

Rosemount™ CT4215 Leak Detection System



Preface

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All possible care has been taken in the preparation of this publication, but Emerson™ and its agents and distributors accept no liability for any inaccuracies that may be found. This manual reflects the state of the product at the issue date below, but further enhancements while in service may mean that the manual does not reflect your particular system.

Emerson reserves the right to make changes without notice both to this publication and the products which it describes.

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Important information

Important

Users must read, understand, and comply with the following information before proceeding.

All users, installers, operators, and maintainers must be familiar with operating the detector. To install, start up, operate, maintain, and service the detector in a safe manner, it is MANDATORY to read all additional instruction manuals shipped with the detector. The following instruction manual(s) are available and / or referenced within this manual:

Rosemount™ CT4215 Quick Start Guide: 00825-0100-4245

User information

Important

All users must read this page before proceeding!

Emerson™ designs, manufactures, and tests its products to meet many national and international standards. The Rosemount™ CT4215 is a sophisticated technical product, and to ensure it continues to operate as designed and within normal specifications, it MUST be installed, used, and maintained correctly. The following instructions MUST be adhered to and integrated into your safety program when installing, using, and maintaining Rosemount™ products.

- Failure to follow the proper instructions may cause:
 - Loss of life
 - Personal injury
 - Damage to property
 - Damage to this instrument
 - Warranty invalidation
- Read all instructions prior to installing, operating, and servicing the product.
- If you do not understand any of the instructions, contact your Rosemount™ representative for clarification.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation, and maintenance of the product.
- Install your equipment as specified in the installation instructions of the appropriate manual and in accordance with applicable local and national codes.
- Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, use qualified personnel to install, operate, update, program, and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Emerson™.
- Unauthorized parts and procedures can affect the product's performance, place the safe operation of your process at risk, and VOID YOUR WARRANTY. Look-alike substitutions may result in fire, electrical hazards, or improper operation.
- To prevent electrical shock and personal injury, all equipment doors must be closed and protective covers in place, except when maintenance is being performed by qualified personnel.
- The information contained in this document is subject to change without notice.

General safety notice/residual risk

Installation, operation, and maintenance of the detector must be in accordance with these instructions.

When operated as intended and all applicable safety instructions are observed, an element of risk will remain, including, but not limited to, the following:

- Explosion protection measures may become ineffective on the occurrence of one failure (for Category 3 instruments).
- The emission of gases hazardous to health may be possible when all gas connections have been correctly made.

To avoid exposure to the dangers of residual risks, take particular care when installing, operating, maintaining, and servicing the detector.

Authorized personnel

In-depth specialist knowledge is an absolute requirement for working with and on the detector. Personnel installing, operating, servicing, and maintaining the detector must be instructed, trained, qualified, and authorized for hazardous areas with the operating company and the manufacturer. It is the operating company's responsibility to:

- Train staff.
- Observe safety regulations.
- Follow the safety instructions and procedures in the product manual.

Operators must:

- Be trained.
- Read and understand all relevant sections of the product manual before commencing work.
- Know the safety mechanisms and regulations.

WARNING!

To avoid explosions, loss of life, personal injury, and damage to this equipment and on-site property, do not install, operate, maintain, or service this instrument before reading and understanding this instruction manual and receiving appropriate training.

Regulations and standards

Regulations / Standards	Description
2014/35/EU	The Low Voltage Directive
2014/30/EU	The Electromagnetic Compatibility Directive
2012/19/EU	Waste Electrical and Electronic Equipment (WEEE) Directive
USA 21 CFR 1040.1	Laser products
BS EN 60825-1	Safety of laser products. Equipment classification and requirements (identical to IEC 608250-1 2007)
BS EN 61010-1 2010 IEC 61010-1 2010	Safety requirements for electrical equipment for measurements, control, and laboratory use. General requirements
BS EN 61326-1: 2013	Electrical equipment for measurement, control, and laboratory use. EMC requirements. General requirements

Associated publications

Quick Start Guide:

Compliance approvals



This product complies with USA 21 CFR 1040.10.

This product is designed and manufactured under an approved quality management system to ISO 9001: 2008.

Emerson and the detector have satisfied the requirements for applying the CE marking to the detector.

This equipment meets all requirements of the EMC and Low Voltage directives.

Waste disposal



Do not dispose of measuring tools into household waste.

Only for EC countries:

In accordance with European Directive 2012/19/EU for Waste Electrical and Electronic Equipment and its implementation into national right, measuring tools that are no longer usable must be collected separately and disposed of in an environmentally correct manner.

Safety and information notices

This article is in accordance with IEC 60079-0: 2011 Clause 30. This article must not be changed amended or removed.

DANGER!

WILL CAUSE DEATH

Failure to follow this warning will result in death or serious injury to personnel.

WARNING!

DANGER TO PERSONNEL

Failure to follow this warning may result in serious injury to personnel.

CAUTION!

MAY CAUSE DAMAGE TO EQUIPMENT

Failure to follow this warning may result in damage to the equipment.

NOTICE

Important or tip messages will appear in this format.

Safety Information

All authorized users, including installation, operation, and maintenance personnel, must observe the following safety precautions and warnings.

DANGER!

ELECTRIC SHOCK

The detector operates using mains voltage that is dangerous to life. Make sure that the circuit breakers are set to *OFF* and tagged off before removing the top cover or opening the front cover.

Failure to observe this precaution will cause death, personal injury, and/or damage to persons and/or property.

WARNING!

OPTICAL RADIATION EXPOSURE HAZARD

The detector contains lasers. Opening the detector and attempting to perform adjustments and procedures other than those specified in this manual may result in hazardous optical radiation exposure.

All lasers within the detector are Class 1. The emitted laser light is invisible (mid-infrared) and the combined laser powers are sufficiently low at the first accessible aperture that the unprotected eye will not be damaged. This class is eye safe under all operating conditions.

It is, however, possible to cause damage to the eye through not following correct procedures. Do not look at the laser with any kind of magnifier or optical measuring device.

WARNING!

HAZARDOUS SUBSTANCES

The detector may contain hazardous substances. Always handle the detector assemblies and components with extreme caution.

Gas handling components within the detector will contain particulate matter from the sample gases. Over the life of the detector, the concentration of particulate matter will become enriched within the gas handling components. When performing repairs and maintenance on the detector:

- Handle used gas handling components with extreme caution.
- Avoid direct skin contact with used gas handling components.
- Do not smoke, drink, or eat in the work area.
- Wear goggles or eye shields.
- Wear a suitable face mask to protect against inhalation of particulate matter.
- Do not wet fingers, eyes, or any exposed skin.
- Pack used gas handling components for disposal in sealed packaging and label them *Contaminated*.

Dispose of contaminated items as hazardous material according to the applicable local, national, or international health and safety regulations and pollution regulations.

WARNING!

EXPLOSION HAZARD

Always lock-out tag-out the gas handling system when shutting down the detector. Unauthorized operation of the gas handling system when maintenance is being performed on the detector or its associated pipes/hoses may result in highly flammable gas being released, causing fire or explosion.

WARNING!

HIGH PRESSURE GAS AND AIR

The compressed air supply operates at a pressure that can cause injury, e.g., damage to eyes and skin punctures from debris blown by the high pressure gas or compressed air.

Always lock off or tag off the calibration gas supply and compressed air supply when shutting down the detector.

WARNING!

EXPLOSION HAZARD

The sample gas in the system must be vented to prevent fire or explosion during maintenance and to prevent damage to the detector during startup.

The sample gas in the pipes leading to the detector must be purged to prevent hazards to personnel during maintenance. Purge the sample gas in accordance with the safe working procedures for the site.

Allow the detector and system for returning the sample gas to run for five minutes to allow any sample gas in the system to be returned to the exhaust.

WARNING!

HEAVY INSTRUMENT

The detector weighs 119 kg (268 lb.) and is designed to be floor mounted. It must be moved in accordance with local safety regulations. Emerson™ recommends that a minimum of two people using suitable tools for transportation and lifting are employed.

Use suitable fasteners for the weight of the unit.

Make sure the unit is mounted on a solid, stable, and suitable floor.

Failure to follow this warning could cause an explosion or potentially hazardous situation, which if not avoided, could result in death or serious injury.

WARNING!

ELECTRICAL SHOCK HAZARD

Only trained, qualified personnel may install and connect power and signal cables. The installation/connection must be in accordance with all legislative requirements and applicable standards.

Only qualified personnel, familiar with the resulting potential risks, should install these instruments.

Instruments providing screw terminals for electric connections may require working near live parts.

Failure to follow this warning could cause an explosion or potentially hazardous situation, which if not avoided, could result in warranty invalidation, property damage, death, or serious injury.

WARNING!

HIGH PRESSURE HAZARD

The maximum compressed air pressure at the inlet valve must not exceed 10 bar (145 psi). Failure to follow this warning could cause a potentially hazardous situation, which if not avoided, could result in death or serious injury.

WARNING!

LOOSE ITEMS

Do not place any loose items on top of the system or inside the compartments when doors or covers are open.

Make sure that all loose items, tools, and equipment are removed from the compartments before closing doors and covers.

Failure to follow this warning could cause a potentially hazardous situation, which if not avoided, could result in death or serious injury.

⚠ WARNING!

On completion of any maintenance and/or modifications, make sure:

- All tools and equipment are removed.
- No contamination (water/dust) is in the compartments.
- The detector is wiped clean.
- Vents are clear and not obstructed.
- The system is in a safe state for operation.

Failure to follow this warning could cause a potentially hazardous situation, which if not avoided, could result in death or serious injury.

⚠ WARNING!

TRANSPORTATION HAZARD

Use safety approved lifting equipment. Ensure that the equipment is tested, meets the lifting ratings for the weight of the equipment, and is in good operational condition. Failure to verify that equipment meets the lifting ratings and is in good operational condition may injure personnel or damage the detector.

⚠ CAUTION!

EQUIPMENT DAMAGE

Always follow the startup procedure. Damage to the detector may result from a failure to follow this procedure.

Failure to perform pre-system startup checks may cause damage to equipment.

⚠ CAUTION!

EQUIPMENT DAMAGE

Always follow the shutdown procedure. Damage to the detector may result from a failure to follow this procedure.

⚠ CAUTION!

EQUIPMENT DAMAGE

Ensure that the local power voltage where the unit is to be installed corresponds to the unit's nominal voltage as given on the name plate label.






NOTICE

As a general principle, if any optical component other than the cell assembly, the laser modules, and the detectors is unserviceable, Emerson™ must repair the detector. This is because the repair, replacement, and alignment of the optical components requires the use of special optical test/calibration equipment and procedures. When an item is unserviceable, and no replacement procedure is given in this manual, Emerson™ must repair the fault.

Symbols displayed on and inside the detector

To minimize risk, labels displaying warning signs are fixed to the transmitter. You must understand their meaning, take suitable precautions, and read all instructions given in the accompanying manuals before conducting any operations.

The following table gives examples and definitions of each symbol used.

Symbol	Definition
	<p>General warning Refer to instruction manual before proceeding.</p>
	<p>Danger electricity Make sure that the system is disconnected from all electrical power supplies prior to opening doors or removing covers.</p>
	<p>Laser radiation</p>
	<p>Earth (ground) identification</p>
	<p>AC power supply</p> <hr/> <p>Note The label shown is for illustration only. It is possible that the image will show a voltage in the range of 100 to 240 Vac.</p> <hr/>

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1 Leak detection overview

Gas concentrations are measured using mid-infrared optical absorption spectroscopy. The light sources are Quantum Cascade Lasers (QCLs), which are operated to produce wavelength sweeps that cover the absorption lines of the target gases.

The laser is mounted in the baseplate between the upper and lower enclosures of the leak detector, and light is directed through the measurement cell and onto a detector. When molecules from a leaking container enter the measurement cell, they partially absorb the laser light. The variation in the intensity of the light indicates a leaking container, and the container is rejected from the line.

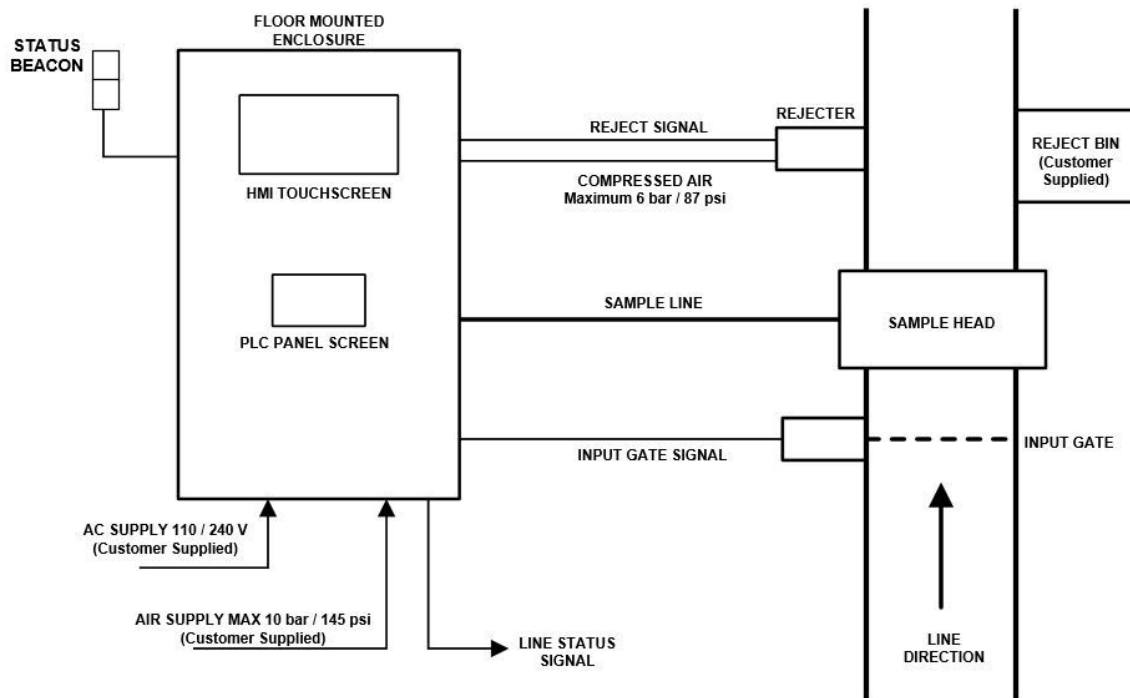
The leak detector identifies packaged products that have a break in seal integrity as they are carried along a conveyor belt at speed. The leak detection system consists of a sampling head which draws air from around the product. The air is passed through the measurement cell for high speed analysis.

1.1 System overview

The Rosemount™ CT4215 Leak Detector is used on packaged lines and comprises an all metal enclosure containing the Quantum Cascade Laser (QCL) analyzer, PLC control, compressed air preparation, and vacuum. The external component may include light gates, sample head, and a rejection mechanism to safely remove defective products from the line.

Figure 1-1 shows the leak detection system.

Figure 1-1: Leak Detection System Block Diagram

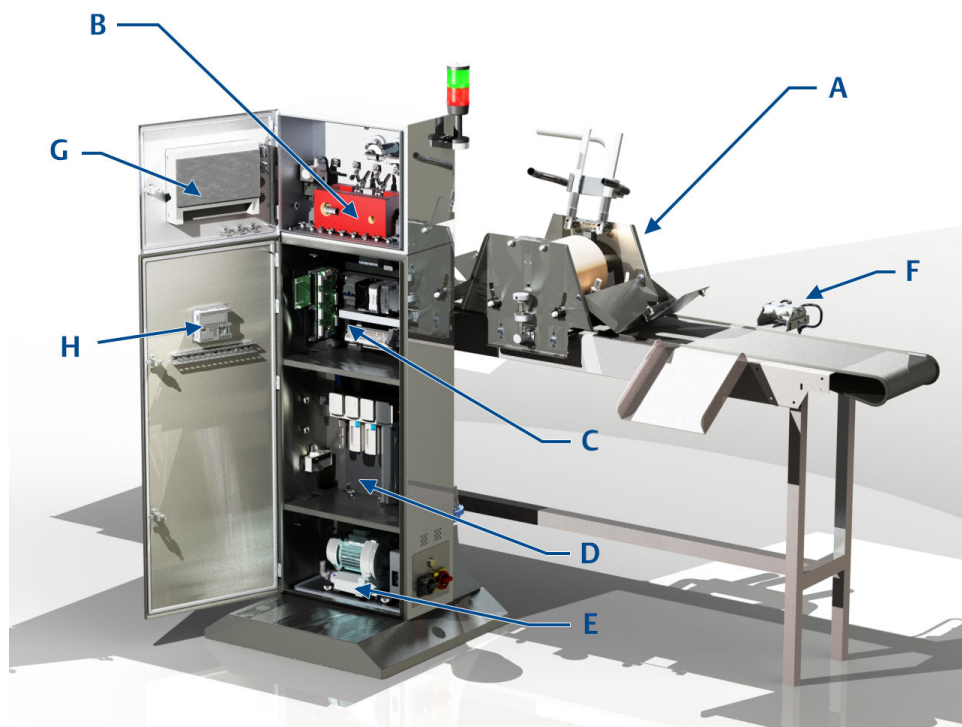


2 Equipment and accessories

2.1 Typical installation

Figure 2-1 shows a typical installation for a Rosemount™ CT4215 on a food handling line.

Figure 2-1: Rosemount™ CT4215 Parts



- A. *Sample head¹: draws air from around the packaged product into the measurement cell.*
- B. *Analysis cell: the laser beam and sample gas pass through here for analysis.*
- C. *Electronics: laser, detector, PLC, and DC power supply.*
- D. *Air preparation: compressed air must be filtered and dried for optimum performance.*
- E. *Vacuum pump: high flow rate pump for fast sample delivery to measurement cell.*
- F. *Reject mechanism²: compressed air reject mechanism.*
- G. *Touchscreen HMI: user interface for system.*
- H. *PLC panel screen: screen set to certain PLC parameters. This will be locked to operators under normal operation.*

1. Sample head is modular and may differ depending on application.
2. May differ depending on application.

2.2 System connections

Figure 2-1 shows a typical installation for a Rosemount™ CT4215 on a food handling line. *Figure 2-2* shows the external connections of the packaged leak detection system. These are located at floor level on the rear of the unit.

Figure 2-2: External Connections

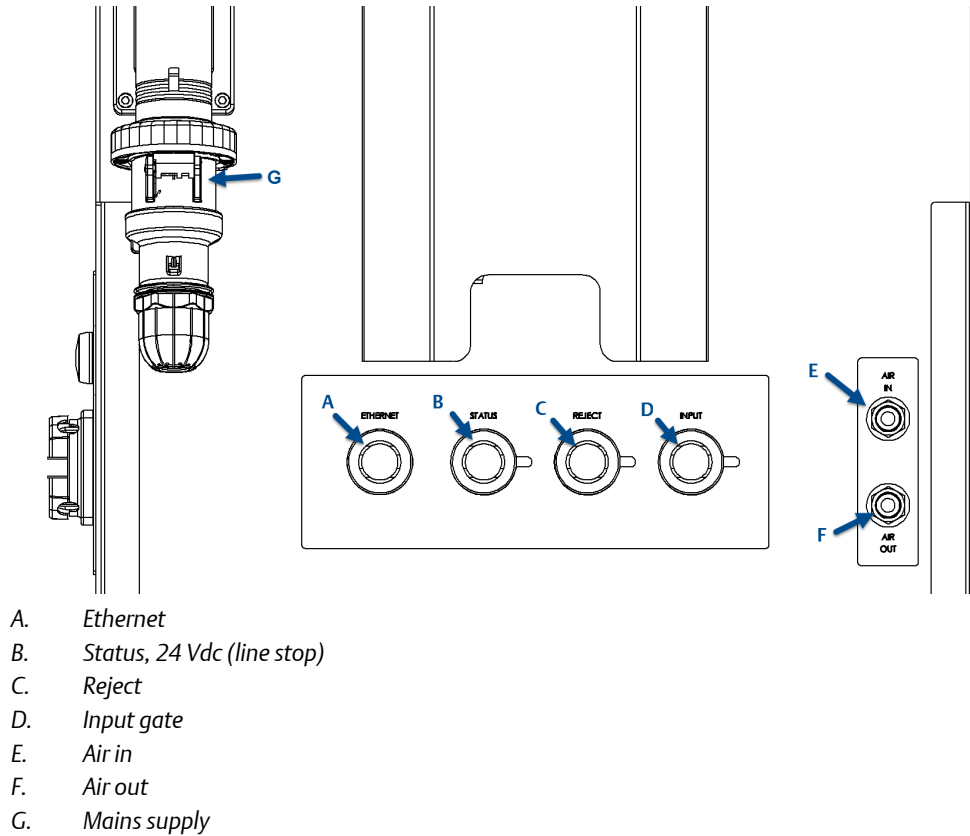


Table 2-1: External Connections

Letter	Designation	Type	Max rating	Description
A	Ethernet	RJ45 Ethernet	N/A	Communication with sensor
B	Status, 24 Vdc (line stop)	Bulgin 4P female	250 Vac/dc, 6 A	Customer supplied 24 V signal when line is running. Rosemount™ CT4215 health status is returned (see Section 6.4).
C	Reject	Bulgin 3P female	250 Vac/dc, 10 A	24 V signal to the rejection solenoid when a defective pack is detected.
D	Input gate	Bulgin 4P female	250 Vac/dc, 6 A	Gate signal to the sensor to count incoming packs.
E	Air in	8 mm push fit	10 bar (145 psi)	Customer supplied compressed air
F	Air out	8 mm push fit	6 bar (90 psi)	Regulated compressed air for accessories, i.e., rejection
G	AC supply	Mennekes right angle 2P+E	Yellow: 110 - 130 V Blue: 200 - 250 V 16A	Customer supplied mains

2.3 Typical sample head

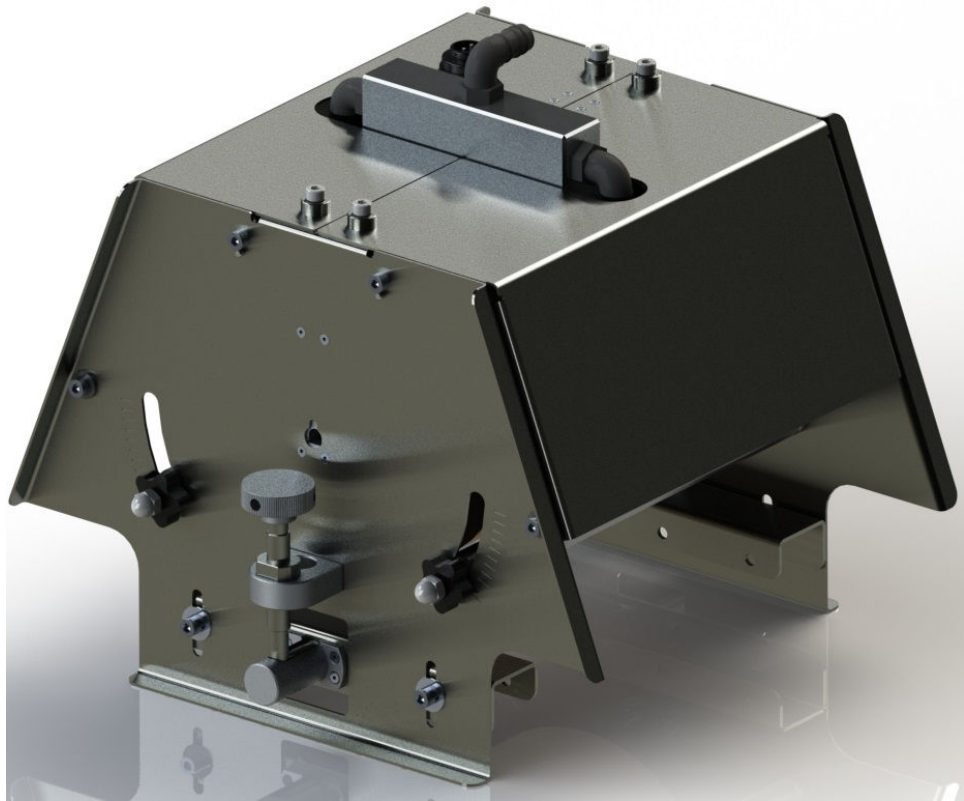
The sample head is used to draw air from around the product and deliver it to the measurement cell.

To ensure a high air flow rate, the sample head is connected to the leak detector using a $\frac{3}{4}$ -in. hose, shown in [Figure 2-3](#). There is a central roller with a sample head at either side.

Note

The sample head shown is for food packaging; this may change depending on the product/production line.

Figure 2-3: Sample Head (Closed)



⚠ WARNING!

CRUSH AND CUT HAZARD
Moving parts can crush and cut.

Do not operate with the sample head open.

Failure to observe this warning may cause serious injury to personnel.

2.4 Air preparation plate

The customer supplied compressed air is filtered to remove impurities and is pressure-regulated.

The assembly shown in [Figure 2-4](#) is mounted inside the leak detector control system cabinet.

Figure 2-4: Compressed Air Preparation Plate

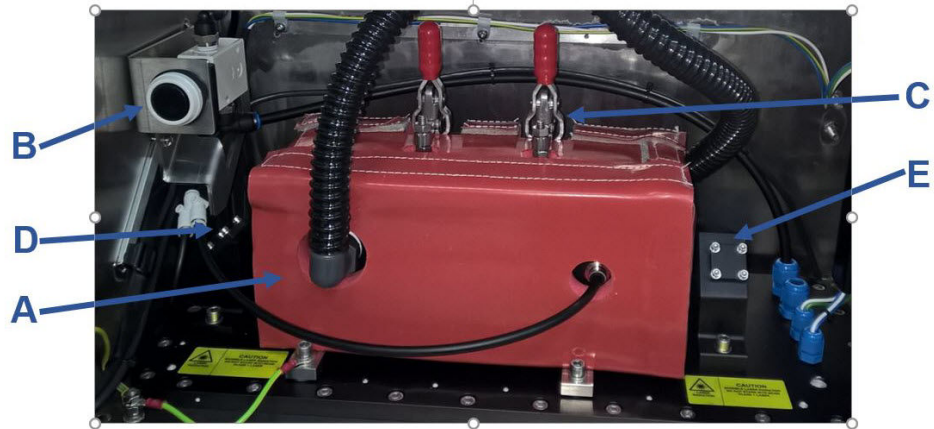


- A. Shut off valve
- B. Pressure regulator with 40 µm filter
- C. 0.1 µm filter
- D. Pressure switch (MPa)
- E. Membrane dryer
- F. Solenoid switch

2.5 Upper enclosure

The upper enclosure is accessible with an 8 mm Allen key and comprises the following components shown in [Figure 2-5](#). The upper enclosure is the main area for maintenance access (see [Chapter 7](#)).

Figure 2-5: Upper enclosure



- A. *Measurement cell with insulating jacket*
- B. *Manual purge button*
- C. *Cell lid clamps*
- D. *Cell input mirror, directs laser into cell*
- E. *Cell output mirror, directs laser onto the detector*

3 Installation

3.1 Installation requirements

The customer provides the following:

Table 3-1: Installation Requirements

Customer provided	Specification
Mains supply (defined by customer)	110/120 Vac, 50 Hz
or	
Mains supply (defined by customer)	220/240 Vac, 60 Hz
Circuit breaker	16A (maximum)
Mounting	Affix to floor or building structure
Compressed air	8-10 bar / 115 - 145 psi

For the electrical power wiring, use 16 AWG stranded, three conductor copper plain or tin plated wire, rated for a minimum of 250 Vac for the required cable length. Cables must be terminated in accordance with national/local electrical standards and must be rated for operation in ambient temperatures > 176 °F (80 °C).

Emerson™ does not supply a switching system with the instrument. The customer must supply a suitably rated switch or circuit breaker to be included with this installation. Check the installation of the switch for conformity in accordance with national/local regulations and standards by inspection. The switch or circuit breaker must be suitably located, easily reached, and identified as the disconnection device for the leak detection system.

The leak detection system provides a protective earth terminal. To prevent electrical shock hazards, connect the instruments to a protective earth. Any interruption of the earth connector inside or outside the instrument or disconnecting the earth terminal may cause potential electrical shock hazard.

Figure 3-1: Line Installation Location

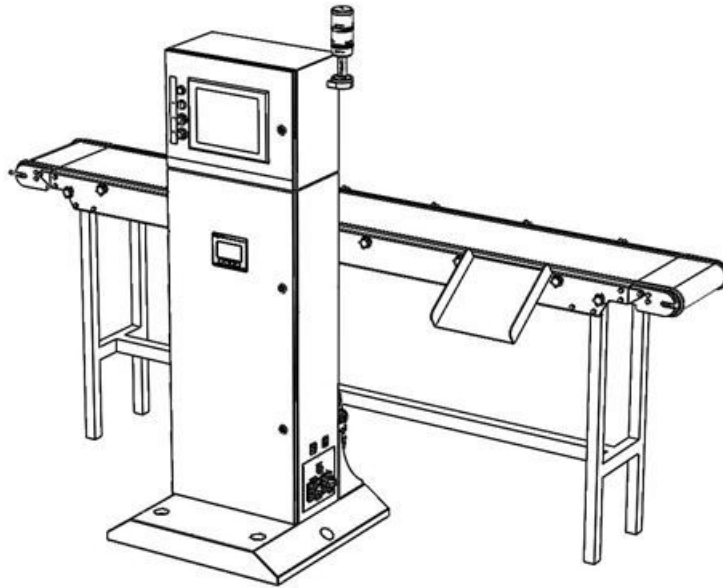


Figure 3-2: Ground Fixing

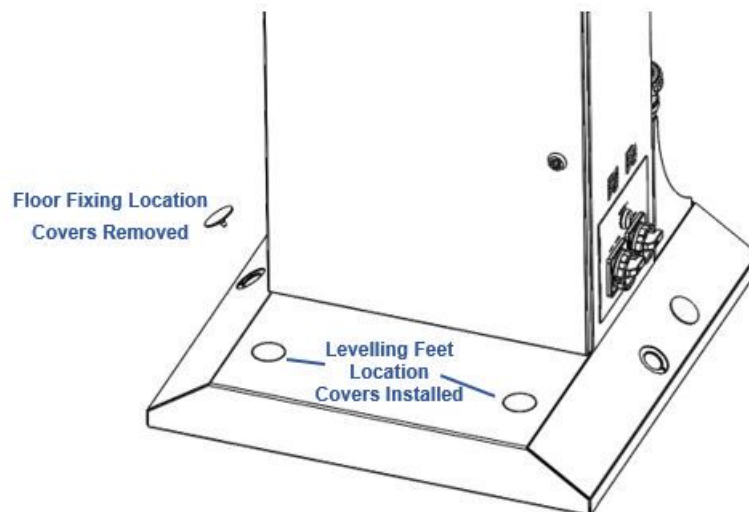


Figure 3-3: Installation of Reject Mechanism

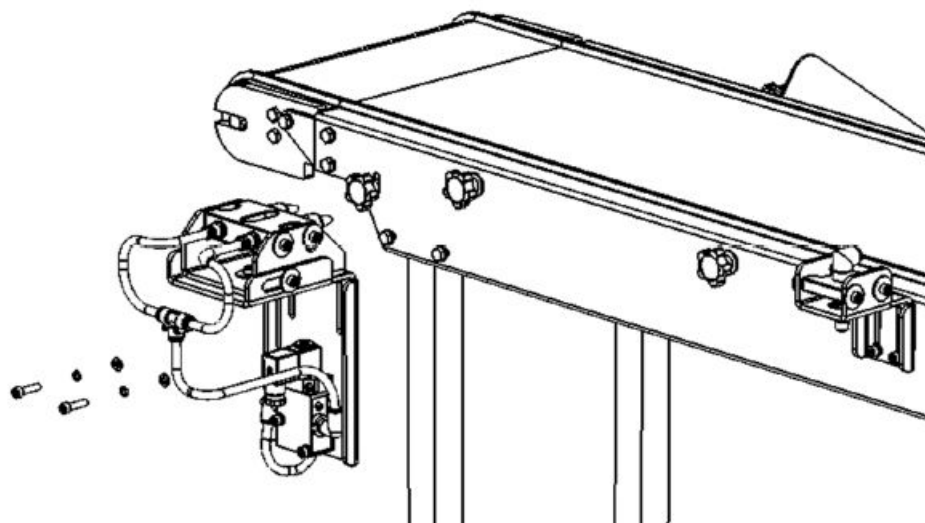
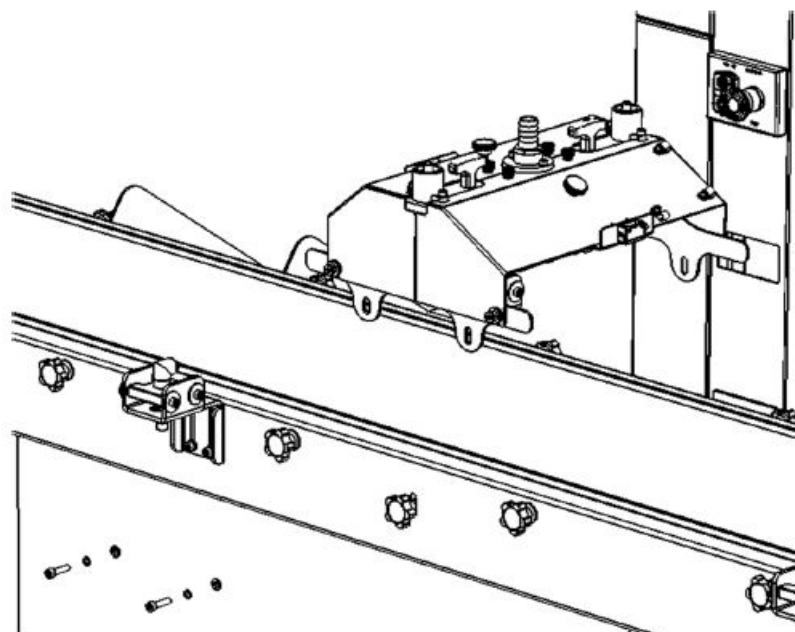


Figure 3-4: Sample Head Installation



3.2 Installation instructions

Only Rosemount™ Customer Care Representatives should install this instrument.

⚠ WARNING!

LIFTING HAZARD

The system weighs 268 lb. (119 kg). Beware of collision injury and topple injury when moving. Emerson™ recommends using a forklift to move the system.

⚠ WARNING!

CRUSH HAZARD

Be careful not to crush hands and feet when moving the system.

⚠ WARNING!

DRILL INJURY

Be careful to avoid injuring hands and eyes when drilling. Wear correct personal protective equipment (PPE) at all times.

Procedure

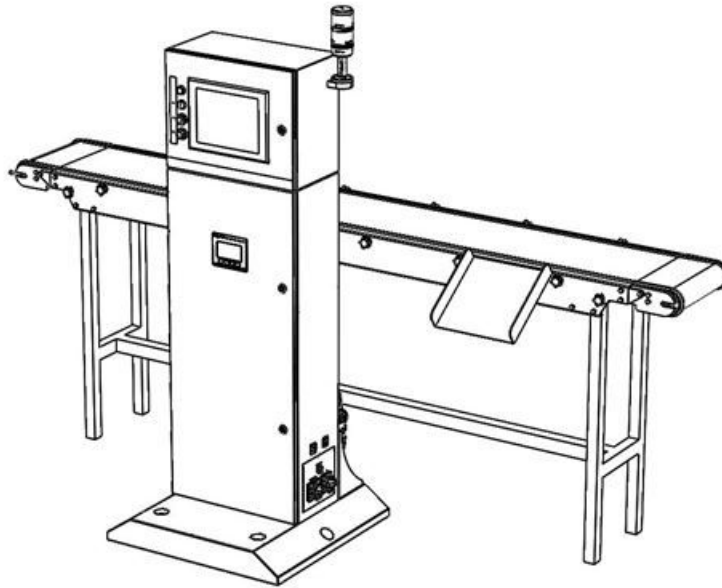
1. Place the delivery crate in an open and easily accessible area, close to where the unit will be assembled and installed.
2. Remove the instrument from the crate.
 - a. Remove the fixing screws (marked in red) from the front panel of the crate and the front panel section. Place the front panel section from the crate in a safe place well away from the working area.
 - b. Release the two straps located on the unit upright section.
 - c. Carefully remove the unit from the crate.
 - d. Remove all additional parts from the crate and place them to the side of the unit.
3. Ensure that all additional parts shown are present after unloading the crate.

Required parts are shown below.

Table 3-2: Rosemount™ CT4215 Installation Parts

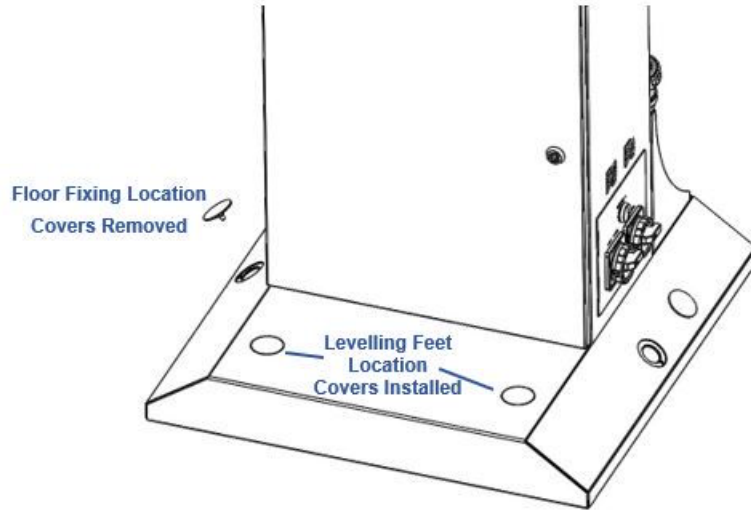
Item	Description	Quantity
A	Reject assembly	1
B	Light gate assembly	1
C	Sample head	1
D	Hardware kit	1

4. Place the unit enclosure at the desired position on the product line.

Figure 3-5: Line Installation Location

-
5. Ground the instrument.
 - a. Lower the feet to the ground.
 - b. Raise the unit a few inches off the ground.
 - c. Remove the wheel brackets.
 - d. Lower the unit to the floor.
 - e. Use the feet to level of unit if required.
 - f. Bolt the unit to the floor as per site standards.

Figure 3-6: Ground Fixing



Refer to the fastener manufacturer's guide for fixing instructions and torque.

- g. Place the cap covers over the access holes.
6. Attach the light gate to the track.
- a. Drill the location hole(s) into the track side faces in the approximate positions required for input gate.
Use track location *T* slots if available (no drilling required).
 - b. Place the light gate in the required position on the track using the fasteners supplied in the hardware kit. Hand tighten the fasteners only at this time.

⚠ WARNING!

DRILL INJURY

Be careful to avoid injuring hands and eyes when drilling. Wear correct PPE at all times.

- c. Adjust the angle and height of the light gate to suit the package being scanned.
- d. Secure the light gate in place using the fasteners fitted previously.
- e. Torque the fasteners to 7.6 Nm (5.6 ft.-lb.).

7. Attach the reject mechanism.

⚠ WARNING!

DRILL INJURY

Be careful to avoid injuring hands and eyes when drilling. Wear correct PPE at all times.

- a. Drill two location holes into the track side face in the approximate positions required for the reject mechanism.

Use track location *T* slots if available (no drilling required).

- b. Attach the reject mechanism on the track in the approximate position required using two M6 socket head cap screws, two spring washers, and two washers.
- c. Leave the reject mechanism loose by hand tightening the fasteners only.
- d. Secure the reject mechanism in place using previously fitted bolts.
- e. Torque fasteners to 5.6 ft-lb. (7.6 Nm).
- f. Adjust the angle and depth of the the reject mechanism as required. Loosen the side bolts to adjust the angle and then tighten them when aligned.

8. Attach the sample head.

⚠ WARNING!

DRILL INJURY

Be careful to avoid injuring hands and eyes when drilling. Wear correct PPE at all times.

- a. Drill four location holes into the track side face in the approximate position required for the sample head.

Use track location *T* slots if available (no drilling required).

- b. Place the sample head on the track in the approximate position required using four M6 socket head cap screws, two spring washers, and two washers.
- c. Leave the sample head loose by hand tightening the fasteners only.
- d. Secure the sample head in place using previously fitted fixings.
- e. Torque fasteners to 5.6 ft-lb. (7.6 Nm).
- f. Adjust the sample head height to the track as required to suit pack thickness. Loosen side bolts to adjust the height on the slots and then tighten them when aligned to the required pack height.

4 Startup

The Leak Detection System must be installed and fully commissioned by qualified Rosemount™ personnel prior to customer operation.

1. Turn the unit isolator switch (shown below) to the ON position.

Once power has been started, the system takes approximately two minutes to boot.

Figure 4-1: Isolation Switches



2. Ensure the compressed air supply is open.
3. When production begins, turn the blower isolator to the **ON** position.

NOTICE

Emerson™ recommends that the blower is switched off when the production line is not running. This will extend the lifetime of the sample air filter.

4. Press the **Reset** button on the front of the console and ensure there is a green light on the beacon.

5 Shutdown

Complete the following steps to safely shut down the system when it is not in use.

⚠ CAUTION!

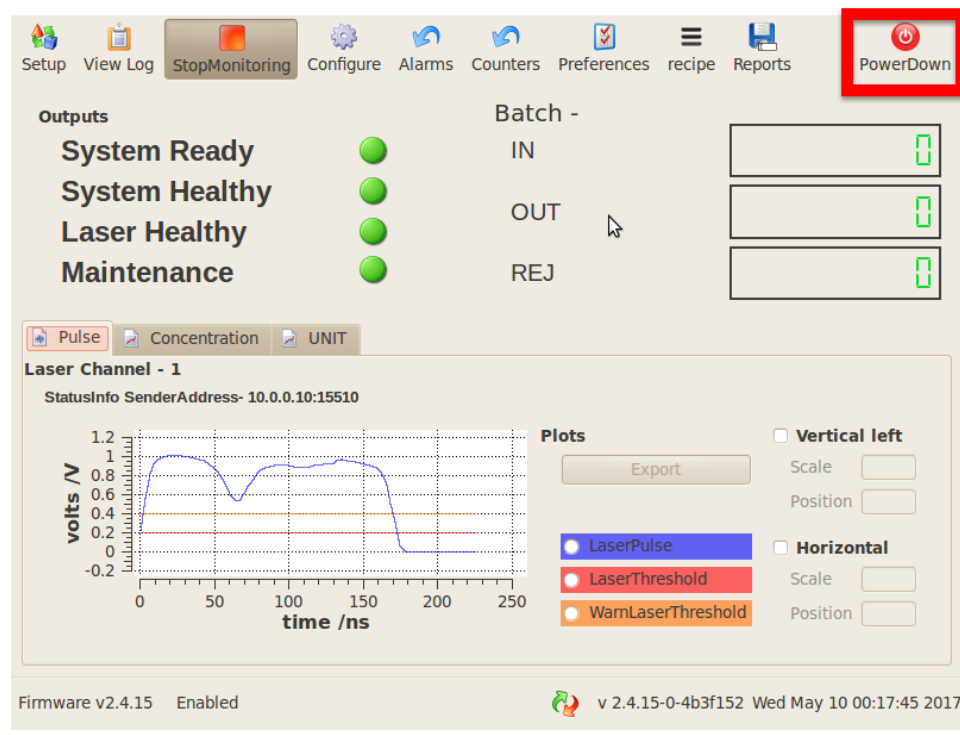
EQUIPMENT DAMAGE

Failure to follow the correct shutdown procedure may damage the instrument. Only use the isolation switch on its own to shut down the system in an emergency as a last resort to remove power from the system.

Procedure

1. Press the **PowerDown** button at the upper right corner of the human machine interface (HMI).

Figure 5-1: Shutting Down the System



This shuts down the HMI.

2. Turn the unit isolator to the OFF position.

NOTICE

Turning the unit isolator switch to OFF switches the system off. At this point, mains voltage is still applied inside the enclosure. Before opening the packaged Leak Detection System, isolate the mains to the enclosure at the mains supply.

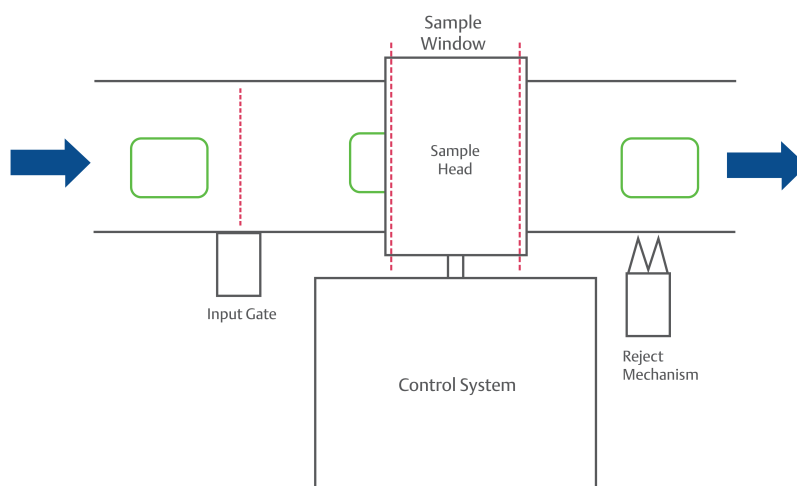
3. Close the compressed air supply if required.

6 Operation

The packaged Leak Detection System is designed to run autonomously with minimal user interaction required. After the startup procedure in [Chapter 4](#), the system needs only a green light to run.

There are up to three components mounted onto the packaged production line. The layout of the line is shown schematically in [Figure 6-1](#).

Figure 6-1: Schematic Layout of the System On Line



The packs flow on the schematic above from left to right. The packs pass through the input gate which is located before the sample head. A space of at least 1 in. (2.5 cm) is required between packs in order to ensure correct counting and rejection. A space of at least 6 in. (15.2 cm) is advised for best operation.

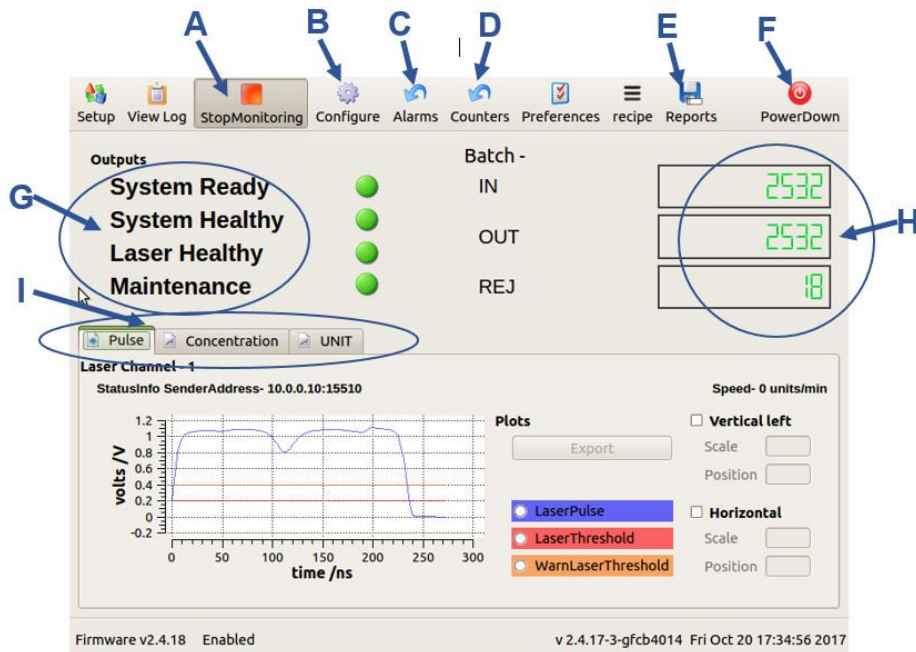
The sample head then analyzes the pack/container.

The reject mechanism safely removes faulty containers from the production line without the need to stop the line. The distances between the components is set at the time of install and is determined by the speed of the production line.

6.1 Leak detector manager (LDM) software

The LDM software is designed to give clear information at-a-glance.

Figure 6-2: LDM Home screen



- A. **Start/Stop Monitoring:** Automatically starts monitoring during startup. Pressing the button again will pause the system and stop measuring.
- B. **Configure:** Accesses the settings and parameters of the system and is password protected.
- C. **Reset Alarms:** Clears alarms and resets status alarms to green.
- D. **Reset Counters:** Returns the counters to 0.
- E. **Reports:** Accesses the logging features of the system. Use a USB to log and export production statistics and rejection data.
- F. **Power Down:** Safely shuts down the HMI.
- G. **Outputs:** Explained in [Section 6.3](#).
- H. Counters
- I. **Tab selection:** Toggle between the three tabs to change which visual information is displayed.
 - A. Pulse: Displays the laser pulse amplitude in volts (see [Figure 6-2](#)).
 - B. Concentration: Displays the CO₂ measurement plot and shows a spike for a leaking pack (see [Figure 6-3](#)).
 - C. UNIT: Displays the measurement plot between the gates, refreshing for each pack (see [Figure 6-4](#)).

Figure 6-3: Concentration Tab

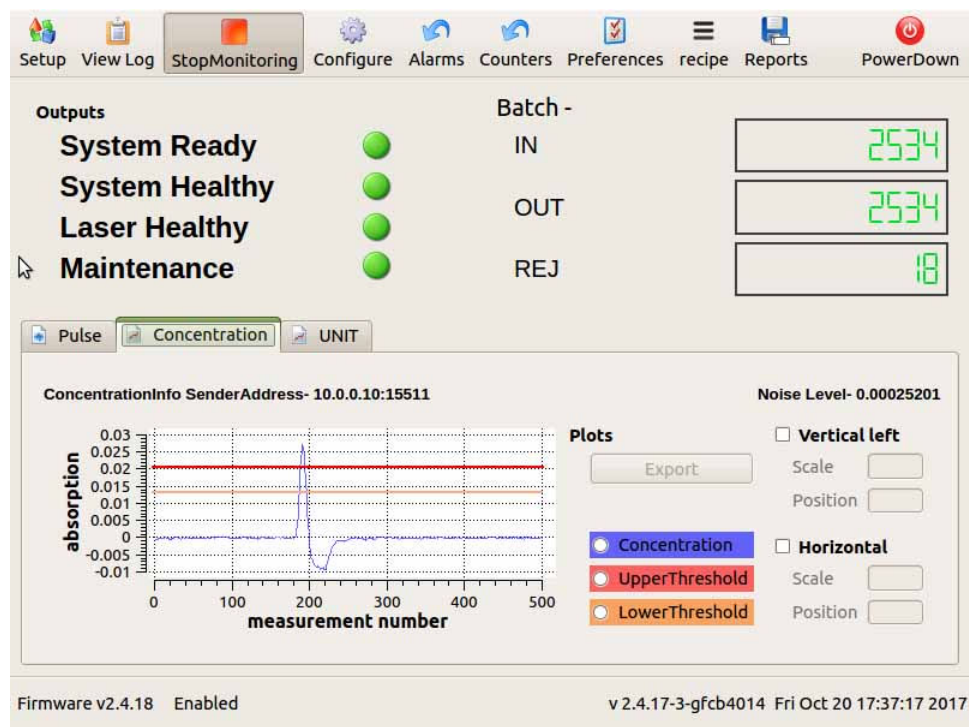


Figure 6-3 shows the *Concentration* tab with one leaking package passing through. When the blue line reaches the upper threshold (red line), the sensor sends a rejection signal to the PLC and then the rejection solenoid to remove the faulty pack from the line. The lower threshold is typically approximately 80 percent of the upper threshold and prevents the system from missing a marginal leak.

Figure 6-4: UNIT Tab

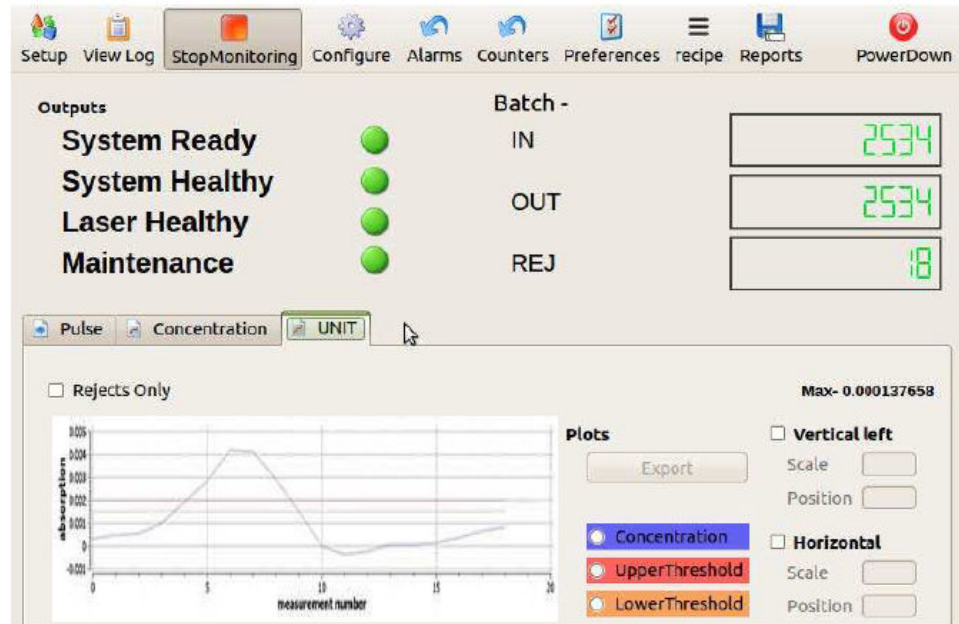


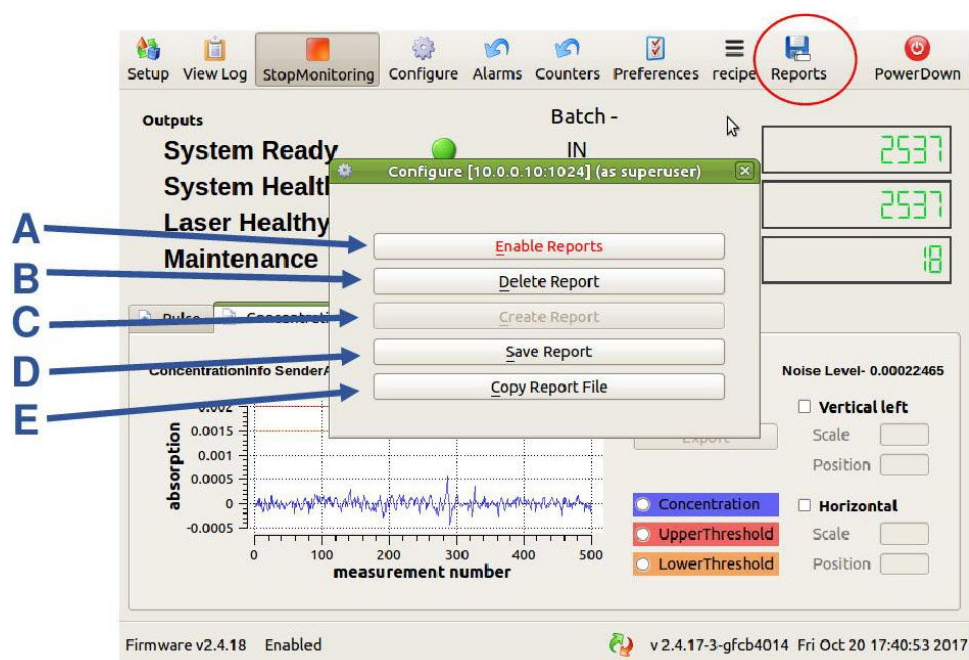
Figure 6-4 shows the UNIT tab when a leaking pack has passed through. The plot shows all data points between the input and output gate and records the size of the rejection spike.

6.2 Data logging and reporting

The system can store production statistics like packs processed and number of rejects. This can be transferred from the HMI on a USB stick to be analyzed elsewhere.

To enable the *Reporting* screen, click the *Reports* tab. The *Reporting* screen is password protected, and the password will be supplied or changed during installation.

Figure 6-5: Reports Popup Window



- A. **Enable/Disable Reports:** Turn reporting on or off.
- B. **Delete Report:** Delete a file from a specified location.
- C. **Create report:** Set the file name and save location.
- D. **Save Report:** Save the current file to a specified location.
- E. **Copy Report File:** Move a file from one location to another.

Note

The file must be saved as <filename>.txt

You can export the .txt report file to a USB stick and process it elsewhere. If you open the file using Microsoft® Excel or a similar program, it will look like the example below.

Figure 6-6: Sample Report File

A	B	C	D	E	F	G	H
Log	file	opened	at	28.06.2017	09:10:19		
Client	name	ABC					
Product	name	Tasty ABC					
Batch	number	14					
Number	UNITS	Rejected	16				
Number	UNITS	Processed	729				
Log	file	closed	at	28.06.2017	09:39:57		
Date	Time	Leak(abs)	Leak(cal)	UT	LT	noiselevel	reject
28.06.2017	09:10:05	0.00136928	0	0.005	0.004	0.000534323	0
28.06.2017	09:10:09	0.000571722	0	0.005	0.004	0.000612099	0
28.06.2017	09:10:12	0.00140842	0	0.005	0.004	0.000612099	0
28.06.2017	09:10:14	0.000849349	0	0.005	0.004	0.000612099	0
28.06.2017	09:10:20	0.0119992	0	0.005	0.004	0.000651409	1
28.06.2017	09:10:23	0.00117535	0	0.005	0.004	0.000423098	0
28.06.2017	09:10:25	0.00119883	0	0.005	0.004	0.000423098	0
28.06.2017	09:10:27	0.0007473	0	0.005	0.004	0.000423098	0
28.06.2017	09:10:29	0.000668466	0	0.005	0.004	0.0003398	0
28.06.2017	09:10:31	0.00100697	0	0.005	0.004	0.0003398	0

- *Client/Product/Batch:* These are entered during the creation of the log file.
- *Date/Time:* The timestamp for each unit; this is set by the PC.
- *Leak (abs):* The maximum concentration value for each unit. If this value is greater than the upper threshold, this package will be rejected.
- *Leak (cal):* For certain applications, a calibration factor may be applied in order to have units for leakage (i.e., bubbles/second or mg/day).
- *UT:* The upper threshold value. If the concentration exceeds this value, the package is rejected.
- *LT:* The lower threshold: If two consecutive concentration points exceed this value, the package is rejected.
- *Noiselevel:* the noise value at the time when the package is logged.
- *Reject:* Packages which do not breach thresholds are *reject = 0*, and those which breach thresholds are *reject = 1*.

Note

If you want to view only rejected packages, then filter column H to show only rows with 1 in them.

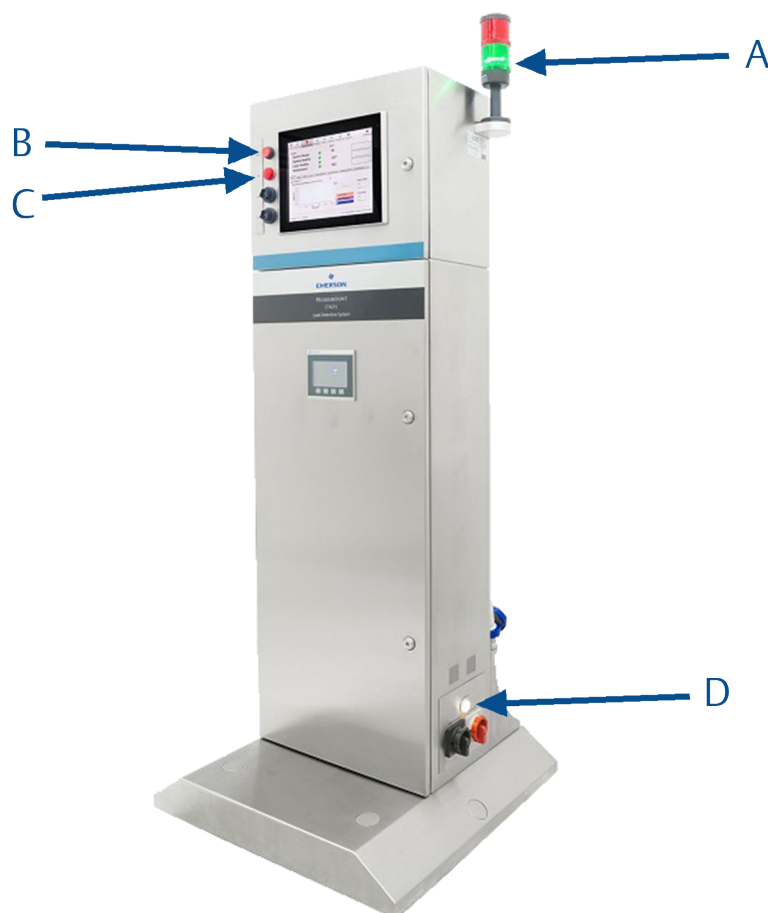
NOTICE

The *CanInfo* type is logged for all units processed; the *Reject* type only shows the reject value.

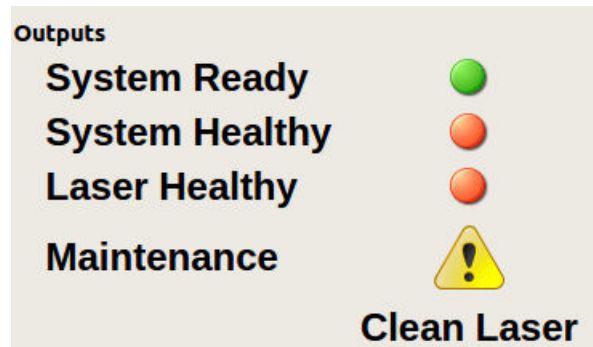
6.3 Status lamps / errors

There are a number of errors that the Leak Detection System monitors, which may occur during the normal operation of the system. The errors are displayed as an illuminated lamp on the front of the enclosure. All errors latch and are cleared by the **RESET** button on the front of the enclosure. The errors are detailed below and, when activated, will trigger the red beacon bulb and line stop (if applicable).

Figure 6-7: Cabinet Status Indicators

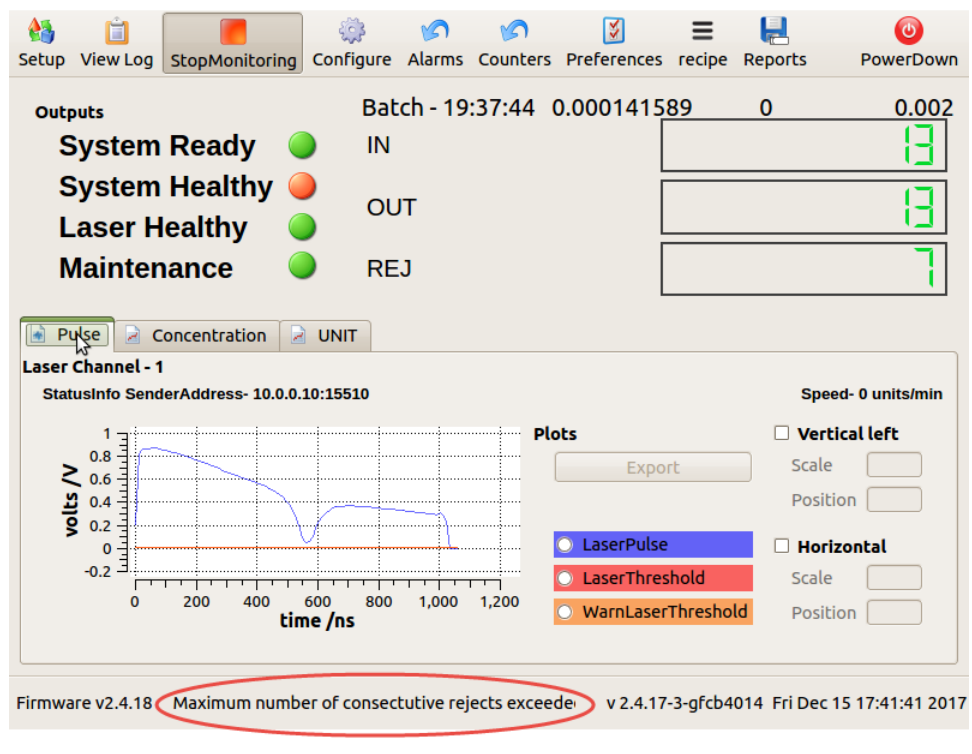


- A. *Alarm beacon: Green for healthy; red for unhealthy/line stop.*
- B. ***RESET** button to clear latched alarms.*
- C. ***AIR** status bulb. Illuminates when blower or compressed air is off.*
- D. *Blower status: A status bulb turns on when power is supplied to the blower. If the power is interrupted, the bulb doesn't turn on, and the **AIR** warning bulb turns on.*

Figure 6-8: LDM Software Errors

1. System Ready: Shows when the system is ready for use. This is red during system start up.
2. System Healthy: The system can become unhealthy if the gate in/out count is different or if there have been n consecutive rejects (the default value is five consecutive rejects). Press **Reset counters** on the HMI to clear the error.
3. Laser Healthy: The laser becomes unhealthy if it is below the threshold value (see the red line in [Figure 6-2](#)). Check the beam path for obstruction or clean the cell mirrors as described in [Section 7.2](#). This error automatically clears when the pulse amplitude is above the threshold.
4. Maintenance: The yellow warning triangle appears if the laser pulse amplitude is below the warning threshold value. System performance is not affected, but you should consider activating the mirror purge or cleaning the cell mirrors soon. This error automatically clears when the pulse amplitude is above the warning threshold.
5. Too many Consecutive Rejects: If several packs are rejected in a row, this error is triggered. [Figure 6-9](#) shows the error message generated. To reset this error, press the **Reset Alarms** button on the touch screen.

Figure 6-9: Consecutive Rejects Error



6.4 Line stop

The control system provides a signal that can stop the production line if there are errors on the system.

The signal is sent to the STATUS connector shown in [Figure 2-2](#). The connection is a volt-free contact and can be configured in *Normally Closed* (NC) and *Normally Open* (NO) from a customer supplied 24 V.

Table 6-1: Line Stop Plug Pin Numbering

	24 V line	0 V line
Normally Closed (NC)	1	2
Normally Open (NO)	3	2

The overall system is high when healthy (green light) and low when unhealthy (red light).

6.5 PLC configuration screen

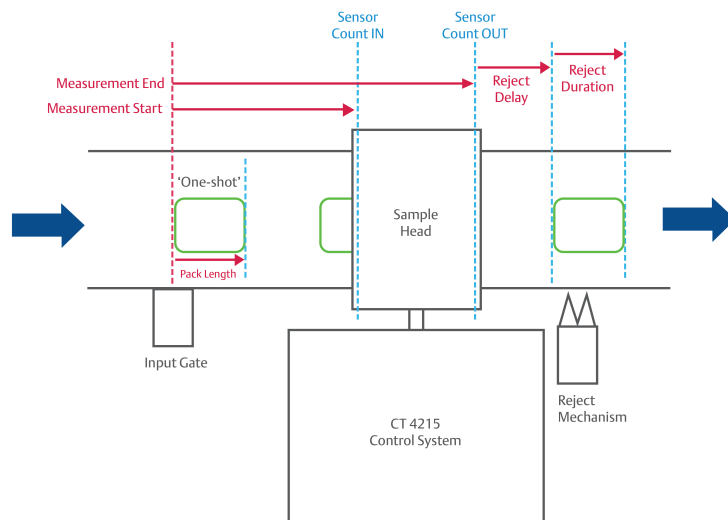
⚠ CAUTION!

EQUIPMENT DAMAGE

The PLC settings directly control the analysis and rejection of defective containers. Only trained personnel should change the settings listed below. The PLC screen has password protection in order to prevent unauthorized access. The credentials are provided to the relevant department during installation. Following any change to line speed, pack size, or pack spacing, qualified personnel should verify the system.

The system is designed to accommodate changes in pack size and line speed. There are five configurable parameters highlighted in red below.

Figure 6-10: PLC Configurable Parameters



The PLC screens are shown in [Figure 6-11](#) with an explanation of each button in [Table 6-2](#).

Figure 6-11: PLC Configuration Screens

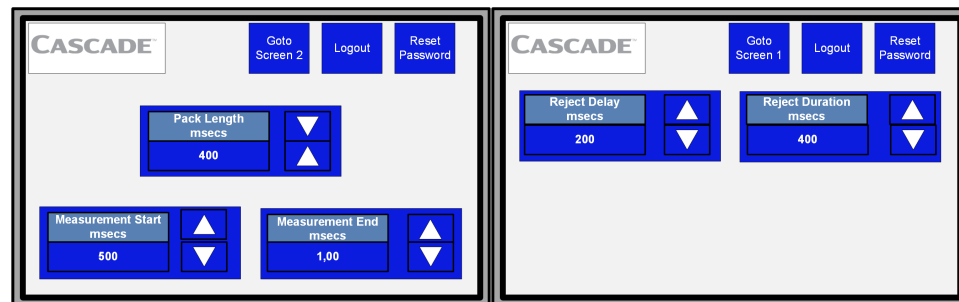


Table 6-2: PLC Configuration Parameters

Parameter name	Description	Range
Pack Length	The length of time a pack takes to pass the input gate. This timer is a de-bounce to prevent double counting of uneven packs.	0 - 2000 ms
Measurement Start	The delay between the pack passing the input gate and the sensor counting it IN and beginning analysis.	0 - 9000 ms
Measurement End	The delay between the pack being counted in and the sensor finishing analysis. This ensures complete inspection from leading edge to trailing edge. This also generates the pack OUT count on the software screen.	0 - 10000 ms
Reject Delay	The time between the bag being counted OUT and the rejection mechanism.	60000 ms (1 minute)
Reject Duration	The length of time for which the rejection solenoid is open for rejection.	10000 ms

7 Maintenance

The packaged Leak Detection System is inherently reliable at reducing the requirement for routine maintenance. This section provides information on the schedule of maintenance you should perform to ensure the reliable performance of the system.

⚠ WARNING!

ELECTRIC SHOCK

For all maintenance inside the lower section of the console, the system must be powered off using the shutdown procedure detailed in [Chapter 5](#). Inside the console there are potentially dangerous voltages.

7.1 Scheduled maintenance

The maintenance activities and their related frequencies are shown below.

7.2 Clean cell mirrors

Follow the steps below to clean the cell mirrors in the Rosemount™ CT4215.

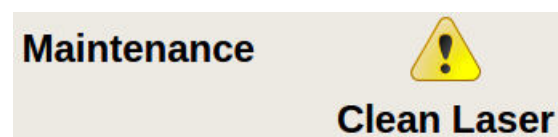
⚠ CAUTION!

EQUIPMENT DAMAGE

The cell mirrors are an optical device; only clean them when required. Avoid over cleaning the mirrors. Use only the cleaning parts listed in this document.

If the laser pulse amplitude drops below the laser warning threshold (default 0.4 V), then the yellow Maintenance warning message appears on the HMI ([Figure 7-1](#)).

Figure 7-1: Error Message for Pulse Amplitude below Warning Threshold



The system performance is not affected and runs as normal, but consider purging the cell or prepare to clean the cell mirrors soon.

If the laser pulse amplitude drops below the laser threshold (default 0.2 V), the Laser Healthy alarm turns red, and the **LASER** bulb on the front of the control system is red. At this point, the line stops, because of the red light; clean the mirrors.

Figure 7-2: Error Message for Pulse Amplitude below Threshold

Laser Healthy



Procedure

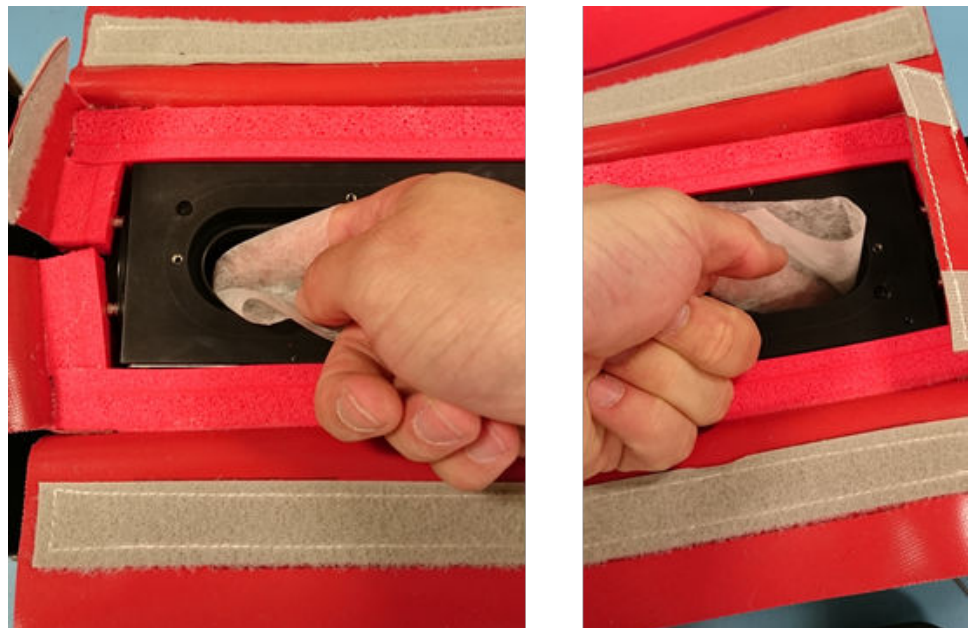
1. Switch off the **BLOWER ISOLATOR** and compressed air supply.
2. Open the upper enclosure to see the red measurement cell jacket.
3. Release the two clamps on top of the cell lid.
4. Remove the top cover of the cell jacket.
5. Remove the black cell cover.
6. Use only Thor Labs lens cleaning tissue (P-5000-0613) to gently wipe the mirrors on each side of the cell (see [Figure 7-3](#)).

⚠ CAUTION!

EQUIPMENT DAMAGE

Avoid skin contact with the mirrors as oils can be deposited.

Figure 7-3: Cleaning the Cell Mirrors



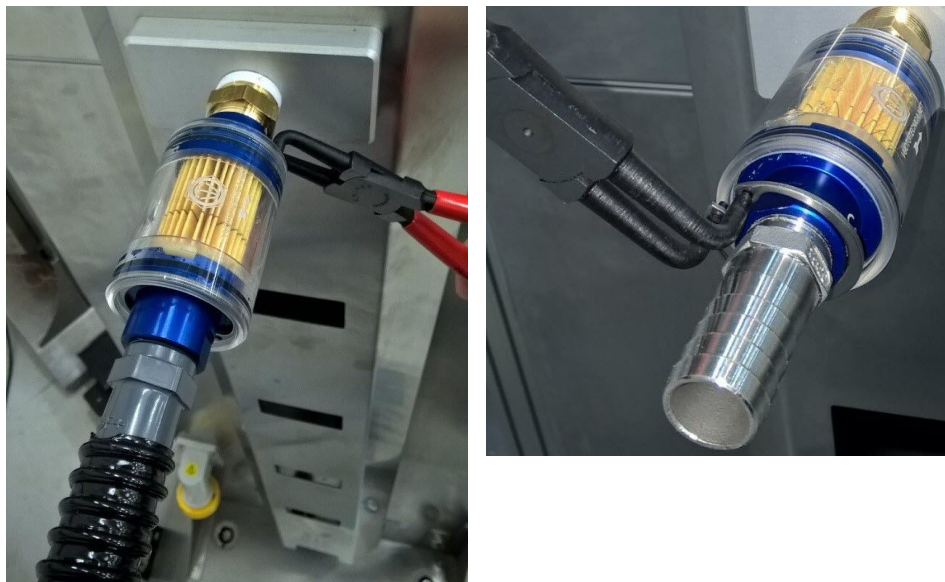
7. Once the mirrors have been cleaned, check the pulse amplitude on the HMI and ensure it is > 0.4 V, resetting any alarms.
8. Replace the black cell lid, red cell cover, and clamps.
9. Switch on the **BLOWER ISOLATOR** and press the **Purge** button for a few short bursts.
10. Close the upper enclosure and reset any alarms.

7.3 Air filter

The air filter is located externally at the rear of the upper enclosure and prevents dust and debris from reaching the cell. Emerson™ recommends inspecting the filter at monthly intervals. The steps below show how to access the air filter for inspection or changing.

1. Isolate the blower so that there is no air flow through the filter and cell.
2. Using circlip pliers, remove the circlip from the end of the filter housing, [Figure 7-4](#).

Figure 7-4: Removing the Circlip from the Filter Housing



3. Remove the end fitting from the filter housing, taking care not to damage the O-ring or the filter housing in the process, [Figure 7-5](#).

Figure 7-5: Removing the End Fitting from the Filter Housing



4. Remove the filter for inspection/cleaning or replacement, [Figure 7-6](#). Retain the O-ring.

Figure 7-6: Removing the Filter from the Filter Housing



7.4 Control system

The leak detector system is inherently tolerant to high levels of contamination/dust without a reduction in performance.

Depending on the factory cleaning regulations, wipe down the control cabinet with suitable cleaning products as required. Emerson™ recommends doing this monthly.

7.5 Sample head

The sample head comes into contact with packages, so it should be cleaned and inspected in line with the factory standards. Only clean the sample head when the system is switched off, compressed air is off, and the conveyor is off.

7.6 Recommended spare parts

The following parts are available from Emerson™.

Table 7-1: Spare Parts

Part number	Part description
P-6000-00358	Valve, solenoid
P-6000-00357	Filter/regulator, 40 m
P-6000-00355	Filter 0.01 m
P-6000-00495	Lens cleaning tissue (pack of 5)
B-6000-0007-C	PCB, digitiser, Mk5
E-4004-6002-B	PCB, motherboard
E-4004-6001-D	PCB, pulse module
E-4001-9001-B	PCB, opto
M-3000-0936 Assy	Assy, cell mirror
M-3000-1367-B	Assy, pneumatic plate
P-6001-00052	Module, detector
P-6000-00139	Relay, 110 Vac
P-6000-01303	Blower, side channel
B-6000-0007-C	PCB, digitiser

8 Troubleshooting and diagnostics

The Rosemount™ CT4215 leak detection system is designed to run unattended and to recover from system issues where possible. This section is designed to assist in the identification and solution of potential problems. If in doubt, contact Rosemount™ customer services for clarification on solutions before continuing.

Table 8-1: Possible Problems and Solutions

Fault symptom	Order of troubleshooting	Action or item to be replaced
System is not switching on.	Check the mains power is connected and on at the supply. (There may be a customer-provided circuit breaker fitted in a nearby cabinet).	Reset customer MCB if tripped.
	Check the system isolator is set to the ON position.	Switch the isolator ON.
	Check the 12/24 V MCBs Q1/Q2 have not tripped.	Reset MCBs if tripped.
	Check inside AC distribution box.	
Laser pulse is not displayed.	Check the network connection on the motherboard for flashing LED.	
	Check the HMI ethernet for flashing LED.	
	Check network switch hub for flashing LED.	
	Check UDP addresses match in <i>Configuration</i> screen and <i>Setup</i> screen.	Default values for the UDP addresses are 65501 and 65502.
	Check the laser ribbon cable.	Reconnect the cable (do not hot plug if loose).
	Check the detector ribbon cable and SMA.	Reconnect the cable (do not hot plug if loose).
Concentration graph is not updating.	Check the network connection on the motherboard for flashing LED.	
	Check the HMI ethernet for flashing LED.	
	Check network switch hub for flashing LED.	
	Check UDP addresses match in <i>Configuration</i> screen and <i>Setup</i> screen.	Default values for the UDP addresses are 65501 and 65502.
	Check the laser ribbon cable.	Reconnect the cable (do not hot plug if loose).
	Check the detector ribbon cable and SMA (do not hot plug).	Reconnect the cable (do not hot plug if loose).

Table 8-1: Possible Problems and Solutions (continued)

Fault symptom	Order of troubleshooting	Action or item to be replaced
Maintenance alarm on LDM.	If the pulse is below the LASER warning threshold, consider purging the cell with compressed air.	Purge the cell.
	<p>Note The system will still be healthy.</p>	
	Consider cleaning the cell mirrors soon when pulse is below threshold.	Clean the mirrors.
Laser unhealthy.	If the pulse is below the laser threshold, clean the cell mirrors.	Clean the mirrors.
	Check the laser beam path for obstructions.	Clear any obstructions from the laser beam path.
System unhealthy.	If the pulse is below the laser threshold, clean the cell mirrors.	Clean the mirrors.
	Check the laser beam path for obstructions.	Clear any obstructions from the laser beam path.
	If the system has rejected n consecutive rejects, press the Reset alarms button on LDM.	Press the Reset button (see Section 6.3).
	If the IN/OUT count does not match, reset the counters.	Reset the counters.
AIR warning light illuminated.	Check the blower isolator is in the ON position and the blower status bulb is illuminated.	Switch the isolator ON.
	Check the compressed air supply is open.	Turn on the air.
	Check the compressed air supply pressure is within the specified range of the pressure switch (0.3 - 0.5 MPa). Pressure switch should be green.	Confirm the supply pressure. (See Section 2.4 for location of the pressure regulator).
Traffic light is red and does not reset to green when Reset pressed.	Check if the LDM dashboard is green.	Repeat the rows Laser unhealthy and System unhealthy above.
	Check if the AIR warning light is illuminated.	Repeat the row AIR warning light illuminated above.
System is not counting packs.	Check the INPUT gate cable is attached at both ends: control system and light gate.	Attach the cable (do not hot plug if loose).

Table 8-1: Possible Problems and Solutions (continued)

Fault symptom	Order of troubleshooting	Action or item to be replaced
	Check that the orange LED is flashing on the light gate when a pack enters the system.	Gate sensitivity can be adjusted using the dial on the light gate. It should flash orange when the beam is broken at a distance of approximately 20 to 200 mm.

Appendix A

Specifications

The following table shows the general characteristics of the Leak Detection System.

Table A-1: System Specifications

Item	Measurement	Notes
Control enclosure		
Dimensions	33 x 23 x 69 (74) in. 840 x 588 x 1743 (1900) mm	Depth x width x height (top of beacon)
Weight	268 lb. 119 kg	
Sample head		
Dimensions	19 x 20 x 13 in. 480 x 500 x 320 mm	Depth x width x height
Weight	30.9 lb. 14 kg	
Detectable gases		
Standard		Ethanol - drinks
Specify on order		CO ₂ - food
Environment		
Air temperature	23 to 86 °F -5 to 30 °C	Ambient
Humidity range	10 to 95%	Relative humidity (non-condensing) at 95 °F (35 °C)
Production line area services required		
System operating voltage	110/240 Vac, 50/60 Hz	Specify on order
System power consumption	600 W	Maximum power requirement
Factory air supply	116 psi to 145 psi 8 to 10 Bar	Clean, dry, and oil free
Line space requirement	3.9 ft. 1.2 m	Standard free line (approximate, dependent on line speed)
Air filter particulate filter	5 µm	Inline filter

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