# ReactIR 247
# Safety Information

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# 1. Introduction

The ReactIR 247 analyzer is a dedicated industrial process monitoring system designed to operate safely in the harsh plant environment, while monitoring critical reaction components in real time using in-situ, mid-infrared measurements. The ReactIR 247 base unit can operate continuously or in batch mode. The base unit is operated by the iC IR or iC Process software. The software enables users to connect to the ReactIR 247 base unit, do real time *in situ* or batch monitoring, and data importing for post-process analysis and reporting.

This document contains basic instructions for site preparation, technical specifications, instrument installation, and safety information, as well as for care and maintenance. Additional instructions and information can be found in the ReactIR 247 Hardware Manual.

Should you have questions that are not addressed in this document, please contact your Mettler-Toledo AutoChem representative.

## 1.1 General Policies

The ReactIR 247 equipment is subject to the installation and repair policies described below.

### 1.1.1 Installation Policy

Site preparation for the ReactIR 247 equipment is the end user's responsibility. Structural installation details, particularly for installations in hazardous environments should be prepared and supervised by a certified and registered professional engineer who is properly qualified to assure a safe installation at the end user site.

Mettler-Toledo AutoChem is not licensed to provide certification of mechanical, structural, or piping designs that may be required for installation of the ReactIR 247 system into specific applications. Such designs must be prepared and supervised by a certified and registered professional engineer in the end user organization.

### 1.1.2 Repair Policy

Mettler-Toledo AutoChem warrants its products against defects in materials and workmanship for twelve months. For details, please refer to the warranty provided with the instrument.

It is recommended that you retain the original packing materials in the event you need to return the ReactIR 247. If factory service is required, contact your field service engineer for a Return Material Authorization (RMA) form.

### 1.1.3 Service and Technical Assistance

Contact Mettler-Toledo AutoChem through the numbers and information below.

Mettler-Toledo AutoChem
7075 Samuel Morse Drive
Columbia, MD 21046
www.mt.com/autochem

Tel: + 1.410,910,8500
Fax: +1.410.910.8600
Email:
AutochemCustomerCare@mt.com

# 2. Product Description

This chapter includes the following sections:

- Overview of the ReactIR 247 System
- Site Preparation Overview (End User Responsibility)
- ReactIR 247 System Components

## 2.1 Overview of the ReactIR 247 System

The ReactIR 247 is a unique process-hardened FTIR spectrometer designed to fit into nearly any space. It requires only power and network connectivity to monitor critical reaction components in real time using in-situ, mid-infrared measurements. Capable of tracking key reactants, products, by-products and intermediates, the ReactIR 247 system proves valuable in improving process efficiency and safety of liquid-based chemistry. The system is available for use in a normal location and hazardous locations such as Kilo labs, pilot plants, production facilities and hydrogenation labs. Simplicity of design assures low cost of ownership without a sacrifice in value.

**Note:** Sampling technology interfaces are sold separately.

### 2.1.1 ReactIR 247—Normal Location Classification

Process FTIR system designed for 24/7 monitoring—base unit includes:

- Temperature stabilized DTGS detector
- Communication via RJ45 terminated Ethernet cable
- 100/240VAC 50/60Hz (specify country at time of order)
- Safe area classification—No potentially explosive gases, vapors, or dust present
- One year system warranty

### 2.1.2 ReactIR 247—Hazardous Area Location

Process FTIR system designed for 24/7 monitoring—base unit includes:

- Temperature stabilized DTGS detector
- Communication via Fiber Optic, Duplex, ST terminated cable
- 100/240VAC 50/60Hz (autoswitching base unit)
- Hazardous area classification-Potentially explosive gases, vapors, or dust present

- One year system warranty

Power / Communication Junction Box: included with HL base unit

- 100/240VAC 50/60Hz (specify voltage at time of order)
- Media converter, which accepts RJ45 Ethernet cable and converts to multimode ST fiber
- Hazardous area classification-Potentially explosive gases, vapors, or dust present

Figure 1—ReactIR 247 Base Unit (with K4 and Sentinel sampling technology)

## 2.2 Site Preparation Overview (End User Responsibility)

Permanent or temporary installation site for a ReactIR 247 must include the following items:

- Electrical supply

- LAN connection
- Area and Mounting Preparation

See Chapter 4, “Specifications” for details.

Power and communications connections must meet local and national codes for the area of installation. For hazardous area installations certified power or power / communication junction boxes must be used. Junction boxes may be supplied by the end user as long as such boxes are properly certified for use in the hazardous area.

## 2.3 ReactIR 247 System Components

Components in a typical ReactIR configuration include the base unit, optical conduit, and Sentinel. An optional breakout box is a separate component in the system for hazardous location configurations.

**Note:** There are no user-serviceable parts inside a ReactIR 247 base unit.

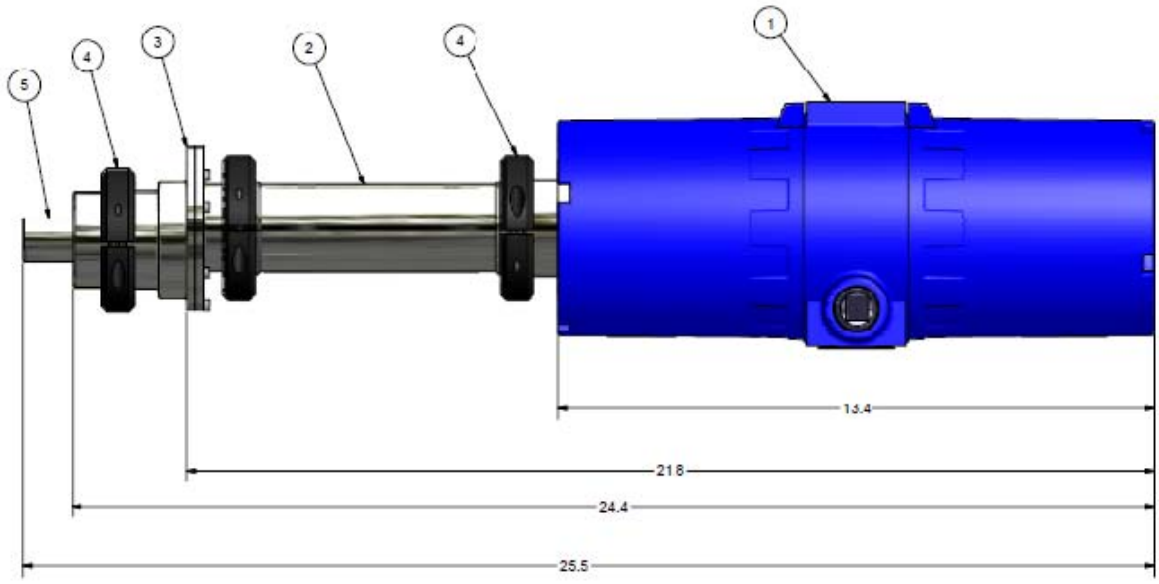



Figure 2--ReactIR 247 with optical coupling, jog coupling and Sentinel

| | Component | Description |
|---|---|---|
| 1 | **ReactIR 247 base** | Primary component of the system containing electrical and |

| | | |
|---|---|---|
| | **unit** | optical devices |
| 2 | **Optical Coupling** | Hardware for directing and focusing infrared light |
| 3 | **Jog Assembly** | Hardware for directing infrared light |
| 4 | **Clamp (3)** | Connectors for optical hardware |
| 5 | **Sentinel** | Sensor hardware for detecting infrared active chemical species. |

Table 1 -- ReactIR 247 Example End User Configuration

## 2.4 Power / Communication Junction Box

In hazardous area locations a junction box (Figure 3 and Figure 4) houses power and communications connections. Three entries are provided as shown in the figures and listed in the table. No additional entries are permitted.

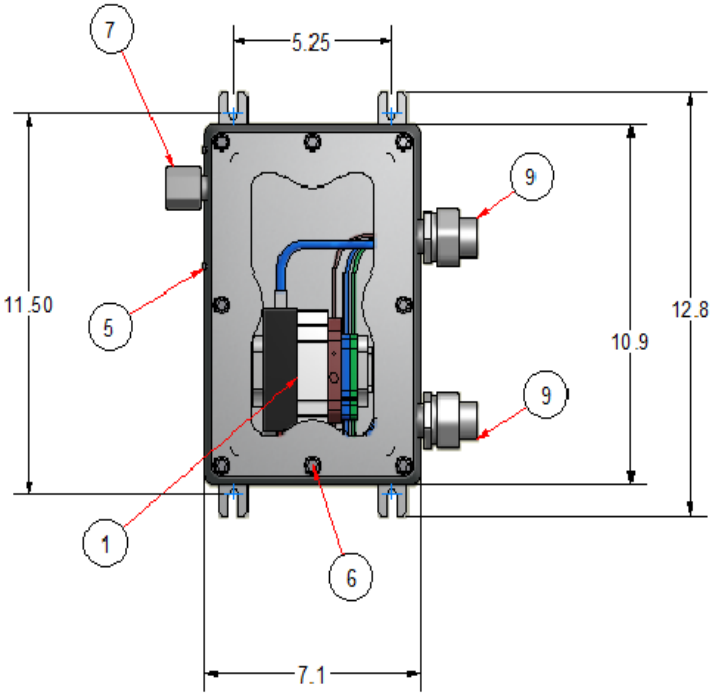



Figure 3--View of power / communications junction box with dimensions

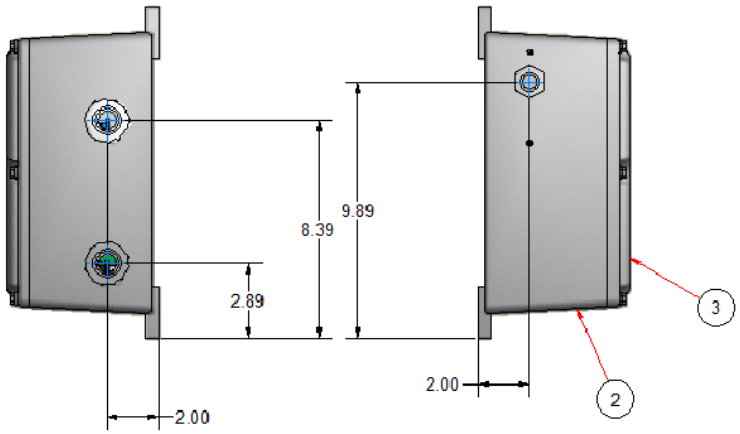



Figure 4--External view of power / communications junction box with dimensions

Table 2—Power / Network Junction Box Components

| | Component | Description |
|---|---|---|
| 1 | Media Converter Module<br><br>DC Power Supply<br>Circuit Breaker<br><br>Terminal Block<br>End Stops (2) | Versitron—MF7273S-- Shielded RJ-45 jack (copper) / Multi-Mode ST (fiber)<br>Meanwell—DR-15-12—12 V Output<br>Weidmuller—9101503500—1 x 2 amps @ 110V,<br>Weidmuller—9101203500—2 x 1 amp @220V<br>Entrelec—0125 116 .01—1 @ 110V, 0 @ 220V<br>Entrelec—0206 351.16 |
| 2 | Enclosure (AXI 484) | PN: 200-0528 |
| 3 | Enclosure Lid | Lid supplied with 200-0528 |
| 5 | Screws (fiber connection) | 4-40 x ¼ Hex Socket Head Cap Screws (ATEx version only) |
| 6 | Screws (lid) | ¼-20 x ½ Hex Flange Screw |
| 7 | Fiber Feedthru | ½ NPT Hex Fiber Optic Feedthru |
| 9 | Hex Nipple | McMaster #51205K325, ¾ NPT |

# 3. Safety

This chapter includes the following sections:

- Overview
- Safety Symbols
- System Unit Safety
- Power Supply Cord
- Mounting
- Transport

Per the ISO 9001 procedures followed at Mettler-Toledo AutoChem, the ReactIR 247 system adheres to applicable regulations and standards in the area of intended use. Requirements for compliance with local regulations may be different. The end user of the equipment is responsible for compliance with all local, corporate, or other applicable regulations.

**Note**: If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

## 3.1 Overview

The ReactIR 247 analyzer can be installed in normal and hazardous locations (up to Zone 1 in the European Community).

## 3.2 Safety Symbols

The following symbols identify safety information:

| | |
|---|---|
|  | **Caution/Vorsicht/Attention**<br>Any note with this next to it requires care. |
|  | **Risk of electrical shock**<br>Gefahr eines elektrischen Schlags<br>Risque d'électrocution |
|  | **Risk of explosion**<br>Exposionsgefahr<br>Risque d'éxplosion |
|  | **Risk of burns**<br>Verbrennungsgefahr<br>Risque de brûlures |
|  | **Risk of exposure to LASER radiation**<br>Gefahr der Aussetzung von LASERstrahlung<br>Risque d'exposition à des radiations d'un LASER |

## 3.3 System Unit Safety

The following sections identify/address ReactIR 247 system safety:

### 3.3.1 Proper Setup

Improper installation and operation of the ReactIR 247 can result in safety hazards in classified areas.

Opening enclosure of system unit will expose interior electrical components and heat sources that risk an explosion in a classified environment.

| | |
|---|---|
|  | **Caution**—Improper installation and operation of the ReactIR 247 can result in safety hazards in classified areas. |

| | |
|---|---|
|  | **Caution**—Opening access to the base unit will expose interior electrical and heat sources that risk an explosion in a classified environment. |

### 3.3.2 Safety Certification / Area Classification

The ReactIR 247 is fully compliant with UL / CSA and European Union safety standards for operation in hazardous and normal locations up to Zone 1, IIB+H2. Each unit carries one of the following labels shown in Figure 5 depending on the region where the equipment is installed.

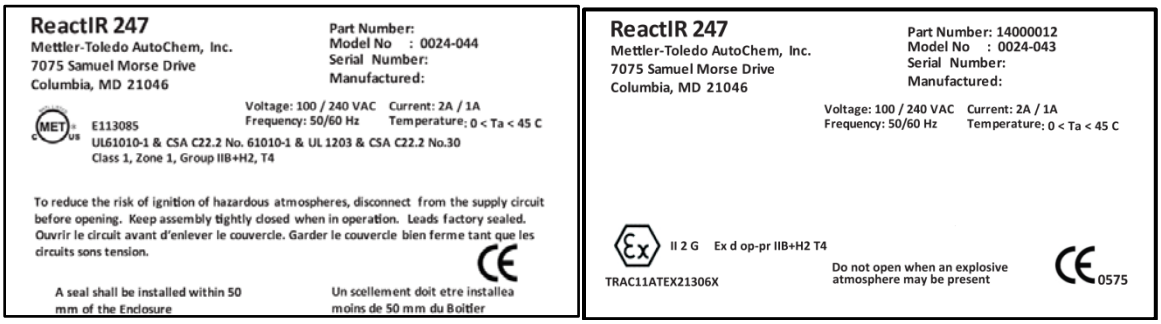



Figure 5--ReactIR 247 Label

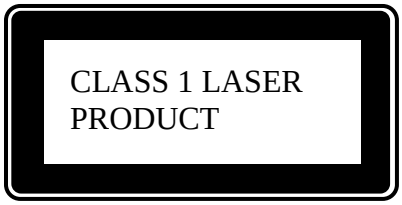
### 3.3.3 Electrical Loads

The primary ReactIR 247 label (Figure 5) on the enclosure exterior provides ready reference to the electrical loads for proper safety consideration. The label identifies the specific part and serial number, manufacturing address and date.

### 3.3.4 Temperature Specifications

The ReactIR 247 operates reliably within an ambient temperature range of 0°C to 45°C (32°F to 115°F). The ReactIR 247 can be safely stored in the temperature range of -25°C to 75°C (-13°F to 167°F).

### 3.3.5 Laser Safety




All ReactIR 247 systems contain a Class 1 laser product and are in compliance with U.S. Department of Health and Human Services (DHHS) Radiation Performance and in accordance with International Standards

21 CFR 1040.10 and 1040.11 Class 1 Laser Product

except per deviations pursuant to Laser Notice 50, dated June 24, 2007

Class 1 Laser Product per IEC/EN 60825-1:2007

### 3.3.6 Power Supply Cord

| | |
|---|---|
|  | **WARNING— Do not supply power to the system using any power cord except one that meets local and national standard codes. In hazardous area classifications, the power connection must be made via a certified junction box (see "Connections in Hazardous Locations"** |

### 3.3.7 Mounting

| | |
|---|---|
|  | **Caution— Using the four mounting holes ensure that the ReactIR 247 is secured to a wall mount, frame, or base plate.** |

Refer to Chapter 5—Installation for mounting instructions.

### 3.3.8 Transport

Remove sampling technology prior to moving the ReactIR 247 analyzer from one sampling point to another.

Refer to Chapter 6, “Care and Maintenance” for instructions on "ReactIR 247 Relocation, Packaging, and Storage."

# 4. Specifications

This chapter provides specifications for the following ReactIR 247 components:

- Materials of Construction
- Weight
- System Dimensions
- Operating Temperature Range
- Utilities

Specifications include those provided by Mettler-Toledo AutoChem and those that are your responsibility as the end user.

## 4.1 Materials of Construction

All ReactIR 247 models have the materials of construction specified in the following table. Refer to “ReactIR 247 System Components” as a visual aid to identify items below:

Table 3--ReactIR 247 Materials of Construction

| Component | Description |
|---|---|
| **Base Unit Enclosure** | Painted aluminum |
| **Optical Window** | Tempered soda-lime float glass |
| **Base Unit Seals** | EPDM |
| **Placard with Safety Markings** | Stainless steel |
| **Sampling Technology Flange** | Stainless steel |

## 4.2 Weights

Below are the weights for the ReactIR 247 base unit, each frame type, and optional accessories.

Table 4--ReactIR 247 Weight

| Item | Kilograms | Pounds |
|---|---|---|
| **ReactIR 247 Base Unit** | **8.0** | **17.6** |
| | | |
| **Power / Communications Junction Box** | **9.4** | **20.6** |

Table 5—Sampling Accessory Weights

| Item (add to base unit weight) | Kilograms | Pounds |
|---|---|---|
| **K4 Conduit** | **4.5** | **10.0** |
| **Sentinel on a K4 Conduit** | **5.0** | **11.0** |
| **Jog Assembly** | **0.8** | **1.6** |
| **Optical Tube** | **1.2** | **2.7** |
| | | |

## 4.3 System Dimensions

The diagrams in this section show the dimensions of the ReactIR 247 base unit and optional junction boxes. Dimensions appear in inches.

- ReactIR 247—Base Unit
- Power / Communications Junction Box

### 4.3.1 ReactIR 247 Base Unit

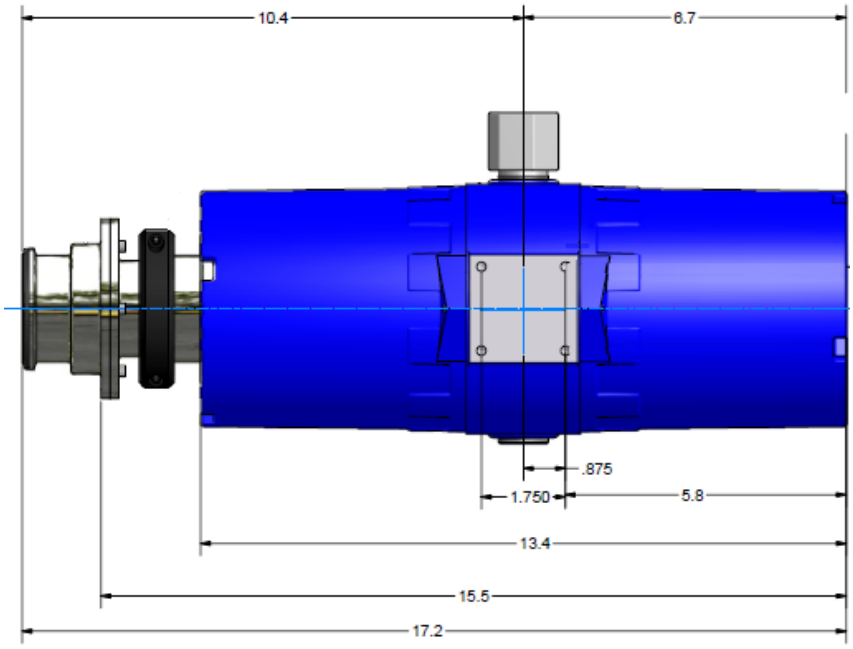



Figure 6—ReactIR 247 Base Unit Dimensions

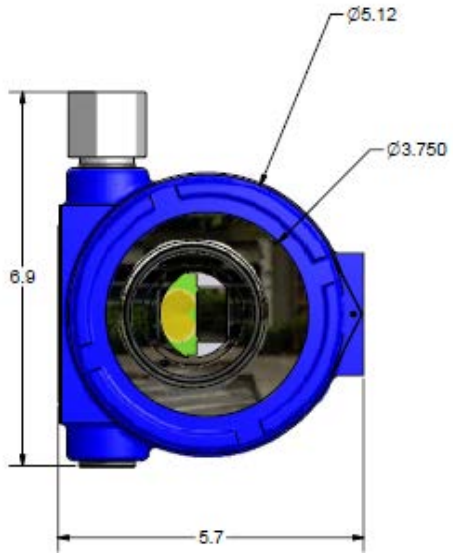



Figure 7--ReactIR 247 Base Unit Dimensions

### 4.3.2 Power / Communications Junction Box

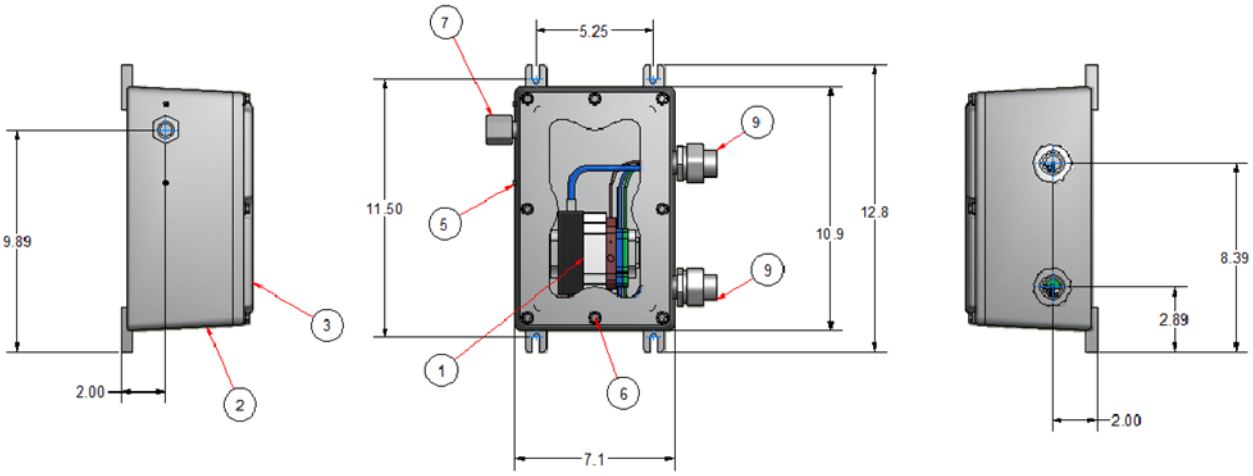



Figure 8--Power / communications junction box dimensions (entry locations included)

## 4.4 Operating Temperature Range

The ambient temperature operating range is: 0°C to 45°C (32°F to 115°F).

This range allows the ReactIR 247 to maintain a stable enclosure temperature for producing optimal analytical measurements. Any environmental temperature outside the operating temperature range may affect the precision or accuracy of the process measurements.

## 4.5 Utilities

ReactIR 247 requires power and communications connections for operation as described below.

### 4.5.1 Electrical Power

| | |
|---|---|
|  | **Caution**—Safe installation of the ReactIR 247 requires caution when connecting electrical power to the unit. |

**Note:** Mettler-Toledo AutoChem recommends the installation of an AC line conditioner.

Below are the power specifications for North America and Europe. Depending on the voltage classification, use a dedicated power line in accordance with the amperage values outlined in the tables below.

**Note:** A current limiting device such as a fuse or breaker (see specification table below) must be installed in the power line to limit the maximum current to the system. The proper circuit breaker comes with the optional junction boxes.

Table 6I--ReactIR 247 Minimum Power Requirements

| Nominal Voltage (VAC) | Power (VAC) | Hertz | Current (Amps) |
|---|---|---|---|
| 110 | **> 85** | **50 - 60** | **2** |
| 230 | **< 240** | **50 - 60** | **1** |

The ReactIR 247 base unit requires 100/240 VAC, 2A/1A, 50/60 Hz (autoswitching) to operate. In normal areas simply use the appropriate country specific power cord supplied with the system to connect to an AC outlet.

In hazardous locations, the end user provides the necessary power connection to the ReactIR 247 via a certified junction box either Mettler-Toledo AutoChem or end user supplied. Mettler-Toledo AutoChem supplied junction boxes are not autoswitching and are ordered as 110 VAC, 2A, 50/60 Hz or 230 VAC, 1A, 50/60 Hz. Mettler-Toledo AutoChem supplied junction boxes are provided with openings for mains (input) and ReactIR 247 (output) power. All junction box connections should be made according to local and national standards for hazardous areas.

| | |
|---|---|
|  | **Caution**— User shall ensure that when the equipment is supplied without a mains cable fitted that appropriate connection and protection is made in accordance with local and national codes of practice for all models. For ReactIR 247 in the European location, adhere to the requirements of EN60079-14 as well. |

Table 7 -- Summary of ReactIR 247 Power Connections

| Area | Connection | Properties |
|---|---|---|
| **Normal** | Cable | Standard country specific industrial line cord |
| **Hazardous** | Conduit | Rigid or Flexible Explosion proof conduit |
| **Hazardous** | Cable | Armored BS-5467, BAS EC, 10G, 3 conductor |
| **Hazardous** | Cable | Harmonized HO7RN, 10G, 3 conductor |

# 5. Installation

This chapter provides procedures on how to install or reinstall a ReactIR 247 system. Installation information is organized in the following sections:

- Installation Instructions
- Starting the ReactIR 247 System

Basic installation includes site preparation performed by the end user and installation performed by a field service engineer.

## 5.1 Site Preparation

A field service engineer will install the ReactIR 247 system upon completion of the site preparation (see “Site Preparation Overview (End User Responsibility)”).

## 5.2 Installing ReactIR 247

A field service engineer will proceed with the ReactIR 247 system installation after confirmation that the site has been properly prepared. In addition to verifying the site preparation and receipt of ordered parts (including service agreements/programs), the process covers all aspects of the final stages of system installation.

### 5.2.1 Installation Instructions

Below are the basic steps to install the ReactIR 247.

1. Mount the ReactIR 247 Analyzer
2. Connect sampling technology – optical coupling of sampling technology must extend a minimum of 12 inches in length from the front flange of ReactIR 247 and be made from steel, aluminum, hastelloy or titanium. All joints must be fastened via clamp that requires a tool for assembly / disassembly
3. Make Earth Ground Connection
4. Connect Power to the ReactIR 247 Analyzer
5. Connect Communications to ReactIR 247 Analyzer

5.2.1.1 Mounting the ReactIR 247 Analyzer

The ReactIR 247 has four threaded holes available for mounting. Mettler-Toledo AutoChem offers a variety of optional mounting plates and brackets which may be used to secure the analyzer. Alternatively the end user may supply their own mounting hardware.

| | |
|---|---|
|  | **Caution**—Safe mounting of the ReactIR 247 during installation requires caution in handling to avoid risk of personal injury and hardware damage. When using anything other than a benchtop mount a minimum of two individuals must be present to lift and secure the unit. |

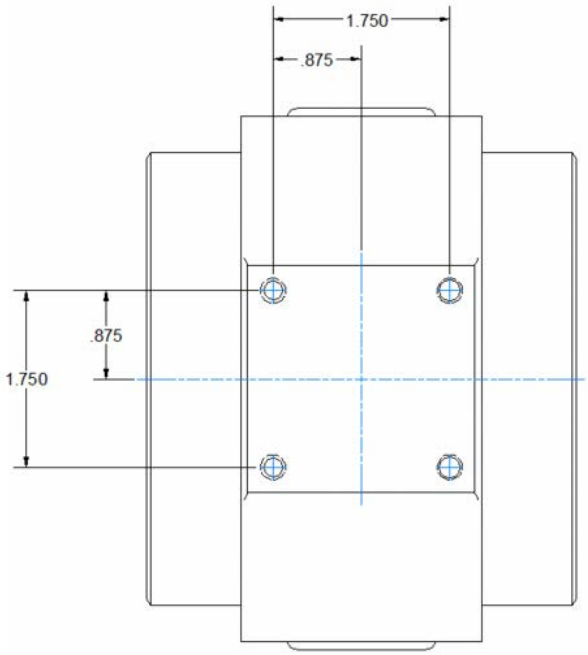



Figure 9--ReactIR 247 mounting holes--1/4-20 UNC-2B

**Note:** Optional frames include vibration damping components. End user provided mounting options must include vibration isolation / damping equipment. Failure to provide proper vibration isolation may compromise analytical results in environments where vibration is present.

### 5.2.1.2 Make Earth Ground Connection

Use ground strap with minimum 12 AWG.

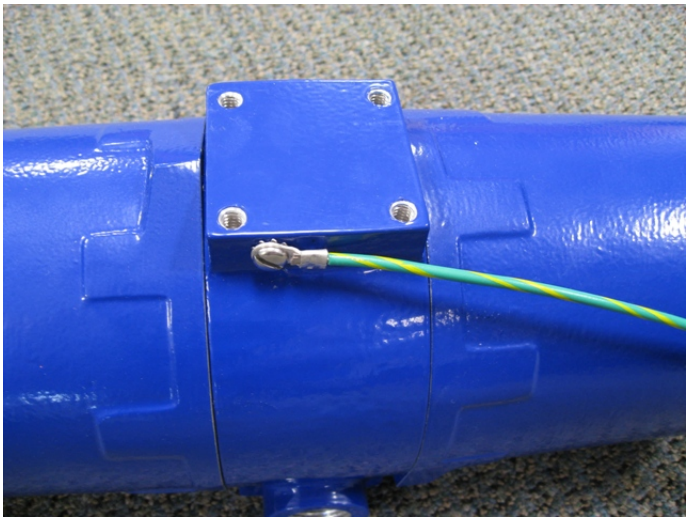


Figure 3--ReactIR 247 with earth ground connection

Separate grounding of the Power or Power / Communication junction box is not required as the ReactIR 247 and junction boxes should be connected via metallic conduit or armoured cable.

### 5.2.1.3 Connect Power to the ReactIR 247 Analyzer

Ensure that your power supply meets the specifications under "Electrical Power". For normal areas simply connect the country specific line cord to an AC outlet. For hazardous areas a junction box certified for the zone of installation must be provided.

Connections to the junction box must comply with country and local electrical codes for the zone of installation (for example a flameproof cable gland or potted conduit fitting).

| | |
|---|---|
| ⚠ | **Caution**—External power connection to the junction box providing power to the ReactIR 247 must be made using an appropriately approved and suitably rated cable gland or conduit fitting in accordance with the manufacturer's instructions. |

5.2.1.4 Connect Communications to the ReactIR 247 Analyzer

The ReactIR 247 can be connected to the end user communications network in two ways:

- RJ45 Connection
- Fiber Optic via Optional Power / Communications Junction Box
  - Additional protective means should be applied to the fiber connection (e.g. robust, environment appropriate fiber optic cable or conduit)
  - Additional protective means should be applied to the fiber coupling (e.g. Loctite or similar adhesive or other means) such that a tool must be used to disconnect the cabling from the coupler

| | |
|---|---|
|  | **Caution**—External communications connection to the end user network must be made using appropriately approved and suitably rated connectors, switches, media converters and cables in accordance with local and national standards for the zone of installation. |

5.3 Starting the ReactIR 247 Analyzer

1. Apply power to the ReactIR 247 analyzer. Allow 30 minutes for the instrument electronics to warm up before taking critical measurements.
2. Using the LED's on the back panel verify that the ReactIR 247 is ready for use. Description of the LED's is found in the table below. Refer to ReactIR 247 manual for additional LED definitions.

Table 8--Description of System LED's

| LED | State | Meaning |
|---|---|---|
| #1 | Off | ReactIR 247 is without power |
| | Amber (blinking 500 ms on 500 ms off) | Ethernet interface active using factory defaults; connection not established |
| | Amber (solid) | System on, but no network module found |
| | Green (blinking 500 ms on 500 ms off) | Ethernet interface active using software specified parameters; connection not established |
| | Green (solid) | Network link (Ethernet or WiFi) established |
| #2 | Off | System is not scanning |
| | Green (blinking) | System is scanning, but not sending data to software application |
| | Green (solid) | System is scanning and sending data to software application |

| | | |
|---|---|---|
| #3 | Off | No faults and system is communicating with software |
| | Amber (solid) | No communication with software |
| | Red (solid) | System fault |

# 6. Care And Maintenance

The ReactIR 247 system care and maintenance chapter includes the following sections:

- Maintaining the ReactIR 247 System
- ReactIR 247 Relocation, Packaging, and Storage

## 6.1 Maintaining the ReactIR 247 System

### 6.1.1 Replacement Parts

The following list contains available parts along with the normal replacement period. A qualified service engineer should replace these items. This information is useful for planning potential cost of ownership.

| Part | Lifetime |
|---|---|
| IR Source Element | 1 – 2 years |
| DTGS Detector | 1 – 2 years |
| Laser Diode | > 5 years |
| Modulator | > 5 years |
| ZnSe Window | > 5 years |

## 6.2 ReactIR 247 Relocation, Packaging and Storage

To prevent and minimize damage to the analyzer, follow the instructions below to prepare the ReactIR 247 for relocation, shipment, and storage.

### 6.2.1 Shutdown

- Shut-off power to ReactIR 247.
- Disconnect from utilities.
- Remove sampling technology from the analyzer and cover the front flange.
- Refer to instructions on packaging and storing sampling technology.

| | |
|---|---|
|  | **WARNING**—Do not touch the Zinc Selenide window in the flange as finger prints can negatively affect system performance. |

### 6.2.2 Packaging Specification for Shipment

Complete the procedures in the previous section (Shutdown).

To maximize protection of the ReactIR 247 during transport, we highly recommend that the instrument be shipped in a case that can be purchased as an option.

### 6.2.3 Reinstalling the ReactIR 247

Refer to Chapter 5 "Installation".

# Appendix A

## A-1: Hazardous Area Classification Certificate

This appendix provides the following certificates for the ReactIR 247 instrument that are intended for use in hazardous areas:

EC Type Examination Certificate (following page)

For a ReactIR 247 system intended for use in potentially explosive atmospheres in the United Kingdom or the European Continent. The certificate is issued in accordance with the ATEX Certification Scheme.

See “Description of Marking Details” later in this section for descriptions of the segments within the marking.

## A-2: ATEX Certificate

Insert ATEX Certificate Here

## A-3: Description of Marking Details

The following sample and table describe segments within the marking:

II 2 G  Ex d IIB+H2 T4

TRAC11ATEX21306X

| Segment | Description |
|---|---|
| Ex | Notified Body = TRaC |
| II | Equipment Group indicating suitable for use in surface industry (above ground) |
| 2 | Category of the surface industry |
| G | Suitable for use above ground in gas environment (Zone 1) |
| Ex | Hazardous Area |
| d | Flameproof |
| op-pr | Limit or prevent energy transmission from optical radiation |
| IIB + H2 | Suitable for use in Ethylene plus Hydrogen gas environment |
| T4 | Surface temperatures do not exceed 130° C |