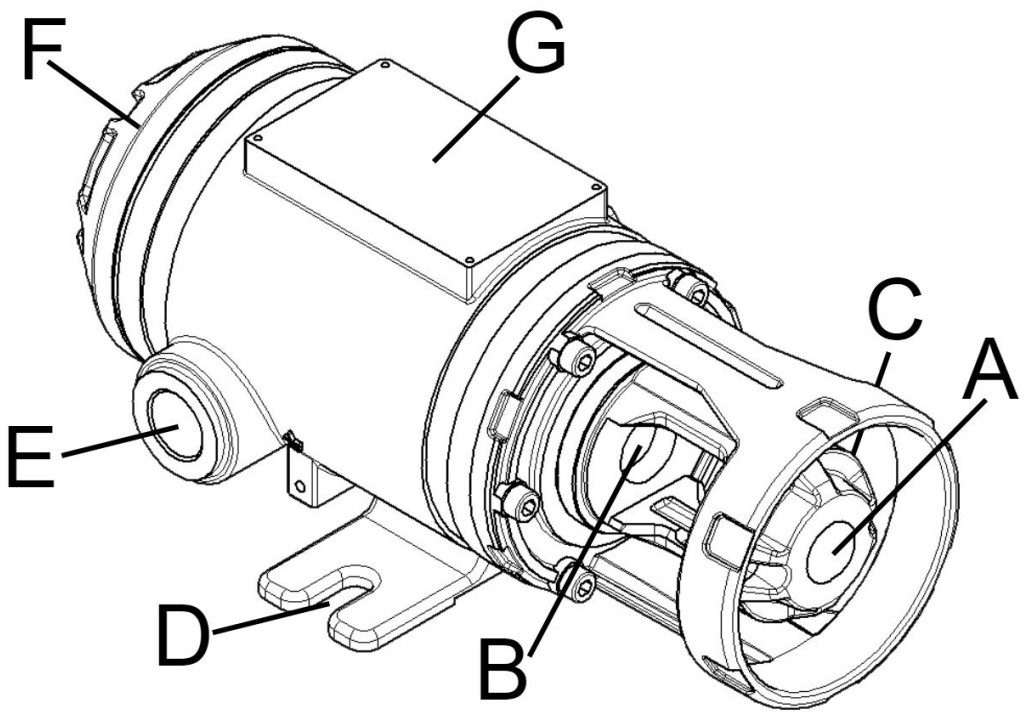
A Description and detection principle

The Rosemount 625IR is an explosion-proof, rugged optical gas detector that can detect flammable gases. Emerson calibrates the detector at the factory for life, so it requires very little effort to install and maintain the detector.

Emerson has built the detector for long maintenance intervals in very demanding environments, such as extreme temperatures and tough vibrations. The detector has built-in condition monitoring that enables the operator to better plan for maintenance and has less risk of unplanned shutdowns.

The 625IR contains no consumable parts and has no special restrictions on storage pressure.

Figure A-1: 625IR Optical Gas Detector parts

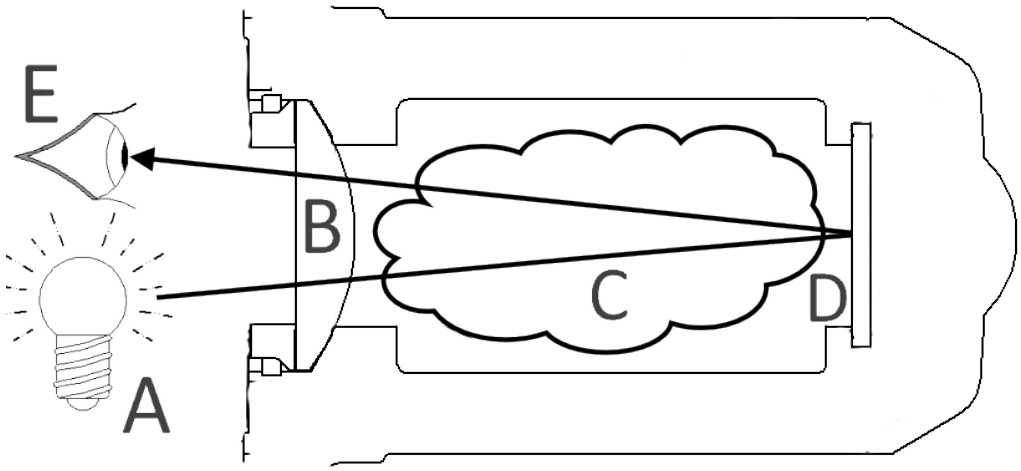


A. Multi-colored indicator light
B. Sapphire lens
C. Mirror with heating
D. Mounting leg
E. Two entries for cable glands, ¾" NPT
F. Terminal compartment cover
G. Sign plates with certification details

A.1 Detection principle

The Rosemount 625IR uses an optical detection principle. The basic working principle is illustrated in Figure A-2 and consists of the following basic parts:

Figure A-2: 625IR detection principle



A. *Light source: Generates infrared light (2-6 µm region) and directs it to B.*
B. *Sapphire lens: Focuses light so that it passes through C.*
C. *Gas to be measured: The gas will absorb some wavelengths, depending on the type of gas. The higher the concentration of the gas, the more light is absorbed.*
D. *Mirror: After passing through the gas, the remaining light is reflected by a mirror back through the gas again, reaching the lens directly at E.*
E. *Light sensors: Measure what wavelengths have been absorbed and how much light has been absorbed. Based on this information, the gas detector can decide if the target gas is above the alarm level.*

In addition to the basic principles described in Figure A-2, the detector has more functions to compensate for changes, such as temperature and component aging over time.

B Ordering information, specifications, and certifications

For ordering information and specifications, refer to the Rosemount 625IR Product Data Sheet.

For product certifications, refer to the Rosemount 625IR Quick Start Guide.

C Dimensions

Rosemount 625IR dimensions

Figure C-1: Mounting

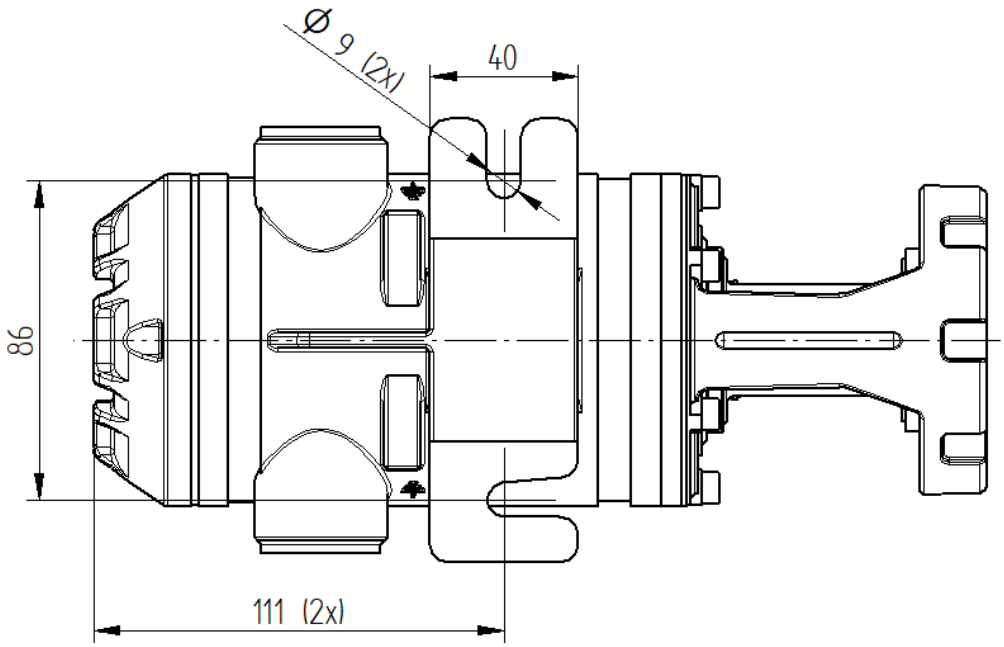


Figure C-2: Width

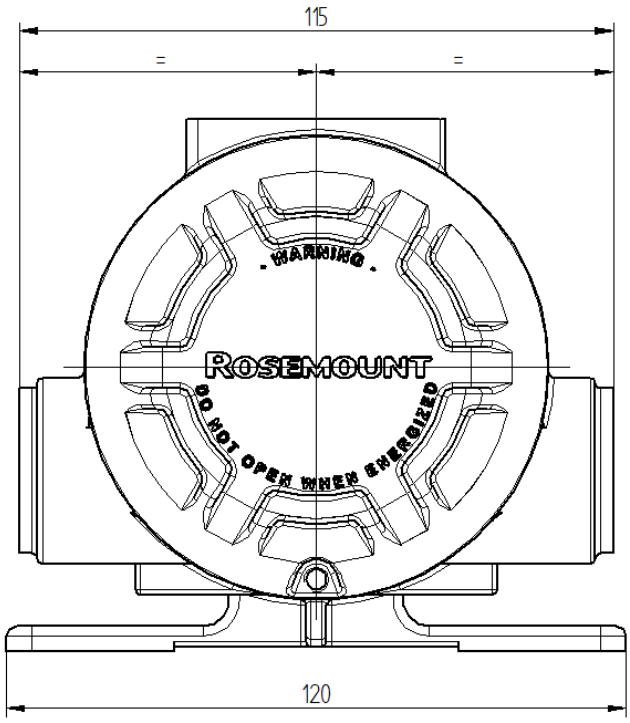
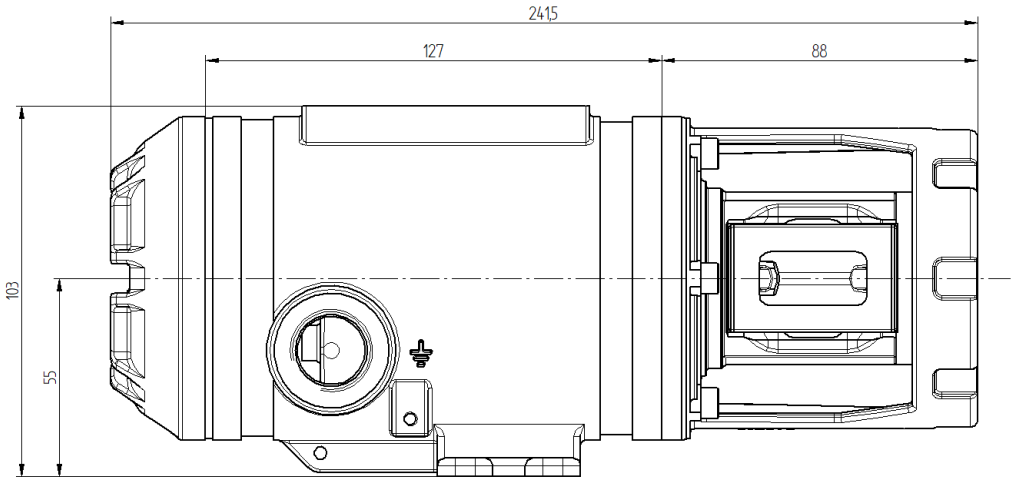


Figure C-3: Length and height



625IR Duct dimensions

The 625IR Duct comes in two lengths with dimensions shown in Figure C-4, Figure C-5, and Figure C-6.

Figure C-4: Mounting

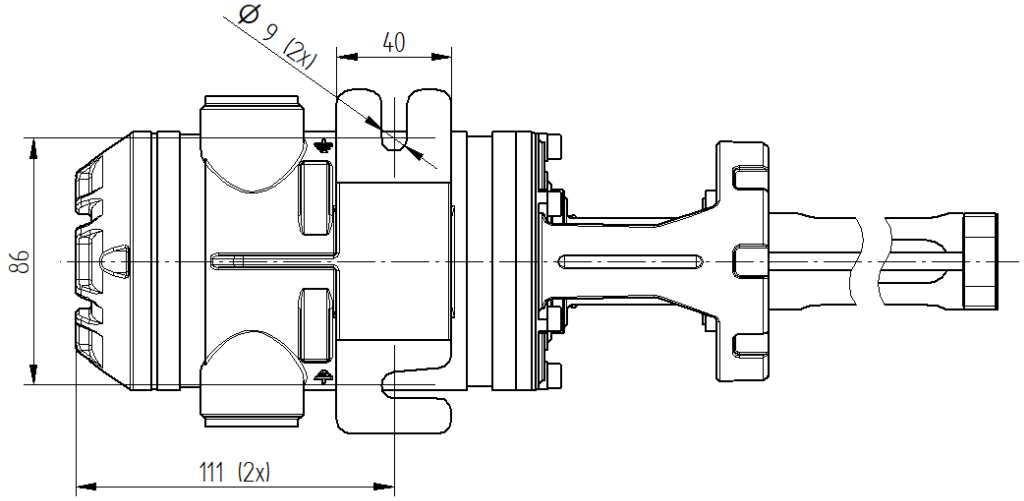


Figure C-5: Width

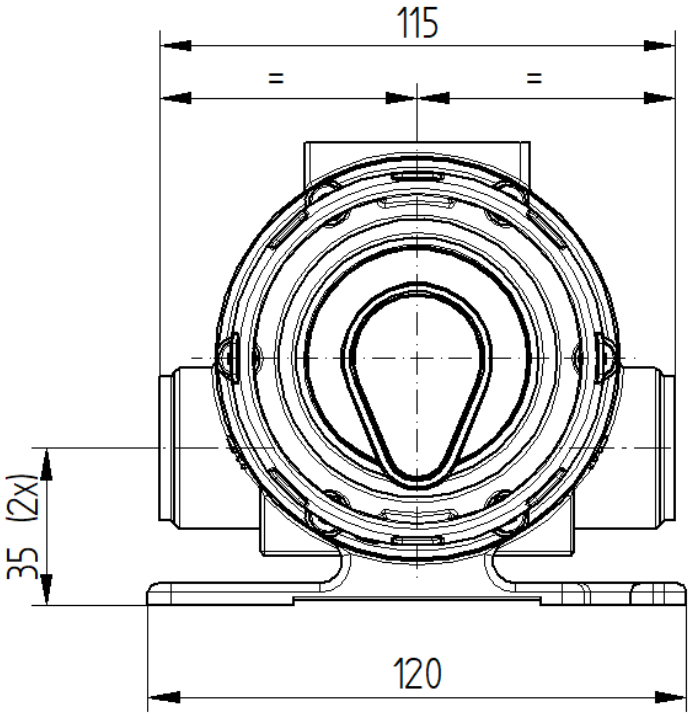
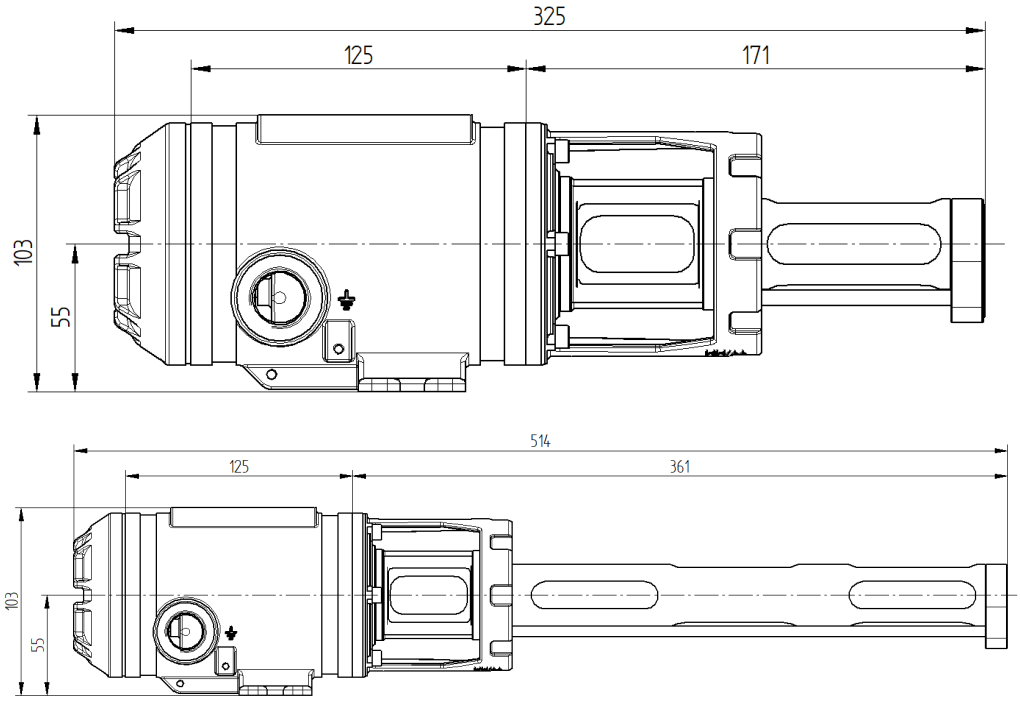


Figure C-6: Length and height



D Contact support

Prerequisites

NOTICE

If there are issues with the Rosemount 625IR, then refer to Troubleshooting.
Do not return the 625IR to the supplier for repair if you have not followed the troubleshooting procedure.

Procedure

1. Contact the supplier/dealer to consult for troubleshooting in case the issue can be resolved without returning the product.
2. Package the detector in a secure manner, preferably in the same box in which it was received.
3. Include a description of the issue in the package.

E Detecting other gases

Emerson calibrates the Rosemount 625IR and 625IR Duct for specific gases, but they are also sensitive to other specific gases. This is important to consider to avoid false alarms, but it can also be very useful to detect other hazardous gases.

For example, a 625IR propane detector will also measure butane, isobutane, ether, and isopentane with very similar gas readings, so the same alarm levels should also be applicable for these gases. Other gases can react more strongly or weakly and must be accounted for.

For example, methanol will measure very strongly on a propane detector, so a higher alarm level may be preferable. Xylene has a weaker response, so a lower alarm level may be preferable.

Table E-1 is an overview of some gases that the detector will detect. Contact your vendor for more details on these and other gases.

Table E-1: Gas detection levels

Investigated gas (CAS number)	Type of response in the detector		
	Similar level (recommended detector)	Very strong and non-linear	Weak detection (< 40% response)
Butane (106-97-8)	625IR propane	625IR methane	N/A
Isobutane (75-28-5)	625IR propane	625IR methane	N/A
1,3 butadiene (106-99-0)	625IR propane	625IR methane	N/A
1-butene (25167-67-3)	625IR propane	625IR methane	N/A
Dimethylamine (124-40-3)	625IR propane	625IR methane	N/A
Diethyl ether (60-29-7)	625IR propane	625IR methane	N/A
Ethane (74-84-0)	625IR propane	625IR methane	N/A
Ethanol (64-17-5)	625IR propane	625IR methane	N/A
Ethene (74-85-1)	N/A	N/A	625IR propane 625IR methane
Ethylene oxide (75-21-8)	N/A	625IR methane	625IR propane
Hexane (110-54-3)	625IR propane	625IR methane	N/A
Isopropylamine (75-31-0)	625IR propane	625IR methane	N/A
Methane (74-82-8)	625IR methane	N/A	625IR propane
Methanol (67-56-1)	625IR propane	625IR methane	N/A
Ethylamine (75-04-7)	625IR propane	625IR methane	N/A
Pentane (109-66-0)	625IR propane	625IR methane	N/A
Isopentane (78-78-4)	625IR propane	625IR methane	N/A
Propane (74-98-6)	625IR propane	625IR methane	N/A
Propene (115-07-01)	N/A	625IR methane	625IR propane
Xylene (108-38-3)	N/A	625IR methane	625IR propane

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For more information: **Emerson.com/global**

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