Rosemount™ CT5800 Continuous Gas Analyzer
Preface

Published by Emerson.

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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General inquiries about this or other Cascade Technologies products should be sent to qcl.csc@emerson.com.

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Important information

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

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 analyzer. To install, start up, operate, maintain and service the analyzer in a safe manner, it is MANDATORY to read all additional instruction manuals shipped with the analyzer. The following instruction manual(s) are available and / or referenced within this manual:

Rosemount CT5800 Quick Start Guide: D-7010-0055

All instructions must be saved for future use. Contact your local service center or sales office if you are missing documents.

User information

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

IMPORTANT: All users must read this page before proceeding!

Emerson (Rosemount) designs, manufactures, and tests its products to meet many national and international standards. The Rosemount CT5800 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 Emerson (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 Emerson (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 (Rosemount).
- 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 analyzer 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 analyzer.

Authorized personnel

**NOTICE**

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

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

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<td>Explosive atmospheres. Equipment protection by flameproof enclosures</td>
</tr>
<tr>
<td>IEC 60079-0:2011 Ed 6</td>
<td>Explosive atmospheres - Part 0: Equipment - General requirements</td>
</tr>
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(1) May affect equipment tested prior to April 20, 2016, but shipped at a later date.

(2) All equipment tested from April 20, 2016 will be subject to the directive.

### Associated publications

- Quick Start Guide: D-7010-0055

### Compliance approvals

This product complies with USA 21 CFR 1040.10. It is also designed and manufactured under an approved quality management system to ISO 9001:2008.
Emerson and the Rosemount CT5800 Gas Analyzer have satisfied the requirements for applying the CE marking to the Rosemount CT5800 Gas Analyzer.

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

Explosive / hazardous area protections

This article is in accordance with IEC 60079-0: 2011 Clause 30.
This article must not be changed, amended, or removed.
Emerson has satisfied the requirements of and complies with IEC, ATEX, and North American regulators for operation of electrical/electronic equipment in hazardous locations.

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

⚠️ **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.

This article is in accordance with IEC 60079-0: 2011 Clause 30.

This article must not be changed, amended, or removed.

---

**DANGER!**

**FLAMMABLE SUBSTANCES**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

Internal parts of the analyzer may reach temperatures of 65 °C (150 °F) and may present an ignition source.

Exercise care when using oil, paint, cleaning rags, and other flammable substances near the analyzer. A fire may result if this precaution is not observed. Always assume that the interior of a analyzer is hot unless it has been switched off and allowed to cool down.

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

---

**DANGER!**

**ELECTRIC SHOCK**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

---

**DANGER!**

**FAILURE TO LOCK-OUT GAS HANDLING SYSTEM MAY CAUSE DEATH.**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

---

**DANGER!**

**FAILURE TO VENT SAMPLE GAS MAY CAUSE DEATH.**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

Allow the analyzer 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!**

**EXPLOSION HAZARD**

The unit described in this manual may not be used in explosive atmospheres without additional safety measures.
**WARNING!**

**ELECTRICAL SHOCK HAZARD**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

Do not operate without covers secure.

Do not open while energized.

Installation requires access to live parts which can cause death or serious injury.

For safety and proper performance, this instrument must be connected to a properly grounded three-wire source of power.

**WARNING!**

**TOXIC GASES**

This unit’s exhaust may contain toxic gases such as (but not limited to) sulfur dioxide. These gases can cause serious injuries. Avoid inhaling exhaust gases.

Connect the exhaust pipe to a suitable flue and inspect the pipes regularly for leaks.

All connections must be airtight to avoid leaks.

**WARNING!**

**GASES HAZARDOUS TO HEALTH**

Follow the safety precautions for all gases (sample and span gases) and gas cylinders.

Before opening the gas lines, purge them with air or neutral gas (N\textsubscript{2}) to avoid danger from escaping toxic, flammable, explosive, or hazardous gases.

**WARNING!**

**FLAMMABLE OR EXPLOSIVE GASES**

When supplying explosive gases or flammable gases with concentrations of more than 25% of the lower explosion limit, Emerson recommends implementing one or more additional safety measures:

- Purging the unit with inert gas
- Stainless steel internal pipes
- Flame arrestors on gas inlets and outlets
- Infallible measuring cells

**WARNING!**

**CONNECTING UNITS FOR PERMANENT INSTALLATION**

Only qualified personnel following all applicable and legal regulations may install the unit and connect it to power and signal cables. Failure to comply may invalidate the unit's warranty and cause exposure to the risk of injury or death.

This unit may only be installed by qualified personnel familiar with the possible risks.

Working on units equipped with screw-type terminals for electrical connections may require the exposure of energized components.

Wall-mounted units have no power switch and are operational when connected to a power supply. The operating company is therefore required to have a power switch or circuit breaker (as per IEC 60947-1/-3) available on the premises. This must be installed near the unit, easily accessible to operators and labeled as a power cut-off for the analyzer.
WARNING!

EXPLOSION HAZARD
Exhaust gases may contain hydrocarbons and other toxic gases, such as carbon monoxide. Carbon monoxide is toxic.
Faulty gas connections may lead to explosion and death.
Ensure that all gas connections are connected as labeled and airtight.

WARNING!

EXPLOSION HAZARD
This article is in accordance with IEC 60079-0: 2011, Clause 30.
Read all instruction manuals (including versions for auxiliary equipment) before installing this instrument.
Failure to observe this warning and/or follow safety instructions could cause an explosion or potentially hazardous situation, which if not avoided, could result in death or serious injury.

WARNING!

EXPLOSION HAZARD
This article is in accordance with IEC 60079-0: 2011 Clause 30.
When installing and wiring this instrument, you must comply with all relevant national legislative requirements and regulations.
Consider all safety instructions within this manual and all associated analyzer instruction manuals.
Failure to observe this warning and/or follow safety instructions could cause an explosion or potentially hazardous situation which, if not avoided, could result in death or serious injury.

WARNING!

EXPLOSION HAZARD
This article is in accordance with IEC 60079-0: 2011 Clause 30.
When the analyzer is out of order, all inputs and outputs connected to external equipment must be shut off.
Failure to observe this warning and/or follow safety instructions could cause an explosion or potentially hazardous situation which, if not avoided, could result in death or serious injury.

WARNING!

EXPLOSION HAZARD
This article is in accordance with IEC 60079-0: 2011 Clause 30.
Only properly trained personnel who understand the contents of all applicable manuals and related instructions must conduct the startup procedure.
Failure to observe this warning and/or follow safety instructions could cause an explosion or potentially hazardous situation which, if not avoided, could result in death or serious injury.

WARNING!

EXPLOSION HAZARD
This article is in accordance with IEC 60079-0: 2011 Clause 30.
Do not open while an explosive atmosphere may be present.
Failure to observe this warning and/or follow safety instructions could cause an explosion or potentially hazardous situation which, if not avoided, could result in death or serious injury.
**WARNING!**
Do not open when energized

**AVERTISSEMENT**
Ne pas ouvrir si une atmosphère explosive gazeuse est présente.

**WARNING!**

**EXPLOSION HAZARD**
This article is in accordance with IEC 60079-0: 2011 Clause 30. Use only replacement parts and components authorized by Emerson. All replacement parts and components must be suitable Ex-certified components for use in hazardous areas. Failure to comply will void certification and may cause explosions.

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

**AVERTISSEMENT**
Ne pas ouvrir sous tension

**WARNING!**

**EXPLOSION HAZARD BY BATTERY**
This article is in accordance with IEC 60079-0: 2011 Clause 30.

The Rosemount CT5800 contains a low voltage battery for data backup purposes on the CPU.

Under normal operating conditions, there is no need to replace the battery during the analyzer lifetime. However, if it is to be replaced, make sure only the same type and model is used.

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

**WARNING!**

**EXPLOSION HAZARD**
This article is in accordance with IEC 60079-0: 2011 Clause 30.

When the analyzer is out of order, all inputs and outputs connected to external equipment must be shut off.

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

**WARNING!**

**EXPLOSION HAZARD DURING MAINTENANCE**
Disconnect the system from voltage before opening the enclosure. Do not open the analyzer when an explosive atmosphere may be present.

Failure to observe this warning and/or follow safety instructions could cause an explosion or potentially hazardous situation which, if not avoided, could result in death or serious injury.
**WARNING!**

**OPTICAL RADIATION EXPOSURE HAZARD**

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

The Rosemount CT5800 is Class 1. The beams are fully enclosed, and there is no access to the laser beams while the product is in operation or during maintenance. Failure to follow the correct procedures may cause damage to the eye. Do not look at the lasers with any kind of magnifier or optical measuring device.

**Classification**

There are three types of lasers that may be included in the Rosemount CT5800: Quantum Cascade Lasers (QCLs), Interband Cascade Lasers (ICLs), and Tunable Diode Lasers (TDLs). The characteristics of the lasers contained within are given in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>QCL</th>
<th>ICL</th>
<th>TDL</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation mode</td>
<td>Pulsed</td>
<td>Pulsed</td>
<td>Pulsed</td>
<td></td>
</tr>
<tr>
<td>Lasers per system</td>
<td>1 - 6</td>
<td>1 - 6</td>
<td>1 - 6</td>
<td>Maximum of 6 lasers per system</td>
</tr>
<tr>
<td>Wavelength</td>
<td>4 - 10 µm</td>
<td>2 - 5 µm</td>
<td>760 nm</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>&lt; 5 mW</td>
<td>&lt; 5 mW</td>
<td>&lt; 5 mW</td>
<td></td>
</tr>
<tr>
<td>Pulse duration</td>
<td>&lt; 1 µs</td>
<td>1 µs</td>
<td>&lt; 5 µs</td>
<td></td>
</tr>
<tr>
<td>Pulse repetition frequency</td>
<td>&lt; 100 kHz</td>
<td>&lt; 100 kHz</td>
<td>&lt; 100 kHz</td>
<td></td>
</tr>
<tr>
<td>Duty cycle</td>
<td>&lt; 5%</td>
<td>&lt; 5%</td>
<td>&lt; 5%</td>
<td></td>
</tr>
</tbody>
</table>

In accordance with USA 21 CFR 1040.10, the Rosemount CT5800 has warning labels at appropriate positions.

The location of laser safety labels in the Rosemount CT5800 is specified in Section 1.5.

The use of control or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

**WARNING!**

**HAZARDOUS SUBSTANCES**

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

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

- 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!**

LOCK-OUT GAS HANDLING SYSTEM

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

**WARNING!**

HEAVY ITEM

Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lbs.). Always use suitable lifting/moving equipment when moving the analyzer. Wear suitable protective gloves and protective footwear.

When preparing the analyzer for transport by air, road, or rail, safeguard the analyzer against movement or break-away during transport by securely strapping it in place.

**WARNING!**

HEAVY INSTRUMENT

The analyzer weighs 80 kg (176.37 lb) and must be wall or frame mounted.

Emerson recommends that the analyzer is only moved and lifted by a minimum of two people using suitable lifting and transportation equipment.

Use suitable fasteners for the weight of the units.

Make sure the wall or stand the unit is mounted on is solid, stable, and of a suitable material to hold the unit.

Do not mount the analyzer on stud or partition walls.

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

**WARNING!**

HAZARDOUS GAS

This article is in accordance with IEC 60079-0: 2011 Clause 30.

The product stream that the analyzer is examining may be hazardous even at low concentrations. Therefore, take special care to ensure that the sample gas return port either returns the sample gas to the product stream or discharges the sample gas to a location that will not cause a hazard.

**WARNING!**

POTENTIAL ELECTROSTATIC CHARGING HAZARD

This article is in accordance with IEC 60079-0: 2011 Clause 30.

The keypad is non-conducting and may generate an ignition capable level of electrostatic charges under certain extreme conditions. Ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high pressure steam) which might cause a build-up of electrostatic charges on non-conducting surfaces. Additionally, only clean the equipment with a damp cloth.

**AVERTISSEMENT**

Danger potentiel de charges électrostatiques - voir instructions
**WARNING!**

HIGH PRESSURE GAS AND AIR
This article is in accordance with IEC 60079-0: 2011 Clause 30.

The calibration gas supply and compressed air supply operate 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 analyzer.

**WARNING!**

VENT SAMPLE GAS
This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

Allow the analyzer 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!**

BURNS
Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

• Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
• The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.

**WARNING!**

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

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

Allow the analyzer 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!**

CRUSHING HAZARD
Take care not to crush hands when closing the front door of analyzer field housings.

Keep out of the closing area between the enclosure cover and base.

**WARNING!**

EXPLOSION
Danger of explosion if battery is incorrectly replaced. Replace only the same or equivalent type.
CAUTION!
EQUIPMENT DAMAGE
Always follow the startup procedure. Damage to the analyzer may result from a failure to follow this procedure.

CAUTION!
EQUIPMENT DAMAGE
Always follow the shutdown procedure. Damage to the analyzer may result from a failure to follow this procedure.

CAUTION!
UNSERVICEABLE EQUIPMENT
If the pressure and temperature measurements are out of tolerance, refer to Chapter 7 for guidance.

CAUTION!
EMC
This is a Class A product. In a domestic environment, this product may cause radio interference, in which case you may be required to take adequate measures.

CAUTION!
EQUIPMENT DAMAGE
If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

CAUTION!
HAZARD FROM WRONG SUPPLY VOLTAGE
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.

CAUTION!
EQUIPMENT DAMAGE
Additional notes for units with screw-type terminals
Cables for external data processing must be double-insulated against mains power.
If this is not possible, cables must be laid in such a way as to guarantee a clearance of at least 5 mm from power cables. This clearance must be permanently secured (e.g., with cable ties).
## Safety and system labels and annotation

The labels and annotation applied to the analyzer are specified in the table below.

<table>
<thead>
<tr>
<th>Label type</th>
<th>Example</th>
<th>Location</th>
</tr>
</thead>
</table>
| Identification label (including serial number, model number, and USA FDA compliance label) | Made in the UK  
  Manufactured XXXX 2017  
  Rosemount CT5800 Continuous Gas Analyzer  
  Serial number: CT5800-XXXX  
  Model number: CT5800  
  Glendevon House  
  Castle Business Park  
  Stirling, FK9 4TZ  
  United Kingdom  
  Tel. +44 (0)1786 447 721  
  Fax: +44 (0) 1786 475 822  
  Emerson.com/RosemountGasAnalysis | Bottom right                                                             |
| Laser radiation CAUTION label                                             | ![Laser Radiation CAUTION Label](image)                                                                                                         | Interior on analysis cell |
| Laser module identification label                                         | ![Laser Module Identification Label](image)                                                                                                     | On each laser module housing |
| Earth identification label                                                | ![Earth Identification Label](image)                                                                                                            | Back plate                |
| WARNING statement                                                         | ![WARNING Label](image)                                                                                                                           | Interior adjacent to electric power connections |
| AC power supply voltage label                                             | ![AC Power Supply Voltage Label](image)                                                                                                         | Interior adjacent to electric power connections |
| AC power supply Danger label                                              | ![AC Power Supply Danger Label](image)                                                                                                          | External on base adjacent to mains power input conduit |
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1 Plan

1.1 Description

The Rosemount™ CT5800 Continuous Gas Analyzer, referred to hereafter as Rosemount CT5800 or the analyzer, is an electronic sensor that uses laser spectroscopy to perform analysis of process gas streams.

The function of the analyzer is to detect and measure up to tentwelve different types of gas at concentrations ranging from parts per million (ppm) to percentage levels in the process gas stream.

Built within a flameproof enclosure, the analyzer is designed for operation in potentially explosive environments to measure industrial process applications requiring Ex hazardous area certification.

The analyzer is designed to be wall mounted. However, take care to make sure that the analyzer is not exposed to vibration and/or excess low frequency.

**WARNING!**

HEAVY ITEM

In accordance with IEC 60079-0: 2011 Clause 30.

Make sure that the wall the unit is mounted on is solid, stable, and of a suitable material to hold the weight of the analyzer.

Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lb). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.

This manual is intended for the personnel who install, operate, and maintain the equipment.

1.1.1 Intended use

The Rosemount CT5800 is intended to be used as an analyzer for industrial purposes. The Rosemount CT5800 must not be used in medical, diagnostic, or life support applications or as a safety device.

An interruption of the protective earth line, e.g., in an extension cable, may result in risk to you.

Live parts are accessible when operating the instrument with doors open or covers removed.
The emission of gases hazardous to health may be possible even when all gas connections have been correctly made.

1.1.2 Notes on batteries

This instrument contains an Li battery (button cell) of type CR 2032. The battery is soldered into position and usually does not need to be replaced during the instrument’s lifetime.

At the end of lifetime, the instrument must be disposed of in compliance with the waste regulations.

Batteries may leak, overheat, or explode if not handled properly.

Do not open or try to charge a battery.

Do not expose batteries to heat or fire.

**WARNING!**

**EXPLOSION**

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type.

**AVERTISSEMENT**

Risque d’explosion si la pile n’est pas remplacé correctement. Remplacer uniquement par une pile de type identique ou équivalent.

1.1.3 Installing and connecting the unit

The following notices should be followed to ensure compliance with the low voltage directive (Europe) and other applicable regulations.

- Suitable grounding should be made at all connectors provided for this purpose.
- All safety covers and grounding connections must be properly reinstated after maintenance work or troubleshooting.
- A fuse shall be provided at the installation site which will completely disconnect the unit in case of failure. Installing an isolating switch may also be beneficial. In either case, these components must be constructed to conform to recognized norms.

1.2 Equipment purpose and role

The analyzer is a gas sensor system that can be configured to measure the concentrations of multiple small molecules in a gas sample that is provided to the analyzer via a sample line.

The types of molecules that are measured depend on the system configuration.
The analyzer can be configured to detect and measure up to twelve different gases, depending on the combination of laser modules fitted.

1.3 System overview

A complete Rosemount CT5800 system consists of a gas handling system, the analyzer, and the associated interconnecting wiring and gas piping.

Measurement data from the analyzer can be displayed in the process control center.

The Rosemount CT5800 is supplied by Emerson. The gas handling system may be provided by either you or Emerson, depending upon the specific installation. The circuit breakers used to control the application of electrical power to the analyzer, the interconnecting wires, and gas piping are provided by you. In Figure 1-2, the items supplied by Emerson are colored blue, customer-supplied items are colored purple, and items that can be supplied by either Emerson or you are green. Table 1-1 lists the main items of the system.
The analyzer is designed for industrial process applications requiring ATEX Zone 1 hazardous area certification and uses an Ex d flameproof enclosure. It contains an optical system with multiple lasers and a series of optical components that provide an optical path, a heated multi-pass analysis cell, and sample and outlet ports that can be connected to a gas handling system, and control and analysis electronics. The number of lasers installed depends upon customer requirements. The complete system operates Vac from a 110/240 Vac 50/60 Hz supply.

Gas concentrations are measured using mid-infrared optical absorption spectroscopy. The light sources are lasers, which are operated to produce wavelength sweeps that cover the absorption lines of the gases. The light from each laser is routed through an optical path to the analysis cell, which provides measurement of low concentrations of the subject gases. An external sample handling system conditions the sample gas and draws it through the analysis cell. The light exits the multi-pass analysis cell and is directed to a receiver in the analyzer. The variation in the intensity of light in the vicinity of the absorption lines is measured, and the concentration is determined using a comprehensive spectral fitting routine.

There is no sample conditioning provided within the analyzer; the sampled gas must be brought within the parameters shown in Section 1.9 before entering the analyzer. Detailed characteristics of the analyzer are also given in Section 1.9.

Table 1-1: Main Items of the Rosemount CT5800 System

<table>
<thead>
<tr>
<th>Item</th>
<th>Name or description</th>
<th>Supplied by</th>
<th>Part number</th>
<th>Quantity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rosemount CT5800</td>
<td>Emerson</td>
<td>CT5800</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Table 1-1: Main Items of the Rosemount CT5800 System (continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>Name or description</th>
<th>Supplied by</th>
<th>Part number</th>
<th>Quantity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>CT5800 software package, version 5.x.x</td>
<td>Emerson</td>
<td>N/A</td>
<td>1</td>
<td>Software is embedded in PC board. Version described in manual</td>
</tr>
<tr>
<td>3</td>
<td>Gas handling system</td>
<td>Customer (optionally by Emerson)</td>
<td>Customer choice or Emerson</td>
<td>1</td>
<td>Optional supply by Emerson</td>
</tr>
<tr>
<td>4</td>
<td>Heated gas sample line hose</td>
<td>Customer/Emerson</td>
<td>Customer choice</td>
<td>1</td>
<td>Optional supply by Emerson</td>
</tr>
<tr>
<td>5</td>
<td>Exhaust line hose (for sample gas)</td>
<td>Customer/Emerson</td>
<td>Customer choice</td>
<td>1</td>
<td>Optional supply by Emerson</td>
</tr>
<tr>
<td>6</td>
<td>Reference gas cylinders (instrument gas) for calibration purposes</td>
<td>Customer</td>
<td>Customer choice</td>
<td>1 per gas cylinder</td>
<td>Dependent upon number of gases being measured</td>
</tr>
<tr>
<td>7</td>
<td>Pressure regulator</td>
<td>Customer</td>
<td>Customer choice</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Pneumatic T-piece</td>
<td>Customer</td>
<td>Customer choice</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Excess flow line</td>
<td>Customer</td>
<td>Customer choice</td>
<td>1</td>
<td>Required for calibration</td>
</tr>
<tr>
<td>10</td>
<td>240 Vac power cable</td>
<td>Customer</td>
<td>Customer</td>
<td>1</td>
<td>Connect CT5800 to mains power supply</td>
</tr>
<tr>
<td>11</td>
<td>Cable from analyzer to control center</td>
<td>Customer</td>
<td>Customer choice</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Main circuit breaker</td>
<td>Customer</td>
<td>Customer choice</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.4 **Customer information**

This manual contains all the important information that must be followed to ensure the correct operation and safety of personnel when operating the analyzer.

All personnel must read this manual carefully before commencing any work on the analyzer.

For information regarding installation, consult *Chapter 2* and the Quick Start Guide (D-7010-0052).

Emerson is committed to continuously improving its products and documentation. Every effort will be made to include in the documentation any modifications by the manufacturer. However, it should be noted that this document reflects the supplied sensor at the revision date on the front cover.

Should you require further information, or should particular problems arise that are not covered in this manual, you can request additional help from Cascade Technical Support (*qcl.csc@emerson.com*) or Emerson distribution partners. Further contact details for Emerson can be found on the back page of this manual.

1.5 **Safety precautions and conditions for safe use**

**WARNING!**

> Before installing or performing any maintenance on the analyzer, read and understand the safety information given in the preliminary information of this manual.

The analyzer described in this manual has been quality control tested and left the manufacturer in pristine condition. To achieve the correct and safe operation of this product, it must be transported, installed, operated, and maintained as described by the manufacturer.

**Conditions for safe use**

- This equipment has flamepaths which differ from those in IEC60079-1/EN 60079-1. Cascade Technologies Ltd (*qcl.csc@emerson.com*) must be contacted for guidance when maintaining the flamepaths.
- The fasteners which secure the cover are non-standard and shall therefore only be replaced by fasteners supplied by the manufacturer for this purpose. The fasteners must always be fitted with the washer supplied by the manufacturer.
- The equipment has non-conductive surfaces which are a potential electrostatic charging hazard - see instructions for guidance.
- The process gas flow rate is limited to a maximum of 6 liters per minute.
- The equipment shall only be used with process gases which are in gas groups B, C or D (Divisions) or IIb + H 2 (Zones) and must not contain oxygen or any other oxidizer in concentrations greater than that found in normal air.
CSA Certificate North American conditions

- The equipment has flameproof joints with dimensions which are other than those specified in Table 2 of ANSI/UL 60079-1: 6th edition and Table 3 of CSA C22.2 60079-1:16. These flameproof joints are not intended to be repaired, but where necessary the original manufacturer shall be contacted for guidance and information on the dimensions of the flameproof joints.
- The fasteners which secure the cover are non-standard and shall therefore only be replaced by fasteners supplied by the manufacturer for this purpose. The fasteners must always be fitted with the washer supplied by the manufacturer.
- The equipment has non-conductive surfaces which are a potential electrostatic charging hazard – see the instructions for guidance.
- The user shall ensure that the flow of process gas is limited to a maximum flow rate of 6 liters per minute.
- The equipment shall only be used with process gases which are in gas groups B, C or D (Divisions) or IIB + H₂ (Zones) and must not contain oxygen or any other oxidizer in concentrations greater than that found in normal air.
- This assessment does not cover reliable function, performance, or other properties of the equipment not related to safety.
- The equipment is to be installed using wire no larger than 1mm² (18 AWG).
- The equipment is only to be installed by manufacturer trained personnel.
- If at any time there is a conflict between the system safety provisions and any relevant local (national or regional) requirements, local requirements always take precedence.
- The equipment is not to be used with flammable liquids.

1.6 Qualified personnel

This manual provides installation, operation, and maintenance personnel with the level of knowledge required to safely start, operate, and switch off the analyzer.

The installation, advanced operation, switching off, and servicing of the analyzer must only be performed by technically qualified personnel in the field of instrumentation and control who are familiar with this manual and have been specially trained on the analyzer. Only qualified and trained persons have the required specific knowledge to correctly interpret the general safety information, warnings, and procedures given in this manual and apply them to this particular application. Emerson or its distribution partners can provide this training on request.

Knowledge of the safety information within this manual and its technically correct implementation are prerequisites for danger-free installation, operation, and maintenance of the analyzer.
1.7 **Software version**

The analyzer includes software that is used to control the operation of the instrument. This manual describes software version 5.x.x.

1.8 **Gas detection**

The analyzer is highly configurable in the gases that can be detected and their range of concentrations.

1.9 **Detailed system specifications**

*Table 1-2* gives the physical characteristics of the analyzer. Schematic diagrams of the sensor and mounting points are shown in *Figure 1-3*. *Table 1-3* gives the general characteristics of the instrument.

### Table 1-2: Physical Characteristics

<table>
<thead>
<tr>
<th>Rosemount CT5800</th>
<th>Value</th>
<th>Units</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>External dimensions (closed)</td>
<td>694.5 x 292 x 515</td>
<td>mm</td>
<td>Length x Width x Height</td>
</tr>
<tr>
<td></td>
<td>27.34 x 11.5 x 20.28</td>
<td>in.</td>
<td>Nominal dimensions</td>
</tr>
<tr>
<td>External dimensions (open)</td>
<td>694.5 x 292 x 1047.5</td>
<td>mm</td>
<td>Nominal dimensions, front panel at lowest point</td>
</tr>
<tr>
<td></td>
<td>27.34 x 11.5 x 41.24</td>
<td>in.</td>
<td>To open the enclosure, the minimum height required is 1030 mm (40.55 in.)</td>
</tr>
<tr>
<td>Front panel swept radius</td>
<td>545</td>
<td>mm</td>
<td>Allow sufficient space for the front panel to swing through an arc of 180 ° (see Figure 1-4).</td>
</tr>
<tr>
<td></td>
<td>21.46</td>
<td>in.</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>80</td>
<td>kg</td>
<td>Approximate weight</td>
</tr>
<tr>
<td></td>
<td>176.37</td>
<td>lb</td>
<td>The Rosemount CT5800 must be wall mounted. It must not be mounted on stud or partitioned walls.</td>
</tr>
</tbody>
</table>

### Table 1-3: General Characteristics

<table>
<thead>
<tr>
<th>Rosemount CT5800</th>
<th>Value</th>
<th>Units</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>110 to 240</td>
<td>Vac</td>
<td>50/60 Hz ± 10%(factory set)</td>
</tr>
<tr>
<td>Peak power consumption</td>
<td>1100</td>
<td>W</td>
<td>Max consumption per gas analyzer</td>
</tr>
<tr>
<td>Continuous steady-state power consumption</td>
<td>800</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>Electrical compartment enclosure</td>
<td>-</td>
<td>-</td>
<td>Aluminum</td>
</tr>
</tbody>
</table>
Table 1-3: General Characteristics (continued)

<table>
<thead>
<tr>
<th>Rosemount CT5800</th>
<th>Value</th>
<th>Units</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical compartment enclosure</td>
<td>-</td>
<td>-</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Measurement technique</td>
<td>-</td>
<td>-</td>
<td>Mid IR absorption spectroscopy</td>
</tr>
<tr>
<td>Mid IR source</td>
<td>-</td>
<td>-</td>
<td>Quantum Cascade Laser</td>
</tr>
<tr>
<td>Near IR source</td>
<td>-</td>
<td>-</td>
<td>Interband Cascade Laser Tunable diode laser</td>
</tr>
<tr>
<td>Laser classification</td>
<td>Class 1</td>
<td></td>
<td>BS EN 60825-1: 2007 safety of laser products. Equipment classification and requirements (identical to IEC 60825-1 2007)</td>
</tr>
<tr>
<td>Inlet gas port connector</td>
<td>6</td>
<td>mm</td>
<td>Swagelok type, factory-configured, specify on order</td>
</tr>
<tr>
<td></td>
<td>1/4</td>
<td>in.</td>
<td></td>
</tr>
<tr>
<td>Outlet (exhaust) gas port connector</td>
<td>6</td>
<td>mm</td>
<td>Swagelok type, factory-configured, specify on order</td>
</tr>
<tr>
<td></td>
<td>1/4</td>
<td>in.</td>
<td></td>
</tr>
<tr>
<td>Measurement result signals</td>
<td>4 to 20</td>
<td>mA</td>
<td>4 or 8 channel outputs, specify on order</td>
</tr>
<tr>
<td></td>
<td>or Modbus over TCP / IP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warm-up time</td>
<td>90</td>
<td>minutes</td>
<td></td>
</tr>
</tbody>
</table>
Table 1-4: Environmental Characteristics

<table>
<thead>
<tr>
<th>Environmental characteristic</th>
<th>Value</th>
<th>Units</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature range</td>
<td>-20 to 55</td>
<td>°C</td>
<td>Ambient temperature</td>
</tr>
<tr>
<td></td>
<td>-4 to 131</td>
<td>°F</td>
<td></td>
</tr>
<tr>
<td>Sample gas temperature range</td>
<td>4 to 60</td>
<td>°C</td>
<td>Factory set, specify on order</td>
</tr>
<tr>
<td></td>
<td>39 to 140</td>
<td>°F</td>
<td></td>
</tr>
</tbody>
</table>
Table 1-4: Environmental Characteristics (continued)

<table>
<thead>
<tr>
<th>Environmental characteristic</th>
<th>Value</th>
<th>Units</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample gas moisture content</td>
<td>8</td>
<td>%</td>
<td>Maximum</td>
</tr>
<tr>
<td>Sample gas particulate density</td>
<td>5</td>
<td>mg/m³</td>
<td>Maximum</td>
</tr>
<tr>
<td>Sample gas particulate size</td>
<td>10</td>
<td>μm</td>
<td>Maximum</td>
</tr>
<tr>
<td>IP code</td>
<td>66</td>
<td></td>
<td>IP to IEC 60529</td>
</tr>
<tr>
<td>Sensor humidity range</td>
<td>10 to 95</td>
<td>%</td>
<td>Relative humidity (non-condensing) at 45 °C (113 °F)</td>
</tr>
</tbody>
</table>

1.9.1 Optical description

The laser modules are located in the core of the analyzer. Each laser module produces a separate light beam, and these beams are combined linearly as the modules are aligned in the system. The combined beams are closely coupled, parallel, and coaxial about a virtual line. The laser light beams pass through an optical steering assembly, which directs the laser beam through the sample cell.

The sample cell contains a set of mirrors to create a path through the sample gas that is between 0.6 m and 15 m through multiple reflections along the length of the cell. The laser beams exit the cell at the opposite end from where they entered and are directed using a second optical block to a receiver.

By measuring and analyzing the light detected by the receiver unit, it is possible to accurately determine the concentrations of the target molecules within the gas sample cell.

1.10 Unpacking the analyzer

This procedure may require a minimum of two people to safely remove the equipment from the shipping container.

⚠️ WARNING!

HEAVY ITEM
In accordance with IEC 60079-0: 2011 Clause 30.

Make sure that the wall the unit is mounted on is solid, stable, and of a suitable material to hold the weight of the analyzer.

Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lb). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.
**WARNING!**

TRANSPORTATION HAZARD
Use safety-approved lifting equipment. You must ensure safe lifting procedures for the weight and mass of the equipment are followed.

Failure to use proper lifting procedures may cause injury to personnel or damage the analyzer.

**WARNING!**

EXPLOSION HAZARD
This article is in accordance with IEC 60079-0: 2011 Clause 30.

When installing and wiring this instrument, you must comply with all relevant national legislative requirements and regulations.

Consider all safety instructions within this manual and all associated analyzer instruction manuals.

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

**WARNING!**

EXPLOSION HAZARD
Installing the instrument requires opening the enclosure and working at the open instrument. This is permitted only when both no hazardous atmosphere is present and the instrument and connected external circuitry are de-energized.

Depending on the local regulations, this may require a competent hot work supervisor to issue a hot work permit.

**CAUTION!**

SHOCK AND VIBRATION
The Rosemount CT5800 contains sensitive electronic equipment. It must not be subjected to any shock and or vibration.

Damage to the analyzer may result from a failure to follow this caution.

**Procedure**

1. On receipt of goods, look for any visible damage to the analyzer and verify that all items noted to be shipped were received. Record on the goods receipt note any damage or missing items, noting both the item(s) and the quantity missing.
2. Visually inspect the exterior of the analyzer for signs of damage, corrosion, gas leaks, or signs of previously overheating.
3. Report anything found to the maintenance organization.
4. Attach suitably rated and tested lifting slings to the safety engineered lifting eye bolts mounted on the sides of the enclosure.
5. One person carefully guides the equipment from the horizontal to the vertical position while the other person lifts the equipment.
6. Use safety approved and tested lifting equipment to remove the analyzer from the shipping container.
7. Place the analyzer on a solid, level surface and prepare to wall mount the analyzer.
8. Make sure that the analyzer is stored in its protective plastic cover until installation.
2 Install

This section describes the correct installation procedure for the analyzer.

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

### 2.1 Site requirements

Select an appropriate site for installing the analyzer.

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

**WARNING!**

INSTALLATION REQUIREMENTS
The place of installation must be clean, dry, and protected against strong vibrations and frost. Please observe the advisable operating temperatures given in the technical data. Units must not be subjected to direct sunlight or sources of heat.

For outdoor installation, Emerson recommends installing the unit in a cabinet. At a minimum, it should be protected against rainfall.

**WARNING!**

FIRE AND EXPLOSION
In accordance with IEC 60079-0: 2011 Clause 30.

Do not open the Ex d enclosure unless the area is known to be free of flammable materials or unless all devices are switched off.

Failure to ensure the area is safe or leaving the device powered on can cause an explosion or fire and serious injury to personnel.
Install

### DANGER!

**ELECTRIC SHOCK**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

In accordance with IEC 60079-0:2011 Clause 30, install the analyzer in a suitable position with shading to protect it from the elements. The displays and control panel on the front of the housing must not be exposed to direct UV light sources or direct sunlight.

### WARNING!

**POTENTIAL ELECTROSTATIC CHARGING HAZARD**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

The keypad is non-conducting and may generate an ignition capable level of electrostatic charges under certain extreme conditions. Ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high pressure steam) which might cause a build-up of electrostatic charges on non-conducting surfaces. Additionally, only clean the equipment with a damp cloth.

The analyzer has a T3 temperature classification which specifies the maximum surface temperature of the instrument, under a fault condition, is 200 °C (392 °F). You must ensure that no combustible gas concentrations are present, whether on a continual or occasional basis, which have an ignition temperature below the T classification of the unit.

### WARNING!

**FIRE AND EXPLOSION**

Do not open the Ex d enclosure of the analyzer unless the atmosphere in the area is known to be below the ignitable concentration of combustible gases or materials.

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

In accordance with IEC 60079-0: 2011 Clause 30, the analyzer must be installed in a suitable position with shading to protect it from the elements. The displays and control panel on the front of the housing must not be exposed to direct UV light sources or direct sunlight.

A fuse must be provided at the installation site which will completely disconnect the analyzer in case of failure. Installing an isolating switch may also be beneficial. In either case, these components must be constructed to conform to recognized norms.

In accordance with IEC 60664-1, the analyzer must be installed in an area of not more than Pollution Degree 2.

Provide sufficient space around the analyzer to allow maintenance and servicing of this unit.
2.2 Mounting

This procedure requires a minimum of two people to safely move and mount the analyzer. Outline dimensional drawings of the analyzer are shown in Detailed System Specification.

**NOTICE**

In accordance with IEC 60079-0: 2011 Clause 30. The positions of the glands for the three electrical conduits are shown in Figure 2-4. These positions must not be redesigned or repositioned without reference to Emerson.

**WARNING!**

HEAVY ITEM

In accordance with IEC 60079-0: 2011 Clause 30.

Make sure that the wall the unit is mounted on is solid, stable, and of a suitable material to hold the weight of the analyzer.

Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lb). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.

Make sure that the wall fixing points are capable of supporting a load of 80 kg (176.37 lb.) each; this includes a x2 safety factor. All mounting points are 15 mm diameter holes.

**Procedure**

1. Use safety approved equipment to lift the analyzer from the stable platform.
   
   One person guides the unit into position as the other person carefully operates the lifting equipment.

2. Mount the analyzer using the factory fitted and pre-drilled wall mounting brackets (*Figure 2-1*) using four M8 x 1.25 (5/16 - 18 UNC) A2/A4 grade 70 bolts.
Figure 2-1: Mounting Details

WALL MOUNTING PATTERN

WALL MOUNTING BRACKET

DETAIL C
SCALE 1:1

Ø9.5 ± .25
Ø9.5 ± .25
Mounting brackets are 4 mm (1/16 in.) thick stainless steel. Position the bolts in such a way to allow maximum use of all thread length. Make sure that the fasteners used are suitable for the load and surface the analyzer is mounted on.

Emerson recommends installing the analyzer in an upright (vertical) position; other orientations may affect the measuring results.

3. If you want to increase security on the installation of the analyzer by thread-locking the fittings, only do this with compounds compatible with the hazardous area zone classification of the installation location.

4. Make sure the bolts are secure. Apply maximum torque permissible for the material combination of the supporting structure.

5. Remove the lifting eyes and retain them for future use. Protect the threads with plastic grommets and a suitable grease.

Postrequisites
Do not place any additional load on the analyzer.

2.3 Connecting the system

2.3.1 Opening the enclosure

Use these procedures to make the electrical, power, and gas line connections.

1. Make sure that the hinges are securely connected to the enclosure.

**WARNING!**

HEAVY FRONT HOUSING
The Rosemount™ CT5800 front housing is heavy (30 kg (66.14 lb)). After removing the captive bolts, provide support when opening the lid.

Failure to properly support the lid may cause injury to personnel.

**CAUTION!**

EQUIPMENT HAZARD

Inspect the hinges for damage before removing the M16 x 45 captive bolts to open the housing.

Make sure no obstructions are in the opening radius when the front housing is opened.

2. Unscrew the 20 off M16 x 1.5 inch captive bolts holding the front and rear housings of the enclosure together.
3. Carefully lower the front enclosure to the fully open position.

A. 20 off M16 captive bolts
4. Apply masking tape to the flanges, seal, and flamepath to protect them from scratches, chipping, and other forms of damage or deformation.

**WARNING!**

**PROTECT FLAMEPATH**
Protect the flamepath with masking tape. Any damage to the flamepath will invalidate certification.

5. Continue the installation with the power and signal cables (see Section 2.3.2).
2.3.2 AC power safety information

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

**WARNING!**

**ELECTRIC SHOCK**
Only qualified personnel, taking into account all applicable standards and legislative requirements, should install the analyzer and connect the power and signal cables.
Failure to follow instructions may cause personal injury or death.

- Instruments providing screw terminals for electrical connections may require working near live parts.
- Rosemount CT5800 gas analyzers do not have power switches and are operable when connected to power.
- A customer-supplied power switch or circuit breaker (complying with IEC 60947-1/-3) must be in the building installation. The switch has to be installed near the analyzer, must be easily accessible, and has to be assigned as a disconnector for the analyzer.
- Disconnect instruments with screw terminals from power when working at power terminals (pull power plug or operate power switch / circuit breaker in building installation).
- The analyzer provides a protective earth terminal. To prevent electrical shock hazards, connect the instruments to a protective earth. The instruments must be connected to power with a three wire power cable with earth conductor. Any interruption of the earth connector inside or outside the instrument or disconnecting the earth terminal may cause potential electrical shock hazard.

**WARNING!**

**EXPLOSION HAZARD**
In accordance with IEC 60079-0: 2011 Clause 30.

The purge controller bypass function shall only be enabled during setup or maintenance and only when the area is known to be non-hazardous.

Failure to observe this warning could cause an explosion or potentially hazardous situation which, if not avoided, may cause death or personal injury.

The customer supplied circuit breaker must be in accordance with ATEX / IECEx / North American protection concepts. The main power isolator controls the application of electrical power to the analyzer.

Electrical protection for the instrumentation circuitry of the analyzer is provided by fuses F1 and F2 located inside the analyzer.
**Table 2-1: Electrical power requirements**

<table>
<thead>
<tr>
<th>Electrical supply</th>
<th>Power consumption</th>
<th>Voltage</th>
<th>Fuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrumentation supply voltage</td>
<td>500 W (peak)</td>
<td>110 to 240 Vac, 50/60 Hz ± 10%</td>
<td>3.15 A internal fuses F1 and F2. See Section 2.3.4.</td>
</tr>
<tr>
<td></td>
<td>300 W (usual)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purge supply voltage</td>
<td>10 W</td>
<td>110 to 240 Vac, 50/60 Hz ± 10%</td>
<td>1 A (located in secondary circuit breaker)</td>
</tr>
</tbody>
</table>

For the electrical power wiring, use 16 AWG stranded, 3 conductor copper or tin plated copper power wire, rated for at least 250 Vac, of the required length.

Cables must be rated for operation in ambient temperatures > 80 °C (176 °F).

Cables must be terminated in accordance with local electrical codes.

A switching system is not supplied with this equipment. You 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 analyzer.

**Figure 2-4: CT5800 Bottom view - Gas connectors and cable glands**

A. Gas connections (flame arrester) (M18 x 1.5)
B. Conduit / cable entry apertures (M20 x 1.5)
C. Wall fixing line
D. Earth (ground) bond

The customer supplied circuit breaker must be in accordance with suitably certified hazardous area Ex protection concepts. The main power isolator controls the application of electrical power to the analyzer.
**WARNING!**

**EXPLOSION**
Do not open the instrument when it is energized.

Ensure that external circuitry is disconnected or de-energized before opening the instrument.

All cables (power and signal) must end (be connected) in either a safe (nonhazardous) area or in a protecting enclosure (e.g., explosion-proof junction box).

---

**WARNING!**

**INSTALLATION USING CONDUITS**
Rosemount CT5800 analyzers provide metric threads for installing cable entries.

Installing conduits requires using metric-to-NPT adapters.

To be compliant with the North American ordinary location (Ordloc) and hazardous area (Hazloc) certification, use stainless steel with captive O-ring seals.

Select a type of conduit and seals in accordance with local codes and suitable for the site of installation.

For North American sites, seals must be fitted no more than 50 mm (1.97 in.) from the Ex d entry point.

Unused entries are provided with plugs, secured in place with thread locking compound.

---

**WARNING!**

A seal shall be installed within 50 mm of the enclosure.

---

**AVERTISSEMENT**

Un scellement doit être installé à moins de 50 mm du boîtier.

---

**WARNING!**

**INSTALLATION USING CABLE GLANDS**
All cable glands must be suitable certified for use in area of application (Zone / Class / Division).

When installing the analyzer in a hydrogen environment and/or applying hydrogen to the analyzer, do not use the standard compression type cable glands. Use suitable compound barrier cable glands to stay compliant to EN 60079-14.

When selecting cable glands, make sure the correct diameter is selected to ensure correct cable fit.
CAUTION!

SELECT THE CORRECT TYPE OF CABLE ENTRY.

Before starting to install the analyzer, verify what type of cable entry is required at your site of installation.

Rosemount CT5800 gas analyzers may be equipped with cable glands (regulated e.g., for installations covered by ATEX / IEX / Ex) or may be installed with conduits (e.g., in North America).

Electrical protection for the instrumentation circuitry of the CT5800 is provided by fuses F1 and F2 located inside the analyzer.

Figure 2-5: Fuses

Connect power to the system through the power gland on the base of the analyzer (Figure 2-4).

2.3.3 Earthing/grounding the analyzer

The system must be suitably earthed / grounded using the M5 stud bonded to the rear of the system and the connector inside with cable between 1.5 and 4 mm square.
**NOTICE**

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

**WARNING!**

**ELECTRIC SHOCK**

In accordance with IEC 60079-0: 2011 Clause 30

The analyzer must be earthed/grounded in accordance with national/local regulations.

Failure to observe this warning may cause death or personal injury.

---

**Figure 2-6: Earth Bond**
2.3.4 Connecting the signal cables

Connect the signal cables through conduit outlets 2 and 3 as shown in the figures below.

**NOTICE**

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

The signal cables are connected to the system through conduit outlets 2 and 3 as shown in Figure 2-7 and Figure 2-9. All signal cables are to be minimum 20 AWG tri-rated switchgear cables. Customer supplied conduit and cables must be terminated in the conduit outlets in accordance with local electrical codes.

**Figure 2-7: Cable Glands, Conduits, and Gas Line Connections**

- A. Breather
- B. Gas connection out (flame arrestor) (M18 x 1.5)
- C. Gas connection in (flame arrestor) (M18 x 1.5)
- D. Conduit / cable entry apertures (M20 x 1.5)

**Figure 2-8: Signal connections**
**Figure 2-9: Signal cable connections**

![Diagram of signal cable connections]

**Table 2-2: Power, Digital, and Analog Connections**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>System supply (L)</td>
</tr>
<tr>
<td>2</td>
<td>System supply (N)</td>
</tr>
<tr>
<td>3</td>
<td>Digital output 1</td>
</tr>
<tr>
<td>4</td>
<td>Digital output 2</td>
</tr>
<tr>
<td>5</td>
<td>Digital output 3</td>
</tr>
<tr>
<td>6</td>
<td>Digital output 4</td>
</tr>
<tr>
<td>7</td>
<td>Digital output 5</td>
</tr>
<tr>
<td>8</td>
<td>Digital output 6</td>
</tr>
<tr>
<td>9</td>
<td>Digital output 7</td>
</tr>
<tr>
<td>10</td>
<td>Digital output 8</td>
</tr>
<tr>
<td>11</td>
<td>Digital output 9</td>
</tr>
<tr>
<td>12</td>
<td>Digital output 10</td>
</tr>
<tr>
<td>13</td>
<td>Digital output 11</td>
</tr>
<tr>
<td>14</td>
<td>Digital output 12</td>
</tr>
<tr>
<td>15</td>
<td>Analog output 1</td>
</tr>
<tr>
<td>16</td>
<td>Analog output 2</td>
</tr>
<tr>
<td>17</td>
<td>Analog output 3</td>
</tr>
<tr>
<td>18</td>
<td>Analog output 4</td>
</tr>
<tr>
<td>19</td>
<td>Analog output 5</td>
</tr>
<tr>
<td>20</td>
<td>Analog output 6</td>
</tr>
<tr>
<td>21</td>
<td>Analog output 7</td>
</tr>
<tr>
<td>22</td>
<td>Analog output 8</td>
</tr>
<tr>
<td>23</td>
<td>Status output 1 (check function)</td>
</tr>
<tr>
<td>24</td>
<td>Status output 2 (maintenance required)</td>
</tr>
<tr>
<td>25</td>
<td>Status output 3 (out of specification)</td>
</tr>
</tbody>
</table>
Table 2-2: Power, Digital, and Analog Connections (continued)

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Status output 4 (failed)</td>
</tr>
</tbody>
</table>

Table 2-3: Ethernet Interface Module wiring to MOXA Ethernet Socket

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Designation</th>
<th>Color coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tx+</td>
<td>Orange / White</td>
</tr>
<tr>
<td>2</td>
<td>Tx</td>
<td>Orange</td>
</tr>
<tr>
<td>3</td>
<td>Rx+</td>
<td>Green / White</td>
</tr>
<tr>
<td>4</td>
<td>Not used</td>
<td>Blue</td>
</tr>
<tr>
<td>5</td>
<td>Not used</td>
<td>Blue / White</td>
</tr>
<tr>
<td>6</td>
<td>Rx-</td>
<td>Green</td>
</tr>
<tr>
<td>7</td>
<td>Not used</td>
<td>Brown / White</td>
</tr>
<tr>
<td>8</td>
<td>Not used</td>
<td>Brown</td>
</tr>
</tbody>
</table>

2.3.5 Connecting the sample supply and return lines

Sample gas supply and sample return connections are from 6 mm (1/4 in.) Swagelok type fittings.

The Rosemount CT5800 has one gas input and one gas output, which are located on the base of the instrument (Figure 2-7).

The gas sample that is to be measured for impurities enters the instrument through the sample gas input port.

Once the sample gas has been examined for impurities, it is expelled from the instrument through the sample gas return port.

**NOTICE**

The breather blanking cap must be removed and nothing should ever be connected to this port.

To avoid the risk of gas leaks, make sure that these connections are made correctly and tightly. Both the sample gas supply pipe and the sample return pipe should be thermal insulated.

**NOTICE**

The Swagelok recommendation for pipe fittings of this size is to tighten the nut finger tight and then tighten an additional one and a quarter (1 and 1/4) turns with a spanner.

The maximum gas supply pressure is 2 BarG.
The sample supply line must be heated all the way to the sample gas input port on the Rosemount CT5800 to prevent condensation forming at any point in the sample supply line.

**WARNING!**

HAZARDOUS GAS
This article is in accordance with IEC 60079-0: 2011 Clause 30.

The product stream that the analyzer is examining may be hazardous even at low concentrations. Therefore, take special care to ensure that the sample gas return port either returns the sample gas to the product stream or discharges the sample gas to a location that will not cause a hazard.

**WARNING!**

MAINS SUPPLY CABLE
Make sure that the mains supply cable used is of a suitable rating for the unit power requirements. Failure to do so may result in personal injury.

The Ethernet connector provides an Ethernet output from the instrument that may be used for downloading data for failure diagnostic purposes.

The results of the gas analysis are output from the instrument through the 4-20 mA analog outputs and sent to your process control center.

The status outputs provide fault indications to your process control center. Each digital output is connected to a normally closed relay, located inside the analyzer, which will open in response to the detection of a specific fault. The possible causes of a fault indication are:

- The sample gas concentration is outside of specification, i.e., the sample gas concentration has exceeded the measurement range of the instrument.
- The analyzer is out of specification or has developed a fault.

**WARNING!**

HIGH VOLTAGE
Voltages up to 250 Vac, 50 Hz may be present on the digital output terminals.

External circuits should be installed in accordance with national wiring regulations.

Failure to obey the wiring regulations may result in serious injury to personnel.

**WARNING!**

EMC COMPATIBILITY
The analyzer passed electromagnetic compatibility (EMC) tests based on all electrical cables and harnesses attached to the instrument having a length of 3 m (9.8 ft.) Attaching cables and wiring harnesses longer than 3 m (9.8 ft.) may cause injury to personnel.
2.4  Test connections

Before sealing the cable glands, it is vital to test the new connections in order that any faults can be remedied before the cables are permanently sealed.

⚠️ WARNING!

EXPLOSION HAZARD
In accordance with IEC 60079-0: 2011 Clause 30.

The cable glands used in this analyzer are only suitable for use in areas with a low risk of mechanical damage and must be suitably protected.

Failure to observe this warning could cause an explosion or potentially hazardous situation which, if not avoided, may cause death or personal injury.

The cable glands can be temporarily sealed with a suitable sealant to allow testing.

The tests described below are a basic check to prove function, rather than a test of sensor capability.

The analyzer should be started according to the startup procedure in Section 3.3.

⚠️ WARNING!

INSTALLER RESPONSIBILITY
In accordance with IEC 60079-0: 2011 Clause 30 + CSA report.

It is your responsibility to connect the analyzer to a suitable alarm or automatic shutdown facility.

Failure to observe this warning could cause a potentially hazardous situation which, if not avoided, may cause death or personal injury.

2.4.1  Testing power input cables and circuit breakers

The power input cables and circuit breakers can be tested as follows.

⚠️ NOTICE

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

Procedure

1. Set the main circuit breaker to ON.
2. Check that the display controller lights up.

The instrument begins to power up.
2.4.2 Temperature sensor and cell heater

The sample cell is controlled to operate at a pre-set temperature. This involves a heater and a temperature sensor.

**NOTICE**

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

**Procedure**

1. Check that a temperature reading is displayed against Temperature on the display controller as described in Chapter 4.

2. Leave the analyzer operating and confirm that the temperature rises until the analysis cell reaches the pre-set operating temperature around 50 °C (122 °F).

   This takes approximately 90 minutes.

2.4.3 Pressure sensor

The pressure sensor monitors the pressure in the analysis cell.

**NOTICE**

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

**Procedure**

1. Check that a pressure reading is displayed under Pressure on the display controller.

   The reading is approximately 760 Torr at atmospheric pressure.

   **NOTICE**

   A Torr is a non SI unit of pressure, defined as 1/760 of standard atmospheric pressure, and is equal to the fluid pressure of 1 mm of mercury.

2. If desired, cap off the gas inlet and use an external pump to evacuate the cell.

   Make sure the pressure drops as expected.
2.4.4 Analog output cables

In order to generate a 4-20 mA output, the analyzer must be left for 90 minutes to warm up, and the analysis cell must be at the correct pressure. The 4-20 mA outputs operate when the analysis cell is between 40 and 60 °C (104 and 140 °F) and the pressure is between 180 and 220 Torr. It is not essential to flow sample gas through the system; nitrogen or atmospheric air is adequate for this test.

Procedure

With the analyzer at operating temperature and pressure, ensure that a current between 4 mA and 20 mA is generated on each 4-20 mA output, as listed in Section 2.3.4.

This can be measured as a current with a multimeter.

2.4.5 Measurement valid flag

The measurement flag is normally open contact. It is simplest to test this with a multimeter.

With the analyzer closed and compressed air applied as described in the startup procedure (Section 3.3) when the system is operating correctly, an open contact is created between the two contact wires (white).

Procedure

To test the Error state, shut off the sample gas and allow the pump to reduce the cell pressure below 180 Torr.

At this point, the contact should close and there should be no resistance between the two white wires.

⚠️ WARNING!

FIRE AND EXPLOSION
In accordance with IEC 60079-0: 2011 Clause 30.

Do not open the Ex d enclosure unless the area is known to be free of flammable materials or unless all devices are switched off.

Failure to ensure the area is safe or leaving the device powered on can cause an explosion or fire and serious injury to personnel.

2.5 Closing the housing

After all internal connections have been made and proved/tested, the enclosure must be closed, and the 20 off M16 x 45 captive screws and form A washers must always be secured in accordance with the torque sequence.

See Figure 2-11.

Procedure

1. Remove all protective covering from the flamepath and enclosure sealing gasket.
2. Inspect the seal.
   If any damage is detected, stop the process immediately and report to maintenance.
3. Clean the seal to remove any adhesive from the protective cover.
4. Inspect the flanges/flamepath for damage, i.e., scratches, chipping, and/or other form of damage/deformation.
   If any damage is detected, stop the process immediately and report to maintenance.
5. Carefully lift the housing up and align with the rear housing.
6. Make sure that all holes are aligned. If necessary, use the two holes (**Figure 2-10**) to assist alignment.

**Figure 2-10: Alignment holes**

7. Insert the captive M16 bolt and engage the threads on the rear housing.
8. Refer to the torque sequence (**Figure 2-11**) and tighten all bolts.
WARNING!

HAZARDOUS AREA PROTECTION
Captive M16 x 45 screws and form A washers must always be used to secure the enclosure shut.

Failure to follow the warning will invalidate hazardous area Ex d protection.

Figure 2-11: Torque sequence

All bolts must be tightened in sequence to a torque value of 25 Nm (18.44 ft-lb).

2.6 Commissioning

Once the sensor is fully installed as described above, commission it according to the commissioning plan agreed on between you and Emerson.
3  Startup procedure

3.1  Introduction

⚠️ CAUTION!

EQUIPMENT DAMAGE

Always follow the startup procedure. Damage to the Rosemount™ CT5800 may result from a failure to follow this procedure.

The Rosemount CT5800 normally operates continuously. It should only be necessary to start up the instrument under the following circumstances.

- When the Rosemount CT5800 is first switched on following installation.
- Following repair or maintenance.
- When it has been switched off as part of a plant shutdown or maintenance.

3.2  Preparation for use

The analyzer must be installed and fully commissioned prior to startup.

⚠️ WARNING!

BURNS

Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.
3.3 Startup procedure

**NOTICE**

The gases shown in the screenshots and the measurements thereof may be different from those shown in your particular analyzer. They indicate the functionality of the software, which is the same regardless of the gases being measured.

**NOTICE**

To stop the startup procedure at any time, set the main circuit breaker to **OFF**.

To start up the analyzer, perform the following steps:

**Procedure**

1. Visually inspect the exterior of the analyzer for signs of damage, corrosion, gas leaks, or overheating. Report anything found to the hazardous area Ex maintenance organization.

2. Make sure that the analyzer has been correctly installed (see Chapter 2).

3. Make sure that the enclosure is closed and all bolts are correctly torqued.

   If the enclosure cannot be closed and locked, report it to the maintenance organization and do not proceed further until the door has been repaired.

4. Make sure that the gas handling system is turned **OFF**.

5. Make sure that the external circuit breaker is set to **OFF**.

6. Visually examine the gas ports (if necessary, refer to Section 7.16.3) to make sure that the sample supply line and the sample return line are correctly attached to the analyzer.

7. Visually check that the electrical connections have been made to the instrument.

8. Set the main circuit breaker to **ON**, which applies main power to the instrument.

   The analyzer begins its automatic startup. The control PC that forms part of the instrument is configured to automatically load the necessary gas sensor software and configuration files. The startup sequence commences automatically under software control.

   After a few seconds, the Gas Sensor Main screen (**Figure 3-1**) appears on the display controller. If it does not, report the fault to the maintenance organization.
9. Start up the system for returning the sample gas.
10. Start up the gas handling system that conditions the sample gas before it is fed into the analyzer.

At the end of the startup procedure, the gas measurements initially appear as $0.00 \text{ ppm}$ until the first readings are taken. After a few seconds, the initial gas concentrations will be displayed.
4 Operating the analyzer

4.1 Introduction

This chapter describes the controls, displays, and indicators on the and how to use the display controller located on the front panel of the instrument.

4.2 Normal operation

The analyzer is designed for long term continuous operation, and therefore its normal state is to be switched on and performing gas measurements. The analyzer is usually only switched off for maintenance. The shutdown procedure used to switch off the analyzer is described in Chapter 8 of this manual.

Provided that the start-up procedure described in Chapter 3 has been followed, the analyzer does not require any human intervention during normal operation other than occasional calibration checks.

During normal operation, either the Gas Sensor Main screen (Figure 4-1) or the Pressure and Temperature screen (Figure 4-2) is shown on the display controller. To toggle between these two screens, press.

Figure 4-1: Gas Sensor Main screen
CAUTION!

UNSERVICEABLE EQUIPMENT

If the pressure and temperature measurements are out of tolerance, refer to Chapter 7 for guidance.

On both the Gas Sensor Main screen and the Pressure and Temperature screen, if the analyzer makes more measurements than can fit on the display, use ▲ and ▼ to scroll down the list.

4.3 Front panel controls and indicators

The analyzer is configured from the display controller located on the front panel.
NOTICE

On/Off circuit breakers

There are no On/Off switches on the analyzer. The application of electrical power to the instrument is controlled through an external circuit breaker.

The circuit breaker is a simple 2-pole on/off circuit breaker that must be set to On to permit the safe operation of the analyzer.
4.4 Display controller

Figure 4-4: Front Panel Display Controller

A. LCD display
B. Navigation buttons

You can control the analyzer through six navigation buttons (Figure 4-4, B) on the display controller.

The LCD display (A) can be used to display:
1. Gas concentration measurements obtained
2. Operating temperature and pressure
3. Help screens
4. Step-by-step calibration
5. Diagnostics

The navigation buttons (B) are configured to perform different functions according to which software screen is shown on the LCD display.

Table 4-1: Display Controller navigation button functions

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Up Arrow]</td>
<td>Normally used to scroll up. Referred to as UP.</td>
</tr>
<tr>
<td>![Down Arrow]</td>
<td>Normally used to scroll down. Referred to as DOWN.</td>
</tr>
<tr>
<td>![Select]</td>
<td>Normally used to select. Also accesses the Main Menu from the Home screen. Referred to as RIGHT.</td>
</tr>
<tr>
<td>![Back]</td>
<td>Used to go back to the previous screen. No function from the Home screen. Referred to as LEFT.</td>
</tr>
<tr>
<td>![Home]</td>
<td>Used to access the context sensitive Help pages. Referred to as HOME.</td>
</tr>
</tbody>
</table>
Table 4-1: Display Controller navigation button functions (continued)

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="button" /></td>
<td>Generally used to select an alternative function. Also allows you to toggle between gas and physical measurements from the Home screen. Referred to as ENTER.</td>
</tr>
</tbody>
</table>

The analyzer employs Intelligent Device Management which enables self-monitoring and diagnostics. This ensures that operators are made aware of malfunctions so they can take appropriate action. Table 4-2 defines the symbols that may be displayed.

Table 4-2: Diagnostic symbols

- ![heart](image) System running
- ![diamond](image) Maintenance required: still valid output signal
- ![triangle](image) Out of specification: signal out of the specified range
- ![arrow](image) Indicates the analyzer is performing a calibration or validation or that the software has been deliberately stopped.
- ![times](image) Failure: non-valid output signal

4.5 Gas Sensor Main screen

When the analyzer is switched on, at the end of the startup procedure, the Gas Sensor Main screen (Figure 4-5) appears. The Gas Sensor Main screen is the screen that is normally displayed.

**NOTICE**

The gas concentrations shown in the following screenshots may be different from those shown in your particular analyzer. The screenshots indicate the functionality of the software, which is the same regardless of the gases or gas concentrations being measured.
The Gas Sensor Main screen displays the gas concentration measurements obtained by the analyzer. In the example shown in Figure 4-5, the gases ammonia (NH₃), water (H₂O), carbon monoxide (CO), and formaldehyde (H₂CO) are being measured, and for each gas, the concentration detected is in parts per million (ppm).

At the end of the startup procedure, the gas measurements initially appear as 0.00 until the first readings are taken. After a few seconds, the initial gas concentrations are displayed.

The Gas Sensor Main screen also shows the status of the analyzer. In the example shown in Figure 4-5, the instrument is Running and OK (i.e., no faults have been identified).

If a fault is identified, ? is displayed; if maintenance is required, is displayed.

To access other screens through the Main menu, press (Refer to Figure 4-5).

 is a link between the Gas Sensor Main screen (Figure 4-5) and the Pressure and Temperature screen (Figure 4-6). Press to toggle between the two screens.

 is a link to the Help system. Press to go to a Help screen (described in Section 4.7).

On the Gas Sensor Main screen, has no function when the analyzer is operating correctly. If, however, the software detects a fault, an error message is displayed. Press to get further information on the error.

4.6 Pressure and Temperature screen

The Pressure and Temperature screen (Figure 4-6) shows pressure and temperature measurements taken inside the analyzer.
The **Gas T** reading is the temperature, in °C, of the gas within the analysis cell.

The **Press** reading is the pressure, in Torr, inside the analysis cell.

---

**NOTICE**

A Torr is a non-SI unit of pressure defined as 1/760 of standard atmospheric pressure and is equal to the fluid pressure of 1 mm of mercury.

---

### 4.7 Help system

The analyzer software includes a context-sensitive help system. Press 📚, which is available on most of the software screens, to open the Help system.

The help system contains a number of different Help screens, each conveying a different message. As the help system is context-sensitive, the help screen that appears is the one that is most appropriate to the software function engaged when 📚 was pressed. *Figure 4-7* shows an example of a help screen.
4.8 Main menu

To access the Main menu (Figure 4-8), press \( \text{left arrow button} \) on either the Gas Sensor Main screen (Figure 4-5) or the Pressure and Temperature screen (Figure 4-6). The Main menu options are:

- **DIAGNOSTICS**: Displays various parameters used in the internal calculations and compares desired and actual parameters, for example, the analysis cell pressure and temperature. The diagnostics routines and screens are used to perform fault diagnosis.

- **FAULTS**: Takes you to a screen that lists any faults affecting the analyzer. This option is used as part of the failure diagnosis procedures.

- **GAS SERVICE**: Allows you to check the sensor readings against a known gas source (verification) or, if necessary, to calibrate the analyzer against that known gas source (calibration).

- **DATA SERVICE**: Takes you to a screen that allows data to be downloaded from the instrument. The downloaded data is used to diagnose faults.

- **SYSTEM**: Takes you to a screen that allows you to shut down the analyzer or access system information, such as software versions or IP addresses. The main motherboard IP address can also be changed from this menu. Some of these options are not available on older analyzers.
4.9 BACK button

On most of the software screens, is configured as a BACK button. Press to return to the previous screen.
5 Verifying Gas Concentrations

5.1 Verification

Verification flows the known gas concentration through the analyzer and gives you a display of the measurement, the cylinder value, and the difference between the two. You can use verification to confirm that the analyzer is within tolerance. If it is out of tolerance, perform a calibration (see Section 6.3).

5.1.1 Zero verification

Zero verification confirms that when no sample gas is flowing through the analyzer, the gas concentrations measured by the instrument are zero. Zero verification is done by comparing the analyzer measurements to a known sample gas using the following procedure:

**Prerequisites**

Run the analyzer at a stable temperature for at least thirty minutes prior to commencing this procedure.

Use nitrogen gas of *instrument gas* purity as the zero verification gas.

**Procedure**

1. Make sure that a pressure regulator is connected to the nitrogen gas bottle.
2. Connect a hose from the nitrogen gas bottle through a T-piece to the sample supply port on the rear of the analyzer. Connect an excess flow line to the unused port on the T-piece and route the excess flow line to a suitable extractor.
3. On the display controller of the analyzer, browse to the *Main menu* as described in Section 4.8.
4. Refer to *Figure 4-8*. Using ▲ and ▼, select GAS SERVICE.
5. Press ▼.

The Select gas screen (*Figure 5-1*) opens.
6. Use ▲ and ▼ to move the cursor until the gas that you wish to zero verify is selected. Press ▶.

The Select Type screen (Figure 5-2) opens.

7. Use ▲ and ▼ to move the cursor until the ZERO verification option is selected, as shown in Figure 5-2.

8. To perform a verification, press ▶.

The Manual/Automatic screen (Figure 5-3) opens.

The Verify Zero screen (Figure 5-4) opens.

10. Allow the concentrations to stabilize and wait for two minutes after stabilization.

This screen gives a reading of the concentration of the selected gas that is present as an impurity in the nitrogen calibration gas, as measured by the instrument. In the example (Figure 5-4), the gas being measured is NH₃ (ammonia), and the instrument has detected a concentration of 0.40 ppm.

11. If the reading is within tolerance, no further action is required. Press ▶️ to end the zero verification process.

The display controller proceeds to the Result screen (Figure 5-5).
12. If the reading is outside tolerance, the instrument should be zero calibrated. Refer to Section 6.3.1.

13. In either case, press to return to the Calibration / Verification Complete screen (Figure 5-6).

14. To perform a zero verification for another gas, press . The software returns to the Select gas screen (Figure 5-1).

15. Repeat the actions in steps 6-13 for the next gas.

16. To perform a span verification, press . Then follow the span verification procedure in Section 5.1.2.
17. If you are finished verifying the analyzer, press \( \Rightarrow \). The software returns to the Gas Sensor Main screen.

5.1.2 Span verification

To verify the span gas concentrations measured by the analyzer when reference gas is flowing, use the following procedure.

**Prerequisites**

Run the analyzer at a stable temperature for at least thirty minutes prior to commencing this procedure.

**Procedure**

1. Use a certified reference gas cylinder as the source of the span verification gas.
2. Make sure that a pressure regulator is connected to the reference gas bottle.
3. Connect a hose from the reference gas bottle, through a T-piece, to the sample supply port on the rear panel of the analyzer.
4. Connect an excess flow line to the unused port on the T-piece and route the excess flow line to a suitable extractor.
5. On the display controller, browse to the Main menu as described in Section 4.8.
6. Using \( \uparrow \) and \( \downarrow \), select GAS SERVICE (Figure 5-7).

**Figure 5-7: Main menu**

![Main menu](image)

7. Press \( \Rightarrow \).

The Select gas screen (Figure 5-8) opens.
8. Use ▲ and ▼ to move the cursor until the gas that you wish to span verify is selected. Press Enter.

The Select Type screen (Figure 5-9) opens.

**Figure 5-9: Select Type screen**

9. Use ▲ and ▼ until the SPAN verification option is selected, as shown in Figure 5-9.

To perform a verification, press Enter.

The Mode selection screen opens (Figure 5-10) for manual or automatic verification.
10. Press \( \rightarrow \) for manual verification.

The Span input screen (Figure 5-11) opens.

11. Use \( \downarrow \) and \( \uparrow \) to highlight each digit in turn; then use \( \leftarrow \) and \( \rightarrow \) to increase or decrease the value until the concentration displayed matches the cylinder you are using.

**NOTICE**

The cylinder concentration must be entered in ppm.

12. Press \( \Rightarrow \) to proceed to the next step.
The Verify Span screen (Figure 5-12) opens.

Figure 5-12: Verify span screen

13. Press $\text{△}$ to cancel the manual verification.
14. Press $\text{□}$ to finish.
15. Repeat steps 5-9.
16. Press $\text{△}$ for automatic verification.
   
   This opens the valve (where applicable) and flows the span gas.
17. Allow the concentrations to stabilize and wait for two minutes after stabilization.

   This screen gives a reading of the concentration of the selected gas that is present, as measured by the instrument. In the example shown in Figure 5-12, the gas being measured is NH$_3$ (ammonia), and the instrument has detected a concentration of 2000.29 ppm.

18. If the reading is within tolerance, no further action is required. Press $\text{□}$ to end the span verification process.

   The display controller proceeds to the Result screen (Figure 5-13).
19. If the reading is outside tolerance, the instrument should be span calibrated. Refer to Section 6.3.2.

20. Press to return to the screen shown in Figure 5-14.

21. If you wish to perform a span for another gas, press . The software returns to the Select gas screen (Figure 5-1) Repeat steps 8 - 16 for the next gas.

22. If you wish to perform a zero verification, press . Then follow the zero verification procedure in Section 5.1.1.

23. If you are finished verifying the analyzer, press .
The software returns to the Gas Sensor Main screen (*Figure 4-5*).

The span verification procedure is now complete.
6 Gas Calibration Procedures

6.1 Required tools

To calibrate the analyzer, you need the following items:

- Nitrogen gas of instrument gas purity for use as a zero calibration gas
- Suitable span calibration gases for each gas measured
- Gas bottle pressure regulators
- Interconnecting hoses to connect the gas bottles to the analyzer
- A T-piece and excess flow line

**NOTICE**

In the case of gases such as H$_2$O, where it is not normally possible to obtain calibrated gas cylinders, it will usually be measured by the same laser as some other gas. Validating the other gases measured by the analyzer (particularly any which are measured by the same laser as H$_2$O) can demonstrate that the system is functioning correctly, meaning there is no need to calibrate the water measurement directly.

If calibration must be carried out (e.g., for legal requirements), it can be calibrated by using a water vapor generator to supply a known concentration of water vapor.

6.2 Main menu

The calibration functions are accessed through the Main menu (Figure 6-1). To get to the Main menu, press MENU on either the Gas Sensor Main screen or the Pressure and Temperature screen, as described in Section 4.8.

**Figure 6-1: Main menu**
The **Main menu** is used to access the software routines and screens that are used for calibration and maintenance. Five options are presented *(Figure 6-1)*. For more information about the options on the **Main menu**, see **Section 4.8**.

On the **Main menu**, ▲ and ▼ can be used to scroll between the menu options (A). When the option you want is highlighted (*GAS SERVICE* is the example shown in *Figure 6-1*), press ► to go to the first screen of that software routine.

### 6.3 Calibration

Calibration flows the known cylinder gas through the analyzer and then adjusts the readout until the measurement matches the cylinder. This adjustment is then applied to all measurements until the next calibration. There are two circumstances in which you may want to calibrate.

1. After you verify (see *Chapter 5*) and find that the analyzer readings are outside of tolerance
2. At regular intervals, such as once a day or once a shift

### 6.3.1 Zero calibration

Zero calibration is calibrating the analyzer so that when no sample gas is flowing through it, the gas concentrations measured by the instrument are zero. Zero calibration is done by calibrating the analyzer measurements against a known sample gas using the following procedure:

**Prerequisites**

Run the analyzer at a stable temperature for at least thirty minutes prior to commencing this procedure.

Use nitrogen gas of *instrument gas* purity as the zero calibration gas.

**Procedure**

1. Make sure that a pressure regulator is connected to the nitrogen gas bottle.
2. Connect a hose from the nitrogen gas bottle through a T-piece to the sample supply port on the rear of the analyzer. Connect an excess flow line to the unused port on the T-piece and route the excess flow line to a suitable extractor.
3. On the display controller of the analyzer, browse to the **Main menu** as described in **Section 4.8**.
4. Using ▲ and ▼, select GAS SERVICE.
5. Press ▶.
   The Select gas screen (Figure 6-3) opens.

6. Use ▲ and ▼ to move the cursor until the gas that you wish to zero calibrate is selected. Press ▶.
   The Select Type screen (Figure 6-4) opens.
7. Use ▲ and ▼ to move the cursor until the ZERO calibration option is selected (see Figure 6-4).

8. To perform a calibration, press \( \text{Cal} \).

The Mode selection screen (Figure 6-5) opens.

Figure 6-5: Mode selection screen


10. The Result screen (Figure 6-6) displays.
11. After the required flush time (dependent on analyzer configuration), the top line on the screen changes from **Calibrate zero** to **Result**. This shows the zero calibration is complete.

12. Press 🔄 to finish the process.

13. Press 🔄 to display the **Calibrate gas** screen (*Figure 6-4*) and perform a span calibration on the same gas (see Section 6.3.2).

### 6.3.2 Span calibration

The span gas concentrations measured by the analyzer when reference gas is flowing can be verified and, if necessary, calibrated against the known reference gas by using the following procedure.

**Prerequisites**

Run the analyzer at a stable temperature for at least thirty minutes prior to commencing this procedure.

**Procedure**

1. Use a certified reference gas cylinder as the source of the span calibration gas.
2. Make sure that a pressure regulator is connected to the reference gas bottle.
3. Connect a hose from the reference gas bottle, through a T-piece, to the sample supply port on the rear panel of the analyzer. Connect an excess flow line to the unused port on the T-piece and route the excess flow line to a suitable extractor.
4. On the display controller of the analyzer, browse to the **Main menu** as described in *Section 4.8*. 
5. Refer to Figure 6-2. Using \( \uparrow \) and \( \downarrow \), select GAS SERVICE.

6. Press \( \triangleright \).

The Select gas screen (Figure 6-7) opens.

**Figure 6-7: Select gas screen**

7. Use \( \uparrow \) and \( \downarrow \) to move the cursor until the gas that you wish to span calibrate is highlighted by the cursor. Press \( \triangleright \).

The Select type screen (Figure 6-8) opens.

**Figure 6-8: Select type screen**

8. Use \( \uparrow \) and \( \downarrow \) to move the cursor until SPAN is selected (Figure 6-8). To perform a calibration, press \( \triangleright \).

The Mode selection screen (Figure 6-9) opens.
9. Use ◀ and ▶ to highlight each digit in turn; then use ▲ and ▼ to increase or decrease the value until the concentration displayed matches the cylinder you are using. Press ◄ to proceed to the next step.

**NOTICE**

The cylinder concentration must be entered in ppm.

The begin Calibrate span screen (Figure 6-10) opens.

---

10. Press ► to confirm. The Calibrate Span screen Figure 6-11 opens.
Figure 6-11: Calibrate Span result screen

11. Allow the concentrations to stabilize and wait for two minutes after stabilization.

   This screen gives a reading of the concentration of the selected gas that is present, as measured by the instrument. In Figure 6-11, the gas being measured is NH₃ (ammonia), and the instrument has detected a concentration of 119.41 ppm (vol).

12. If the reading is within tolerance, no further action is required. Press ▲ or ▼ to abort the span calibration process.

13. If the reading is outside tolerance, press ENTER ▼.

   The analyzer returns to its factory-set calibration.

14. Allow a minute to ensure the readings are stable.

15. If the reading is now within tolerance, no further action is required. Press ▲ or ▼ to abort the span calibration process.

16. If the calibration of the analyzer remains outside of tolerance, you can adjust the calibration by pressing ▼.

   This brings up a Calibrate screen (Figure 6-12).
17. To proceed with the automatic re-calibration, press \( \uparrow \).

The automatic re-calibration of the instrument’s span calibration starts, and the offset shown on the screen (in Figure 6-13 it is 0.997) is applied to the instrument. Press \( \uparrow \) or \( \downarrow \) to abort the calibration process.

When the calibration or verification is complete, the screen shown in Figure 6-13 is displayed.

18. If you wish to perform a span calibration for another gas, press \( \uparrow \).

The software returns to the Select gas screen (Figure 6-7). Repeat steps 7-18 for the next gas.

19. If you are finished calibrating the analyzer, press \( \right \). The software returns to the Main menu shown in Figure 6-2.
Troubleshooting and diagnostics

7.1 Troubleshooting, repairs, and failure diagnostics

Failure diagnosis of the analyzer comprises interpretation of system fault messages shown on the LCD display, visual examination, performing failure diagnostic tests, and downloading performance data and sending that data to Emerson for analysis.

In the failure diagnosis procedures, all controls and indicators are on the analyzer unless otherwise indicated.

Observe and obey all safety precautions when performing preventative maintenance on the analyzer.

Important
The troubleshooting and failure diagnosis procedures described in this chapter assume that any host equipment provided by you is fully functional. Always make sure that the host equipment is fully serviceable before performing failure diagnosis on the analyzer.

Failure diagnosis, repair, and maintenance must only be performed by:

- Maintenance engineers who have the necessary skills, training, and hazardous area Ex training where applicable and who have been authorized to perform maintenance on the analyzer.
- Emerson™ customer care engineers

In all the cases described in this chapter, maintenance personnel must perform the repairs by directly replacing the faulty item with a known serviceable spare part supplied by Emerson. All other items must be repaired or replaced by the manufacturer.

NOTICE
As a general principle, if any optical component other than the cell assembly and the laser module is unserviceable, the analyzer must be repaired by Emerson. Repair, replacement, and alignment of the optical components require the use of special optical test/calibration equipment and procedures.
**DANGER!**

**FLAMMABLE SUBSTANCES**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

Some parts of the analyzer may reach temperatures of 65 °C (150 °F) and may present an ignition source. Exercise care when using oil, paint, cleaning rags, and other flammable substances near the analyzer. A fire may result if this precaution is not observed. Always assume that the interior of a analyzer is hot unless it has been switched off and allowed to cool down.

---

**DANGER!**

**ELECTRIC SHOCK**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

Death or personal injury may result if this is not observed.

---

**WARNING!**

**HEAVY ITEM**

Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lb). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.

---

**WARNING!**

**TRANSPORTATION HAZARD**

When preparing the analyzer for transport by air, road, or rail, safeguard the analyzer against movement or break-away during transport by securely strapping it in place. Use suitable fasteners for the weight of the unit.

Failure to secure the equipment may cause a break-away and injure personnel.

---

**WARNING!**

**INSTALLATION HAZARD**

Make sure that the wall unit is mounted on is solid, stable, and of a suitable material to hold the weight of the analyzer.

The analyzer must not be mounted on stud or partition walls.

Failure to properly install the equipment may cause serious injury to personnel.
**WARNING!**

FIRE AND EXPLOSION

Do not open the Ex d enclosure of the analyzer unless the atmosphere in the area is known to be below the ignitable concentration of combustible gases or materials.

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

**WARNING!**

LASER RADIATION EXPOSURE

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

The Rosemount™ CT5800 is Class 1. The beams are fully enclosed, and there is no access to the laser beams while the product is in operation or during maintenance. Failure to follow the correct procedures may cause damage to the eye. Do not look at the lasers with any kind of magnifier or optical measuring device.

**Classification**

There are three types of lasers that may be included in the Rosemount CT5800: Quantum Cascade Lasers (QCLs), Interband Cascade Lasers (ICLs), and Tunable Diode Lasers (TDLs). The characteristics of the lasers contained within are given in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>QCL</th>
<th>ICL</th>
<th>TDL</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation mode</td>
<td>Pulsed</td>
<td>Pulsed</td>
<td>Pulsed</td>
<td></td>
</tr>
<tr>
<td>Lasers per system</td>
<td>1 - 6</td>
<td>1 - 6</td>
<td>1 - 6</td>
<td>Maximum of 6 lasers per system</td>
</tr>
<tr>
<td>Wavelength</td>
<td>4 - 10 µm</td>
<td>2 - 5 µm</td>
<td>760 nm</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>&lt; 5 mW</td>
<td>&lt; 5 mW</td>
<td>&lt; 5 mW</td>
<td></td>
</tr>
<tr>
<td>Pulse duration</td>
<td>&lt; 1 µs</td>
<td>1 µs</td>
<td>&lt; 5 µs</td>
<td></td>
</tr>
<tr>
<td>Pulse repetition frequency</td>
<td>&lt; 100 kHz</td>
<td>&lt; 100 kHz</td>
<td>&lt; 100 kHz</td>
<td></td>
</tr>
<tr>
<td>Duty cycle</td>
<td>&lt; 5%</td>
<td>&lt; 5%</td>
<td>&lt; 5%</td>
<td></td>
</tr>
</tbody>
</table>

In accordance with USA 21 CFR 1040.10, the Rosemount CT5800 has warning labels at appropriate positions.

The location of laser safety labels in the Rosemount CT5800 is specified in Section 1.5.

The use of control or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
**WARNING!**

**BURNS**

Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.

**WARNING!**

**HAZARDOUS SUBSTANCES**

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

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

- 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.

---

### 7.2 Using the Built-in-Test (BIT) fault diagnostics

The analyzer has a limited BIT diagnostics function.

**Prerequisites**

The BIT function can be used to perform failure diagnosis of some functions in situations where there is a fault other than a complete failure of the equipment. The BIT is accessed and controlled through the display controller mounted on the front panel.
Procedure

1. The STATUS information can be displayed from either the Gas Sensor Main screen (see Figure 7-1) or the Pressure and Temperature screen (see Figure 7-2).

   **Figure 7-1: Gas Sensor Main screen**

   ![Gas Sensor Main screen](image)

   **Figure 7-2: Pressure and Temperature screen**

   ![Pressure and Temperature screen](image)

2. When the analyzer is running correctly, the STATUS displays Running and OK (see Figure 7-1).
3. If a fault is detected the STATUS display in the bottom left-hand corner of the screen changes from OK to a flashing .
If the analyzer stops the STATUS changes to Stopped, and OK changes to a ?.

4. From either the Gas sensor main screen (see Figure 7-1) or the Pressure and Temperature screen (see Figure 7-2), press to go to the Main menu.

5. Press and to scroll to the Faults screen.
Figure 7-5: Main Menu - Faults screen

If the no faults have been identified by the BIT the central area of the Faults screen is blank.

Figure 7-6: Faults screen - No Faults Detected

If the faults are identified by the BIT, the display controller indicates the fault. The precise data displayed varies depending upon where the fault has occurred in the analyzer.

Figure 7-7: Faults detected screen
6. Press ▲ and ▼ to list the fault listed.

7. Press ▶ to display the Fault diagnostic information screen.

Figure 7-8: Cell Heater Temperature Out of Range

8. Examine the data shown on the Fault screen to determine if the suspect component has failed or is operating outside of its correct parameters. If you do not have the necessary information to determine if the suspect component is faulty, contact your local Customer Care representative.

9. From the Main Menu, press ▲ and ▼ to scroll to Diagnostics.

Figure 7-9: Main Menu

The Diagnostics screen lists those main components of the analyzer where problems can be diagnosed using the BIT system. The Diagnostics screen also enables you to check on the status and, where appropriate, the values of any of the listed components.
10. Press ▲ and ▼ to scroll to the component for further troubleshooting.

11. Press ► to display the component's diagnostic information. See Figure 7-11 for a diagnostics example for Laser 1.

---

**Figure 7-11: Laser 1 Component Diagnostics screen**

The parameters data displayed varies depending upon which component was selected for diagnosis.

12. Examine the data shown on the Component Diagnostic screen to determine if the suspect component has failed or is operating outside of its correct parameters. If you do not have the necessary information to determine if the suspect component is faulty, contact your local Customer Care representative.

---

7.3 **Faults menu**

The Faults menu displays an example list of faults affecting the analyzer that have been identified by the BIT. If no faults have been identified by the BIT, the central area of the Faults menu is blank.
However, if the BIT identifies a fault, the display shows what the fault is. See Figure 7-13.

**NOTICE**
The precise data displayed varies depending upon where the fault has occurred.

Using ▲ and ▼, select the fault; then press ▶. This opens a screen similar to Figure 7-14, advising what the actual fault is.
By examining the data shown on the Fault Display, it is possible to determine if the suspect component has failed or is operating outside of its correct parameters. If you do not have the necessary information to determine if the suspect component is faulty, contact Cascade Technologies Ltd for advice and assistance.

7.4 Diagnostics menu

The Diagnostics menu lists those main components of the analyzer where problems can be diagnosed using the BIT system. The Diagnostics menu also enables you to check on the status and, where appropriate, the values of any of the listed components.

Selecting Diagnostics on the Main menu (Figure 7-9) opens the Diagnostics menu (Figure 7-15).

Figure 7-15: Diagnostics menu

▲ and ▼ buttons can be used to highlight a component for further investigation by the BIT system. Once the component that you wish to diagnose has been highlighted, press ◀ to select it. The Diagnostics screen for that component opens. In the example shown in Figure 7-15, LASER 1 is highlighted. Press ◀ to select LASER 1. The LASER 1 component diagnostics screen opens, as shown in Figure 7-16.

Figure 7-16: Laser 1 diagnostics screen
The component diagnostic screen shows the parameters of the component that was selected on the Diagnostics menu. In the example shown in Figure 7-15, the parameters of Laser 1 are shown. The parameters data displayed varies depending upon which component was selected for diagnosis.

By examining the parameters shown, it is possible to determine if the suspect component has failed or is outside of its correct parameters. If you do not have the necessary information to determine if the suspect component is faulty, refer to Cascade Technologies Ltd for advice and assistance.

7.5 Visual examination

A visual examination of the analyzer is recommended as the next step in failure diagnosis if the BIT fails to identify the problem.

⚠️ DANGER!

ELECTRIC SHOCK

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

Death or personal injury may result if this is not observed.

⚠️ WARNING!

TRANSPORTATION HAZARD

When preparing the analyzer for transport by air, road, or rail, safeguard the analyzer against movement or break-away during transport by securely strapping it in place. Use suitable fasteners for the weight of the unit.

Failure to secure the equipment may cause a break-away and injure personnel.

⚠️ WARNING!

INSTALLATION HAZARD

Make sure that the wall unit is mounted on is solid, stable, and of a suitable material to hold the weight of the analyzer.

The analyzer must not be mounted on stud or partition walls.

Failure to properly install the equipment may cause serious injury to personnel.
**WARNING!**

**BURNS**
Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.

**Procedure**

1. Power down the analyzer and allow to cool.
2. Open the front enclosure as described in Section 7.9.
3. Visually examine the exterior of the analyzer for signs of damage.
4. Perform a visual inspection of the optical and electrical components inside the analyzer.
5. If any loose connections are found in the electrical compartment, refer to the wiring diagrams (see Section D.1) to identify and repair the connection.
6. Refit the front housing (see Section 7.17).

**7.6 Failure diagnostics**

If the BIT and the visual examination fail to identify the fault, perform the failure diagnostics and recommended actions.

**General troubleshooting and diagnostics information**

<table>
<thead>
<tr>
<th>Step</th>
<th>Symptom</th>
<th>Test</th>
<th>Result</th>
<th>Recommended actions</th>
<th>Result</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gas reading ab-normal.</td>
<td>Check measurement validity flag.</td>
<td>Reading invalid.</td>
<td>Refer to step 3.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reading valid.</td>
<td></td>
<td>Perform a new zero and span calibration to ensure calibration factors are correct.</td>
<td>Readings return to normal.</td>
<td>Sensor required calibration.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Abnormal readings persist.</td>
<td></td>
<td>Unknown. Contact Cascade Technologies, Ltd.</td>
</tr>
<tr>
<td>Step</td>
<td>Symptom</td>
<td>Test</td>
<td>Result</td>
<td>Recommended actions</td>
<td>Result</td>
<td>Cause</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------</td>
<td>----------------------------------------------</td>
<td>-------------------------</td>
<td>---------------------</td>
<td>-------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>2A</td>
<td>Calibration/validation drift</td>
<td>Check measurement validity flag.</td>
<td>Reading invalid.</td>
<td>Refer to step 3.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reading valid.</td>
<td></td>
<td>Perform a new zero and span calibration to ensure calibration factors are correct.</td>
<td>Readings return to normal. Sensor required calibration. Drift persists. Refer to step 2B.</td>
</tr>
<tr>
<td>2B</td>
<td></td>
<td>Check calibration cylinder.</td>
<td>Cylinder near empty.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Replace cylinder.</td>
<td></td>
<td></td>
<td>Cylinder was empty. Drift persists. Refer to step 2C.</td>
</tr>
<tr>
<td>2C</td>
<td></td>
<td>Check calibration pipework.</td>
<td>Pipework damaged.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Replace pipework.</td>
<td></td>
<td></td>
<td>Pipework was damaged. Drift persists. Unknown. Contact Cascade Technologies, Ltd</td>
</tr>
<tr>
<td>3</td>
<td>Measurement invalid flag</td>
<td>Check display controller to assess which measurements are invalid.</td>
<td>All gas readouts invalid.</td>
<td>Use the display controller to check pressure and cell temperature.</td>
<td>Pressure and temperature are both in range. Hardware failure. Contact Cascade Technologies, Ltd.</td>
<td>Pressure or temperature is out of range. Refer to steps 5 or 6 as appropriate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Analysis cell pressure out of range.</td>
<td>Adjust inlet valve to change pressure.</td>
<td>Pressure returns to normal.</td>
<td>No further action required.</td>
<td>Pressure returns to normal.</td>
<td>Pressure was out of range.</td>
</tr>
</tbody>
</table>
Table 7-1: Functional failure diagnostics table (continued)

<table>
<thead>
<tr>
<th>Step</th>
<th>Symptom</th>
<th>Test</th>
<th>Result</th>
<th>Recommended actions</th>
<th>Result</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Analysis cell temperature out of range</td>
<td>Read cell temperature from display controller.</td>
<td>Temperature too low.</td>
<td>Allow system time to heat up.</td>
<td>System heats up with time.</td>
<td>System was recently started from cold.</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Sensor frozen or unresponsive.</td>
<td>Attempt a reboot.</td>
<td>System reboots successfully.</td>
<td>No further action required.</td>
<td>System reboots successfully.</td>
<td>Computer freeze-up or connection failure. Contact Cascade Technologies Ltd. if this recurs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Other error not covered above.</td>
<td>Unknown. Contact Cascade Technologies Ltd.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.7 **Repairable items**

This chapter describes the repair procedures for all items that are repairable by maintenance personnel who have been trained, are hazardous area Ex version compliant, and are authorized to carry out repairs on the analyzer.

The major items that are repairable without Emerson’s assistance are listed in Appendix C. In all cases, the repair is by direct replacement of the faulty item with a known serviceable item purchased from Emerson that is hazardous area Ex compliant. If any items other than those listed require service, Emerson must perform the repair.

Before commencing any repair on the analyzer, allow it to cool down as detailed in the safety precautions below.
**DANGER!**

**FLAMMABLE SUBSTANCES**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

Some parts of the analyzer may reach temperatures of 65 °C (150 °F) and may present an ignition source. Exercise care when using oil, paint, cleaning rags, and other flammable substances near the analyzer. A fire may result if this precaution is not observed. Always assume that the interior of a analyzer is hot unless it has been switched off and allowed to cool down.

---

**WARNING!**

**BURNS**

Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.

---

**WARNING!**

**HEAVY ITEM**

In accordance with IEC 60079-0: 2011 Clause 30.

Make sure that the wall the unit is mounted on is solid, stable, and of a suitable material to hold the weight of the analyzer.

Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lb). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.

---

**NOTICE**

As a general principle, if any optical component other than the cell assembly and the laser modules is unserviceable, then the analyzer must be repaired by the manufacturer. This is because the repair, replacement, and alignment of the optical components requires the use of special optical test/calibration equipment and procedures.
7.8 Tools required for troubleshooting

The following tools are required to remove and replace components

<table>
<thead>
<tr>
<th>Table 7-2: Required Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tool</strong></td>
</tr>
<tr>
<td>14 mm</td>
</tr>
<tr>
<td>2.5 mm</td>
</tr>
<tr>
<td>4.0 mm</td>
</tr>
<tr>
<td>5.0 mm</td>
</tr>
<tr>
<td>7.0 mm</td>
</tr>
<tr>
<td>8.0 mm</td>
</tr>
<tr>
<td>14 mm</td>
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<tr>
<td>16 mm</td>
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<td></td>
</tr>
</tbody>
</table>

---

**DANGER!**

FLAMMABLE SUBSTANCES

This article is in accordance with IEC 60079-0: 2011 Clause 30.

Some parts of the analyzer may reach temperatures of 65 °C (150 °F) and may present an ignition source. Exercise care when using oil, paint, cleaning rags, and other flammable substances near the analyzer. A fire may result if this precaution is not observed. Always assume that the interior of a analyzer is hot unless it has been switched off and allowed to cool down.

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**WARNING!**

BURNS

Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.
7.9 Opening the enclosure

To gain access to the electrical and optical components, it is necessary to open the front enclosure. Refer to Figure 7-17 and proceed as follows:

**Figure 7-17: 20 off M16 captive bolts**

A. **M16 captive bolts**

**Procedure**

1. Make sure that the hinges are securely connected to the enclosure.

   **WARNING!**
   
   **HEAVY LID**
   Inspect the hinges before damage before removing the M16 x 45 captive screws.

   **Ensure no obstructions are in the opening radius when the front housing is opened.**

2. Undo the 20 off M16 x 1.5 captive bolts holding the front and rear housings of the enclosure together.

3. Carefully lower the front enclosure to the fully open position.
4. Apply masking tape to the flanges, seal, and flamepath to protect them from scratches, chipping, and other forms of damage or deformation.

⚠️ CAUTION!

PROTECT FLAMEPATH

The flamepath must be protected. Any damage to the flamepath will invalidate certification.
5. Set the external breaker ON/OFF switch to OFF. Tag out.
6. Check that the hinges are in good condition.
7. Undo the 20 m16 x 45 cap screws around the housing.
8. Lift the front housing carefully away from the rear housing and downwards.
9. Examine the front housing for signs of physical damage.
   If it is undamaged, retain the front housing. Minor damage to the paintwork on the front housing may be retouched.
10. Make sure that the faces of the flamepath on both the front and back housings are protected.

7.10 Replacing the display and control buttons

The display and button controls are supplied and fitted as one assembly. To replace the display, complete the following instructions.

DANGER!

ELECTRIC SHOCK

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

HEAVY ITEM
In accordance with IEC 60079-0: 2011 Clause 30.

Make sure that the wall the unit is mounted on is solid, stable, and of a suitable material to hold the weight of the analyzer.

Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lb). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.

**WARNING!**

BURNS
Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.

**Procedure**

1. Shut down the analyzer (see Section 8.2).
2. Tag or otherwise identify all wiring harnesses before disconnecting.
3. Open the front enclosure as described in Section 2.3.1. The LCD display will then be accessible as shown in Figure 7-19.
4. Release the four off captive screws that secure the display to the chassis assembly.
Figure 7-19: LCD display and controller assembly

Figure 7-20: Removing the LCD display and controller
5. Using a small spanner, remove and retain the four M5 hex nuts and plain washers from the display and the four M5 hex nuts and plain washers from the display controller PCB.

Retain the nuts and washers for future use.

6. Remove the display and controller by pulling it from the front of the chassis assembly.

7. Unpack and visually inspect the replacement LCD display for damage. If damage has occurred, contact your local Emerson Customer Care Representative.

8. Insert the display into the front panel of the chassis assembly through the front of the chassis assembly.

9. Tighten all the captive screws until the display is held securely against the front panel of the chassis assembly.

10. Make sure that the bolts operate; if necessary, adjust the display position by loosening M5 Hex nuts and align accordingly.

11. Plug the connector and attached wiring harness into the vacant connector location on the display.

12. Close the front enclosure as described in Section 7.17.

13. Remove the Lock-out Tag-out labels from the circuit breaker.

14. Apply power to restart the analyzer.

### 7.11 Replacing the fuses

Use this procedure to replace the two Rosemount CT5800 fuses.

#### Prerequisites

**NOTICE**

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

**NOTICE**

Make sure that the fuses are in place and of the correct rating.

**DANGER!**

**ELECTRIC SHOCK**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

Failure to observe this precaution will cause death, personal injury, and/or damage to persons and/or property.
Figure 7-21: Fuses

Figure 7-22: Wiring diagram
### Table 7-3: Fuses

<table>
<thead>
<tr>
<th>Fuse</th>
<th>Function</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Live line 110/240 Vac (following mains filter)</td>
<td>3.15 A, 240 V, fast acting ceramic</td>
</tr>
<tr>
<td>2</td>
<td>Neutral line 110/240 Vac (following mains filter)</td>
<td>3.15 A, 240 V, fast acting ceramic</td>
</tr>
</tbody>
</table>

### Procedure

1. Shut down the analyzer as described in Section 8.2 and allow it to cool.
2. Follow the procedure for opening the enclosure described in Section 7.9.
3. The fuses are located inside a fuse holder that is mounted on the DIN Rail of the Power Supply Unit (see Figure 7-23).

![Fuse holder position](image)

**Figure 7-23: Fuse holder position**

For clarity, Figure 7-24 shows one of the fuse holders, which is shown in both the closed and partially open positions.
4. No tools are required to remove the fuse. Place a finger on the catch on the upper part of the fuse holder and lift the upper part of the fuse holder as shown in Figure 7-24.

5. Fully raise the upper part of the fuse holder (B) as shown in Figure 7-25 and then push out the old fuse (A).
Figure 7-25: Replacing a fuse

A. Fuse
B. Fuse holder

6. Fit the replacement fuse into the fuse holder. Refer to Table 7-3 and make sure that the fuse is of the correct type and rating. When lowering the upper part of the fuse holder, ensure that it clicks into place when fully lowered.

7. Close the enclosure as described in Section 7.17 and secure with the captive M16 bolts and engage the threads on the rear housing.

8. Remove Lock-Out Tag-Out labels.

**DANGER!**

**ELECTRIC SHOCK**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

9. Apply power to restart the analyzer.
7.12 Replacing the terminal electric cooler (TEC) board

Complete the following instructions to replace the terminal electric cooler (TEC) board. Observe all safety precautions before starting this procedure.

⚠️ WARNING!

EXPLOSION HAZARD
This article is in accordance with IEC 60079-0: 2011 Clause 30.

Read all instruction manuals, including versions for auxiliary equipment) before installing this instrument.

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

⚠️ WARNING!

HEAVY ITEM
Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lbs.). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.

⚠️ WARNING!

BURNS
Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.

Procedure

1. Shut down the analyzer as described in Section 8.2 and allow it to cool.
2. Follow the procedure for opening the enclosure described in Section 7.9.
3. Tag or otherwise identify all wiring harnesses before disconnecting.
4. Remove and retain the four off M3 x 6 mm hex cap screws (D) and associated spring washers (C) and flat washers (B) that secure the TEC board to the back plate.

**Figure 7-26: Replace the TEC board**

5. Remove the TEC Board from the backplate (G).

6. Discard the unserviceable TEC board observing all local and federal laws regarding disposal of electronics.
CAUTION!

ELECTROSTATIC DISCHARGE

Wear an ESD wrist strap or ground yourself to prevent damage to the USB PCB electronics.

7. Examine the replacement TEC Board for damage or delamination. If damaged, contact your local Customer Care representative.

8. Fit the TEC Board (A) in position on the backplate (G). Secure the TEC Board by fitting the four screws (D) and associated spring washers (C) and flat washers (B) that were retained during the removal procedure. Apply Loctite 222 to the four off M3 screws and torque tighten the screws to 0.75 Nm.

9. Connect the wiring harness (F) to the TEC board (A).

10. Connect the ribbon cable (E) to the ribbon cable connector (H) on the TEC board. Make sure that the ribbon cable securely clicks into place in the ribbon cable connector.

11. Close the enclosure as described in Section 7.17 and secure with the captive M16 bolts and engage the threads on the rear housing.

12. Remove Lock-Out Tag-Out labels.

DANGER!

ELECTRIC SHOCK

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

13. Apply power to restart the analyzer.
7.13 Replacing the peripheral board

To replace the peripheral board, complete the following steps.

---

**DANGER!**

**ELECTRIC SHOCK**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

---

**WARNING!**

**EXPLOSION HAZARD**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

Read all instruction manuals, including versions for auxiliary equipment) before installing this instrument.

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

---

**WARNING!**

**HEAVY ITEM**

Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lbs.). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.

---

**WARNING!**

**BURNS**

Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.
**Procedure**

1. Shut down the analyzer as described in *Section 8.2* and allow it to cool.
2. Tag or otherwise identify all wiring harnesses before disconnecting.
3. Refer to *Figure 7-27*. Disconnect the 12 V power wiring harness (E) from the peripheral board (A).
Figure 7-27: Peripheral board

4. Cut the cable tie (C) that secures the TEC board ribbon cable (D) to the connector of the peripheral board ribbon cable (B). Carefully move the TEC board ribbon cable clear of the peripheral board.

5. Disconnect the ribbon cable (B) from the peripheral PCA board (A).
6. Disconnect the relay wiring harness (I) from the peripheral board.
7. Disconnect the three connectors (J, K, and L) of the gas/cell temperature monitoring harness from the peripheral board.
8. Remove the four screws (H), spring washers (G), and flat washers (F).
9. Remove the peripheral board (A) from the analyzer.

**CAUTION!**

**ELECTROSTATIC DISCHARGE**

Wear an ESD wrist strap or ground yourself to prevent damage to the replacement peripheral PCA board.

10. Discard the unserviceable peripheral board observing all local and federal laws regarding disposal of electronics.
11. Remove the replacement peripheral board from the shipping package and inspect for damage. If damaged, contact your local Customer Care representative.
12. Secure the peripheral board by fitting the four screws (H), spring washers (G), and flat washers (F) retained during the removal procedure.
13. Torque tighten the screws to 0.6 Nm.
14. Connect the three connectors (J, K, and L) of the gas/cell temperature monitoring harness respectively to connectors J9, J24, and J37 on the peripheral printed circuit card (PCA).
15. Connect the relay wiring harness (I) to the peripheral board.
16. Connect the peripheral board ribbon cable (B) to the peripheral board.
17. Secure the TEC board ribbon cable (D) to the connector of the peripheral board ribbon cable (B) with a cable tie (C).
18. Connect the 12 V power wiring harness (D) to the peripheral board (A).
19. Close the enclosure as described in Section 7.17 and secure with the captive M16 bolts and engage the threads on the rear housing.
21. Apply power to restart the analyzer.
7.14 Replacing the motherboard

Complete the following steps to replace the motherboard. Observe all safety precautions before starting this procedure.

**DANGER!**

**ELECTRIC SHOCK**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

**Procedure**

1. Shut down the analyzer as described in Section 8.2.
2. Power down the analyzer and allow it to cool.
3. Follow the procedure for opening the enclosure described in Section 7.9.
4. Tag or otherwise identify all wiring harnesses before disconnecting.
5. Disconnect the TRIGGER OUT wiring harness (H) from connector J32 (F).
6. Disconnect the laser module ribbon cables (P) from the motherboard.
The number of laser module ribbon cables to be disconnected will vary depending upon the application for which the analyzer has been configured.

7. Disconnect the 12 V power input wiring harness (O) from connector J16 (M).
8. Disconnect the 12 V power output wiring harness (N) from connector J17 (L).
9. Disconnect the peripheral PCB ribbon cable (K) from connector J7 (J).
10. Disconnect the Ethernet cable (S) from the Ethernet connector (T).
11. Disconnect the HMI display wiring harness (Q) from connector J22 (R).
12. Remove the SD card and retain for future use.
13. Remove and retain the six screws, spring washers, and flat washers (D, C, and A).
14. Remove the motherboard.
15. Discard the unserviceable motherboard observing all local and federal laws regarding disposal of electronics.

⚠️ **CAUTION!**

**ELECTROSTATIC DISCHARGE**

*Wear an ESD wrist strap or ground yourself to prevent damage to the motherboard electronics.*

16. Inspect the replacement motherboard for signs of damage or delamination.
17. Place the motherboard in position on the backplate and secure it by fitting the six screws (D) and the associated spring washers (C) and flat washers (A) retained during the removal procedure. Torque tighten the screws to 0.6 Nm.
18. Insert the SD card removed from the old motherboard.
19. Connect the HMI display wiring harness (Q) to connector J22 (R).
20. Connect the Ethernet cable (S) to the Ethernet connector (T).
21. Connect the peripheral PCB ribbon cable (K) to connector J7 (J).
22. Connect the 12 V power output wiring harness (N) to connector J17 (L).
23. Connect the 12 V power input wiring harness (O) to connector J16 (M).
24. Connect the laser module ribbon cables (P) to the motherboard. Make sure that the laser module ribbon cables are connected to the correct laser module connectors on the motherboard, as tagged or noted down during the removal procedure.
25. Connect the TRIGGER OUT wiring harness (L) to connector J32 (K).
26. Connect the detector module 1 TRIGGER OUT wiring harness (I) to connector J31 (G).
27. If applicable, connect the detector module 2 TRIGGER OUT wiring harness (H) to connector J31 (F).
28. Connect the TEC board ribbon cable (E) to connector J12 (B).
29. Close the enclosure as described in Section 7.17 and secure with the captive M16 bolts and engage the threads on the rear housing.
30. Remove Lock-Out Tag-Out labels.
31. Apply power to the analyzer.
7.15  Replacing the DIN rail components

7.15.1  Removing the DIN rails

To access most components and remove or replace the analysis cell assembly and the core, the lower DIN rail must be removed.

**Prerequisites**

Refer to the following section to remove active components from the DIN rails.

Refer to *Replacing the fuses* for the fuse replacement.

Refer to *Section 7.15.8* for replacing the DC power supply.

Refer to *Section 7.15.4* for replacing the temperature controller.

Before removing any of the active components from the DIN rails, perform the following steps:

**Procedure**

1. Shut down the analyzer as described in *Section 8.2*.
2. Open the enclosure as described in *Section 7.9*.
3. Tag and disconnect all cables and connections as appropriate.
4. Disconnect the two 14 mm gas input and output line connectors at the flame arrestor. Refer to Section 7.16.3.

5. Remove the two M5 socket head cap screws, two M5 Spring washers and two M5 plain washers securing the lower DIN rail support bracket to the base of the enclosure. Retain the screws and washers for future use.
Removing the core

Use this procedure to remove the core.

**DANGER!**

ELECTRIC SHOCK

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

HEAVY ITEM
In accordance with IEC 60079-0: 2011 Clause 30.

Make sure that the wall the unit is mounted on is solid, stable, and of a suitable material to hold the weight of the analyzer.

Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lb). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.

WARNING!

BURNS
Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

• Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
• The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.

CAUTION!

The core can weigh approximately 20 kg (44.09 lb) and does not have dedicated lifting / handling points.

Two people must handle the core when removing it from the housing.

Take care when handling not to damage any of the components.

Procedure

1. Shutdown the Analyzer as described in Section 8.2.
2. Open the enclosure as described in Section 7.9.
3. Tag and disconnect all cables and connections as appropriate.
4. Unscrew the two 14 mm connections to the gas input and output lines (see Figure 7-43).
5. Remove the lower DIN rail as described in Section 7.15.1.
6. Undo the four M5 Socket head cap screws, four M5 spring washers and four M5 plain washers and retain for future use.
Removing the Core

**Figure 7-31: Removing the Core**

7. Carefully lift the core from the enclosure and place on a suitable table or bench.

### 7.15.3 Replacing the Moxa analog input unit

**DANGER!**

**ELECTRIC SHOCK**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

HEAVY ITEM
In accordance with IEC 60079-0: 2011 Clause 30.

Make sure that the wall the unit is mounted on is solid, stable, and of a suitable material to hold the weight of the analyzer.

Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lb). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.

**Procedure**

1. Shut down the analyzer by switching the ON/OFF switches on the front and rear panels to the OFF position and allow the analyzer to cool.
2. Remove the analyzer from the rack using two people to lift the analyzer and place it on a clean workbench.
3. Remove and retain the four screws attaching the top cover to the chassis.
4. Disconnect the Moxa connector from the top of the Moxa analog IN/OUT unit.

5. Disconnect the connectors from the bottom of the Moxa analog input unit.
6. Release the Moxa analog input unit from the DIN rail by pressing a small lever on the underside of the unit. While continuing to press the lever, remove the Moxa analog input unit from the DIN rail.

7. Discard the unserviceable Moxa analog input unit.

8. Inspect the replacement unit for damage. If damage has occurred, contact your local Emerson Customer Care Representative.

9. Insert the replacement Moxa analog input unit in its correct location on the DIN rail. Press the small lever on the underside of the unit and push the unit onto the DIN rail. Release the small lever and check that the unit is secure.

10. Connect Ethernet cable to the Moxa.

11. Close the enclosure as described in Section 7.17 and secure with the captive M16 bolts and engage the threads on the rear housing.

12. Remove Lock-Out Tag-Out labels.

13. Apply power to the analyzer.

7.15.4 Replacing the temperature controller

The two temperature controllers are identical; therefore, the replacement procedure for only one is described. Each temperature controller plugs into a base unit that is mounted on the DIN rail. The base unit has no active components and should not require replacement.

⚠️ DANGER!

ELECTRIC SHOCK

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

⚠️ WARNING!

HEAVY ITEM

In accordance with IEC 60079-0: 2011 Clause 30.

Make sure that the wall the unit is mounted on is solid, stable, and of a suitable material to hold the weight of the analyzer.

Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lb). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.
**WARNING!**

BURNS
Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.

---

**Figure 7-33: Replacing a temperature controller**

![Replacing a temperature controller](image)

A. Temperature controller

**Procedure**

1. Press the small lever. While holding the lever in the down position, unplug the temperature controller (A) from the upper DIN rail.

**NOTICE**

When replacing a temperature controller, the interconnecting wiring does not have to be disconnected from the base unit.
2. Discard the unserviceable temperature controller.
3. Inspect the replacement temperature controller for damage. If damage has occurred, contact your local Customer Care Representative.
4. Fit the replacement temperature controller (A) onto the upper DIN rail. Make sure the orientation of the temperature controller is correct. Press the small lever (C) on the base unit and, while holding the lever in the down position, push the temperature controller home into the base unit. Release the lever and check that the temperature controller is secure.
5. Attach the cables and wiring connections to the temperature controller.
6. Remove the protective masking tape from the flanges, seal, and flamepath.
   - Use care not to damage the flamepath. Any damage to the flamepath will invalidate certification.
7. Close the enclosure as described in Section 7.17 and secure with the captive M16 bolts and engage the threads on the rear housing.
8. Remove lock-out tag-out labels.
9. Apply power to the analyzer.

### 7.15.5 Replacing the Ethernet connector

**WARNING!**

**HEAVY ITEM**

In accordance with IEC 60079-0: 2011 Clause 30.

Make sure that the wall the unit is mounted on is solid, stable, and of a suitable material to hold the weight of the analyzer.

Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lb). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.
Figure 7-34: Replace an Ethernet switch

**Procedure**

1. Power down the analyzer and allow to cool for two hours.
2. Lock-out tag-out the power supply.
3. Remove the twenty M16 captive bolts and carefully open the enclosure.
4. Disconnect the wiring harnesses from the Ethernet connector (B).
5. Press the small lever (F) on the underside of the Ethernet switch to release it from the DIN rail. While continuing to press the lever, remove the Ethernet switch from the DIN rail.
6. Unclip the Ethernet connector (A) from the DIN rail.
7. Inspect the replacement Ethernet connector for damage. If damaged, contact your local Customer Care Representative.
8. Discard the unserviceable Ethernet switch.
9. Clip the replacement Ethernet connector onto the correct location on the DIN Rail. Check the DC power supply is secure.
10. Connect the wiring harnesses to the Ethernet connector.
11. Connect the wiring harness (F) to the Ethernet switch.
12. Close the enclosure cover and secure with the twenty M16 bolts.
13. Remove the lock-out tag-out labels from the power circuit.
14. Apply power to restart the analyzer.

7.15.6 Replacing the laser modules

The analyzer contains multiple laser modules; the precise number of laser modules is determined by the configuration of the analyzer.

**DANGER!**

**ELECTRIC SHOCK**

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

**Prerequisites**

All the laser modules are physically identical, but are NOT interchangeable as they differ in internal settings. Each laser module is a sealed unit and can only be repaired by Emerson. Repair therefore consists of removing the unserviceable laser module and returning it to Emerson for repair.

**Procedure**

1. Power down the analyzer and allow to cool for two hours.
2. Lock-out tag-out the power circuit breaker.
3. Apply masking tape to the flanges, seal, and flamepath to protect them from scratches, chipping, and other forms of damage or deformation.
4. Remove the twenty M16 captive bolts securing the enclosure and carefully open the enclosure.
5. Unscrew the two 14 mm connections to the gas input and output lines (see Figure 7-43).
6. Remove the lower DIN rail as described in Section 7.15.4.
Refer to Figure 7-35 to complete this procedure.

7. Disconnect the ribbon cable (E) and the captive screws (D and F).

---

Figure 7-35: Removing a Laser Module

8. Inspect the replacement laser module for damage.

9. Fit the replacement laser module in position on the base plate (A). The laser module must mate with the two locating pins (B) on the Base Plate.

10. Secure the laser module by tightening the two captive screws (D and F).

11. Connect the ribbon cable (E) to the laser module (C).

12. Remove the protective masking tape from the flanges, seal, and flamepath.

   Use care not to damage the flamepath. Any damage to the flamepath will invalidate certification.

13. Close the enclosure as described in Section 7.17 and secure with the captive M16 bolts and engage the threads on the rear housing.

14. Remove lock-out tag-out labels.

15. Apply power to the analyzer.
7.15.7 Installing the DIN rails

Use this procedure to install DIN rails.

--- DANGER! ---

ELECTRIC SHOCK

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

---

Prerequisites

See Figure 7-29. The DIN rails and gas inlet and outlet lines must be removed to access the analyzer electronics.

Procedure

1. Insert the lower DIN rail in the enclosure.
2. Install the two M5 socket head cap screws, two M5 Spring washers and two M5 plain washers securing the lower DIN rail support bracket to the base of the enclosure.
3. Connect the two 14 mm gas input and output line connectors at the flame arrestor. Refer to Section 7.16.3.
4. Connect all cables and wiring connections as appropriate.
5. Remove the protective masking tape from the flanges, seal, and flamepath.

⚠️ CAUTION!

PROTECT FLAMEPATH

Use care not to damage the flamepath. Any damage to the flamepath will invalidate certification.

6. Close the enclosure as described in Section 7.17 and secure with the captive M16 bolts and engage the threads on the rear housing.
7. Remove lock-out tag-out labels.
8. Apply power to the analyzer.

### 7.15.8 Replacing the DC power supply

Use this procedure to replace the DC Power Supply.
**WARNING!**

**HEAVY ITEM**
Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lb). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.

---

**WARNING!**

**BURNS**
Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.

---

**Procedure**

1. Power down the analyzer and allow to cool for two hours.
2. Remove the twenty M16 captive bolts and carefully open the enclosure.
3. Refer to *Figure 7-37*. Disconnect the wiring harness connector (B) from the top of the DC Power Supply (A).
Replacing a DC power supply

Figure 7-37: Replacing a DC power supply

A. DC power supply
B. Wiring harness connector (top)
C. Wiring harness connector (bottom)
D. Lever

4. Disconnect the wiring harness connector (C) from the bottom of the DC power supply (A).
5. Tag and disconnect all cables and connections as appropriate.
Figure 7-38: Fuse DIN rail screws

A. Fuse DIN rail bolts
B. Power supply unit
6. Remove the two DIN rail M5 screws, spring washers and flat washers and retain for future use.
7. Discard the unserviceable DC power supply.
8. Inspect the replacement DC power supply for damage. If damaged, contact your local Customer Care Representative.
9. Install the replacement DC Power Supply on the bracket assembly.
10. Secure the bracket assembly to the enclosure housing with the two M5 screws, spring washers and flat washers.
11. Reinstall the fuse assembly to the power supply DIN rail.
12. Refer to Figure 7-37. Connect the wiring harness connector (C) to the bottom of the DC power supply (A).
13. Connect the wiring harness connector (B) to the top of the DC power supply (A).
14. Close the front cover and secure with twenty M16 captive bolts.
15. Apply power to restart the analyzer.

7.16 Optical and pneumatic repairs

7.16.1 Replacing the temperature sensor

Use this procedure to replace the temperature sensor.
Prerequisites

**WARNING!**

EXPLOSION HAZARD
This article is in accordance with IEC 60079-0: 2011 Clause 30.

When the analyzer is out of order, all inputs and outputs connected to external equipment must be shut off.

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

**WARNING!**

BURNS
Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.
**Figure 7-40: Temperature and pressure sensors**

A. Temperature sensor  
B. Pressure sensor

Note the routing of the temperature sensor wiring harness and the location of the cable ties that secure the wiring harness.

**Procedure**

1. Disconnect power to the analyzer.
2. Allow the analyzer to cool for at least two hours.
3. Remove the twenty M16 bolts from the housing and carefully lower the front housing to the fully open position.
4. Carefully cut and remove any cable ties that secure the gas temperature sensor wiring harness.
5. Disconnect the gas temperature sensor wiring harness from connector block on the DIN rail.
6. Use a spanner on the temperature sensor’s 6 ¼ mm hex fitting and remove the sensor from the baseplate.
7. Discard the faulty sensor and Dowty washer.
8. Inspect the replacement sensor and washer for damage. If, damaged, contact you local Customer care Representative.
9. Insert the replacement Dowty washer on the base of the temperature sensor and insert into the baseplate.
10. Use a spanner to tighten the sensor fitting.

**NOTICE**

The Swagelok® recommendation for pipe fittings of this size is to tighten the nut finger tight and then tighten an additional one and a quarter (1-1/4) turns with a spanner.

11. Reconnect the wiring harness and fit with cable ties.
12. Close the housing and secure with twenty M16 bolts.
13. Reapply power to the analyzer.
Replacing the pressure sensor

**WARNING!**

HEAVY ITEM
In accordance with IEC 60079-0: 2011 Clause 30.

Make sure that the wall the unit is mounted on is solid, stable, and of a suitable material to hold the weight of the analyzer.

Handle the analyzer with caution during unpacking, installing, maintaining, and transporting to prevent crushing of hands, feet, or other body parts.

The analyzer weighs 80 kg (176.37 lb). Emerson recommends that the analyzer is only moved and lifted by a minimum of two people when lifting and transporting the equipment. Wear suitable protective gloves and protective footwear.

Failure to properly handle the analyzer may cause injury to personnel.

**WARNING!**

BURNS
Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.
Procedure

1. **Figure 7-42: Pressure sensor**

   - Disconnect power to the analyzer.
   - Allow the analyzer to cool for at least two hours.
   - Remove the twenty M16 bolts from the housing and carefully lower the front housing to the fully open position.
   - Carefully cut and remove any cable ties that secure the gas sensor wiring harness.
   - Disconnect the gas sensor wiring harness from connector block on the DIN rail.
   - Use a spanner on the sensor’s 6¼ mm hex fitting and remove the sensor from the baseplate.
   - Discard the faulty sensor and Dowty washer.
   - Inspect the replacement sensor and washer for damage. If, damaged, contact your local Customer Care Representative.
   - Insert the replacement Dowty washer on the base of the temperature sensor and insert into the baseplate.
   - Use a spanner to tighten the sensor fitting.

**NOTICE**

The Swagelok® recommendation for pipe fittings of this size is to tighten the nut finger tight and then tighten an additional one and a quarter (1-1/4) turns with a spanner.

- Reconnect the wiring harness and fit with cable ties.
- Close the housing and secure with twenty M16 bolts.
- Apply power to restart the analyzer.
7.16.3 Replacing the gas input and output lines

Replacing the gas input line.

Prerequisites

DANGER!

 ELECTRIC SHOCK

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

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

Procedure

1. Turn power off at the circuit breaker and attach a lock-out, tag-out tag on the circuit breaker. Allow the analyzer to cool.

   Figure 7-43: Gas input and output lines

2. Remove the twenty M16 bolts and open the front enclosure.
3. Tag and disconnect all cables and connectors.
4. Remove the two M5 socket head cap screws, M5 Spring washers and M5 plain washers securing the DIN rail support bracket to the base of the enclosure. (Retain the screws and washers for future use).
5. Pull the DIN rail away from the enclosure.
6. Unscrew the two 14 mm connections to the gas input and output lines (see Figure 7-43).

7.16.4 Replacing the analysis cell

Complete the following steps to replace the analysis cell.

⚠️ DANGER!

ELECTRIC SHOCK

This article is in accordance with IEC 60079-0: 2011 Clause 30.

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

Death or personal injury may result if this is not observed.

⚠️ WARNING!

BURNS

Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.

To gain access to the electrical, pneumatic, and optical components, it is necessary to open the front enclosure.

Procedure

1. Power down the analyzer and lock-out tag-out the power source. Refer to the Section 8.2 to shut down the analyzer. Allow the analyzer to cool down.
2. Remove and retain the twenty M16 bolts from the housing and open the enclosure.
3. Disconnect the two 14 mm gas input and output line connectors at the flame arrestor. Refer to Section 7.16.3.
4. Remove the lower DIN rail. See Section 7.15.1.
5. Use a flat head screw drive and remove the four fillets.

Figure 7-44: Analysis cell fillets

CAUTION!

Take care not to put any pressure on, or cause any damage to the TEC board.

6. Unscrew the four socket head cap screws.
7. Carefully lift the cell assembly out of the enclosure.
8. Inspect the replacement analysis cell for damage. If the parts are damaged contact your local Customer Care Representative.
9. Insert the replacement analysis cell into the enclosure.
10. Secure with the four socket head screws and spring washers.
11. Attach the four fillets.
12. Insert the DIN rail into the enclosure.
13. Attach the DIN rail with two M5 socket head cap screws, M5 Spring washers and M5 plain washers securing the DIN rail support bracket to the base of the enclosure.
14. Connect all the component cables and connections on the lower DIN rail.
15. Connect the two 14 mm gas input and output line connectors at the flame arrestor. Refer to Section 7.16.3.
16. Close the enclosure and secure with the twenty M16 bolts.
17. Remove the lock-out tag-out tag and apply power to restart the analyser.

7.17 Closing the enclosure

After all internal connections have been made and proved/tested, the enclosure must be closed and the 20 off M16 x 45 captive screws secured in accordance with the torque sequence shown below.

1. Remove all protective masking tape covering the flamepath and enclosure sealing gaskets.
2. Inspect the seal. If any damage is detected, stop the process immediately and report to maintenance.
3. Clean the seal to remove any adhesive from the protective cover.
4. Inspect the flanges/flamepath for damage, i.e., scratches, chipping, or other forms of damage/deformation. If any damage is detected, stop the process immediately and report to maintenance.
5. Carefully lift up the housing and align with the rear housing.
6. Make sure that all holes are aligned.
   If necessary, use the two holes to assist alignment.

**Figure 7-45: Alignment holes**

7. Insert the captive M16 bolts and engage the threads on the rear housing.
8. Refer to the torque sequence (see Figure 7-46) and tighten all bolts.

**WARNING!**

**SECURE ENCLOSURE**

Captive M16 x 45 screws and form A washers must always be used to secure the enclosure.

Failure to follow this warning will invalidate hazardous area (Ex d) explosion-proof protection.

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**Figure 7-46: Torque sequence**

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**Important**

All bolts must be tightened in sequence to a torque value of 20 Nm (14.75 ft-lb).
8 Shutdown procedure

8.1 Shutdown procedure safety precautions

This chapter describes the analyzer's shutdown procedure.

⚠️ CAUTION!

EQUIPMENT DAMAGE

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

The analyzer normally operates continuously. It should only be necessary to shut down the instrument in the following circumstances:

- In order to perform repairs or maintenance on the analyzer
- When the analyzer has to be switched off as part of a plant shutdown or plant maintenance

Use the display controller to perform the shutdown procedure. Refer to Section 4.4 for the display controller navigation instructions.

NOTICE

The gas concentrations shown in the following screenshots may be different from those shown in your particular analyzer. The screenshots indicate the functionality of the software, which is the same regardless of the gases or gas concentrations being measured.

⚠️ WARNING!

BURNS

Do not touch any part of the analyzer. Assume all parts of the analyzer are hot unless it has been switched off and allowed to cool down. Some parts of the analyzer may be heated to 65 °C (150 °F). Always wear proper protective equipment when handling the analyzer.

- Switch off the analyzer and allow it to cool for at least two hours before fitting, removing, or performing any maintenance.
- The analysis cell is insulated against heat loss. Allow the analyzer to cool for at least twelve hours before performing any maintenance on, or in the vicinity of, the analysis cell.

Failure to allow sufficient cooling may cause serious burn injury to personnel. If burns occur, seek immediate medical treatment.
8.2 Shutdown procedure

To shut down the analyzer, perform the following steps:

**DANGER!**

**EXPLOSION HAZARD**

Always lock-out the gas handling system when shutting down the analyzer. Unauthorized operation of the gas handling system when maintenance is being performed on the analyzer or its associated pipes/hoses may result in gas being released, causing fire or explosion. Failure to lock-out gas handling system may cause death.

**Procedure**

1. Shut down the gas handling system that conditions the sample gas and feeds it to the analyzer. Always lock-out the gas handling system to prevent its unauthorized operation during maintenance, which may cause an escape of gas.

   **DANGER!**

   **EXPLOSION HAZARD**

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

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

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

   **Failure to vent sample gas may cause death.**

2. Purge any sample gas in the pipe/hose from the gas handling system to the analyzer using factory air or nitrogen supply.

3. Allow the analyzer to run for five minutes with the purge gas connected, so that any sample gas in the instrument is vented to the exhaust. On the display controller, check that the gas concentrations read 0 ppm before stopping the purge flow.

   **WARNING!**

   **HIGH PRESSURE GAS AND AIR**

   This article is in accordance with IEC 60079-0: 2011 Clause 30.

   The calibration gas supply and compressed air supply operate 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 analyzer.
4. Turn off the calibration gas supply to the analyzer. Lock-out and Tag-out the compressed air supply.

5. Press on the display controller in either the Gas Sensor Main screen (Figure 8-1) or the Pressure and Temperature screen (Figure 8-2).

**Figure 8-1: Gas Sensor Main screen**

![Gas Sensor Main screen](image_url)

**Figure 8-2: Pressure and Temperature screen**

![Pressure and Temperature screen](image_url)

The Main menu (Figure 8-3) opens.
6. On the display controller, use ▲ and ▼ to scroll down to select SYSTEM as shown in Figure 8-3. Then press ► Figure 8-3.

The System screen () opens.

7. Use ▲ and ▼ to select SHUTDOWN as shown in Figure 8-4. Then press ◄.

The Shutdown screen (Figure 8-4) displays.

8. Press ◄ to confirm.

The analyzer displays the Shutdown screen (Figure 8-5) and then stops running.
9. Wait until the heart icon at the top right of the screen stops flashing.
You can now isolate the analyzer by turning off the power supply.
9 Preventative maintenance

9.1 Maintaining the analyzer

This section describes the preventative maintenance of the analyzer.

Preventative maintenance (PM) is also sometimes known as scheduled maintenance or planned maintenance.

Observe and obey all safety precautions when performing preventative maintenance on the analyzer.

Before fitting, removing, or performing any maintenance on the analyzer, make sure that it has been switched off and allowed to cool for at least two hours. Before performing any maintenance on or in the vicinity of the analysis cell, allow the analyzer to cool for at least twelve hours, as the analysis cell is insulated against heat loss.

9.2 Scheduled maintenance

This schedule lists the tasks required by the analyzer and the recommended frequency. Variation in customer sites may require these activities to be performed more or less often than indicated. Details of the tasks to be performed are contained in Table 9-1.

Table 9-1: Scheduled checks

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly</td>
<td>1. Check the zero and span calibration.</td>
</tr>
<tr>
<td></td>
<td>2. Perform the calibration more or less frequently if necessary to meet quality control or plant operation requirements.</td>
</tr>
<tr>
<td>Annually</td>
<td>1. Perform the monthly check detailed in the previous row.</td>
</tr>
<tr>
<td></td>
<td>2. Perform a laser wavelength calibration. Contact your local service representative for guidance.</td>
</tr>
</tbody>
</table>
Preventative maintenance
Appendix A
ATEX / IECEx Assessment Report Summary

This appendix must not be changed, amended, or removed.

A.1 Certification Overview
This report covers the assessment of the Rosemount™ CT5800 Continuous Gas Analyzer to the standards listed in Section 1, in order to support the issue of prime ATEX and IECEx certification.

A.2 Applicant's Name & Address
Cascade Technologies Ltd
Glendevon House
Castle Business Park
Stirling
FK9 4TZ
UK

A.3 Manufacturer's Name & Address
As applicant.

A.4 Trademark

EMERSON

A.5 Product Name/Model Number
Rosemount CT5800 Continuous Gas Analyzer
### A.6 Rating

90-250 Vac, 50-60 Hz, single phase, 500 W

### A.7 Assessment Standards

#### Table A-1: Europe

<table>
<thead>
<tr>
<th>IECEx</th>
<th>ATEX</th>
</tr>
</thead>
</table>

(The requirements of the equivalent ATEX and IECEx standards are similar; therefore, any references in the following report can be regarded as referring to either format unless stated otherwise.)

This report may be issued against standards that do not appear on the UKAS Scope of Accreditation, but have been added through Sira’s flexible scope of accreditation. Sira’s flexible scope is available on request.

#### Table A-2: CSA Certificate North America

<table>
<thead>
<tr>
<th>CAN/CSA-C22.2 No. 61010-1-12</th>
<th>Safety requirement for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN/CSA - C22.2 No.0.0-10 (R2015)</td>
<td>Canadian Electrical Code, Part II - General Requirements</td>
</tr>
<tr>
<td>CAN/CSA - C22.2 No. 60079-0:16</td>
<td>Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements</td>
</tr>
<tr>
<td>CAN/CSA - C22.2 No. 60079-1:16</td>
<td>Explosive Atmospheres - Part 1: Equipment Protection by Flameproof Enclosures &quot;d&quot;</td>
</tr>
<tr>
<td>CSA C22.2 No. 94.1-15 / UL50</td>
<td>Enclosures for Electrical equipment, Non-environmental Considerations</td>
</tr>
<tr>
<td>CSA C22.2 No. 94.2-15 UL50E</td>
<td>Enclosures for Electrical Equipment, Environmental Considerations</td>
</tr>
</tbody>
</table>
## A.8 Marking

### Table A-3: Europe

<table>
<thead>
<tr>
<th>Detail</th>
<th>IECEx</th>
<th>ATEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate number</td>
<td>IECEx SIR 17.0026X</td>
<td>Sira 17ATEX1094X</td>
</tr>
<tr>
<td>Certification code</td>
<td>Ex db IIB+H2 T4 Gb</td>
<td>Ex db IIB+H2 T4 Gb</td>
</tr>
<tr>
<td>Other marking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IP rating</td>
<td>IP66</td>
<td></td>
</tr>
<tr>
<td>Model number</td>
<td>Rosemount CT5800 Continuous Gas Analyzer</td>
<td></td>
</tr>
<tr>
<td>Manufacturer's name</td>
<td>Cascade Technologies Ltd</td>
<td></td>
</tr>
<tr>
<td>Manufacturer's address</td>
<td>Glendevon House</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Castle Business Park</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stirling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FK9 4TZ</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UK</td>
<td></td>
</tr>
<tr>
<td>Ambient range</td>
<td>-20 to 55 °C</td>
<td>-4 to 131 °F</td>
</tr>
<tr>
<td>Serial number</td>
<td>As applicable</td>
<td></td>
</tr>
<tr>
<td>Year of manufacture</td>
<td>As applicable</td>
<td></td>
</tr>
<tr>
<td>Warnings</td>
<td>WARNING - DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT. WARNING - POTENTIAL ELECTROSTATICAL CHARGING HAZARD - SEE INSTRUCTIONS</td>
<td></td>
</tr>
<tr>
<td>Minimum overpressure</td>
<td>0.5 mbar</td>
<td></td>
</tr>
<tr>
<td>Maximum overpressure</td>
<td>10 mbar</td>
<td></td>
</tr>
<tr>
<td>Leakage rate</td>
<td>25 l/min</td>
<td></td>
</tr>
<tr>
<td>Minimum supply pressure</td>
<td>1 Bar</td>
<td></td>
</tr>
<tr>
<td>Maximum supply pressure</td>
<td>2 Bar</td>
<td></td>
</tr>
</tbody>
</table>

### Table A-4: North America

<table>
<thead>
<tr>
<th>Detail</th>
<th>CSA North American Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate number</td>
<td>CSA 70068210</td>
</tr>
<tr>
<td>Marking Class</td>
<td>Class 2258-02</td>
</tr>
<tr>
<td>Certification code</td>
<td>Class 1 Division 2 Groups B, C, D, T4</td>
</tr>
<tr>
<td></td>
<td>Ex db IIB + H2 T4 Gb</td>
</tr>
<tr>
<td>Marking Class</td>
<td>Class 2258-82</td>
</tr>
<tr>
<td></td>
<td>Class 1 Division 2 Groups B, C, D, T4</td>
</tr>
<tr>
<td></td>
<td>Class 1, Zone 1 AEx db IIB + H2 T4 Gb</td>
</tr>
<tr>
<td>Model number</td>
<td>Rosemount CT5800 Continuous Gas Analyzer</td>
</tr>
</tbody>
</table>
### Table A-4: North America (continued)

<table>
<thead>
<tr>
<th>Detail</th>
<th>CSA North American Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer’s name</td>
<td>Cascade Technologies Ltd</td>
</tr>
<tr>
<td>Manufacturer’s address</td>
<td>Glendevon House</td>
</tr>
<tr>
<td></td>
<td>Castle Business Park</td>
</tr>
<tr>
<td></td>
<td>Stirling FK9 4TZ UK</td>
</tr>
<tr>
<td>Ambient range</td>
<td>-20 to 55 °C</td>
</tr>
<tr>
<td></td>
<td>-4 to 131 °F</td>
</tr>
<tr>
<td>IP Rating</td>
<td>Type 3RX IP66</td>
</tr>
<tr>
<td>Serial number</td>
<td>As applicable</td>
</tr>
<tr>
<td>Year of manufacture</td>
<td>As applicable</td>
</tr>
<tr>
<td>Warnings</td>
<td>WARNING - DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT. WARNING - POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE INSTRUCTIONS</td>
</tr>
<tr>
<td>Minimum overpressure</td>
<td>0.5 mbar</td>
</tr>
<tr>
<td>Maximum overpressure</td>
<td>10 mbar</td>
</tr>
<tr>
<td>Leakage rate</td>
<td>25 l/min</td>
</tr>
<tr>
<td>Minimum supply pressure</td>
<td>1 Bar</td>
</tr>
<tr>
<td>Maximum supply pressure</td>
<td>2 Bar</td>
</tr>
</tbody>
</table>

### A.9 Conditions of certification / special conditions for safe use

- This equipment has flamepaths which differ from those in IEC60079-1/EN 60079-1. Cascade Technologies Ltd shall be contacted for guidance when maintaining the flamepaths.
- The fasteners which secure the cover are non-standard and shall therefore only be replaced by fasteners supplied by the manufacturer for this purpose. The fasteners must always be fitted with the washer supplied by the manufacturer.
- The equipment has non-conductive surfaces which are a potential electrostatic charging hazard - see instructions for guidance.
- The user shall ensure that the flow process gas is limited to a maximum flow rate of 6 liters per minute.
- The equipment shall only be uses with process gases which are classified for equipment group IIB + H2 and must not contain oxygen or any other oxidizer in concentrations greater than those found in normal air.
North American conditions

- The equipment has flameproof joints with dimensions which are other than those specified in Table 2 of ANSI/UL 60079-1: 6th edition and Table 3 of CSA C22.2 60079-1:16. These flameproof joints are not intended to be repaired but where necessary the original manufacturer shall be contacted for guidance and information on the dimensions of the flameproof joints.
- The fasteners which secure the cover are non-standard and shall therefore only be replaced by fasteners supplied by the manufacturer for this purpose. The fasteners must always be fitted with the washer supplied by the manufacturer.
- The equipment has non-conductive surfaces which are a potential electrostatic charging hazard - see the instructions for guidance.
- The user shall ensure that the flow of process gas is limited to a maximum flow rate of 6 liters per minute.
- The equipment shall only be used with process gases which are in gas groups B, C, or D (Divisions) or IIB + H2 (Zones) and must not contain oxygen or any other oxidizer in concentrations greater than those found in normal air.
- This assessment does not cover reliable function, performance, or other properties of the equipment not related to safety.
- The equipment is to be installed using wire no larger than 1 mm² (18 AWG).
- The equipment is only to be installed by manufacturer trained personnel.
- If at any time there is a conflict between the system safety provisions and any relevant local (national or regional) requirements, the local requirements always take precedence.
- The equipment is not to be used with flammable liquids.
Appendix B
Theory of Operation

B.1 Overview

The Rosemount™ CT5800 is a gas sensor system that can be configured to measure the concentrations of multiple small molecules carried in the gas sample. The types of molecules that are measured depend on the system configuration.

The analyzer can be configured to detect and measure up to twelve gases, with ranges varying from parts per billion to percent (%) volume levels. A detailed description of the system is given in Detailed System Specification section of this manual.

B.2 Laser

The analyzer uses up to six Lasers to detect and measure the gases. Each Quantum Cascade Laser (QCL) measures between one and three gases. The lasers used in the system may be QCL or Tunable Diode Laser (TDL) laser types.

Inside the QCL, which is about the size of a pin head, electrons cascade down a series of quantum wells, producing a photon at each step. This cascade of electrons can produce between 20 and 100 photons per electron, giving QCLs higher output power than traditional semi-conductor lasers.

The lasing wavelength of a QCL is determined by adjusting the physical thickness of the semiconductor layers, giving access to high power lasers covering the mid-infrared spectral region. A QCL has no need for cryogenic cooling, has excellent spectral quality in chirped mode, and good tuneability.
B.3 Measurement process

In the analyzer, gas concentrations are measured using mid-infrared optical absorption spectroscopy. The light sources are QCLs, which are operated to produce wavelength sweeps that cover the absorption lines of the gases to be measured.

Sample gas, which may contain impurity gases that are to be detected and measured, is conditioned and drawn into the analyzer. Inside the analyzer, the sample gas is fed into an analysis cell, where the laser beams are passed through the gas. The analysis cell contains a set of mirrors that bounce the light back and forth many times, which lengthens the path of the lasers through the gas. On exiting the analysis cell, the light is detected by a receiver unit. The variation in the intensity of light in the vicinity of absorption lines for the gases being detected is measured, and the concentration is determined using a comprehensive spectral fitting routine.
## Appendix C
### Spare parts list

<table>
<thead>
<tr>
<th>Rosemount™ part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-5000-1038</td>
<td>Remote Ethernet I/O 2-port Etnet switch, 6 DI's and 6 relay</td>
</tr>
<tr>
<td>P-5000-1040</td>
<td>ioLogik remote Ethernet I/O 4AO, 2-port Switch</td>
</tr>
<tr>
<td>M-3000-0923</td>
<td>Rosemount CT5800 laser module mounting assembly (Type A)</td>
</tr>
<tr>
<td>M-3000-1293</td>
<td>Rosemount CT5800 laser module mounting assembly (Type B)</td>
</tr>
<tr>
<td>E-4001-6302</td>
<td>Detector TEC</td>
</tr>
<tr>
<td>B-6000-0009</td>
<td>TEC Module CT5000 for O₂ Detector</td>
</tr>
<tr>
<td>E-4001-8001</td>
<td>Motherboard</td>
</tr>
<tr>
<td>E-4001-6201</td>
<td>Peripheral PCB</td>
</tr>
<tr>
<td>P-5000-1487</td>
<td>Cartridge Fuse, F, 5A</td>
</tr>
<tr>
<td>P-5000-1444</td>
<td>CTE8000 series 0-2bar A, 0-5v output, G1/8 in. BSP male</td>
</tr>
<tr>
<td>P-5000-1502</td>
<td>Crydom SPST-NO Solid State Relay DIN Rail Mount, Zero Cross, 5 A rms, 15 V</td>
</tr>
<tr>
<td>P-5000-1232</td>
<td>1 Output Switch Mode DIN rail panel mount power supply, 12 Vdc, 10 A</td>
</tr>
<tr>
<td>P-5000-0286</td>
<td>PT100 lead assembly, 6 mm dia x 50 long</td>
</tr>
<tr>
<td>P-5000-1447</td>
<td>O₂ Detector</td>
</tr>
<tr>
<td>P-5000-1019</td>
<td>Detector</td>
</tr>
<tr>
<td>P-5000-1491</td>
<td>110 V Watlow cartridge 1/4 in. (6.4 mm) OD x 7.5 in. (190.5 mm) x 200 W</td>
</tr>
<tr>
<td>P-5000-1112</td>
<td>Hasselroth XSTREAM display screen</td>
</tr>
<tr>
<td>P-5000-1412</td>
<td>Enclosure sealing gasket (cut to length)</td>
</tr>
<tr>
<td>P-5000-1432</td>
<td>Hasselroth enclosure flame arrestor</td>
</tr>
</tbody>
</table>
Appendix D
Engineering Drawings

Use the wiring diagrams for the Rosemount CT5800 analyzer to assist with troubleshooting faults. These diagrams may be used to locate the position of a wiring connector should it become disconnected.

D.1 List of engineering drawings

Table D-1: Engineering Drawings

<table>
<thead>
<tr>
<th>Drawing number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>W-2000-0038 (Sheets 1-5)</td>
<td>Rosemount™ CT5800 Gas Analyzer</td>
</tr>
<tr>
<td>MOD</td>
<td>DESCRIPTION OF CHANGE</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>TRANSFERRED TO NEW TEMPLATE, CERTIFICATION LABEL ADDED, STATUS RELAYS ON SHEET 2 ENLARGED FOR CLARITY OF READING. CHANGE CONTROL SHEET ADDED</td>
</tr>
</tbody>
</table>
Appendix E
Glossary and abbreviations

The following terms are used in this manual.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caution</td>
<td>Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in equipment damage.</td>
</tr>
<tr>
<td>Danger</td>
<td>Signal word used to indicate an imminently hazardous situation which, if not avoided, will result in death or serious injury.</td>
</tr>
<tr>
<td>Detection limit</td>
<td>Although the gas detection range is given from zero, this is the lowest possible level of gas that the Rosemount™ CT5800 Gas Analyzer can detect.</td>
</tr>
<tr>
<td>Explosive gas(es)</td>
<td>Flammable gases and gas mixtures in a mixture with air within the explosive limits.</td>
</tr>
<tr>
<td>Flammable gas(es)</td>
<td>Gases and gas mixtures are assigned to be flammable if they might become ignitable when in a mixture with air.</td>
</tr>
<tr>
<td>Infallible containment</td>
<td>This term is derived from the standards of explosion protection especially from the requirements for pressurized housings; thus an infallible containment can be characterized by no intended leakage into the gas paths enabling gas to enter the inner compartment of the analyzer housing.</td>
</tr>
<tr>
<td>Intrinsically safe cell (IS cell)</td>
<td>Cells supplied with an intrinsically safe power signal, approved by a Test Institute, to operate with explosive gases. The design ensures the IS cells remain safe even in case of failure, and explosive gases are not ignited.</td>
</tr>
<tr>
<td>Laser beam path length</td>
<td>The optical distance traveled by the laser through the gas being measured.</td>
</tr>
<tr>
<td>Lower explosion limit (LEL)</td>
<td>Volume ratio of flammable gas in air below which an explosive gas atmosphere will not be formed; the mixture of gas and air lacks sufficient fuel (gas) to burn.</td>
</tr>
<tr>
<td>Measurement frequency</td>
<td>The frequency at which all gas concentrations are updated.</td>
</tr>
<tr>
<td>NAMUR</td>
<td>NAMUR is an international user association of automation technology in process industries. This organization has issued experience reports and working documents, called recommendations (NE) and worksheets (NA).</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Electrical Manufacturers Association. 4X specifies a degree of protection to personnel against incidental contact with the enclosed equipment, to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water, and that will be undamaged by the external formation of ice on the enclosure.</td>
</tr>
<tr>
<td>Protection Class IP66</td>
<td>Both terms are used to specify conditions for equipment to be installed outdoors. IP stands for ingress protection; the first number specifies protection against solid objects (6 = dust tight) while the second number specifies the degree of protection against liquids (6 = heavy seas).</td>
</tr>
</tbody>
</table>
### Table E-1: Glossary (continued)

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purge</td>
<td>A purge is the use of high pressure gas to remove particulates that may have built up on the cell mirror surfaces.</td>
</tr>
<tr>
<td>Replace</td>
<td>In the repair procedure, replace means to remove and discard an unserviceable item and then fit a serviceable replacement item.</td>
</tr>
<tr>
<td>Sample flow rate</td>
<td>The rate at which sample gas flows through the cell</td>
</tr>
<tr>
<td>Upper explosion limit (UEL)</td>
<td>Volume ratio of flammable gas in air above which an explosive gas atmosphere will not be formed; the mixture of gas and air is too rich in oxygen to burn.</td>
</tr>
<tr>
<td>Warning</td>
<td>Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury.</td>
</tr>
</tbody>
</table>

### Table E-2: Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>©</td>
<td>Copyright</td>
</tr>
<tr>
<td>%</td>
<td>Percent</td>
</tr>
<tr>
<td>&lt;</td>
<td>Less than</td>
</tr>
<tr>
<td>°</td>
<td>Degree</td>
</tr>
<tr>
<td>AC</td>
<td>Alternating current</td>
</tr>
<tr>
<td>Barg</td>
<td>Pressure, in units of bars, above or below atmospheric pressure</td>
</tr>
<tr>
<td>BS</td>
<td>British Standard</td>
</tr>
<tr>
<td>C</td>
<td>Celsius</td>
</tr>
<tr>
<td>CE</td>
<td>European Conformity</td>
</tr>
<tr>
<td>CH4</td>
<td>Methane</td>
</tr>
<tr>
<td>CO2</td>
<td>Carbon dioxide</td>
</tr>
<tr>
<td>DC</td>
<td>Direct current</td>
</tr>
<tr>
<td>Deg</td>
<td>Degree (temperature)</td>
</tr>
<tr>
<td>e.g.</td>
<td>For example</td>
</tr>
<tr>
<td>EMC</td>
<td>Electromagnetic compatibility</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>Hrs</td>
<td>Hours</td>
</tr>
<tr>
<td>Hz</td>
<td>Hertz</td>
</tr>
<tr>
<td>H₂O</td>
<td>Water</td>
</tr>
<tr>
<td>ICL</td>
<td>Interband Cascade Laser</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electro-technical Commission</td>
</tr>
<tr>
<td>in.</td>
<td>Inches</td>
</tr>
<tr>
<td>IP</td>
<td>Ingress protection</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>IPxx</td>
<td>Ingress protection (xx are numbers that define the protection level)</td>
</tr>
<tr>
<td>IS</td>
<td>Intrinsically safe</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>k</td>
<td>Thousand</td>
</tr>
<tr>
<td>kg</td>
<td>Kilogram</td>
</tr>
<tr>
<td>kHz</td>
<td>Kilo hertz</td>
</tr>
<tr>
<td>L</td>
<td>Liter</td>
</tr>
<tr>
<td>lb</td>
<td>Pound</td>
</tr>
<tr>
<td>LCD</td>
<td>Liquid crystal display</td>
</tr>
<tr>
<td>LED</td>
<td>Light emitting diode</td>
</tr>
<tr>
<td>LEL</td>
<td>Lower explosion limit</td>
</tr>
<tr>
<td>L/min</td>
<td>Liters per minute</td>
</tr>
<tr>
<td>m</td>
<td>Meter</td>
</tr>
<tr>
<td>m³</td>
<td>Cubic meter</td>
</tr>
<tr>
<td>mA</td>
<td>Milliamp</td>
</tr>
<tr>
<td>Max</td>
<td>Maximum</td>
</tr>
<tr>
<td>mBar</td>
<td>milli-Bar</td>
</tr>
<tr>
<td>mbps</td>
<td>Megabits per second</td>
</tr>
<tr>
<td>mg</td>
<td>Milligram</td>
</tr>
<tr>
<td>mg/m³</td>
<td>Microgram/cubic meter</td>
</tr>
<tr>
<td>Mid IR</td>
<td>Mid Infrared</td>
</tr>
<tr>
<td>min</td>
<td>Minute</td>
</tr>
<tr>
<td>mm</td>
<td>Millimeter</td>
</tr>
<tr>
<td>NEC</td>
<td>National Electrical Code</td>
</tr>
<tr>
<td>NFPA</td>
<td>National Fire Protection Association</td>
</tr>
<tr>
<td>nm</td>
<td>Nanometer</td>
</tr>
<tr>
<td>No.</td>
<td>Number</td>
</tr>
<tr>
<td>PC</td>
<td>Personal computer</td>
</tr>
<tr>
<td>PM</td>
<td>Preventative maintenance</td>
</tr>
<tr>
<td>ppm</td>
<td>Parts per million</td>
</tr>
<tr>
<td>psi</td>
<td>Pounds per square inch</td>
</tr>
<tr>
<td>QCL</td>
<td>Quantum Cascade Laser</td>
</tr>
<tr>
<td>TDL</td>
<td>Tunable Diode Laser</td>
</tr>
<tr>
<td>Torr</td>
<td>Unit of pressure defined as exactly 1/760 of a standard atmosphere</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>USB</td>
<td>Universal serial bus</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>V</td>
<td>Volt</td>
</tr>
<tr>
<td>Vac</td>
<td>Volt alternating current</td>
</tr>
<tr>
<td>W</td>
<td>Watt</td>
</tr>
<tr>
<td>WEEE</td>
<td>Waste electrical and electronic equipment</td>
</tr>
<tr>
<td>μm</td>
<td>Micro-meter</td>
</tr>
</tbody>
</table>