Hardware Manual

June, 2011

MK-PB-0067-AC Rev A

DCN 234

ReactIR™ 247

Process Chemistry Understanding

METTLER TOLEDO

7 June 2011

Address comments to:
Mettler-Toledo AutoChem, Inc.
7075 Samuel Morse Drive
Columbia, MD 21046
Tel: + 1 866.333.6822
Fax: +1 410.910.8600
www.mt.com/reactir
For technical support, contact: AutoChemCustomerCare@mt.com

In conformance with the European Directive 2002/96/EC on Waste from Electrical and Electronic Equipment (WEEE), this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.

Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment.

If you have any questions please contact the responsible authority or the distributor from which you purchased this device.

Should this device be passed onto other parties for private or professional use, the content of this regulation must also be related.

Thank you for your contribution to environmental protection.

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Introduction

ReactIR™ 247 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 main control system is a Web application (iC Process) that monitors your chemistry continuously or in batch mode while communicating critical reaction variables to your Distributed Control System (DCS). The remote software (iC IR) enables users to connect to the ReactIR 247 base unit for viewing real time, *in situ* reaction monitoring information that can be used to make process decisions or to establish future monitoring strategies.

ReactIR 247 is equally compatible with a laboratory environment to monitor small-scale reactions for better understanding of the chemistry prior to installation in a production environment. In this case, iC IR is the primary control software offering all the benefits of a lab-based ReactIR product.

Note: In a laboratory environment, iC IR can be used alone as the control software.

This document contains instructions for site preparation, technical specifications, instrument installation and operational checklists, general safety notes, and care and maintenance information. If you are viewing this document electronically, click any blue-colored link to go to the related information and instructions.

Should you have questions that are not addressed in this document, please contact your local METTLER TOLEDO office or our Customer Care Department using the information under "Service and Technical Assistance" on page 9.

Related Documents

The following documents are included on the iC Process Documentation Portfolio:

- "iC Process Software User Guide" (MK-PB-0074-AC) on how to use the iC Process Web application software to control the instrument and the iC Process task pane in iC IR software to create templates for process methods and to connect to the instrument for batch or real-time analysis.
- "iC Process Installation Guide" (MK-PB-0072-AC)
- Quick Reference—iC Process for Operators" (MK-PB-0077-AC)
- "ReactIR 247 Hardware Manual (MK-PB-0067-AC)—This document
- "ReactIR 247 Safety Information"

Symbols in this Manual

To help you recognize information, the following symbols appear throughout this manual. Please pay particular attention to the sections marked by these symbols.

Table 1-1 Warnings, Cautions, and Notes

	**WARNING**—Extremely important safety information—Failure to observe the warning may result in serious personal injury or equipment damage.
	**Caution**—Important information that tells you how to prevent damage to equipment or to avoid a situation that may cause minor injury.
Note:	Information to which you should pay special attention.

General Policies

METTLER TOLEDO equipment is subject to the installation, repair, and computer service policies described below.

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 your site.

METTLER TOLEDO 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 your organization.

Repair Policy

METTLER TOLEDO warrants its products against defects in materials and workmanship for twelve months from the date of installation or fifteen months from the date of shipment. For details, please refer to the warranty provided with the instrument.

For assistance, please contact your Technical Applications Consultant (TAC) or send an email to **AutoChemCustomerCare@mt.com**.

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, your METTLER TOLEDO service engineer will issue you a Return Material Authorization (RMA) form.

Computer Service Policy

If a computer is included as part of your ReactIR 247 system, it will be from a major manufacturer such as Dell. In the U.S. and some European countries, the manufacturer will provide warranty service if required.

METTLER TOLEDO can assist in diagnosing problems with computers, but the computer manufacturer will provide parts and labor for repairs under the service contract.

Software Upgrades

When applicable, upgrades to the instrument and office software are available for iCare subscribers. When a new release or service pack is available, all iCare subscribers with a valid subscription will be notified via email so they can download the installer from the AutoChem Community Web site, https://community.autochem.mt.com. Access to the site requires a password that you can request from the home page. You can also contact Customer Care or your METTLER TOLEDO Technology and Applications Consultant (TAC) using the information on page 9.

Non-iCare subscribers may request a quote for an upgrade by contacting their local salesperson or Customer Care.

Training Programs

Training for the hardware and software is available through the users' Web site (see link above) and through your METTLER TOLEDO TAC. Use the contact information on page 9.

Service and Technical Assistance

METTLER TOLEDO has offices around the world. Contact the Mettler-Toledo AutoChem, Inc. headquarters in the USA for technical support or service. To arrange for specific application assistance from a METTLER TOLEDO Technology and Applications Consultant or for general assistance, contact Mettler-Toledo AutoChem, Inc. through the toll-free number below.

Mettler-Toledo AutoChem, Inc. (Columbia, MD headquarters)	Tel: **+ 1.410.910.8500** Fax: **+1.410.910.8600** Email: **AutoChemCustomerCare@mt.com** Toll Free: **+1.866.333.6822**

Service and Technical Assistance

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Product Description

This chapter includes the following sections:

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 communication 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 value in improving process efficiency and safety of liquid-based chemistry.

Figure 2-1 ReactIR 247—Base unit with K4 mirror conduit sampling technology

The ReactIR 247 instrument is available for use in a normal location classification and in a configuration compatible for 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.

Complementing the simple, yet robust ReactIR 247 instrument is the equally powerful and easy-to-use control software, iC Process. Visualize the progress of a batch or a continuous process at a single glance. Integration with your DCS is standard Modbus/TCP.

Note: Sensor sampling technology interfaces are sold separately.

ReactIR 247—Normal Location Classification (NL)

The ReactIR 247 NL system includes:

- Temperature stabilized DTGS detector
- Communication via RJ45 terminated Ethernet cable
- 100/240VAC 50/60Hz (specify country at time of order)
- One Year System Warranty (Includes sampling technology purchased with system.) System warranty ends one year after installation or fifteen months after shipment.

Figure 2-2 Typical NL configuration

ReactIR 247—Hazardous Area Location Classification (HL)

The ReactIR 247 HL system has two components—the base unit and the breakout box with an electrical conduit connecting the two. There are two configurations of ReactIR 247 HL:

- **HL—NRTL** compatible with Class I / Div 1 in North America and Canada
- **HL—ATEX** compatible with Zone 1 in the European Community

The HL system includes:

- Temperature stabilized DTGS detector
- Communication via RJ45 terminated Ethernet cable
- 100/240VAC 50/60Hz (autoswitching base unit)
- Hazardous area classification—Potentially explosive gases, vapors, or dust present per Class I/Division 1 and Zone 1.
- One Year System Warranty (Includes sampling technology purchased with system.) System warranty ends one year after installation or fifteen months after shipment.

ReactIR 247 HL—ATEX Configuration

Figure 2-3 Typical HL configuration (ATEX)

ReactIR 247 HL—NRTL Configuration

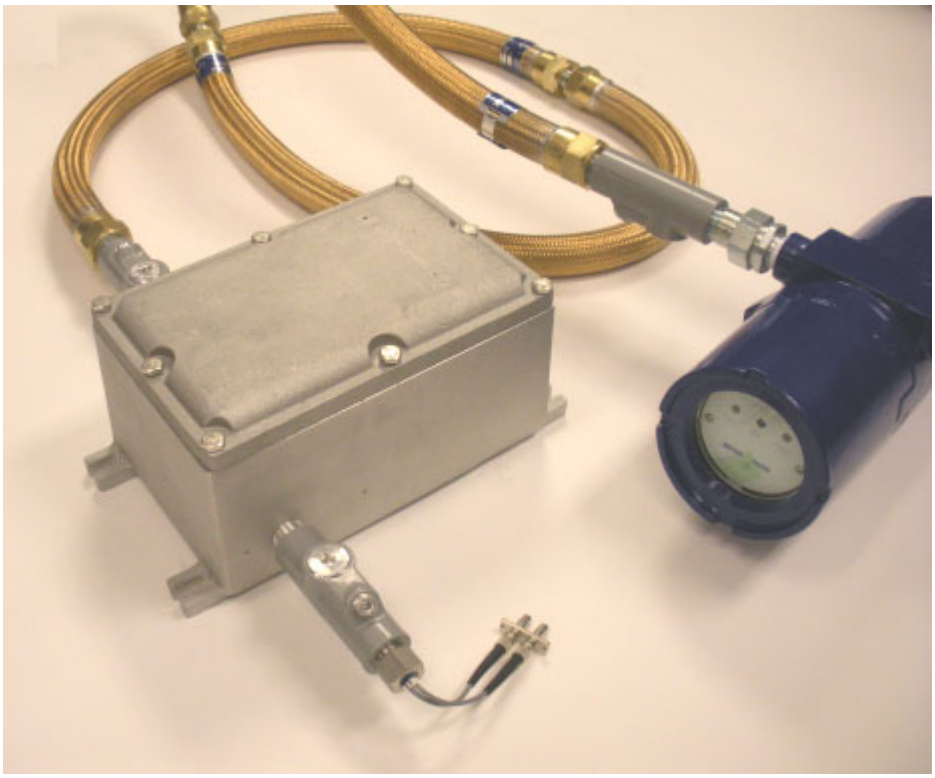

Figure 2-4 Typical HL configuration (NRTL)

See "ReactIR 247 System Components" on page 15 for a description of the components. See Chapter 3, "Safety" for safety-related components.

ReactIR 247 System Components

Components in a typical ReactIR 247 configuration include the base unit, jog assembly, optical conduit, and Sentinel. A 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.

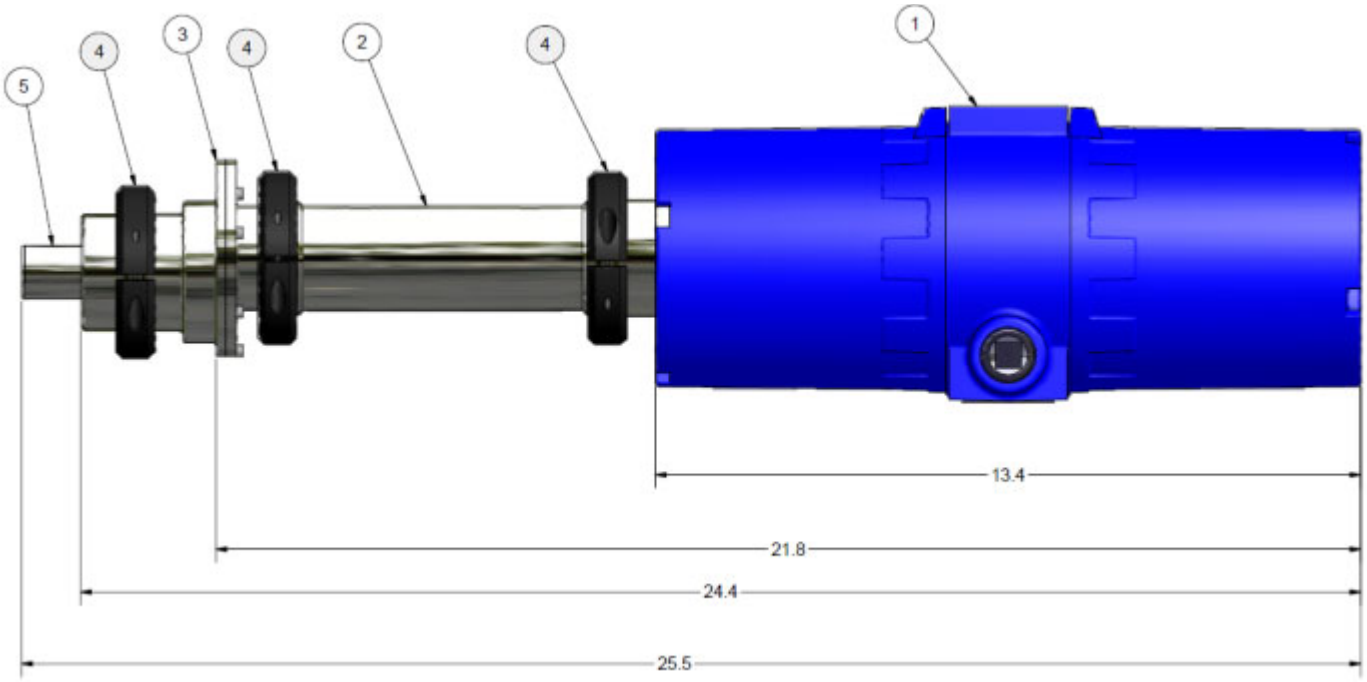

Figure 2-5 ReactIR 247 system base unit with direct optical conduit, jog assembly, and Sentinel

Table 2-1 ReactIR 247 base unit component descriptions

	Component	Description
1	**ReactIR 247 base unit**	Primary component of the system containing electrical and optical devices
2	**Direct Optical Conduit**	Optical hardware for directing and focusing infrared light.
3	**Jog Assembly**	Optical hardware for directing infrared light
4	**Clamp (3)**	Connectors for optical hardware
5	**Sentinel**	Sampling technology hardware for sensing/detecting infrared active chemical species

For specifications, please refer to Chapter 3, "Specifications" starting on page 21.

Power/Communication Breakout Box (HL only)

In hazardous area locations (HL), a breakout box (Figure 2-6) is required that houses power and communications connections. An electrical conduit is provided with the breakout box to safely enclose power and communication cables between the ReactIR 247 and the breakout box.

Figure 2-6 ReactIR 247 breakout box (power and communications)

For HL—ATEX locations, the breakout box includes a bulkhead communications connection. For HL—NRTL locations, the breakout box communication connect is a pigtail with adapter.

Software

The following iC software applications can control a ReactIR 247 instrument:

iC Process Software

iC Process is the Web-based application for the ReactIR 247 instrument that communicates through your LAN for easy access by operators in the control room and process chemists at their desk. The unique user interface offers an immediate visual understanding of batch or continuous reaction dynamics and any process upsets that may occur. Key information can be sent to the Distributed Control System (DCS) via Modbus TCP/IP.

iC Process is the key link to deliver the protocol developed in the laboratory into the kilo lab, pilot plant, or production environment.

Key features include:

- Seamless pathway from lab to plant
- Transfer methods developed in the lab to process methods
- Simple interface for operators

- Data analysis for experts
- Standard interface to DCS

iC IR Software

The ReactIR 247 system is an automated product that uses Mettler-Toledo AutoChem, Inc. proprietary software, iC IR, to provide infrared data collection and analysis possible without the need for an expert. iC IR is the result of many years of evolution through valuable customer feedback that offers powerful reaction analysis functions with an easy-to-use graphical user interface. As a wizard-based application, iC IR guides a user through the experience of collecting, analyzing, and visualizing data so important to gaining real time insight into their chemistry. In essence, iC IR allows chemists to focus on solving chemistry problems instead of learning instrumentation and analysis procedures. Typically, iC IR is used in a laboratory environment, but it can be used with a ReactIR 247 in a lab or as part of a scale-up campaign.

Key features include:

- Record *in situ* reaction spectra
- Record pure component reference spectra
- Real-time peak profiling
- Real-time component analysis (ConcIRT LIVE)
- Real-time solvent/water vapor subtraction
- Linked Views (3D surface, 2D spectra, profile trends, event viewer)
- Replay reaction data
- Export data to Excel
- Export graphs to Word
- Compare results from multiple experiments
- Manage libraries of reference spectra
- Univariate and Multivariate Modeling (optional iC Quant add-on)

iC IR experiments can be saved as templates that an Administrator imports into iC Process software to create process methods. Refer to the "iC Process Software User Guide."

Note: Although iC Process and iC IR can each be used to control the ReactIR 247 instrument, only one software system can be in control at a time. Refer to Appendix B on page 91 for instructions on how to change from one control software to the other.

ReactIR 247 Sampling Technology Configurations

In addition to normal location (NL) and hazardous location (HL) configuration components, a ReactIR 247 system includes the following options for the optical assemblies required with the sampling technology:

Direct Optical Conduit

ReactIR 247 connects directly to your process chemistry with an optical conduit that receives a Sentinel probe sampling technology.

Figure 2-7 Direct optical conduit

K4 Conduit

ReactIR 247 connects to your process chemistry through a K4 mirror conduit that receives a Sentinel probe sampling technology.

Figure 2-8 K4 conduit

ReactIR 247 Mounting Configurations

The ReactIR 247 base unit is available with or without mounting options. For dimensions, refer to "System Dimensions" on page 23.

Note:	Images in this section feature the K4 Mirror Conduit sampling technology.

Base Plate Mounting

The base plate mounting is designed for bench top configurations. The plate includes stabilizing feet.

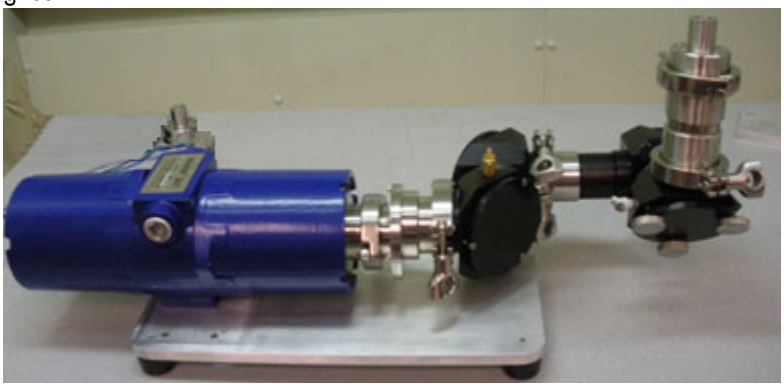

Figure 2-9 Base plate mounting

Base Plate with Lab Jack Mounting

The base plate with lab jack mounting is designed for bench top configurations that require height adjustments.

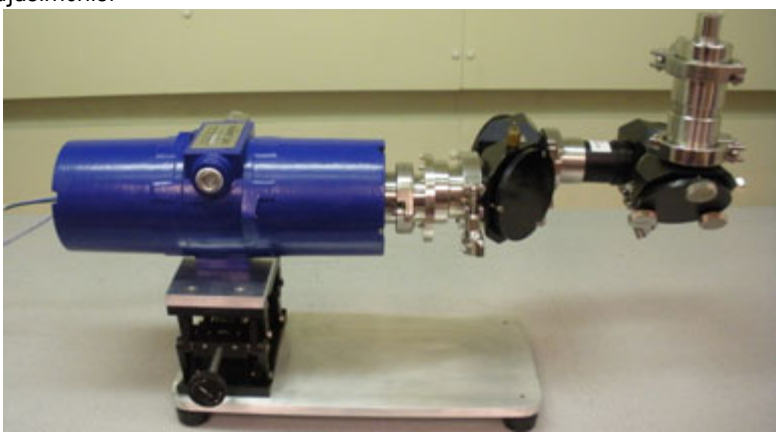

Figure 2-10 Base plate with lab jack mounting

Base Plate with Rack Shelf Mounting

The rack shelf mounting option is designed to be installed in a rack.

ReactIR 247 Local Area Network (LAN) Connections

Communication can be via two types of media—Ethernet connection (NL) or fiber optics (HL through power/communication breakout box).

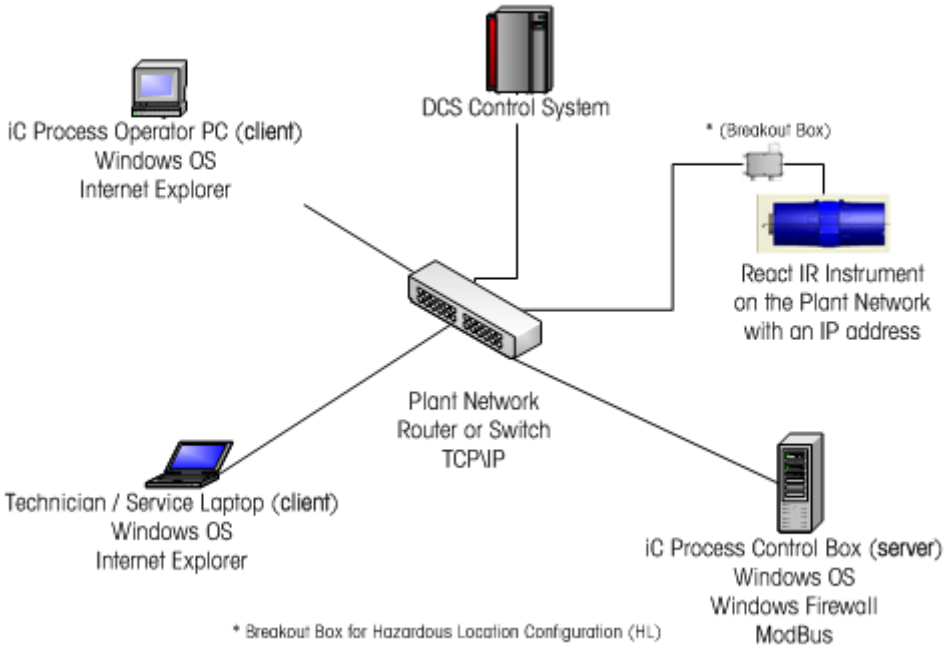

Figure 2-11 Communications diagram

Ethernet Communications (NL Configuration)

In a Normal Location (NL) configuration, the ReactIR 247 connects to a control computer via Ethernet communication through your LAN. Specifications are in Table 3-7 on page 31. As the customer, you are responsible for establishing connectivity to the control computer by plugging in the RJ45 connector on the power and communications cable into your LAN.

Fiber Optic Communications (HL Configurations)

In a Hazardous Location (HL) configuration, the ReactIR 247 connects through your LAN to a control computer via fiber optic communication. The fiber optic originates at the breakout box and terminates at your LAN interface.

Note: If you want to communicate via Ethernet from the LAN to your control computer, you will need to supply a device that converts fiber optic to Ethernet. You are responsible for establishing connectivity to the control computer.

Fiber optic cable specifications in Table 3-8 on page 31 describe the cable provided by METTLER TOLEDO. The cable is typically used as a riser cable and is type OFNR. Data communication networks commonly use duplex patch cables. The Duplex Fiber provides two channels for transmit and receive.

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Specifications

This chapter provides specifications for the following ReactIR 247 components:

- "Materials of Construction" on page 21
- "ReactIR 247 System" on page 22
- "System Dimensions" on page 23
- "Utilities" on page 29

Specifications include those provided by METTLER TOLEDO and those that are your responsibility as the end user.

Materials of Construction

All ReactIR 247 models have the materials of construction specified in Table 3-1. Refer to "ReactIR 247 System Components" on page 15 as a visual aid to identify items below:

Table 3-1 ReactIR 247 Materials of Construction

Specification	Details
Base Unit Enclosure	Painted aluminum
Optical Window	Tempered soda-lime float glass
Base Unit Seals	EPDM
Placard with Safety Markings	Stainless steel
Breakout Box (Power and Communications)	Stainless steel
Jog assembly	Stainless steel, anodized aluminum, EPDM
Direct Optical Conduit	Stainless steel, anodized aluminum, ZnSe windows
Normal Area Electrical Conduit	Powder-coated steel
Hazardous Area Electrical Conduit	Flexible brass
Serial Number Label	316 SS
Base Plate Mount	Powder-coated steel
Lab Jack with Adapter Plate	Powder-coated steel

ReactIR 247 System

Table 3-2 ReactIR 247 System Specifications

Specification	Details
Power * (autoswitching)	**Base Unit (all systems):** ■ **Voltage**: 100–240 VAC ■ **Frequency**: 50/60 Hz ■ **Current**: 2A/1A **Breakout Box (HL only)** Breakout boxes are not autoswitching and ordered as one of the following: ■ 100 VAC, 2A, 50/60 Hz ■ 240 VAC, 1A, 50/60 Hz
Operating Temperature Range **	0°C to 45°C (32°F to 115°F)
Temperature Code	T4—135°C (275°F), surface temperature
Protection Method	Flameproof and explosion-proof enclosures
Communications—NL	Ethernet
Communications—HL	Fiber optic, ST termination, Duplex mode

*An HL system requires a minimum capacity of 4 Amperes (base unit plus breakout box).

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

Weight

Below are the weights for the ReactIR 247 base unit with and without breakout box. Sampling technology weights are listed separately.

Table 3-3 ReactIR 247 Weights

Item	Kilograms	TOTAL	Pounds	TOTAL
ReactIR 247 Base Unit	**8.0**		**17.6**	
Base Plate Mounting		**9.5**		**20.6**
Base Plate Mounting with Lab Jack		**11.0**		**23.6**
Rack Shelf Mount		**11.2**		**24.0**
Breakout Box— with electrical conduit (HL only)	**10.2**		**21.4**	

Table 3-4 ReactIR 247 Sampling Technology Weights

Item (add to base unit weight)	Kilograms	Pounds
Jog Assembly	0.8	1.75
K4 Conduit	4.5	10.00
Direct Optical Conduit	1.2	2.65
Sentinel™	.5	1.00
40-Inch Probe	7.5	15.00

System Dimensions

The diagrams in this section show the dimensions of the ReactIR 247 base unit. Also included are the dimensions for the breakout box required for the hazardous locations (HL).

ReactIR 247 (HL)

For customers that own ReactIR 247 (HL), refer to NL component dimensions and then add the breakout box dimensions (Figure 3-2) Consider also that 10 feet of electrical conduit connect the breakout box and the ReactIR 247 base unit.

- "ReactIR 247—Base Unit Dimensions (NL and HL)" on page 24
- "Breakout Box Dimensions (HL—ATEX)" on page 25
- "Breakout Box Dimensions (HL—NRTL)" on page 25
- "ReactIR 247—Base Unit (NL or HL)—Direct Optical Conduit" on page 26
- "ReactIR 247—Base Unit (NL or HL)—K4 Conduit" on page 26

ReactIR 247 (NL)

For customers that own ReactIR 247 NL, refer to the base unit and sampling technology drawings below. Mounting options only apply for NL configurations.

Base Unit

- "ReactIR 247—Base Unit Dimensions (NL and HL)" on page 24
- "ReactIR 247—Base Unit (NL or HL)—Direct Optical Conduit" on page 26
- "ReactIR 247—Base Unit (NL or HL)—K4 Conduit" on page 26

Base Unit with Base Plate

- "ReactIR 247—Base Unit (NL only) with Base Plate Mounting" on page 27

Base Unit with Lab Jack

- "ReactIR 247—Base Unit (NL only) with Lab Jack Mounting" on page 28

Base Unit with Rack Shelf

- "ReactIR 247—Base Unit (NL only) with Rack Shelf Mounting" on page 29

ReactIR 247—Base Unit Dimensions (NL and HL)

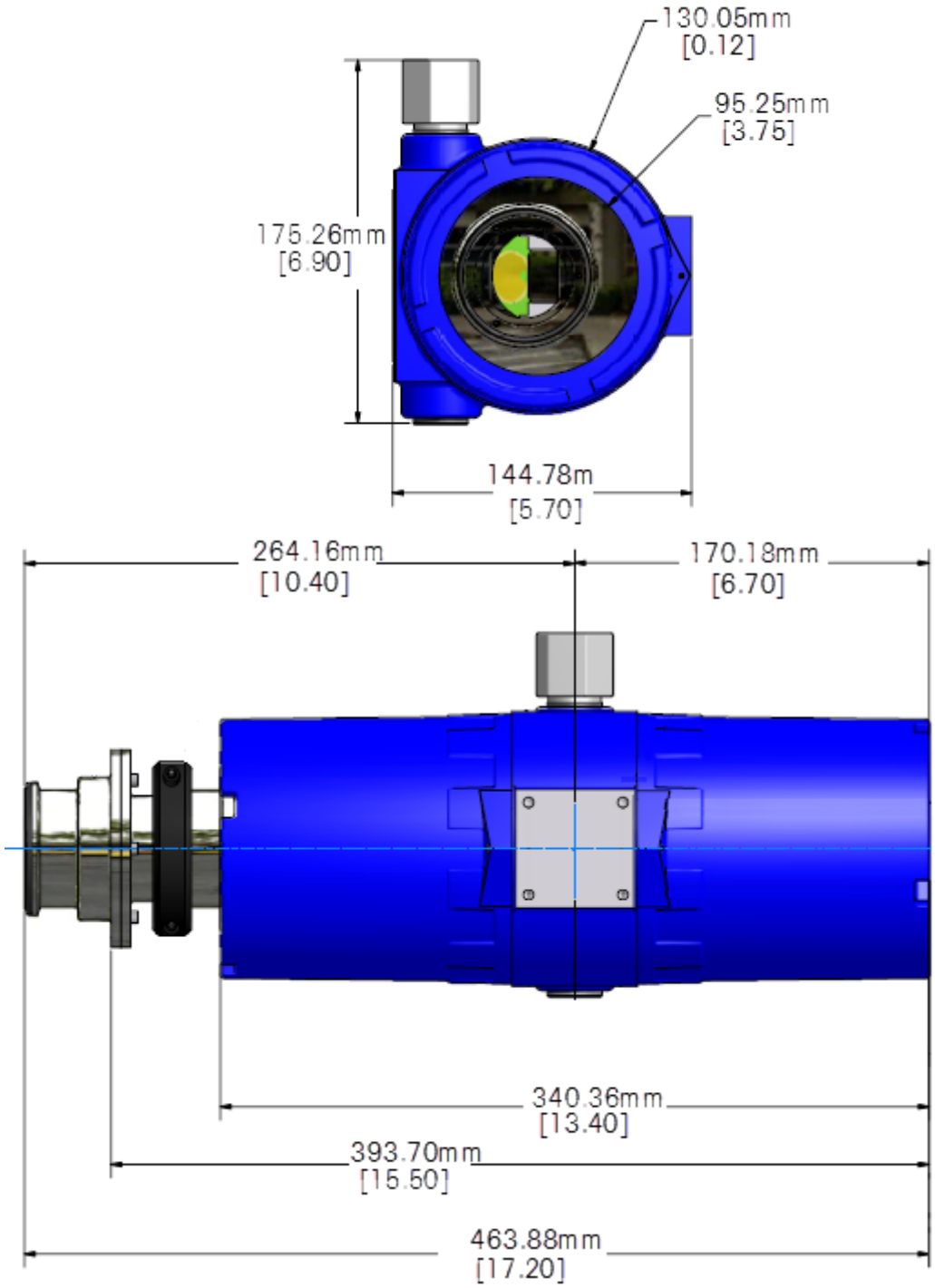


Figure 3-1 ReactIR 247 with Jog assembly (mm[inches])

Breakout Box Dimensions (HL—ATEX)

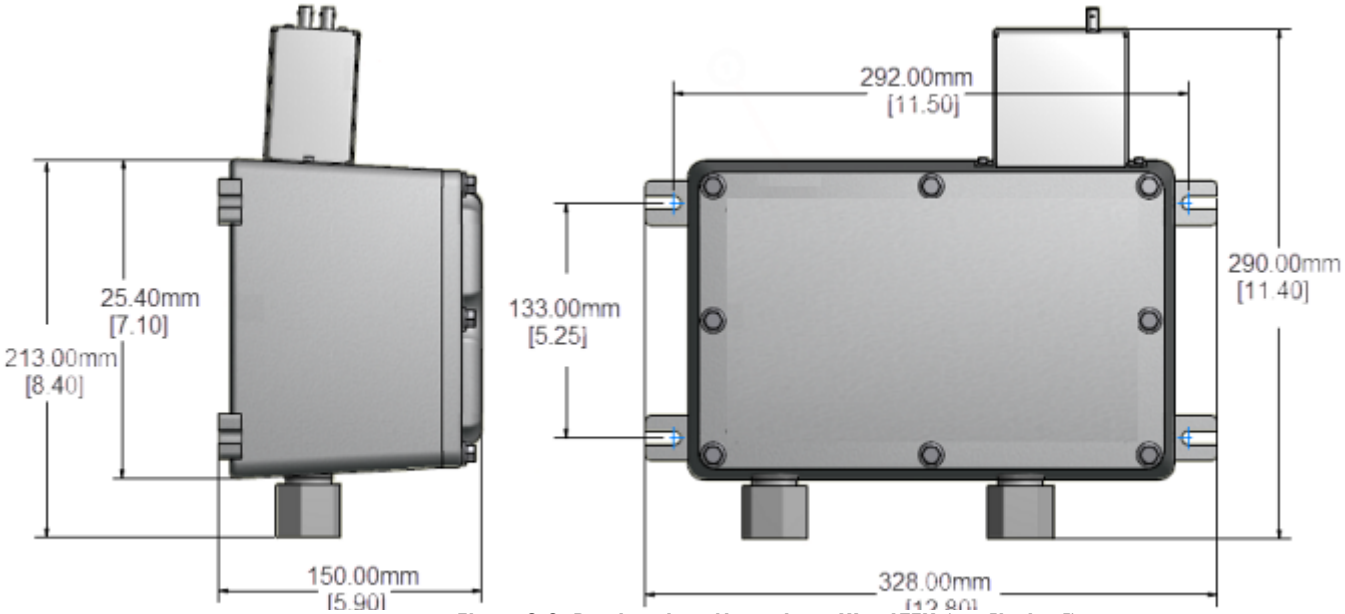


Figure 3-2 Breakout box dimensions: HL—ATEX (mm[inches])

Breakout Box Dimensions (HL—NRTL)

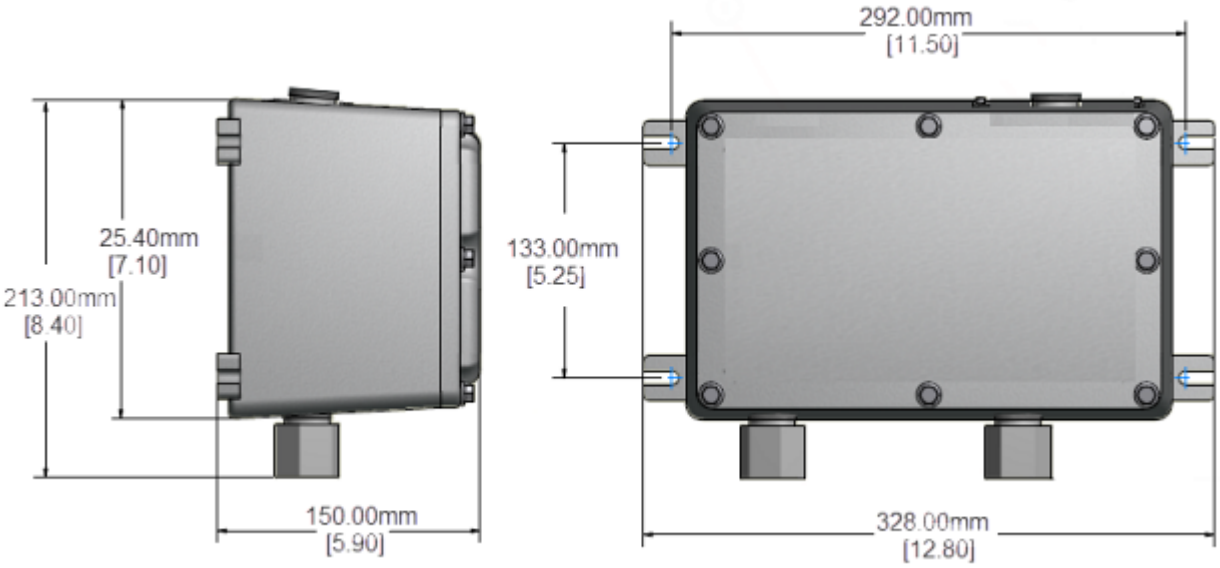


Figure 3-3 Breakout box dimensions: HL—NRTL (mm[inches]

System Dimensions

ReactIR 247—Base Unit (NL or HL)—Direct Optical Conduit

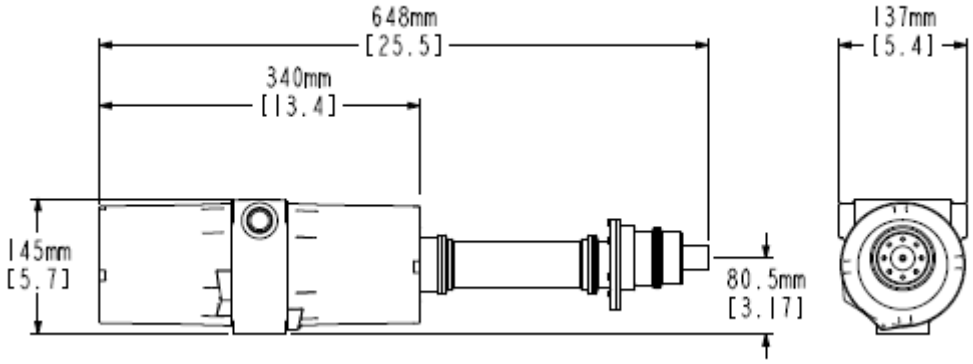


Figure 3-4 ReactIR 247 with Direct Optical Conduit (mm[inches])

ReactIR 247—Base Unit (NL or HL)—K4 Conduit

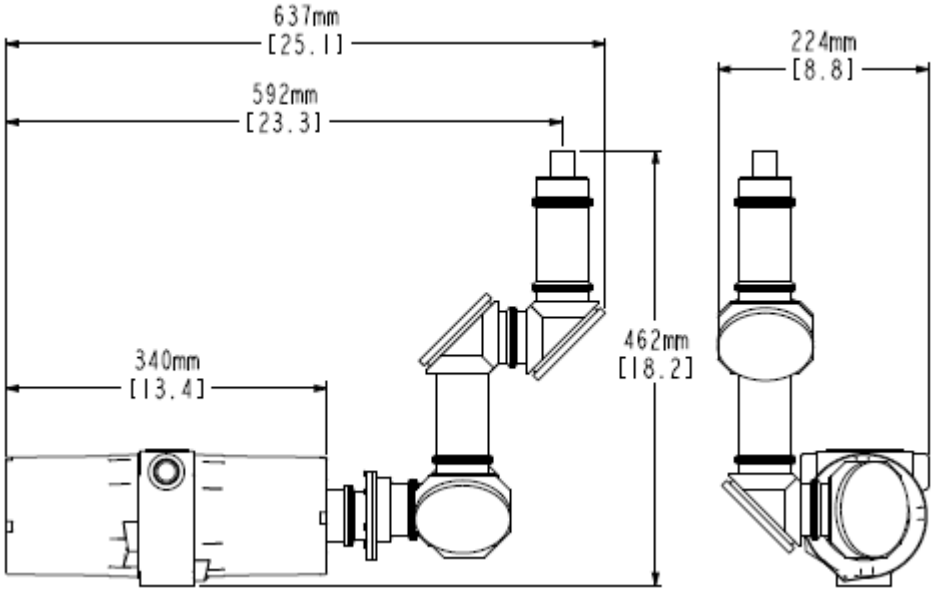


Figure 3-5 ReactIR 247 with K4 conduit (mm[inches])

ReactIR 247—Base Unit (NL only) with Base Plate Mounting

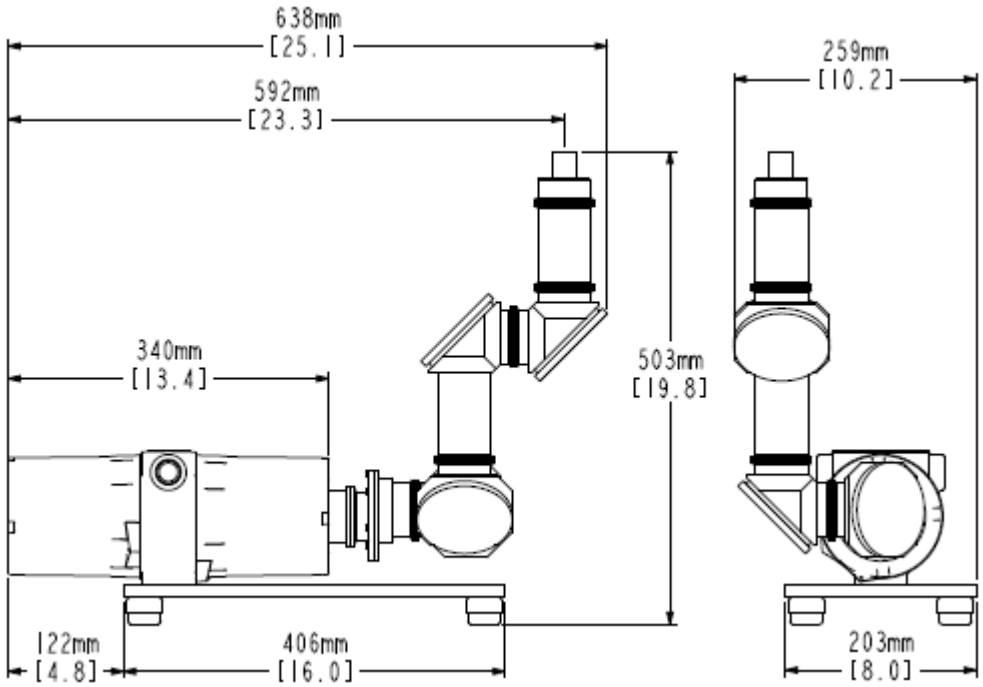


Figure 3-6 ReactIR 247—Base Plate Mounting (mm[inches])

System Dimensions

ReactIR 247—Base Unit (NL only) with Lab Jack Mounting

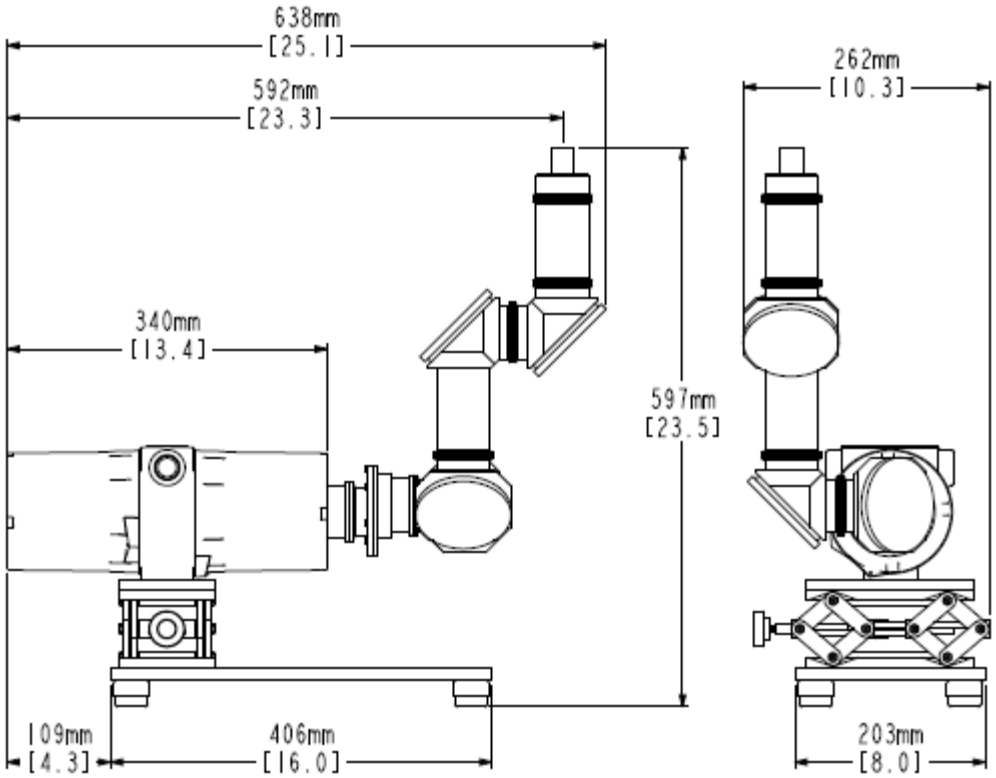


Figure 3-7 ReactIR 247—Base plate mounting and optional lab jack (mm[inches])

ReactIR 247—Base Unit (NL only) with Rack Shelf Mounting

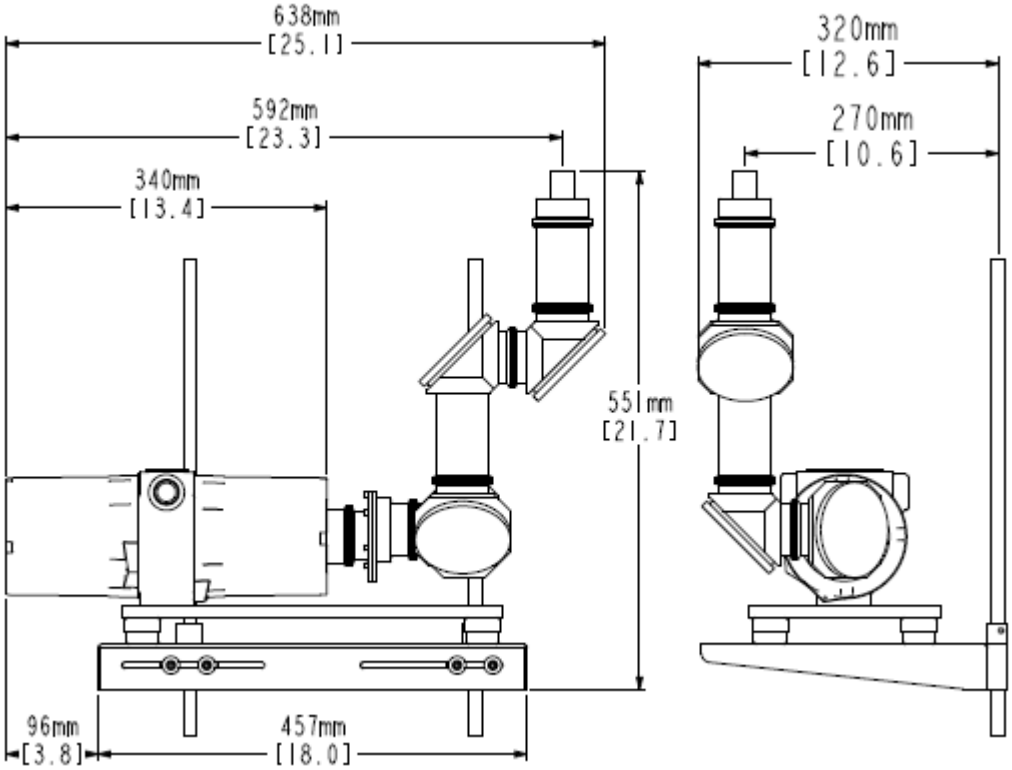


Figure 3-8 ReactIR 247—Rack shelf mounting (mm[inches])

Utilities

ReactIR 247 requires power and communications connections for operation, as described in this section. If the K4 Conduit sampling technology will be used, a supply of instrument quality air is also required.

Electrical Power

Power requirements are determined by the area of intended use.

Normal Location (NL): Non-regulatory environment

Hazardous Location (HL): North America (HL—NRTL) or European Community (HL—ATEX)

Table 3-5 ReactIR 247—Power for Each Configuration

Configuration	Voltage	Frequency	Current
NL or HL—NRTL	100–120 VAC	50/60Hz	2 A
NL or HL—ATEX	200–240 VAC	50/60Hz	1 A

Notes:
- Use a dedicated power line in accordance with the amperage values outlined Table 3-5.
- METTLER TOLEDO recommends the installation of an AC line conditioner.

In Normal Locations (NL)

In a normal location, simply use the appropriate country-specific power cord supplied with the system to connect to an AC outlet.

In Hazardous Locations (HL)

In a hazardous location, the end user provides the necessary power connection to the ReactIR 247 via a certified METTLER TOLEDO-supplied breakout box. METTLER TOLEDO-supplied breakout boxes are provided with openings for customer power supply input.

Each breakout box comes with electrical and communication conduits for safe use in the hazardous area compatible with the ReactIR 247.

Caution—All breakout box connections must be made according to local and national standards for hazardous areas.

Sampling Technology and Conduit Purge

The K4 conduit sampling technology requires a supply of instrument quality purge air to assure maximum infrared measurement performance. See Figure 4-19 on page 44 for a diagram of suggested items to supply purge air to the sampling technology in a ReactIR 247.

Table 3-6 Sampling Technology Air Purge Specifications

Specification	Details
Inlet Pressure Range	Minimum of 5psi (0.34bar) to a Maximum of 10psi (0.7bar)
Minimum Flow (during rapid exchange)	0.5cfm (14LPM) to 1cfm (28LPM)
Dryness	–100°F (–73°C) dew point
CO_2 Free (for specific applications)	Less than 1 PPM
Filtered Air Minimum Particle Size	5 microns
Fitting Connection	1/4-inch (6.35 mm) hose barb, quick-connect fitting

Communications

ReactIR 247 communicates through your Local Area Network (LAN) to a control computer that has the iC Process Web application. Users with access to the LAN and server connected to the ReactIR 247 are then able to implement a reaction monitoring strategy and view the outcome in real time.
Table 3-7 describes the NL Ethernet cable and Table 3-8 describes the HL fiber optic cable. The fiber optic cable can be purchased from METTLER TOLEDO.

Table 3-7 ReactIR 247-to-LAN Cable Specifications (NL)

Specification	Details (Ethernet)
Connectors (2)	RJ45
Diameter	Ethernet cable connectors in the zip cord are 3mm or 0.11inches.
Length	10 feet

Table 3-8 ReactIR 247-to-LAN Cable Specifications (HL)

Specification	Details (Fiber Optic)
Connectors (2)	Type—ST
Fiber Optic Jacket Material	PVC type OFNR (Optical Fiber, Nonconductive, Riser) **Storage**: -40 to +70°C **Operating**: -20 to +70°C
Fiber Optic Conductor Material	■ 62.5 µm fiber core, 125 µm cladding ■ Graded index multimode duplex optical fiber
Bend Radius (Minimum)	■ 4.3 cm loaded ■ 2.8 cm unloaded ■ Crush resistance = 200 N/cm

Control Computer

The ReactIR 247 communicates via TCP/IP to a control computer on your LAN that runs iC Process Web application software.The control computer operates as a server so authenticated users can access as a client. A specific ReactIR 247 instrument is identified as a 'slave' with an IP address. A user opens a Windows Explorer window and specifies the iC Process server.

iC IR users can view and analyze ReactIR 247 batch and continuous process data through the iC IR 'Process' task pane.

Control Computer Specifications

- The iC Process control computer must have the minimum system requirements specified in the ″iC Process Installation Guide.″
- The PC that runs the iC IR software must meet the system requirements specified in the ″iC IR Installation Guide.″

See ″8. Establish Software Communications″ on page 51 for installation information.

4

Installation

This chapter provides procedures on how to install or reinstall a ReactIR 247 system. An Installation Qualification (IQ) checklist is provided for basic installations. Installations in regulatory environments can follow expanded installation validations, as noted below.

Note: **EQPac for Regulatory Environments**—For installation in hazardous area locations under regulatory control or for advanced validation, use the METTLER TOLEDO Equipment Qualification Package (EQPac, QA-VL-0011-AC, P/N:14696522). This service package, sold separately, provides comprehensive details to meet the requirements for installing ReactIR 247 in a Class I/Division 1 (NRTL) or Zone 1 (ATEX) environment.

Installation information is organized in the following sections:

Basic installation includes site preparation performed by the end user and installation performed by a METTLER TOLEDO Field Service Engineer.

Site Preparation

Prior to permanent or temporary installation of a ReactIR 247 system, the end user must ensure that the following items are ready according to specifications in Chapter 3:

- Electrical supply
- Air supply (for K4 sampling technology only)
- LAN connection
- Area and Mounting Preparation

Pre-Installation Checklist

To facilitate installation and operational testing at the time of installation, please make a copy of the "Pre-Installation Checklist" on page 84. A METTLER TOLEDO Field Service Engineer will install the ReactIR 247 system after verifying that site preparation is complete.

The checklist refers to specifications in Chapter 4.

Installation Overview

The installation process differs depending on whether you are installing ReactIR 247 in a normal location (NL) or a hazardous location (HL). In both types of installation, **do not unpack** the system until a METTLER TOLEDO Technology and Applications Consultant (TAC) or Field Service Engineer (FSE) is on site.

Installing ReactIR 247 in a Normal Location

A METTLER TOLEDO AutoChem Field Service Engineer will go through the ReactIR 247 system Installation Qualification (IQ) checklist (page 85) after confirmation that the site has been properly prepared for installation. In addition to verifying the site preparation and receipt of ordered parts (including service agreements/programs), the checklist covers all aspects of the final stages of system installation.

Typical NL Configuration

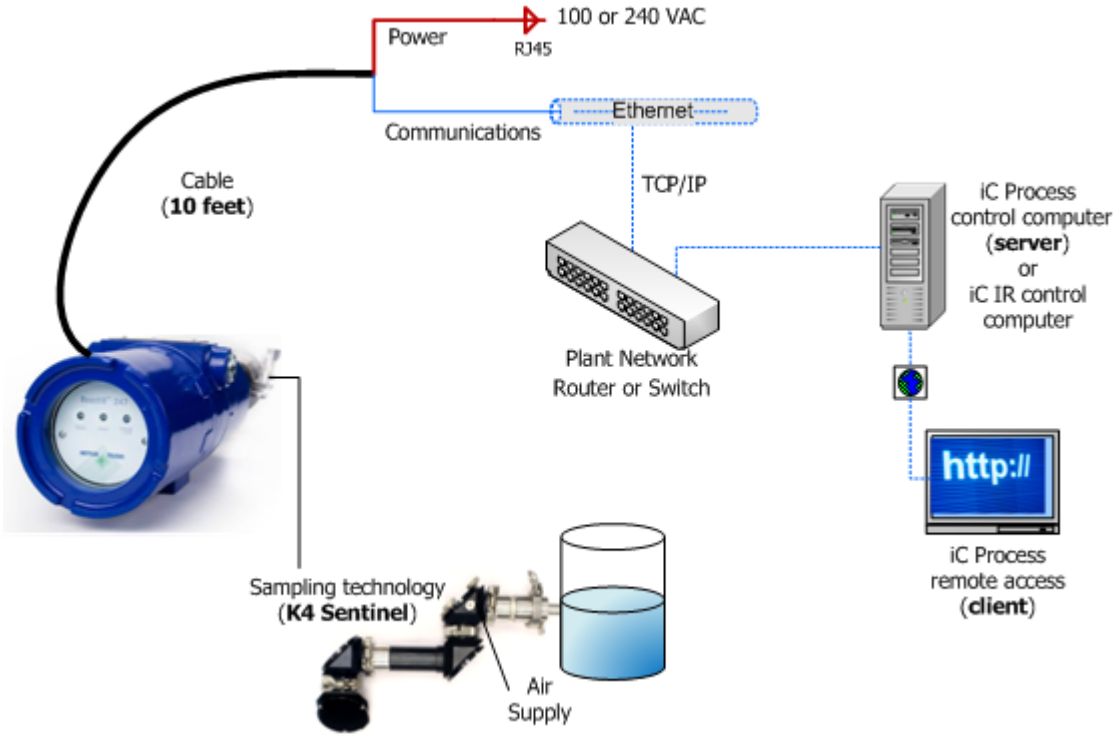


Figure 4-1 Typical NL configuration

Installing ReactIR 247 in a Hazardous Location

A METTLER TOLEDO AutoChem Field Service Engineer will go through the ReactIR 247 system Installation Qualification (IQ) checklist (page 85) after confirmation that the site has been properly prepared for installation. In addition to verifying the site preparation and receipt of ordered parts (including service agreements/programs), the checklist covers all aspects of the final stages of system installation.

For a hazardous area installation, METTLER TOLEDO offers a special Equipment Qualification Package (EQPac) service, as noted on page 33. For the exact area classification of the ReactIR 247, refer to the "ReactIR 247 Safety Information" provided with the instrument.

The diagrams below show typical HL configurations. The breakout box and electrical conduit to the ReactIR 247 instrument differ slightly between the NRTL and ATEX configurations.

- In a typical HL—NRTL configuration (Figure 4-2), the breakout box has a pigtail connection for communications and the electrical conduit from the breakout box to the ReactIR 247 instrument is in three sections with sealed adapters.

Typical HL—NRTL Configuration

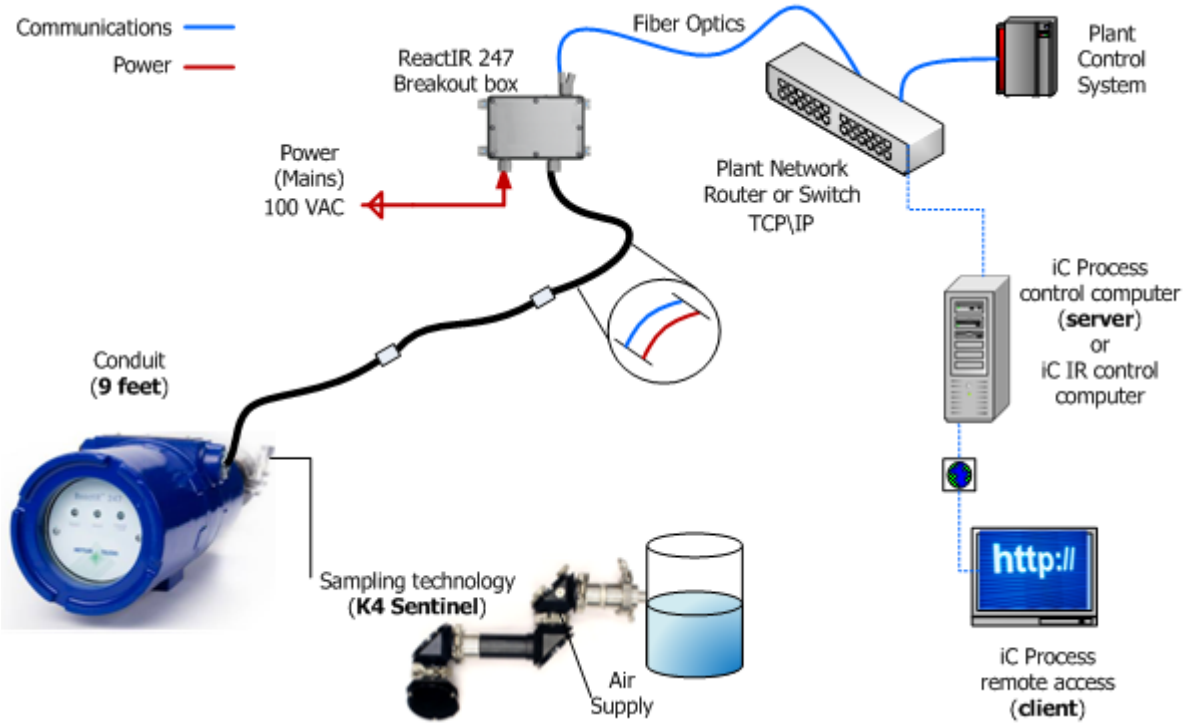


Figure 4-2 Typical HL—NRTL configuration

- In a typical HL—ATEX configuration (Figure 4-3), the breakout box has a bulkhead with a fiber optic connection for communications and the electrical conduit from the breakout box to the ReactIR 247 instrument is in one section.

Typical HL—ATEX Configuration

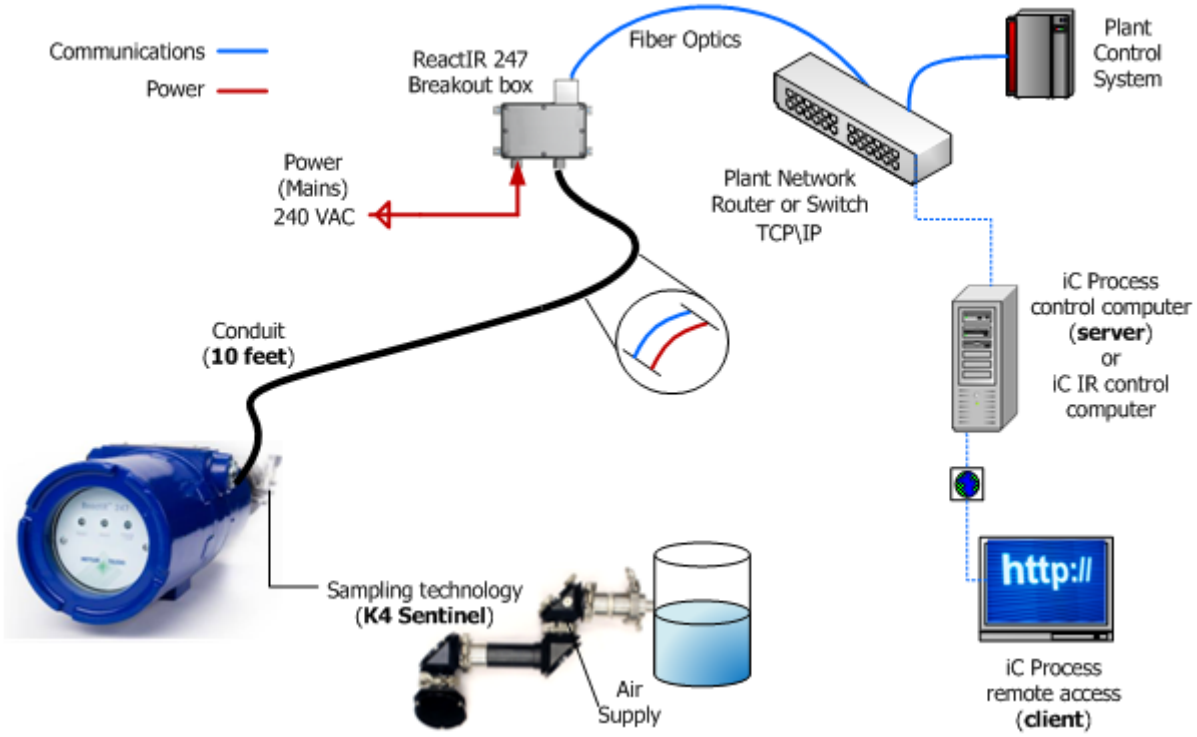


Figure 4-3 Typical HL—ATEX configuration

Acceptance Criteria

In the absence of an EQPac service installation, the "ReactIR 247 Installation Qualification (IQ)" requires approval signatures from the METTLER TOLEDO Field Service Engineer and your Company Project Leader after completion of the checklist procedures.

Note: Place the signed Installation Qualification checklist in a readily accessible location for reference during system service or maintenance.

In EQPac service installations, the package described on page 33, includes several documents that require approval signatures from the METTLER TOLEDO Field Service Engineer and your Company Project Leader.

Installation Instructions

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

Below are the basic steps to install the ReactIR 247.

1. Mount the ReactIR 247 Instrument

The ReactIR 247 has four threaded 1/4-20 UNC-2B holes available for mounting. Figure 4-4 shows the location and dimensions of the mounting holes, which are on the reverse side of the serial number placard.

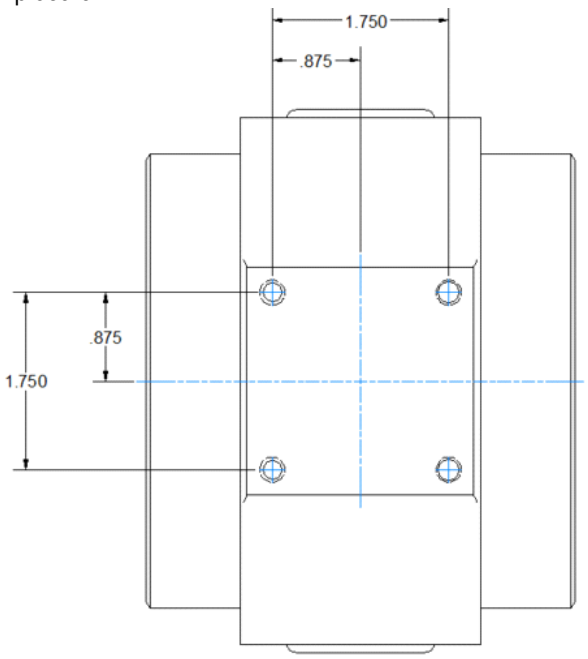


Figure 4-4 base unit mounting holes

METTLER TOLEDO offers a base plate that may be used to secure the instrument, using the mounting holes. Alternatively the end users may supply their own mounting hardware.

Mount the ReactIR 247 instrument as specified below.

Base Unit Mounting:

Figure 4-4: "ReactIR 247—Base Unit Mounting" on page 38

Base Unit with Base Plate Mounting:

Figure 4-6: "ReactIR 247—Base Plate Mounting" on page 39.

Base Unit with Lab Jack Mounting:

Figure 4-6: "ReactIR 247—Base Plate with Optional Lab Jack Mounting" on page 40.

Base Unit with Rack Shelf Mounting (Mobile or Fixed)

"ReactIR 247—Base Plate with Optional Rack Shelf Mounting" on page 40

ReactIR 247—Base Unit Mounting

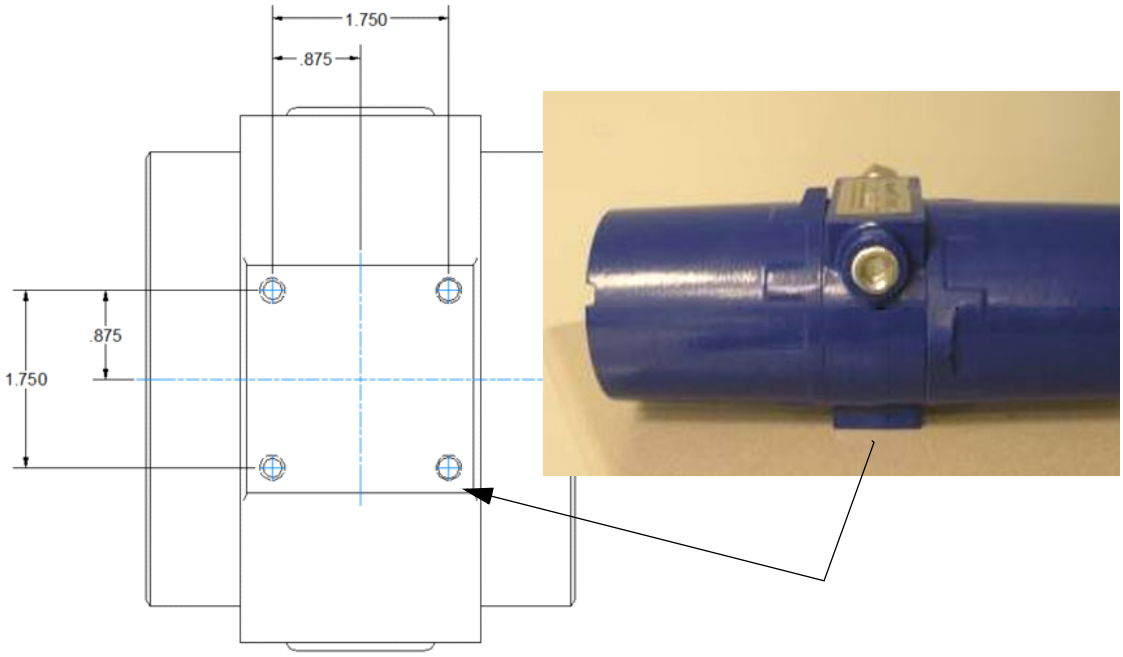


Figure 4-5 ReactIR 247—Mounting holes

1. Identify a location and mounting hardware to secure the ReactIR 247 base unit.
2. Use Figure 4-5 to design your mounting hardware.
3. Ensure that the ReactIR 247 base unit is mounted securely.
   - The mounting device must hold the weight of the unit and all accessories that will be added. Refer to "Weight" on page 22 for the unit and accessory weights.

- If the mounting device is a rack shelf, it should be as rigid as possible to prevent the system from moving or swaying.

Note: The METTLER TOLEDO base plate (page 38), lab jack (page 40), and rack shelf mountings (page 40) use vibration isolators. If you use your own mounting hardware, vibration isolators are required to minimize the potential of inaccurate analytical measurements in an environment with equipment that causes vibration of the ReactIR 247 base unit.

ReactIR 247—Base Plate Mounting

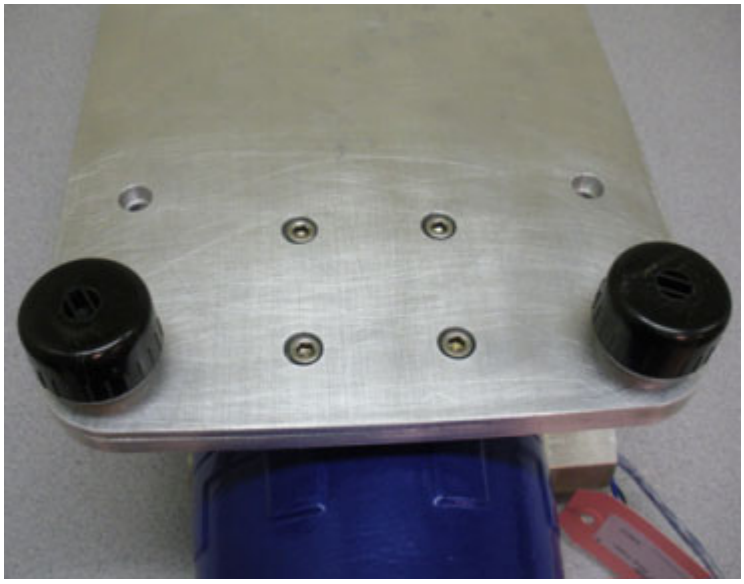


Figure 4-6 Mounting holes (base plate mount)

1. Identify a location to mount your base unit with base plate.
2. Mount the base unit on the base plate. Refer to Figure 4-6.
3. Place the base unit and base plate assembly in your area of intended use.

ReactIR 247—Base Plate with Optional Lab Jack Mounting

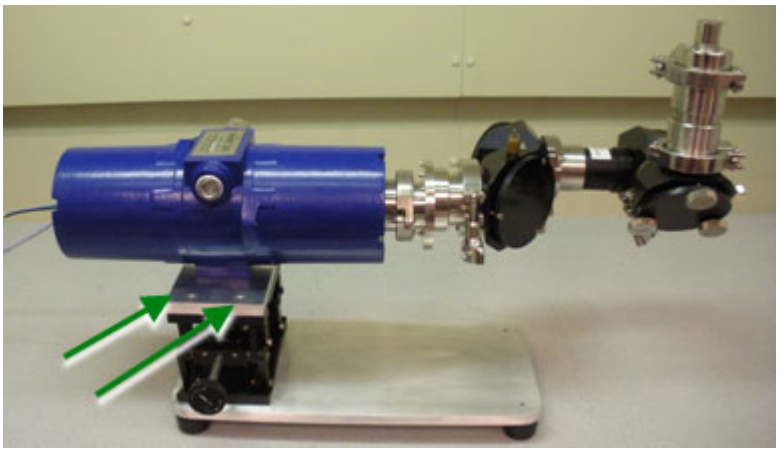


Figure 4-7 Mounting holes (base plate with lab jack mount)

1. Identify a location to mount your base unit with base plate with lab jack.
2. Mount the base unit on the base plate adapter in the same manner shown in Figure 4-6.
3. Mount the base plate adapter on the lab jack, using four (4) bolts provided. Figure 4-7 calls out two of the four bolt holes.
4. Place the base unit with lab jack assembly (Figure 4-7) in your area of intended use.

ReactIR 247—Base Plate with Optional Rack Shelf Mounting

1. Identify a location to mount your base unit rack shelf assembly.
2. Mount the base unit on your rack shelf.
3. Place the base unit and rack shelf assembly in your area of intended use.

2. Make Earth Ground Connection

Use a ground strap with minimum 12AWG.

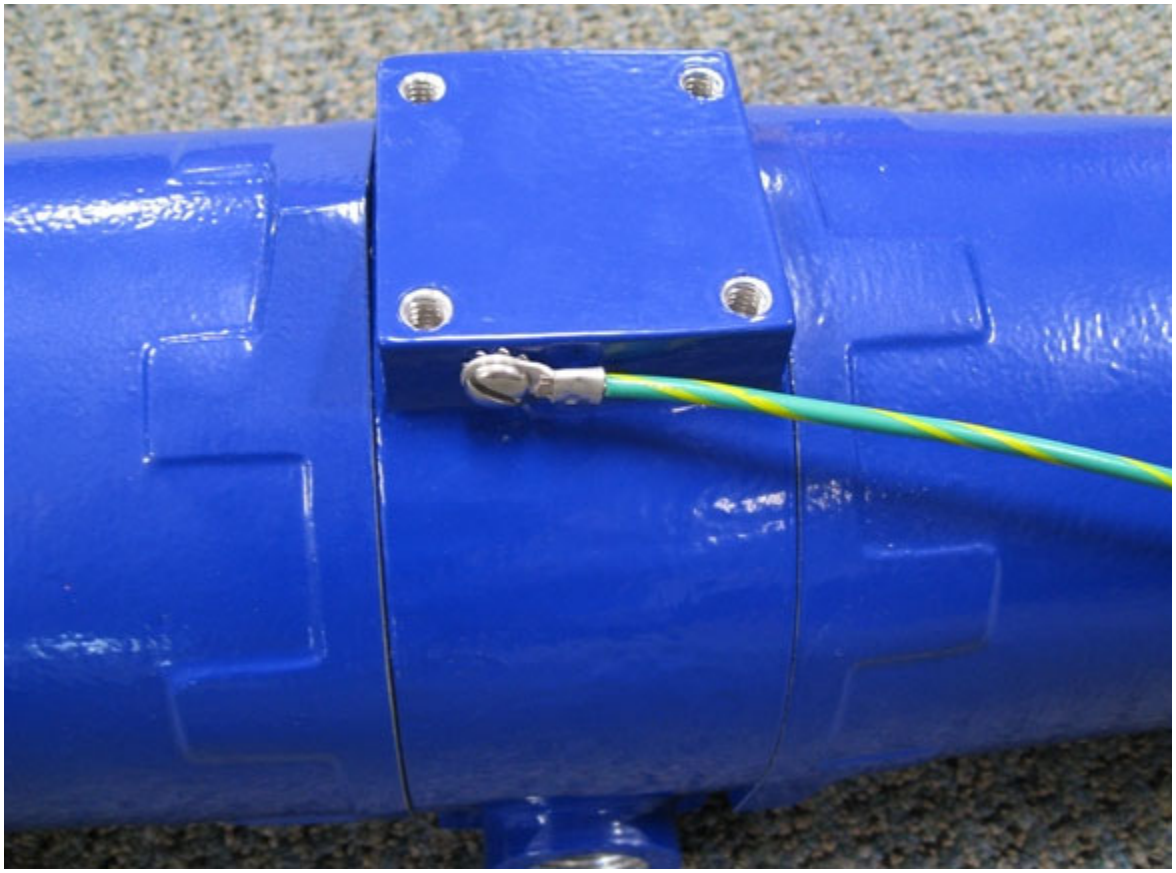


Figure 4-8 ReactIR 247 with earth ground connection

Note:	The ground strap is customer-provided.

3. Connect Power to the ReactIR 247 Instrument

Ensure that your power supply meets the specifications under "Electrical Power" starting on page 29. Hazardous area connection instructions begin on page 43.

In Normal Locations (NL)

Figure 4-1 on page 34 shows a system diagram of the connections in a typical NL configuration. For normal locations, connect the country-specific power terminated line cord to an AC outlet.

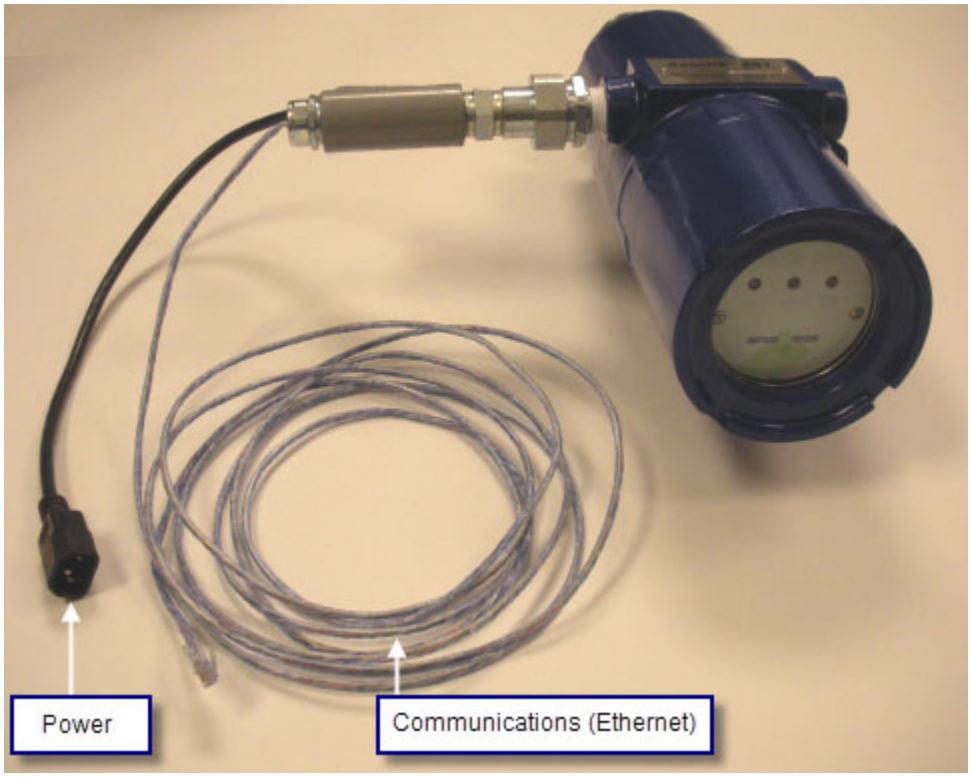


Figure 4-9 ReactIR 247—Power and communications cable (Normal location)

In Hazardous Locations (HL)

For hazardous locations, a breakout box certified for the zone of installation is required. (For system dimensions, refer to page 23.)

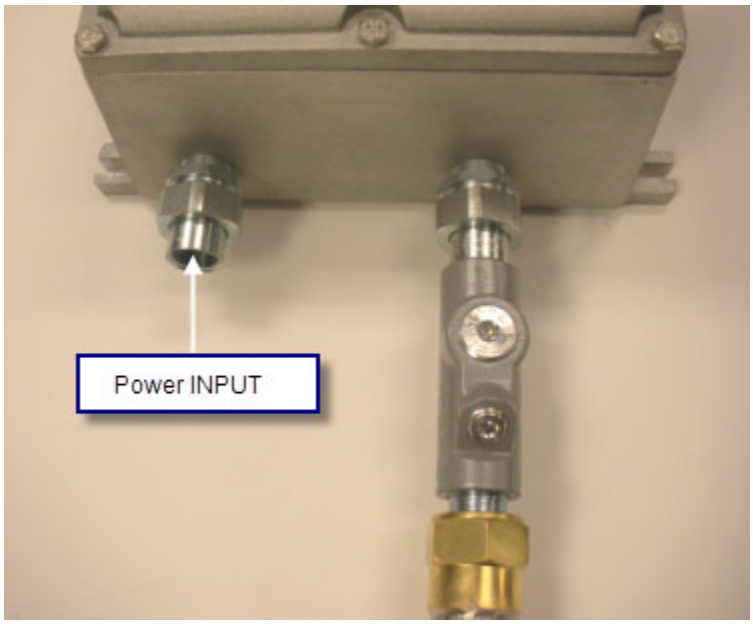


Figure 4-10 Power supply connection to breakout box

Caution—External power connection to the breakout 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 country and local electrical codes.

1. Open the breakout box and connect external power.
   Refer to Figure 4-11 and connect the power input according to Table 4-1.

Table 4-1 Terminal Block Wiring

	Wire	Terminal
3	**Brown**	Line 1
2	**Blue**	Neutral
1	**Yellow/Green**	Earth/Ground

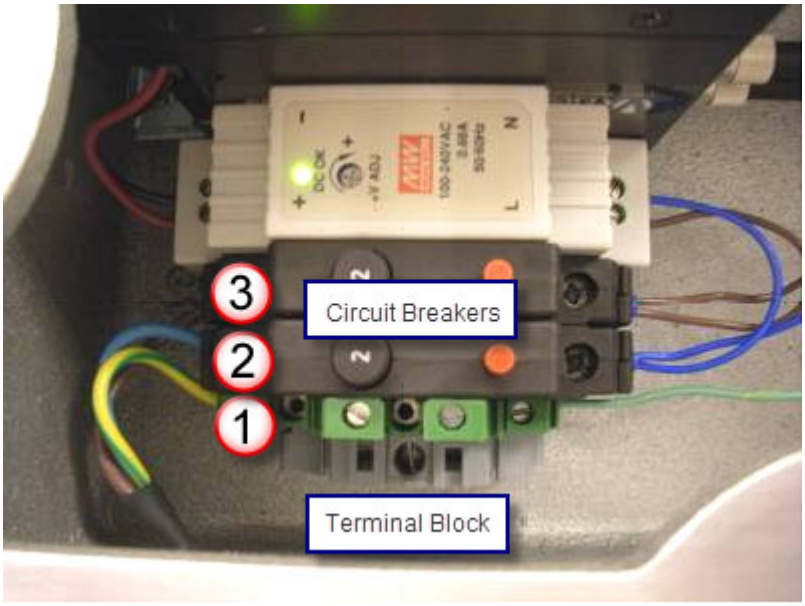


Figure 4-11 Power connection inside breakout box

2. Close the breakout box.

Note: During installation, your METTLER TOLEDO Field Service Engineer will open the box and make the power and communication connections to the instrument (brown and blue wiring on the right side of Figure 4-11.)

4. Connect Communications from ReactIR 247 to Your LAN

The ReactIR 247 can be connected to your communications network in one of the following ways:

- Ethernet cable directly from the ReactIR 247 NL base unit—Normal Location (NL) configuration only
- Fiber Optic cable from the ReactIR 247 HL Power/Communications Breakout box—Separate connection instructions for HL—NRTL and HL—ATEX.

Caution—External communications connection to your communications 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.

In Normal Location

In a ReactIR 247 NL configuration, plug the Ethernet cable (Figure 4-9) from the base unit into your LAN router.

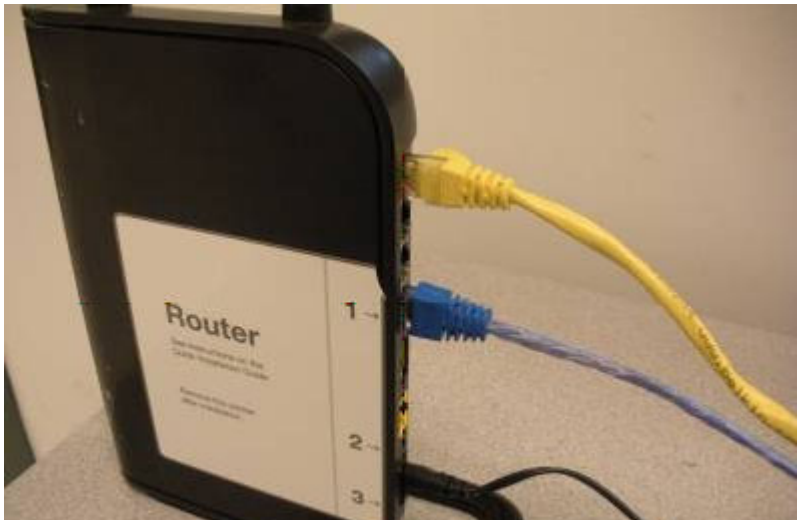


Figure 4-12 ReactIR 247 power and Ethernet communications cable to LAN router

In Hazardous Location

1. Connect Fiber Optic cable to the 100base ST communications output connector on the ReactIR 247 breakout box, as applicable for the HL—ATEX or HL—NRTL configuration.
   - **HL—ATEX configuration:** Connect the fiber optic cable to the power/ communication bulkhead on the breakout box (Figure 4-13).

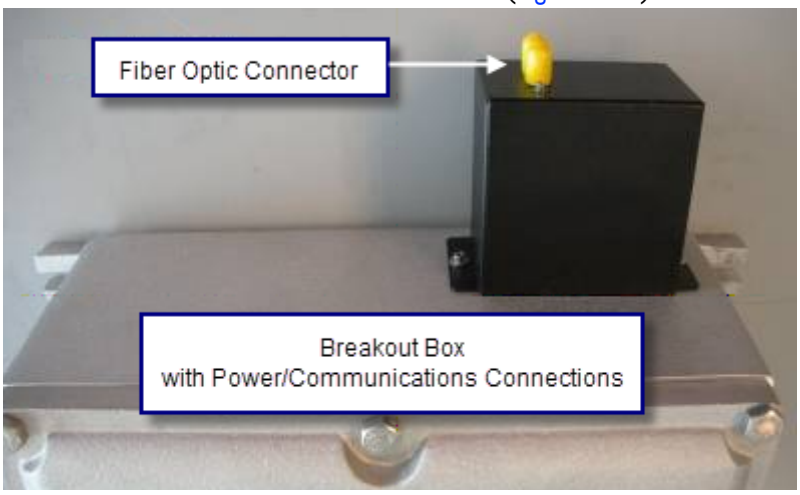


Figure 4-13 Fiber optic ST connector on HL—ATEX breakout box

- **HL—NRTL configuration:** Connect the fiber optic cable to the pigtail coupler.

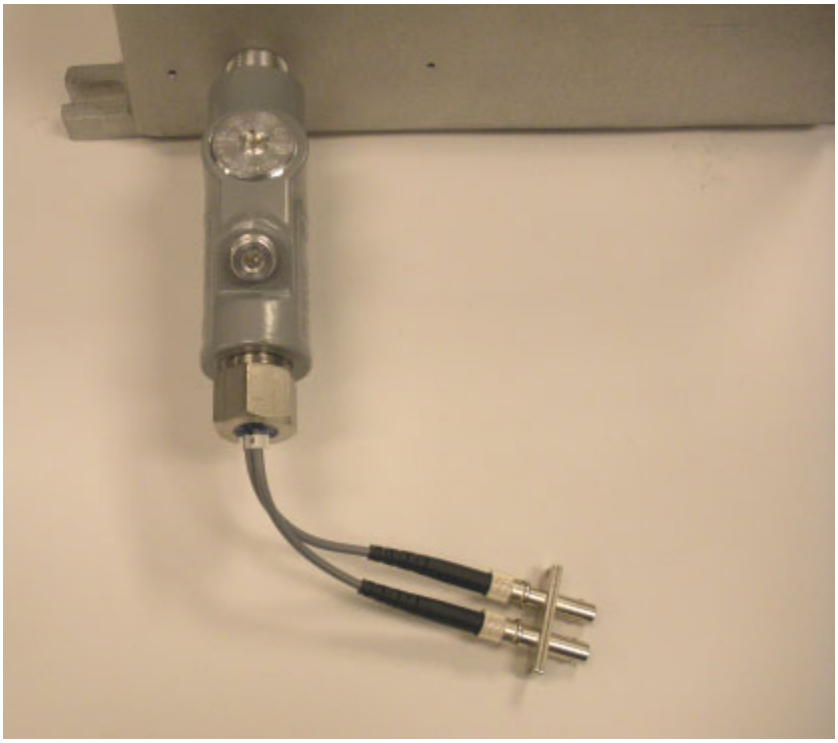


Figure 4-14 Fiber optic ST connector on HL—NRTL breakout box

2. Connect the other end to your Local Area Network (LAN).

Note:	An end-user-supplied device capable of converting the communications media from fiber optic to Ethernet is required if the LAN connection only accepts Ethernet.

5. Connect Sampling Technology to ReactIR 247

Follow the procedure below for the type of sampling technology configuration to be used.

Direct Optical Conduit Configuration

In a direct configuration, the order of installation is (1) Base unit, (2) Conduit, (3) Jog Assembly, and (4) Sentinel.

Figure 4-15 Direct Optical Conduit components, before installation

1. Start with the base unit oriented so the Sample Interface Module (SIM) flange has adequate room for the three sampling technology components.

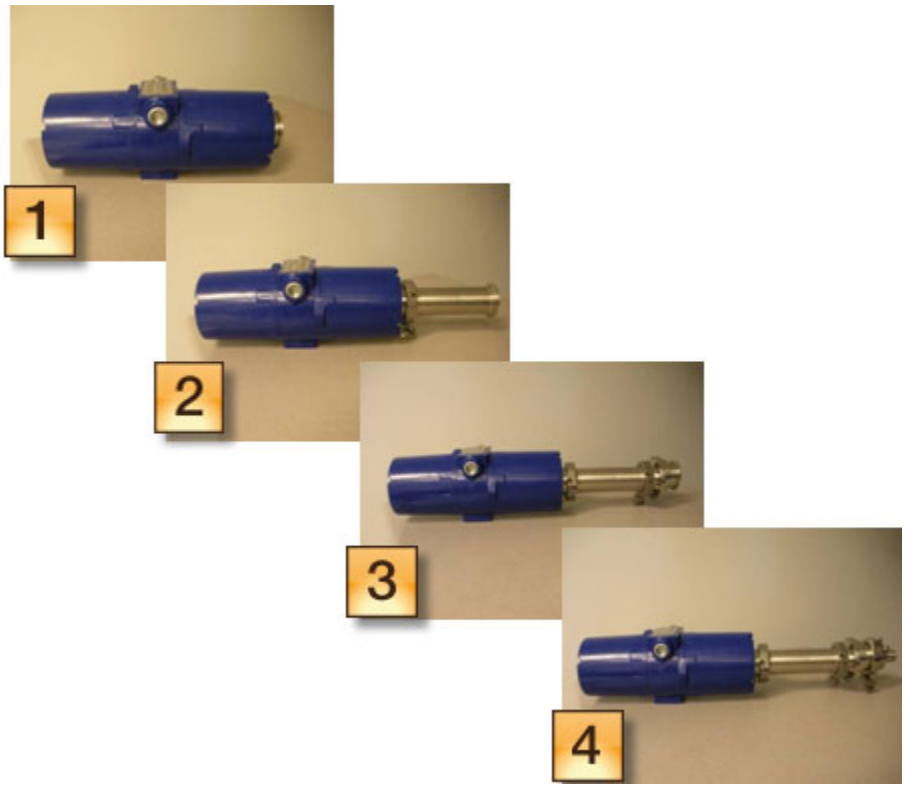


Figure 4-16 Direct Optical Conduit—Four installation steps

2. Using the clamp provided, attach the Direct Optical Conduit to the SIM flange.
3. Attach the Jog Assembly to the conduit.
4. Attach the Sentinel to the Jog Assembly.
5. Check that each clamp is secure.

K4 Conduit Configuration

In a K4 configuration, the order of installation is (1) Base unit, (2) Jog Assembly, (3) K4 conduit, (4) Stand-off, and (5) Sentinel.

1. Start with the base unit oriented so the Sample Interface Module (SIM) flange has adequate room for the sampling technology components.

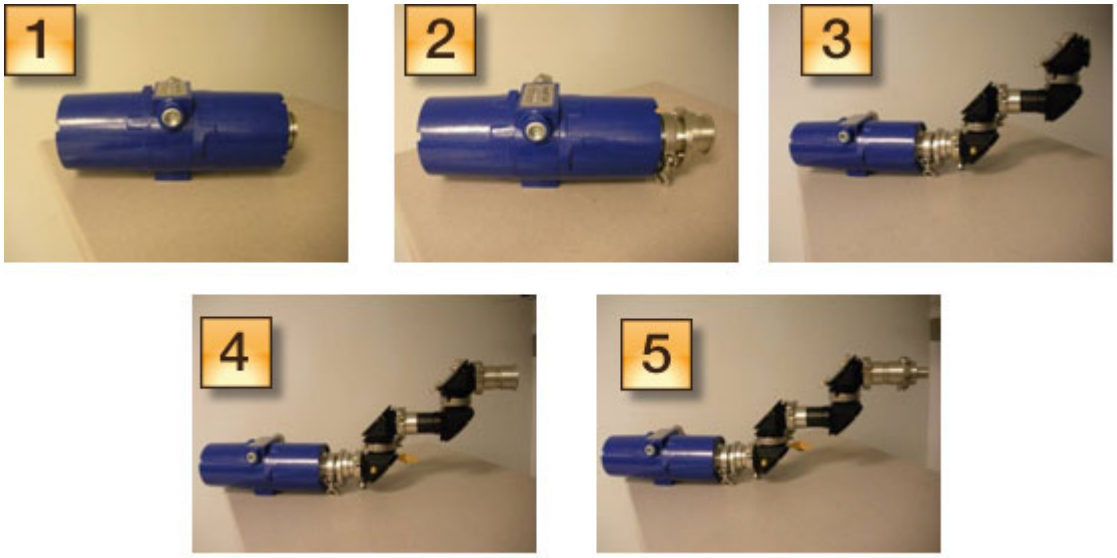


Figure 4-17 K4 Conduit—Five installation steps

2. Attach the Jog Assembly to the SIM flange. Take care to align the pin to the keyed hole.

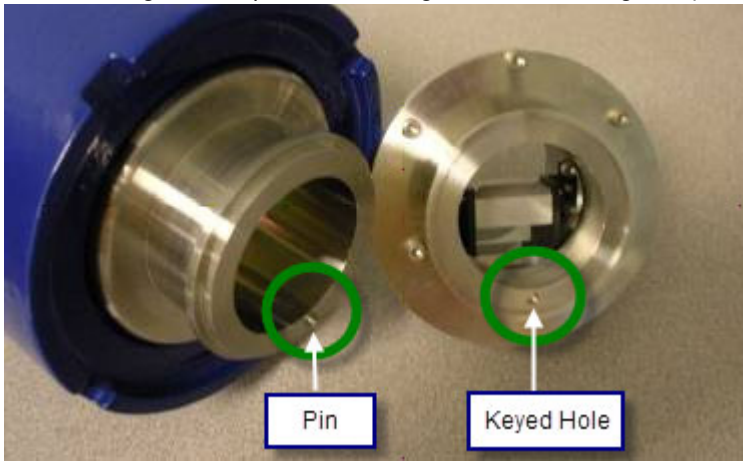


Figure 4-18 Jog Assembly

3. Attach the K4 conduit to the Jog Assembly.
4. Attach the K4 stand-off.
5. Attach the Sentinel to the stand-off.
6. Check that each clamp is secure.

6. Establish the Sampling Technology Conduit Purge (if applicable)

If you are using a K4 Mirror conduit or Straight conduit sampling technology:

1. Attach a filtered, pressure-controlled air supply to the sampling technology.
2. Attach the METTLER TOLEDO-supplied fitting to the sampling technology as shown in the Figure 4-19.

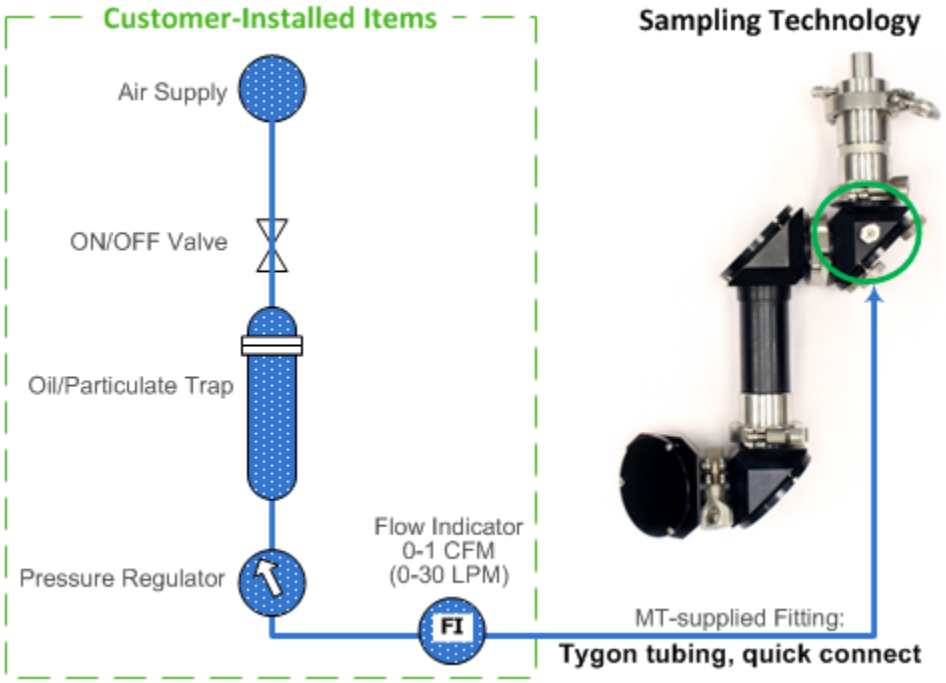


Figure 4-19 Purge-to-sampling technology flow diagram

3. Ensure that all sampling technology clamps are tight.
4. Verify that a purge supply of 5–10psi at a minimum flow rate of 0.5CFM (14L/min) is applied to the sampling technology conduit.

Caution—Above 40 PSI (2.75 bar), damage can occur to the sampling technology.

7. Integrate Sampling Technology to a Process Stream

When the sampling technology interfaces to the process stream using a Sentinel or a cross specially designed by METTLER TOLEDO for your application, tighten the bolts according to the required torque specifications. Refer to Figure 4-20.

Note: If the installation uses a probe rather than a Sentinel, skip this procedure.

1. Using a torque wrench, tighten the bolts of the Sentinel to two torque values.
   a. First, tighten each bolt, sequentially, to 40 in/lbs.
   b. Then, return to bolt #1 and tighten each bolt to 60–75 in/lbs.
2. Tighten the bolts in the numerical sequence illustrated in Figure 4-20 (for a Sentinel).

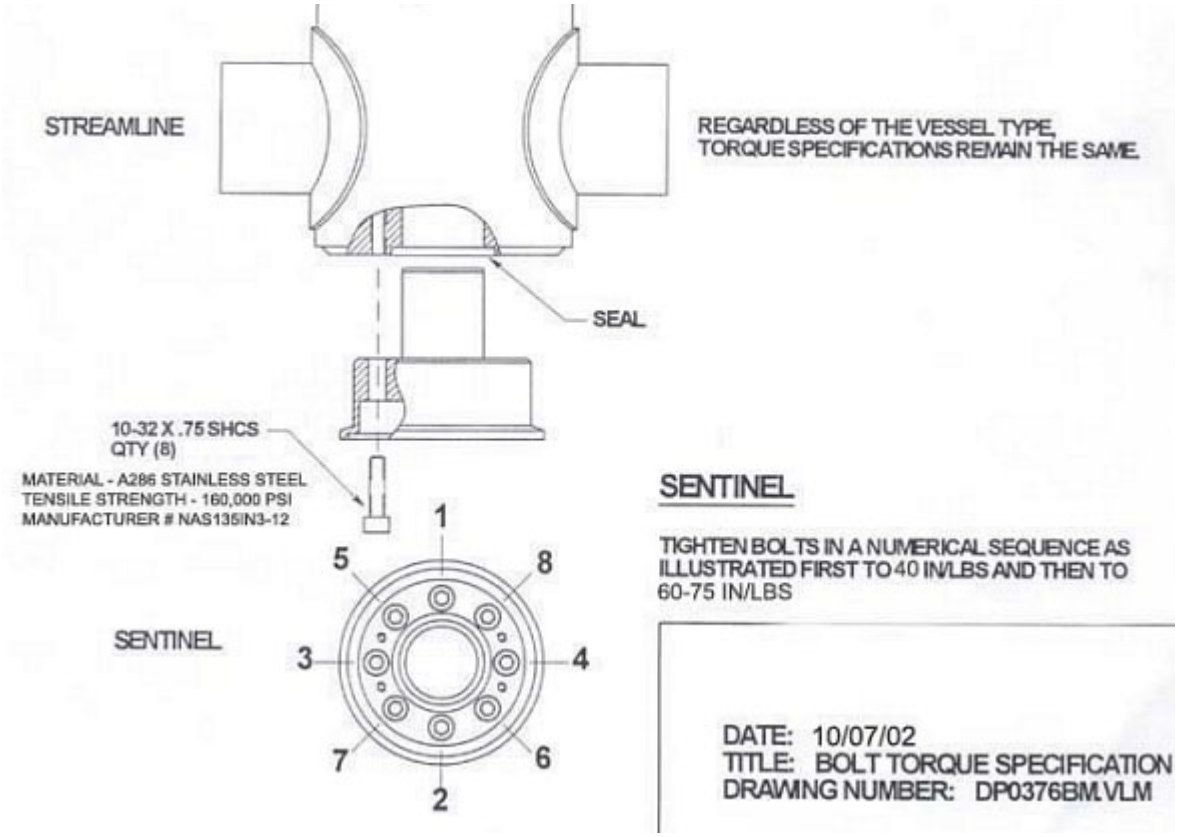


Figure 4-20 Bolt torque specifications for a streamline, Sentinel, or cross special

Apply the same torque specifications used for the Sentinel to the following situations:

- A Streamline uses eight bolts of the same size (10-32 x 0.75 SHCS). Since the bolts are the same size and there are eight of them, apply the same torque specification that was used on the Sentinel.
- For installation of a Sentinel in a cross special, apply the same torque specifications described for the Streamline.

8. Establish Software Communications

The ReactIR 247 system uses your network communications for data input and output between the instrument and the iC Process software. This link then allows connectivity to the PC workstations and Distributed Control Systems of your organization.

Notes:

- **iC Process software**—Establishing and maintaining iC Process communications is the responsibility of your IT department or other responsible party with qualifications. METTLER TOLEDO will assist your human resource in the process.
- **iC IR software**—A ReactIR 247 instrument can also be controlled by iC IR software in a laboratory environment. However, this manual concentrates on communication with iC Process software.

  IMPORTANT: A ReactIR 247 instrument can only be controlled by one software system at the same time. Refer to "Switching Control Software" on page 91 for details.

The software installation process is described in the "iC Process 4.x Installation Guide."

Software installation involves the following phases:

"1. Install iC Process Web Application" on page 51

"2. Verify User Security Setup by Your IT Department" on page 51

"3. Access iC Process through a Client and Add the Instrument" on page 52

"4. Install iC IR Software and the 'Process' Task Pane" on page 52

"5. Communicate to iC Process Software" on page 52

"6. Communicate to ReactIR 247 iC IR "Process" Task Pane" on page 53

1. Install iC Process Web Application

The control machine for the ReactIR 247 instrument runs the iC Process Web application software to control the instrument. Your IT department and the METTLER TOLEDO Field Service Engineer must have the software installed and user/group authentication set up according to the "iC Process Installation Guide."

Get the URL for the iC Process Web application from your IT department so you can access the software.

2. Verify User Security Setup by Your IT Department

Before a client can access the iC Process Web application, user/group security must be set up by your IT department. Access to iC Process is based on your network login ID. Depending on the setup, you may or may not have to log on.

3. Access iC Process through a Client and Add the Instrument

The client can be on the same computer where iC Process is installed (LocalHost) or it can be on a remote PC. The computer name in the URL will either be "LocalHost" or the machine name provided by your IT department.

1. Access iC Process via the URL (provided by your IT department).
2. Add the ReactIR 247 instrument and record the instrument IP Address (requires Administrator or Technician user role).

4. Install iC IR Software and the 'Process' Task Pane

iC IR software experiments created for ReactIR 247 instruments are saved as a template as the first step in creating a method for iC Process batch or continuous processing. In addition, a Process task pane in the iC IR Toolbox enables remote users to connect to the ReactIR 247 instrument and view real-time or post-processing results for analysis.

To install the task pane:

1. Ensure that the iC IR software has been installed on a remote PC according to the "iC IR 4.2 (or higher) Installation Guide." The PC must the specifications in the installation guide.
2. On the iC IR software installation CD or in the iC IR installation folder, locate the Production subfolder and select **InstallPat.CMD** to install the ReactIR 247 task pane components.

   Note: If the operating system is Windows 7 or the Windows Server 2008, you must run this command as an administrator (see the "iC Process 4.2 Installation Guide" or "iC Process Software User Guide" for details.)

3. Start the iC IR software and verify the Process task pane appears in the iC IR Toolbox on the right side of the main window.

5. Communicate to iC Process Software

After power and communication has been connected to the ReactIR 247 instrument, the next step is to communicate with the ReactIR 247 through the iC Process Web application and connect to the iC IR software through the Process task pane.

1. Apply power to the ReactIR 247 base unit.
2. Open Internet Explorer and enter the iC Process URL provided by your IT department.
   http://<computer name>**/#/Home**

   Replace <computer name> with the name of the control machine where iC Process is installed, or replace it with "LocalHost" if the server and client are on the same computer.
3. Refer to the "iC Process Software User Guide" for details on how an Administrator or Technician adds and configures a ReactIR 247 instrument. As part of the configuration, an Administrator or Technician records the IP address of the ReactIR 247 instrument.

6. Communicate to ReactIR 247 iC IR "Process" Task Pane

After iC Process has been installed and configured for the instrument, authorized users can connect to the instrument and view real-time process data or import archive files from iC IR for post-processing analysis.

Note: Before ReactIR 247 instrument can monitor a batch or continuous process, an Administrator must create a method based on a template imported from iC IR. Refer to the "iC Process Software User Guide" for detailed instructions on creating a method, the options to consider when creating an iC IR template, and how to export the template.

Refer to the "iC Process Installation Guide" and the "iC Process Software User Guide" for complete instructions on how to install the "Process" task pane in iC IR and connect to a ReactIR 247instrument. Below are the overall steps to connect to the ReactIR 247 through iC IR software "Process" task pane.

1. Start the iC IR software by clicking a desktop icon.

2. From the software Toolbox on the right side of the Start Page, click the **Process** task pane.
3. In the **Server Name** box, enter the machine ID of the network computer where the iC Process Web application is running. (After successful connection, the name will appear in a drop-down list for ease of selection the next time you want to connect.)

   Note: A METTLER TOLEDO service engineer works with your IT personnel in the initial installation and guides the establishment of user authentication as mentioned in the "Pre-Installation Checklist" on page 84.

4. Click **Connect**.
5. In the **Instrument** box, select the specific ReactIR 247 instrument that you want to work with.

Next Steps

At this point, the ReactIR 247 installation is completed. The next step is to perform operational and functional tests by following the procedures in Chapter 5, "Operation."

Next Steps

5

Operation

This chapter provides instruction on how to test the ReactIR 247 installation by the following operational procedures:

- "Preparing for ReactIR 247 Operational Tests" on page 55
- "Starting the ReactIR 247 System" on page 57
- "Conducting Operational Tests Using iC Process" on page 59
- "Conducting Operational Tests Using iC IR" on page 67
- "Next Steps" on page 78

Operational tests can also be performed periodically, according to your standard operating procedure.

To facilitate rapid completion of operation testing at the time of installation, use a copy of the "ReactIR 247 Operational Qualification (OQ)" on page 86. If the installation is under EQPac service, see note below.

Note: **EQPac for Regulatory Environments**—For installation in hazardous area locations under regulatory control or for advanced validation, use the METTLER TOLEDO Equipment Qualification Package (EQPac, QA-VL-0011-AC, P/N:14696522). This service package, sold separately, provides comprehensive details to meet the requirements for installing ReactIR 247 in a Class I/Division 1 (NRTL) or Zone 1 (ATEX) environment.

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

Preparing for ReactIR 247 Operational Tests

Upon completion of the system installation, a METTLER TOLEDO AutoChem Field Service Engineer will go through the "ReactIR 247 Operational Qualification (OQ)" (form is on page 86) or the EQPac expanded service for operational qualification.

Note: Please follow the test procedures completely to ensure the correct results.

Acceptance Criteria

In the absence of EQPac service qualification, the "ReactIR 247 Operational Qualification (OQ)" (see form on page 86) requires approval signatures from the METTLER TOLEDO AutoChem Field Service Engineer and your Company Project Leader after completion of the checklist procedures. The ReactIR 247 warranty and service contracts officially start at this point.

Note: Place the signed Operational Qualification checklist in a readily accessible location for reference during system service or maintenance.

In EQPac service installations, the package described on page 55, includes several documents that require approval signatures from the METTLER TOLEDO Field Service Engineer and your Company Project Leader.

Definitions

The operational checks use the following terminology:

Administrator role is a system administrator access level with permissions to add and configure instruments and define and approve process methods.

Operator role is a user access to start/stop or pause/resume a batch or continuous process after selecting an approved method. An operator can view the status of the ReactIR 247 and process variables, but may not alter these.

Technician role is a user access to all the actions that an Administrator can perform regarding an instrument, with no access to create or approve methods. Technicians can access the Service submenu to perform Contrast, Stability, and Performance tests for an instrument.

iC Process is the Web application software on a control computer that enables a user to monitor real-time process chemistry and review the status of the diagnostics and process variables on the ReactIR 247.

iC IR is the software that enables a user to monitor real-time chemistry in a lab with capabilities to analyze and review the result sets.

Sampling Technology is the type of sensor and conduit combination placed on the system (see "ReactIR 247 Sampling Technology Configurations" on page 17).

Signal-to-Noise Ratio (SNR) is a measure of ReactIR 247 base unit performance. This value represents a specific method of measurement at METTLER TOLEDO that historically defines performance according to the original design specification.

Acetone Peak Height (Acetone Absorbance) is another measure of ReactIR 247 performance. This value indicates sensor integrity in the Sentinel probe by measuring the absorbance of neat acetone with your sampling technology.

Acetone-to-Noise Ratio (ANR) is a holistic measurement of ReactIR 247 performance through a calculation using Signal-to-Noise and Acetone Peak Height. Knowing the energy throughput of the system (Signal-to-Noise) and sensor path length (Acetone Peak Height), we can calculate a value that best represents the performance across all ReactIR 247 base units and applicable sampling technology. What the value actually provides is assurance of chemistry monitoring that affords detection of reaction start, progress, and end-point. Infrared fingerprints (data) over time will yield absorbance trends of key reaction species (information) at concentrations possible with the ANR value. The higher the ANR, the lower the detection limit of the ReactIR 247. You can purchase a variety of sampling technologies for attaining an ANR that fits the concentration levels to monitor in your chemistry.

Preparing the ReactIR 247 Instrument

ReactIR 247 can operate using iC IR software in a laboratory environment or iC Process combined with iC IR in a campaign or production environment. Instructions for checking operation are separated, based on which software you are using to control the instrument.

"Conducting Operational Tests Using iC Process" on page 59

"Conducting Operational Tests Using iC IR" on page 67

Note: If you plan to run operational tests using the software that is **not** currently controlling the ReactIR 247 instrument, you must change the control to the software of choice. See instructions under "Switching Control Software" on page 91.

Starting the ReactIR 247 System

1. Ensure the Installation Qualification checklist (page 85) or the EQPac expanded qualification is complete.
2. Verify that air is supplied to sampling technology, if applicable.
3. Apply power to the ReactIR 247 instrument.

   Note: Allow four (4) hours for the instrument electronics to warm up before taking critical measurements.

4. Turn on the remote computer and start the iC Process software.
5. Verify that the Power LED (indicator 1 in Figure 5-1) on the front of the instrument is lit and the color is green.
   - Solid amber—Instrument is powered on, without network communication
   - Solid green—Instrument is powered on, with network communication established
6. Verify the Scan light is blinking and the Fault light is NOT illuminated, indicating all functions are operational.

ReactIR 247 LED Indicators

Three LED indicators on the face of the ReactIR 247 instrument communicate the state of the instrument as it relates to power/communication, scanning, and faults. Frequent check of these indicators enables recognition of instrument conditions that may require attention to assure measurement accuracy (see Figure 5-1). A fully functional instrument will yield solid green Power/TCIP and blinking green Scan indicators, with no illumination of the Fault indicator.

Figure 5-1 ReactIR 247 LED Indicators (fully functional state)

Table 5-1 ReactIR 247 LED Indicators

LED		State	Description
1	Power / TCIP	**OFF**	ReactIR 247 is without power.
		Amber—Blinking (500ms ON–500ms OFF)	Ethernet interface active using factory defaults; connection not established.
		Amber—Solid	System on, but no network module found.
		Green—Blinking (500ms ON–500ms OFF)	Ethernet interface active; connection not established.
		Green—Solid	Network link (Ethernet) established.
2	Scan	**Amber**	System not scanning
		Green—Blinking	System is ready to scan, but in idle mode between scans.
		Green—Solid	System is scanning and sending data to software application.
3	Fault	**OFF**	No faults and system is communicating with software application.
		Amber—Solid	No communication with software application.
		Red—Solid	System fault of one or more hardware components.

LED states that are highlighted in Table 5-1, above, indicate a fully operational system.

Conducting Operational Tests Using iC Process

If the ReactIR 247 is solely controlled by iC Process software, use the procedures in this section. If iC IR is the control software, follow the instructions under "Conducting Operational Tests Using iC IR" on page 67.

Perform operational tests in the following sequence:

"1. Check Alignment" on page 59

"2. Check System Performance" on page 61

"3. Check System Stability" on page 65

1. Check Alignment

Note: If you use iC IR to control the ReactIR 247 instrument and you want to run the operational tests using iC Process, an Administrator must change control of the instrument (see instructions on page 94).

This procedure requires the Administrator or Technician role in iC Process.

1. Select instrument.
2. Enter Service Mode by clicking the service icon.

Figure 5-2 Service Mode button on main iC Process window

3. Select **Service** from the left navigation frame. (The Service submenu only appears for user IDs that have the Administrator or Technician authorization.)
4. Keep the default **Contrast** test option from the Service drop-down list.

5. Click **Start Contrast**. Contrast, Peak Height, and Peak Location values appear as the test proceeds.

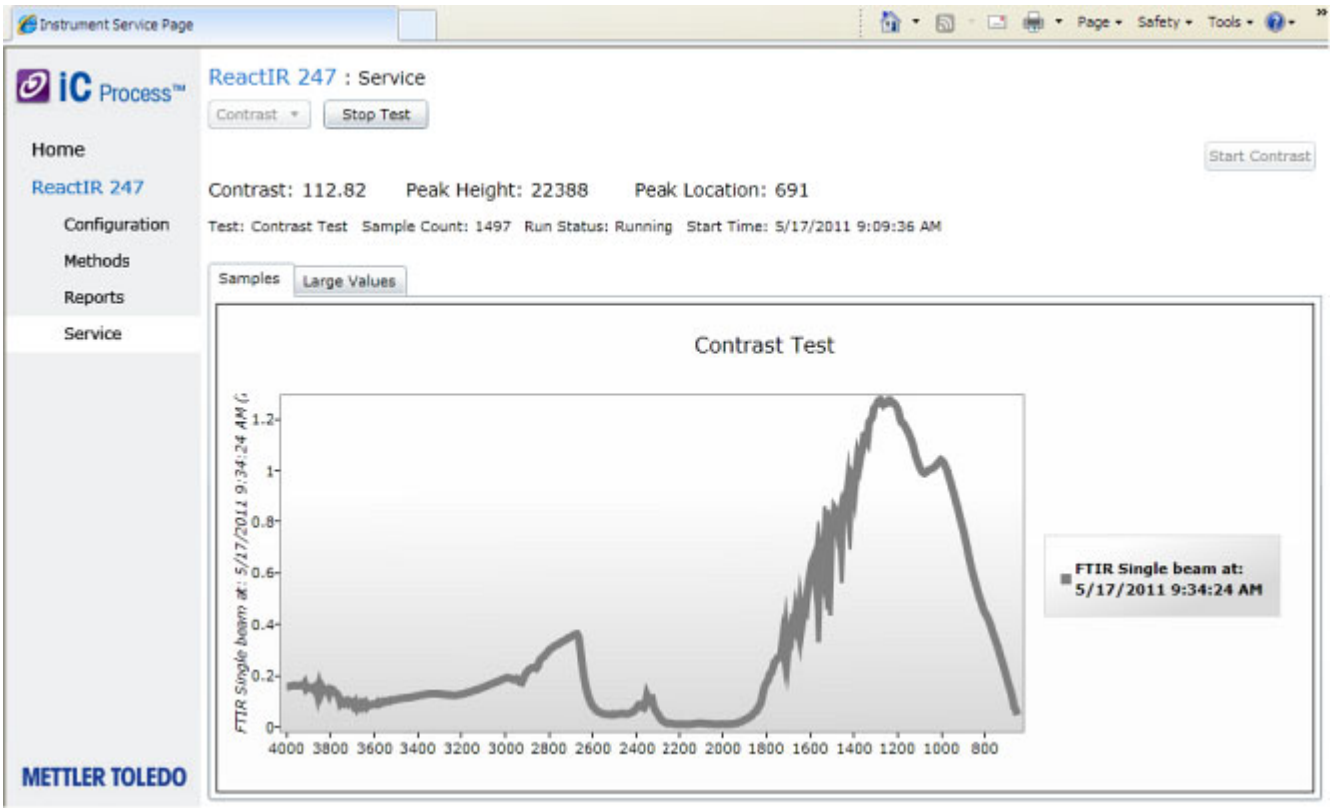


Figure 5-3 Contrast, peak height, and peak location in iC Process

6. To view specific values, select the Large Values tab.

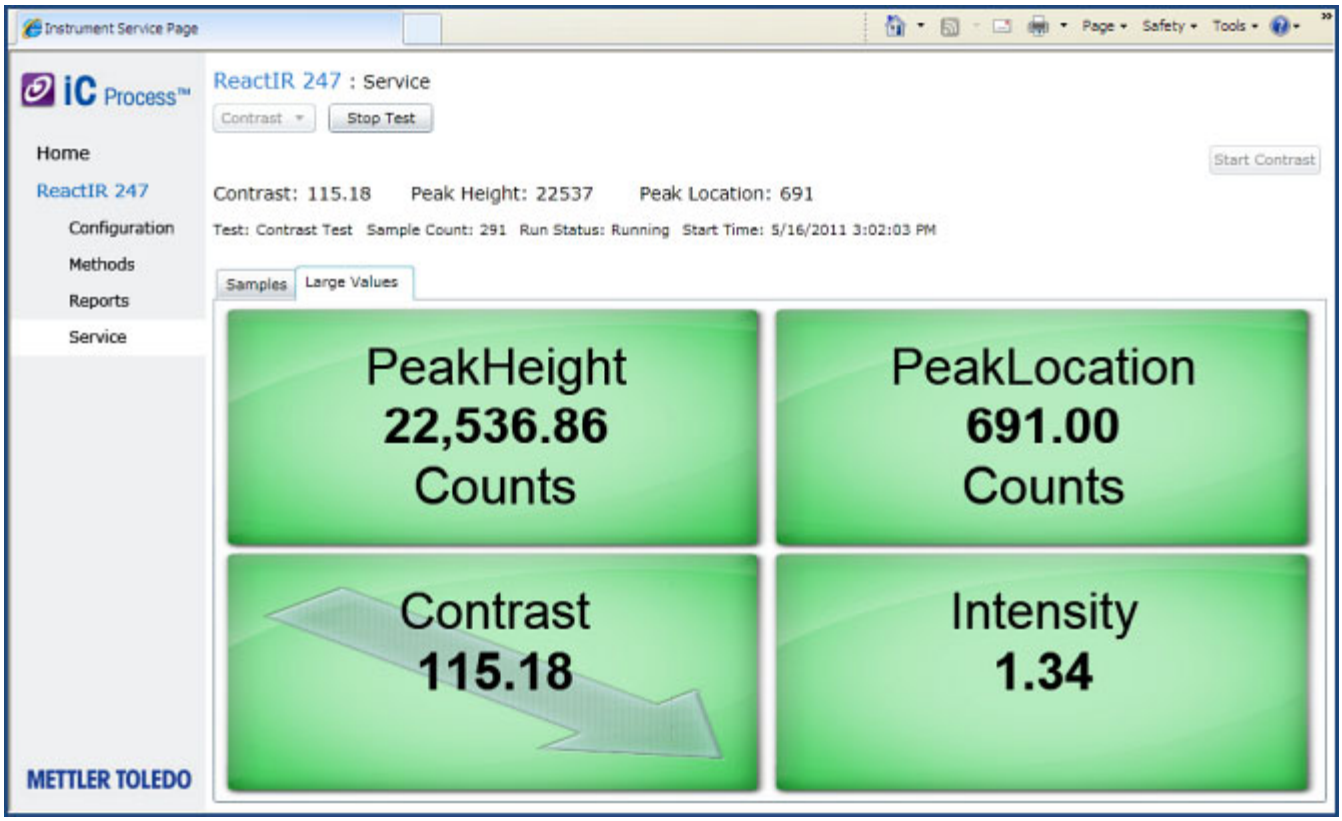


Figure 5-4 Contrast Test—Large Values

7. Adjust alignment of sampling technology, if applicable, to maximize contrast and peak height.
8. Record peak height and contrast test values in Operational Qualification form (page 86) or appropriate EQPac section.

2. Check System Performance

Note: If you use iC IR to control the ReactIR 247 instrument and you want to run the operational tests using iC Process, an Administrator must change control of the instrument (see instructions on page 94).

ReactIR 247 system performance is a combination of the following tests (see definitions on page 56):

- "Signal-to-Noise Ratio (SNR)" on page 70
- "Acetone Peak Height" on page 73
- "Acetone-to-Noise Ratio (ANR)" on page 65

Signal-to-Noise Ratio (SNR)

This procedure requires the Administrator or Technician role in iC Process.

1. Select instrument from the iC Process HOME page.
2. Enter Service Mode by clicking the service icon.

Figure 5-5 Service Mode button on main iC Process window

3. Select **Service** from the left navigation frame.
4. Select **Performance** from the Service drop-down list.
5. Enter ten (**10**) for the Number of Runs.
6. Check the box for 'Run ANR.'
7. Click **Start Performance Test**.
   The Performance Test shows sample spectrum.

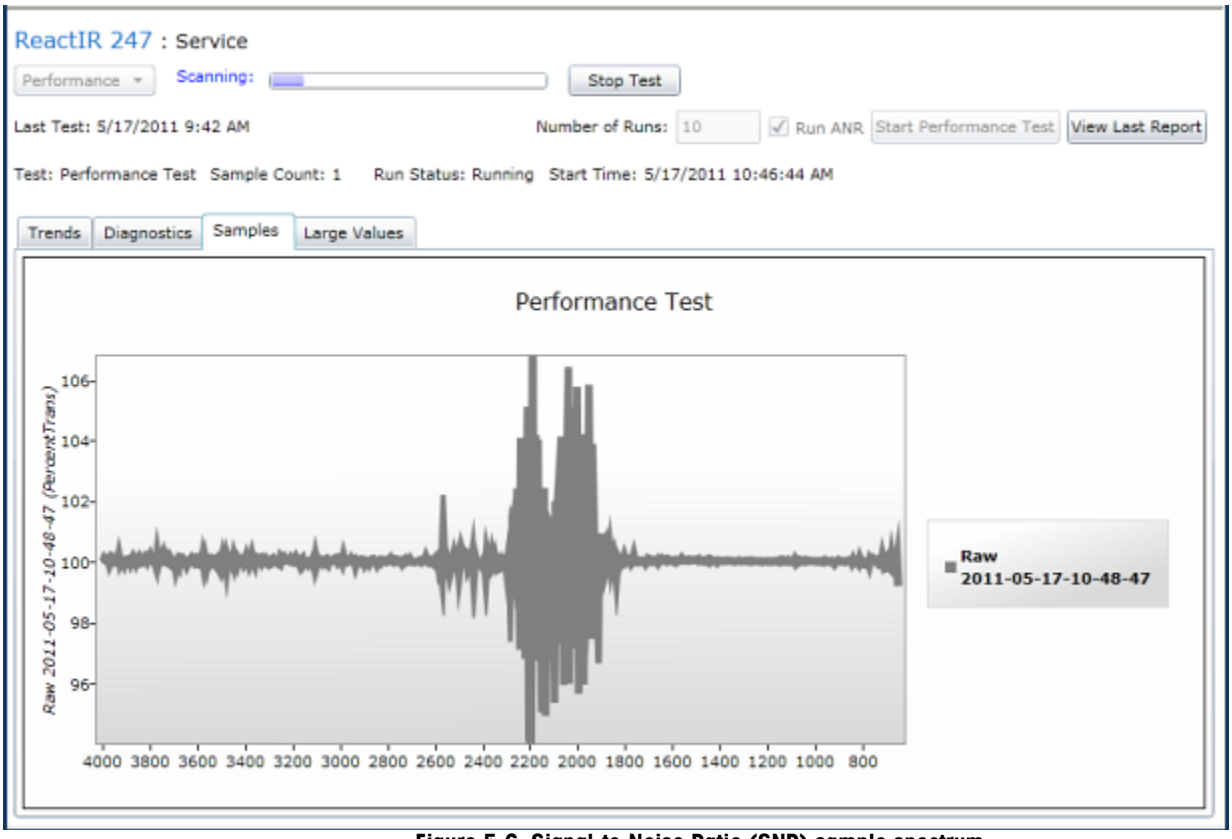


Figure 5-6 Signal-to-Noise Ratio (SNR) sample spectrum

8. Wait for test to complete.
9. Click the Large Values tab and check the results.

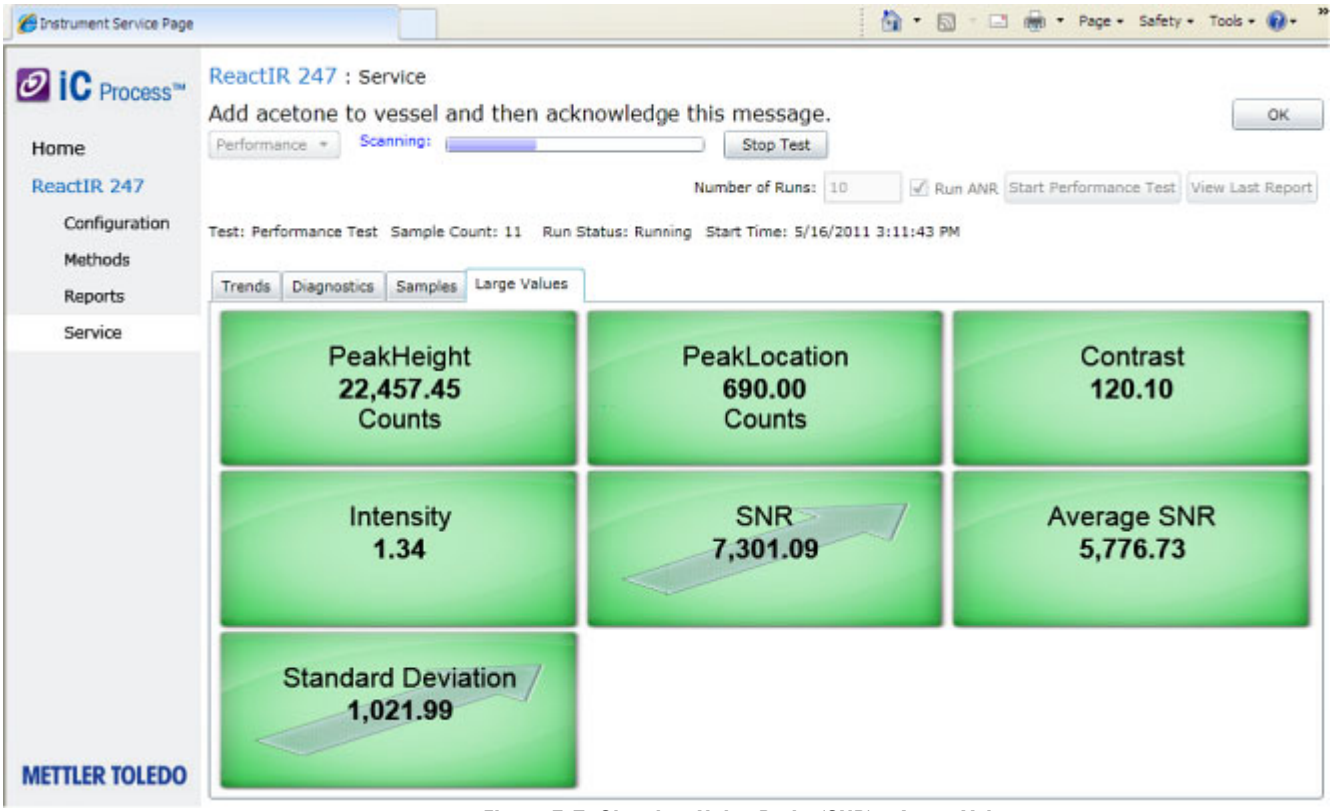


Figure 5-7 Signal-to-Noise Ratio (SNR)—Large Values

10. Record instrument Average Signal-to-Noise (SNR) performance test value in Operational Qualification form (page 86) or appropriate section in EQPac.
11. If the Average SNR is greater than the factory specification in Table 5-2, mark the SNR check box on the "ReactIR 247 Operational Qualification (OQ)" (page 86), and proceed to Acetone Peak Height test.

Table 5-2 Signal-to-Noise (SNR) Factory Specifications

Sampling Technology	Factory Specification—Average SNR Greater Than:
DiComp 25mm (1″) K4	**2500**
DiComp 25mm (1″) Direct Optical Conduit	**2500**
DiComp 102cm (40") Sentinel Direct Optical Conduit	**2500**
SiComp 102cm (40") Sentinel Direct Optical Conduit	**2500**
SiComp 25mm (1″) K4	**2500**
SiComp 25mm (1′) Direct Optical Conduit	**2500**
Special	**See Factory Test Records**

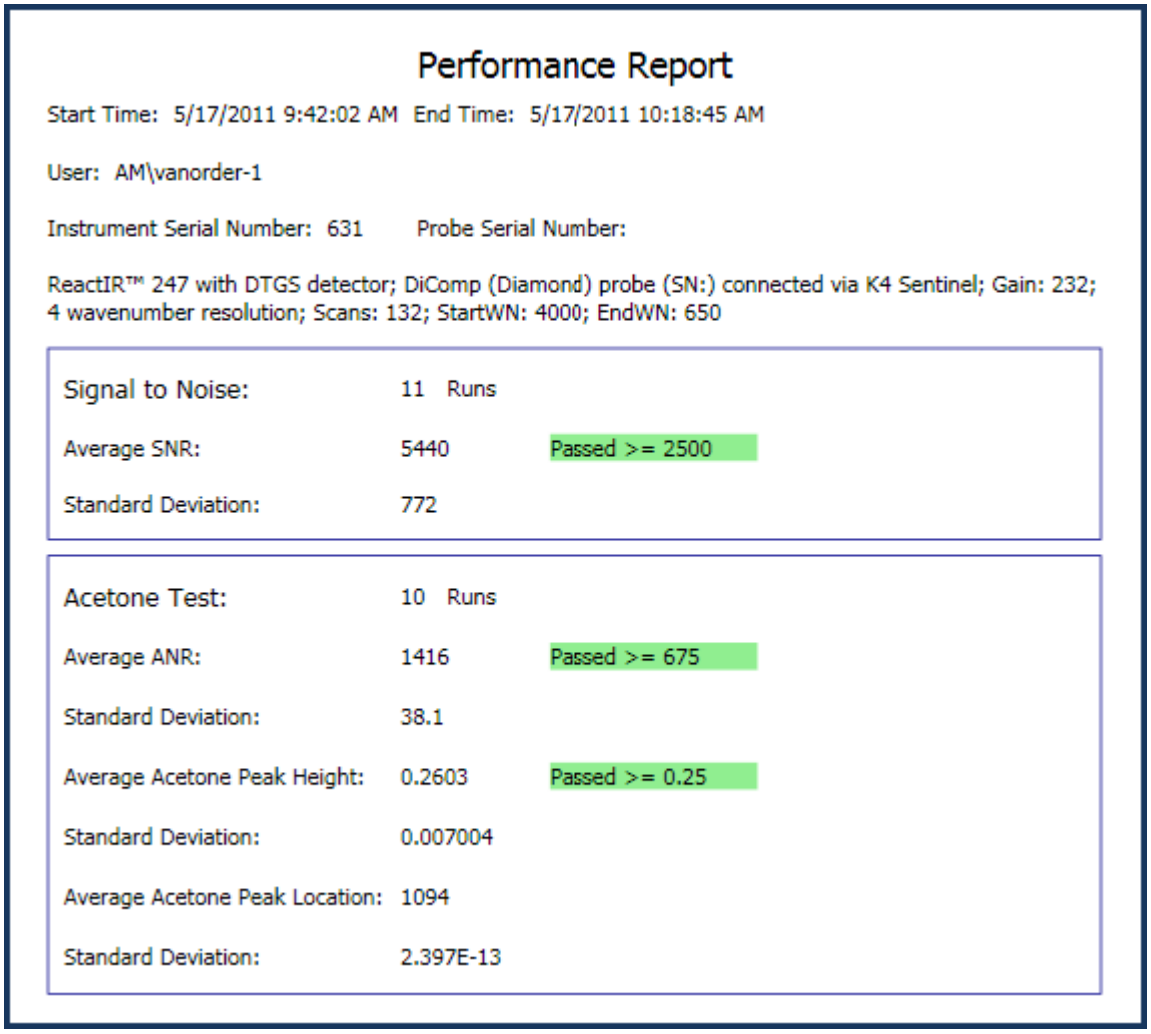
Acetone Peak Height

The Acetone Peak Height test checks sampling technology performance by measuring the peak height with acetone on the sensor. After the SNR test completes, the software prompts you to add acetone for the absorbance test.

1. Place acetone on the sampling technology sensor after the "Add acetone to vessel and then acknowledge this message."
2. Click **OK** and allow test to complete.

   Note: The Large Values remain for one minute following completion of the acetone test. View the Performance Test report (step 3).

3. Click **View Last Report**.



Performance Report

Start Time: 5/17/2011 9:42:02 AM End Time: 5/17/2011 10:18:45 AM

User: AM\vanorder-1

Instrument Serial Number: 631 Probe Serial Number:

ReactIR™ 247 with DTGS detector; DiComp (Diamond) probe (SN:) connected via K4 Sentinel; Gain: 232; 4 wavenumber resolution; Scans: 132; StartWN: 4000; EndWN: 650

Signal to Noise:	11 Runs	
Average SNR:	5440	Passed >= 2500
Standard Deviation:	772	

Acetone Test:	10 Runs	
Average ANR:	1416	Passed >= 675
Standard Deviation:	38.1	
Average Acetone Peak Height:	0.2603	Passed >= 0.25
Standard Deviation:	0.007004	
Average Acetone Peak Location:	1094	
Standard Deviation:	2.397E-13	

Figure 5-8 Performance report with acetone test

4. Check the results in the report against the following factory specification criteria for your sampling technology:

Table 5-3 Acetone Peak Height Criteria

Sampling Technology	Acetone Peak Height Greater than: or equal to
DiComp 25mm (1″) K4	**0.23**
DiComp 25mm (1″) Direct Optical Conduit	**0.23**
DiComp 102cm (40") Sentinel Direct Optical Conduit	**0.23**
SiComp 102cm (40") Sentinel Direct Optical Conduit	**0.23**
SiComp 25mm (1″) K4	**0.23**
SiComp 25mm (1″) Direct Optical Conduit	**0.23**

5. Record the average Acetone Peak Height (Acetone Absorbance) in the OQ form or the appropriate section of the EQPac.
6. If the Peak Height is equal to or greater than the factory specification in the "Acetone Peak Height Greater than or equal to" column in Table 5-3, mark the Acetone Peak Height check box on the "ReactIR 247 Operational Qualification (OQ)" (page 86).

Note: Acetone Noise Ratio (ANR) is the product of SNR and Acetone Peak Height. For reference purposes, an ANR of approximately 1200 indicates a detection limit of approximately 0.1 wt% for a moderate infrared absorbance feature specific to your reactant or product.

Acetone-to-Noise Ratio (ANR)

ANR is an automatic calculation in the software using the following formula:

(Acetone Peak Height) x (Signal to Noise) = ANR

From the Performance Report (Figure 5-8), record the **Average ANR** value in the Functional Testing section of the "ReactIR 247 Operational Qualification (OQ)" form or the appropriate section of the EQPac.

3. Check System Stability

Note: If you use iC IR to control the ReactIR 247 instrument and you want to run the operational tests using iC Process, an Administrator must change control of the instrument (see instructions on page 94).

Prior to checking stability, ensure that the ReactIR 247 was powered for at least four (4) hours. The Power and Scan LEDs should be green, indicating a fully operational state (see "ReactIR 247 LED Indicators" on page 58).

This procedure requires the Administrator or Technician role in iC Process.

1. From the iC Process Home page, select the ReactIR 247 instrument.
2. Enter Service mode by clicking the service icon.

Figure 5-9 Service mode button on main iC Process window

3. Select **Service** from the left navigation frame. (The Service submenu only appears for user IDs that have the Administrator or Technician authorization.)
4. Select **Stability** from the Service drop-down list.
5. Enter the following settings (in minutes):
   Duration: **240**
   Interval: **1**
6. Click **Start Stability**.
7. Select the Large Values tab to observe the values during the test.

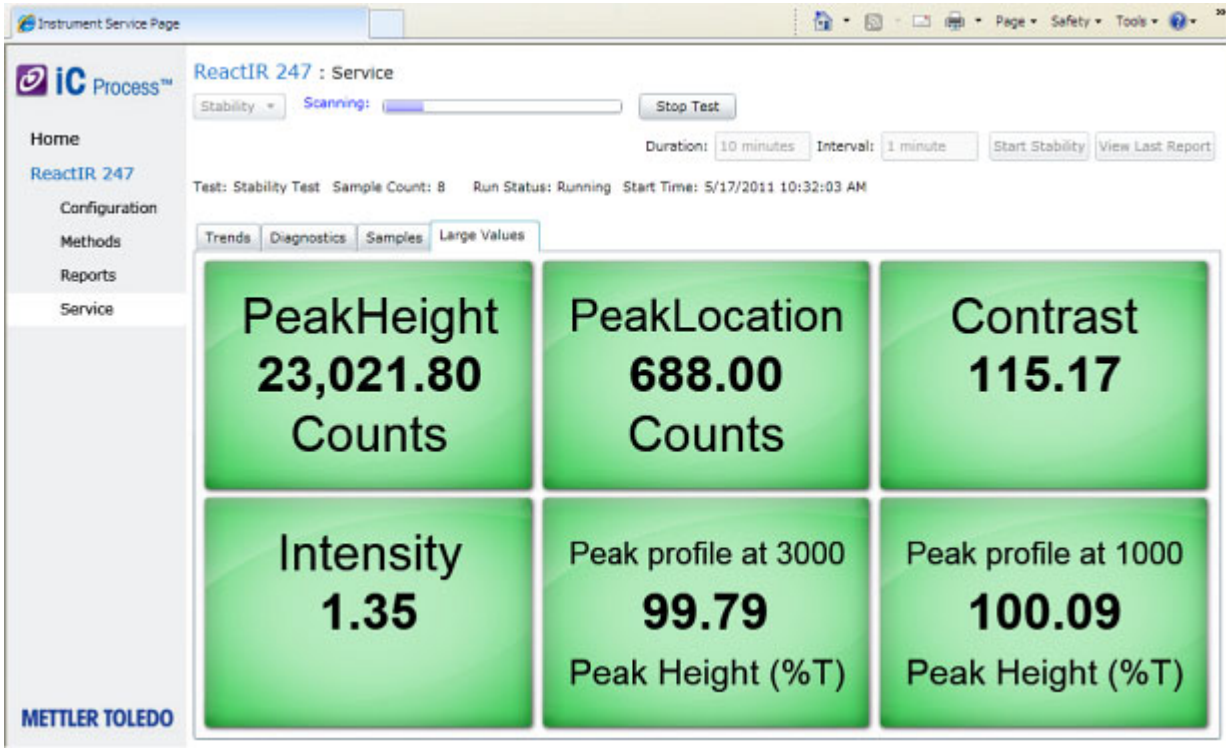
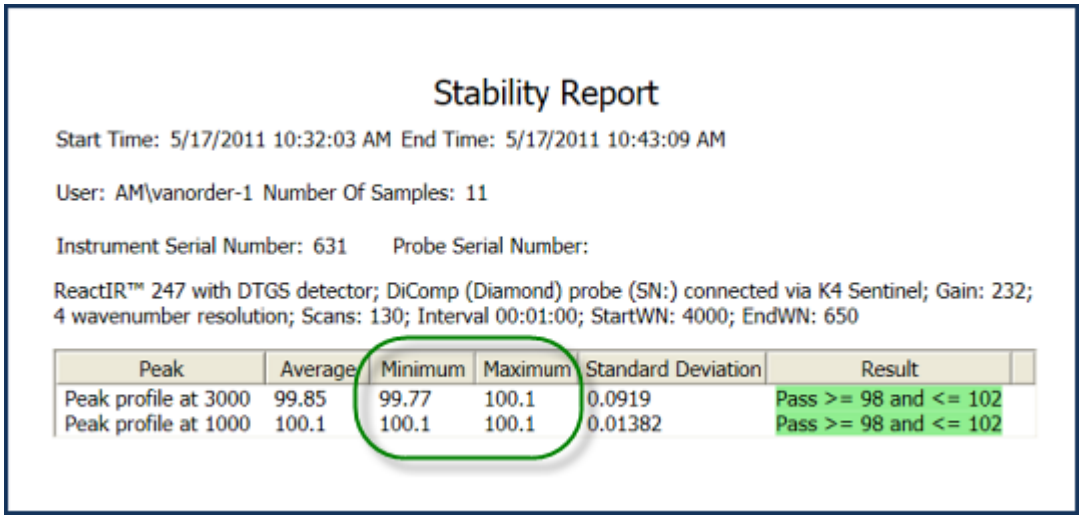


Figure 5-10 Stability test—Large Values

8. Wait for test to complete and click **View Last Report**.



Stability Report

Start Time: 5/17/2011 10:32:03 AM End Time: 5/17/2011 10:43:09 AM

User: AM\vanorder-1 Number Of Samples: 11

Instrument Serial Number: 631 Probe Serial Number:

ReactIR™ 247 with DTGS detector; DiComp (Diamond) probe (SN:) connected via K4 Sentinel; Gain: 232; 4 wavenumber resolution; Scans: 130; Interval 00:01:00; StartWN: 4000; EndWN: 650

Peak	Average	Minimum	Maximum	Standard Deviation	Result
Peak profile at 3000	99.85	99.77	100.1	0.0919	Pass >= 98 and <= 102
Peak profile at 1000	100.1	100.1	100.1	0.01382	Pass >= 98 and <= 102

Figure 5-11 Stability report

9. Record the Minimum and Maximum %T values for each peak in the OQ form (page 86) or the appropriate section in the EQPac.
10. Check the box on the OQ form if the report shows a 'pass' result.

Conducting Operational Tests Using iC IR

If the ReactIR 247 is solely controlled by iC IR software use the procedures in this section. If iC Process is the control software, follow the instructions under "Conducting Operational Tests Using iC Process" on page 59.

Perform operational tests in the following sequence:

"1. Check Alignment" on page 67

"2. Check System Performance" on page 69

"3. Check System Stability" on page 75

1. Check Alignment

Note: If you use iC Process to control the ReactIR 247 instrument and you want to run the operational tests using iC IR, an Administrator must change control of the instrument (see instructions on page 92).

1. Select the **Test Instrument** task pane from the iC IR Toolbox.

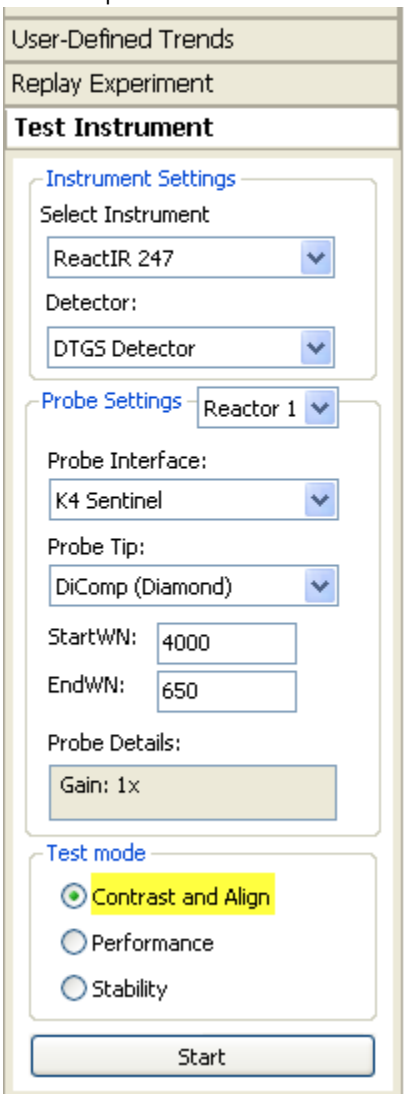


Figure 5-12 Contrast and Align test from iC IR Test Instrument task pane

2. Select appropriate Instrument and Detector.
3. Select applicable Probe Settings.
4. Select **Contrast and Align** from the Test mode section (Figure 5-12).

5. Click **Start**. Align window opens showing contrast, peak height, and peak location.

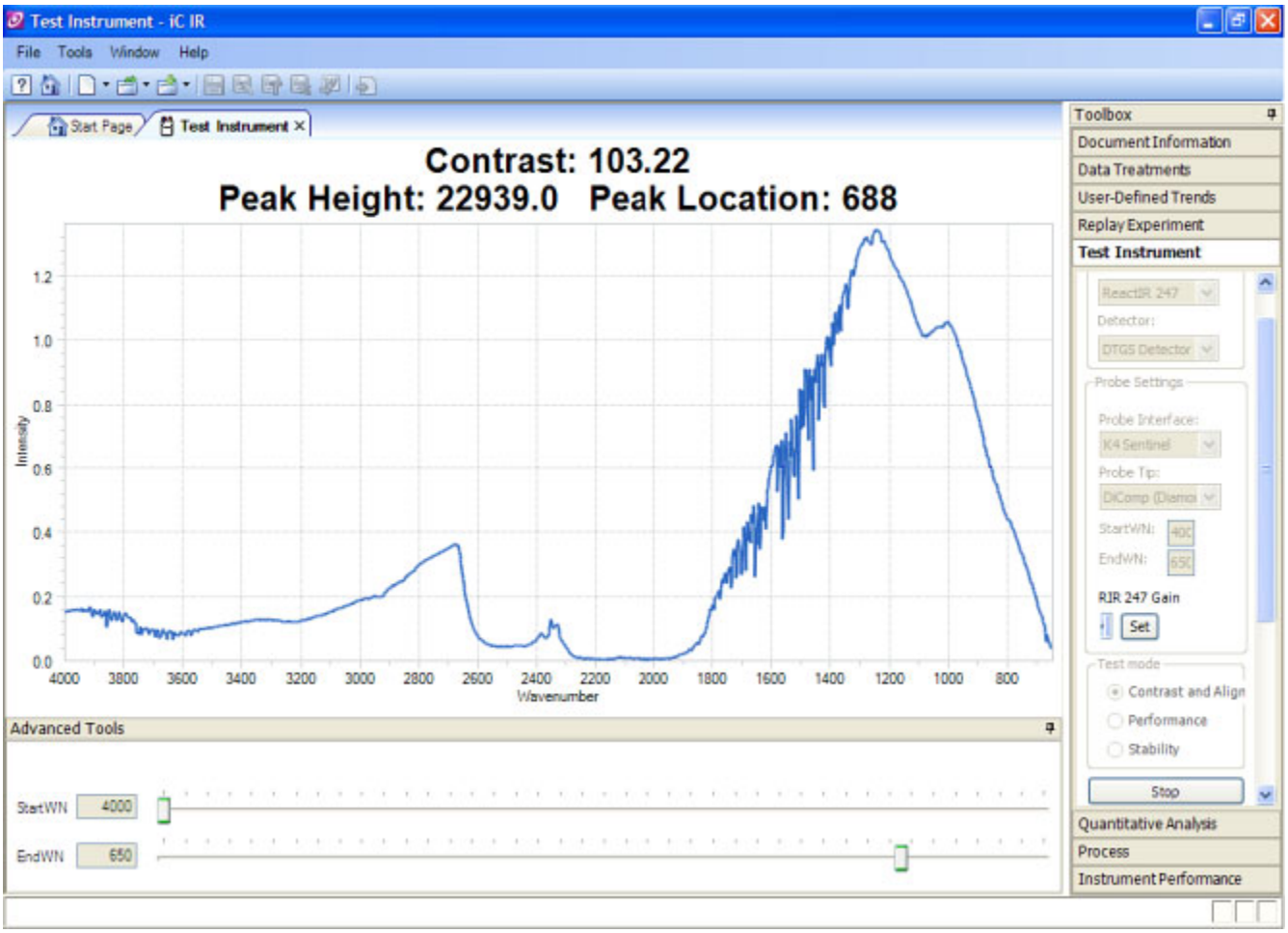


Figure 5-13 Contrast, peak height, and peak location in iC IR

6. Adjust alignment of sampling technology, if applicable, to maximize contrast and peak height.
7. Record peak height and contrast test values in Operational Qualification form (see page 86).

2. Check System Performance

Note:	If you use iC Process to control the ReactIR 247 instrument and you want to run the operational tests using iC IR, an Administrator must change control of the instrument (see instructions on page 92).

ReactIR 247 system performance is a combination of the following tests (see definitions on page 56):

- "Signal-to-Noise Ratio (SNR)" on page 70
- "Acetone Peak Height" on page 73
- "Acetone-to-Noise Ratio (ANR)" on page 65

Signal-to-Noise Ratio (SNR)

1. Ensure the sensor is clean and dry, and void of any potential contact with solvent or reaction mixture.
2. Select the **Test Instrument** task pane from the Toolbox.

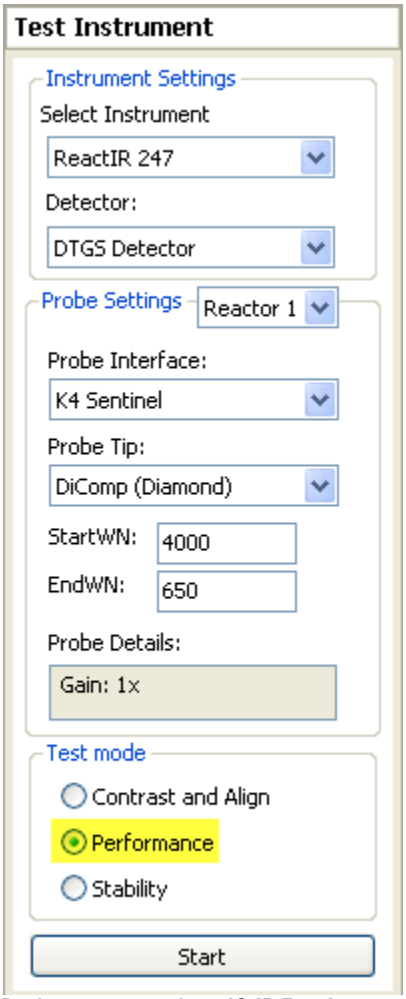
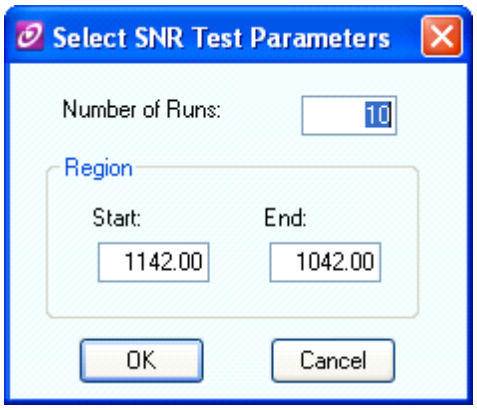


Figure 5-14 Performance test from iC IR Test Instrument task pane

3. Select appropriate Instrument and Detector.
4. Select applicable Probe Settings.

5. Select **Performance** from the Test mode section (Figure 5-14).
6. Click **Start**.
7. Enter **10** as the number of runs.



8. Click **OK**.
   The Performance test window opens to display trend chart and values.The system will collect 10 background / sample pairs. The parameters used for collection are 1 minute scan time and 4 cm^{-1} resolution.

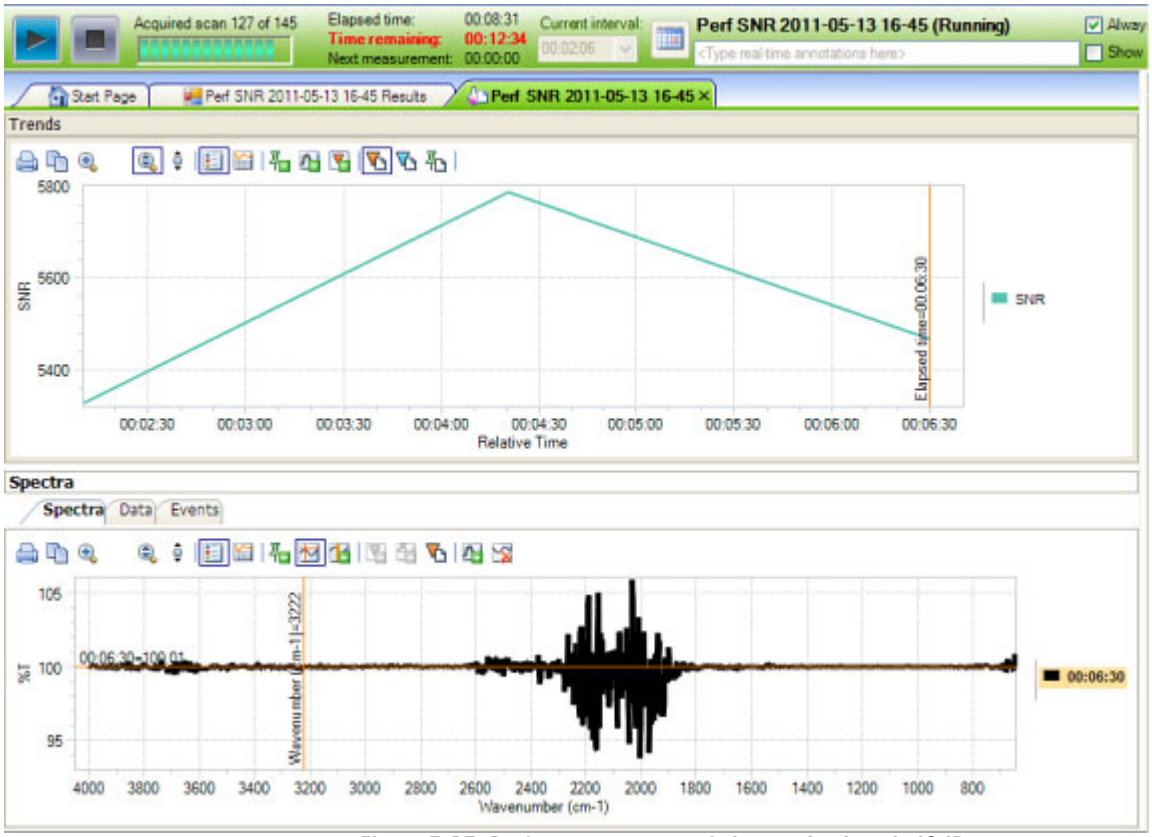


Figure 5-15 Performance test trend chart and values in iC IR

9. Wait for test to complete.
10. Record the Average SNR in the 'Functional Testing' section of the "ReactIR 247 Operational Qualification (OQ)". The value is found in the 'Perf SNR' tab.

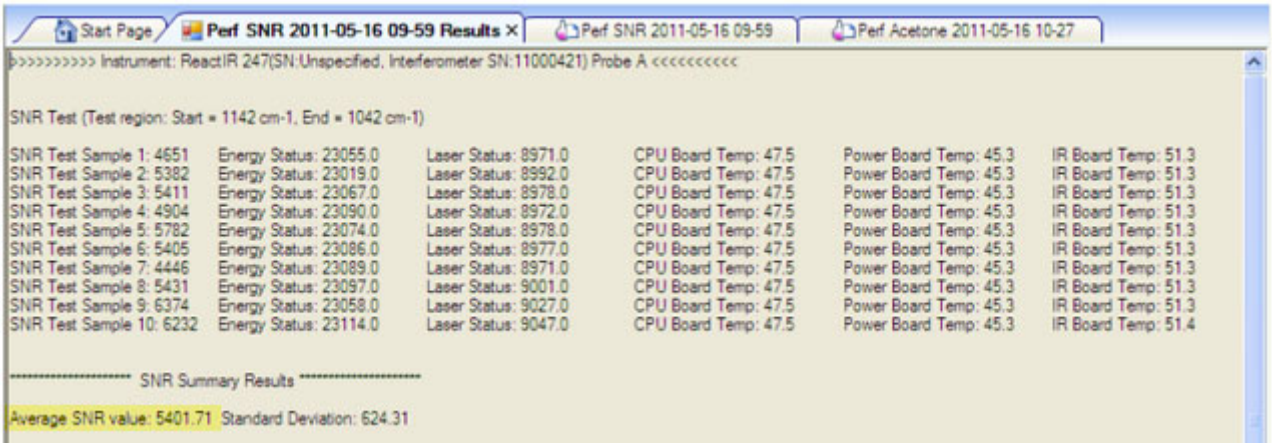


Figure 5-16 Performance test results—SNR

11. Check the results against the following factory specification criteria for your sampling technology:

Table 5-4 Signal-to-Noise (SNR) Factory Specifications

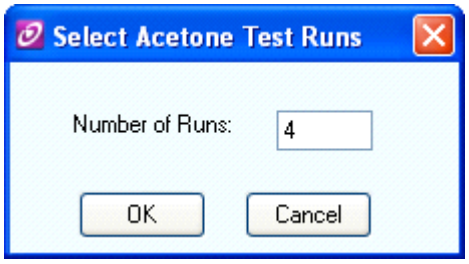
Sampling Technology	Factory Specification—SNR Greater Than:
DiComp 25mm (1″) K4	**2500**
DiComp 25mm (1″) Direct Optical Conduit	**2500**
DiComp 102cm (40") Sentinel Direct Optical Conduit	**2500**
SiComp 102cm (40") Sentinel Direct Optical Conduit	**2500**
SiComp 25mm (1″) K4	**2500**
SiComp 25mm (1″) Direct Optical Conduit	**2500**
Special	**See Factory Test Records**

12. Mark the SNR box in the operational qualification form if the measured value is greater than the acceptable value in Table 5-4.
13. Proceed to Acetone Peak Height test.

Acetone Peak Height

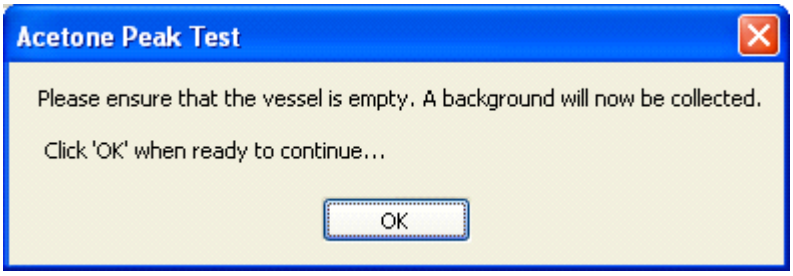
The Select Acetone Test Runs window will appear immediately following completion of the SNR test. The Acetone Peak Height test checks sampling technology performance by measuring the peak height with acetone on the sensor.

1. Enter **4** in the number field for the number of tests.

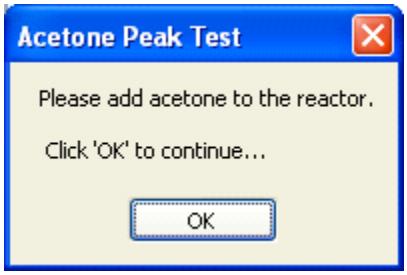


This step instructs the system to collect four acetone spectra.

2. Ensure the sensor is clean and dry. Take note of the precaution in the Acetone Peak Test window.



3. Click **OK**. Wait until the background is collected and the following message appears.



4. Dip the probe into a vessel, vial, or beaker that contains neat acetone. Make sure the liquid completely covers the sensor surface.
5. Select **OK**.

The system will collect the requested number of acetone spectra.

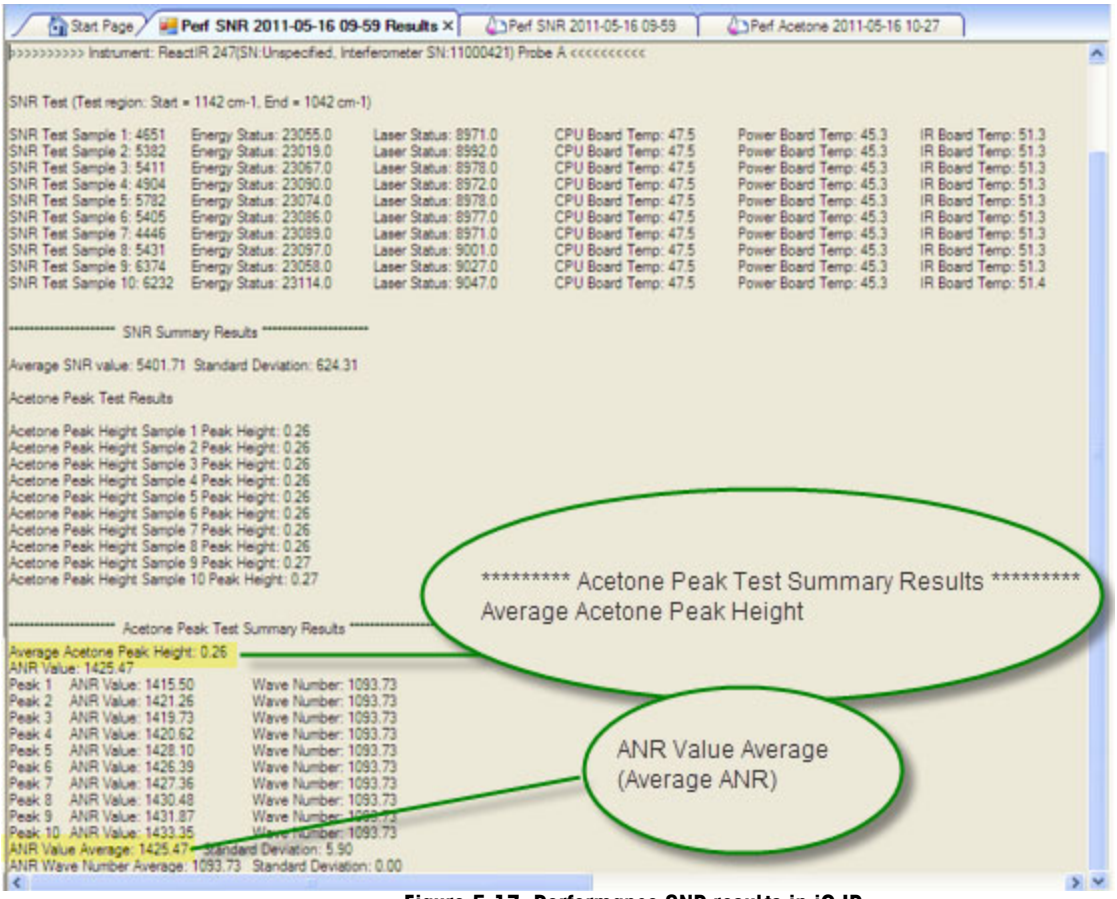


Figure 5-17 Performance SNR results in iC IR

6. Record the **Average Acetone Peak Height** and **Average ANR** in the 'Functional Testing' section of the Operational Qualification form (see page 86).
7. Check the Average Acetone Peak Height results against the following criteria for your sampling technology:

Table 5-5 Acetone Peak Height Criteria

Sampling Technology	Acetone Peak Height Greater than or equal to:
DiComp 25mm (1″) K4	**0.23**
DiComp 25mm (1″) Direct Optical Conduit	**0.23**
DiComp 102cm (40") Sentinel Direct Optical Conduit	**0.23**
SiComp 102cm (40") Sentinel Direct Optical Conduit	**0.23**
SiComp 25mm (1″) K4	**0.23**
SiComp 25mm (1′) Direct Optical Conduit	**0.23**

8. If the Peak Height is equal to or greater than the factory specification in the "Acetone Peak Height Greater than or equal to" column (Table 5-5), mark the Acetone Peak Height check box on the "ReactIR 247 Operational Qualification (OQ)" (see page 86).

> **Note:** Acetone-to-Noise Ratio (ANR) is the product of SNR and Acetone Peak Height. For reference purposes, an ANR of approximately 1200 indicates a detection limit of approximately 0.1 wt% for a moderate infrared absorbance feature specific to your reactant or product.

3. Check System Stability

> **Note:** If you use iC Process to control the ReactIR 247 instrument and you want to run the operational tests using iC IR, an Administrator must change control of the instrument (see instructions on page 92).

Prior to checking stability, ensure the ReactIR 247 was powered for at least four (4) hours. The Power and Scan LEDs should be green, indicating a fully operational state (see "ReactIR 247 LED Indicators" on page 58). If the LED lights show anything other than fully functional do not proceed. Contact METTLER TOLEDO Customer Care using the information page 9.

1. Select the **Test Instrument** task pane from the iC IR Toolbox.

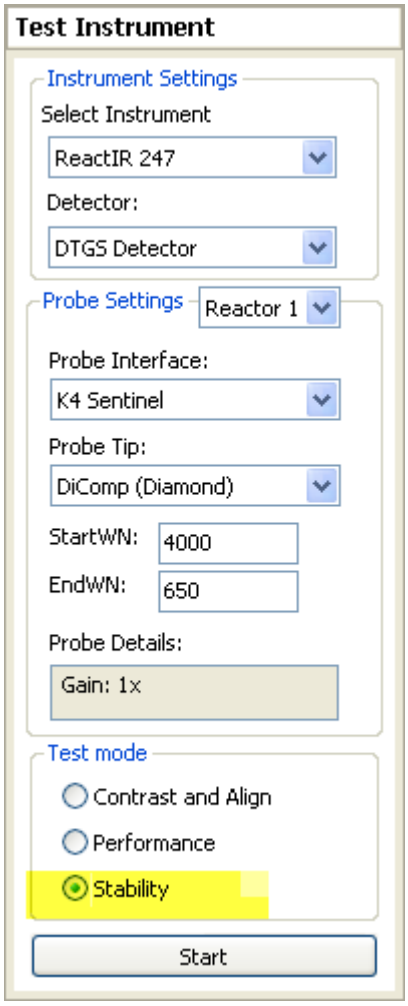


Figure 5-18 Stability test from iC IR Test Instrument task pane

2. Select appropriate Instrument and Detector.
3. Select applicable Probe Settings.
4. Select **Stability** from the Test mode section (Figure 5-18).
5. Click **Start**.

The window shows entry for Duration and Interval.

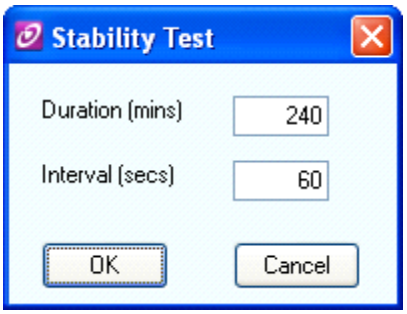


Figure 5-19 Stability test duration and interval entries

6. Enter **240** minutes in the Duration field and **60** in the Interval field.
   These parameters correspond to a 240-minute test that collects a spectrum every 60 seconds.
7. Click **OK** in the Stability window.
   The stability test starts by collecting a background and then successive sample spectra over the 240-minute period. The software automatically measures and plots the %Transmittance value at the wavenumbers that correspond to the sampling technology.
8. Wait for the test to complete.

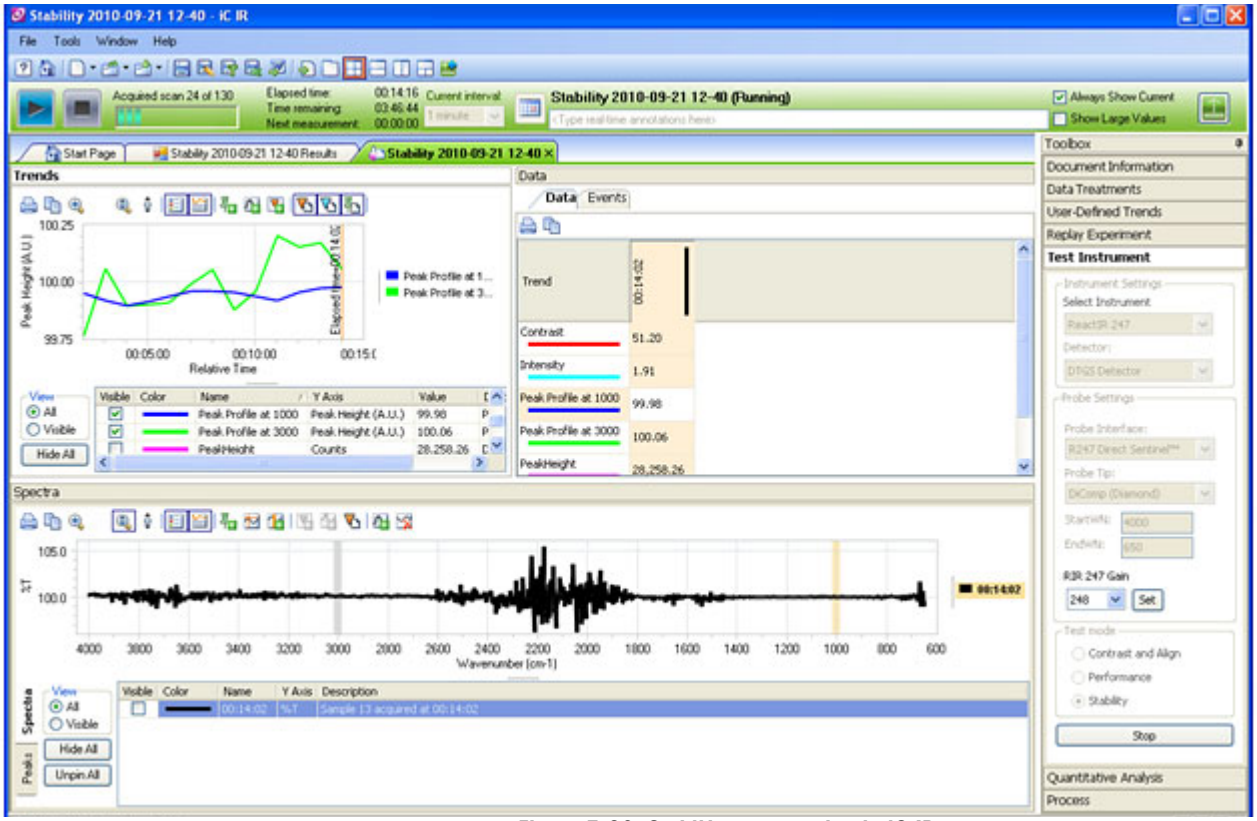


Figure 5-20 Stability test running in iC IR

9. Record the **minimum** and **maximum** %Transmittance (%T) values for each peak in the "ReactIR 247 Operational Qualification (OQ)" form at the conclusion of the test. The values appear in the 'Stability Test Results' tab under ******Summary Results******. Pass criteria is **plus/minus 3%T**.

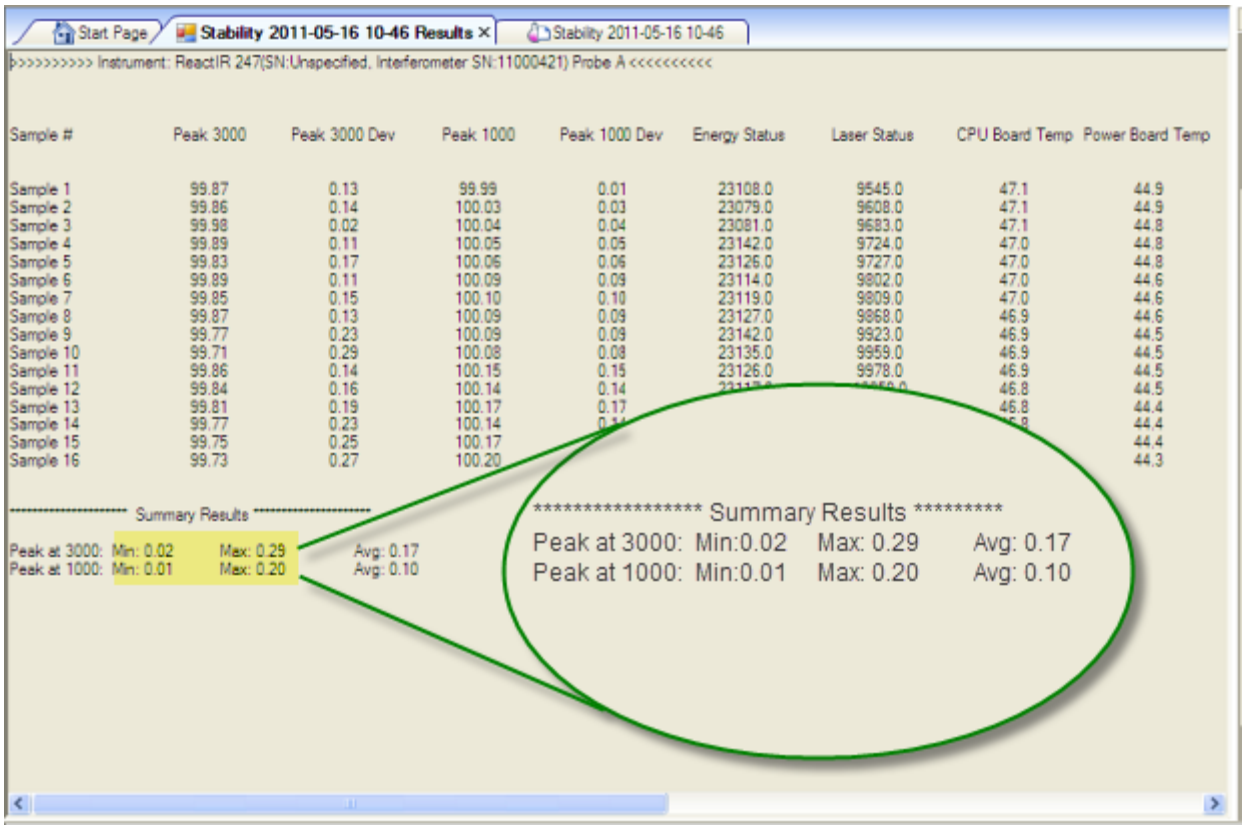


Figure 5-21 Stability test result summary in iC IR

Next Steps

At this point, you have completed the operational checks for a ReactIR 247 installation. Complete the signatures on the "ReactIR 247 Operational Qualification (OQ)" (page 86).

6

Care and Maintenance

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

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

WARNING—To reduce the risk of ignition of hazardous atmospheres, disconnect from the supply circuit before opening. keep assembly tightly closed when in operation.

Maintaining the ReactIR 247 System

Checklists of regular maintenance tasks that should be performed on a daily, monthly, and yearly schedule are in Appendix A. The tasks in the monthly list assume that you have performed the daily maintenance tasks. The yearly list includes tasks that only qualified METTLER TOLEDO service engineers should perform.

- Daily Mantenance Checklist on page 87
- Monthly Maintenance Checklist on page 88
- Annual Maintenance Checklist on page 89

The customer assumes responsibility for maintaining a logbook to record and monitor the operation and performance of the ReactIR 247. Reproduce the checklist forms as needed.

Note: iC Process display messages on the Home page when preventive maintenance should be scheduled. Refer to the "iC Process Software User Guide" for details.

Shutdown and Startup

If the ReactIR 247 must be shut down for periods of weeks, but **not** moved or disassembled, follow the instructions below to best prepare for rapid restart.

Shutdown Procedure

1. Verify that no software operations are in process and exit the iC Process or iC IR control software.

2. Remove power from the ReactIR 247 instrument by unplugging or terminating power at the supply line.
3. Maintain a purge 5psi, 0.5CFM to the sampling technology, if applicable.

Startup Procedure

1. Apply power to the instrument.
2. For K4 conduit sampling technology, check and establish the purge utilities, if applicable. See "4. Connect Communications from ReactIR 247 to Your LAN" on page 44.

ReactIR 247 Relocation, Packaging, and Storage

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

Shutdown

1. Follow the steps under "Shutdown Procedure" on page 79.
2. Disconnect power and network connections. Remove purge from sampling technology, if applicable.
3. Remove the conduit from the instrument and cover the base unit optical port.

Warning:	Do not touch the optic on the port as it contains a ZnSe (zinc selenide) window to prevent finger prints.

4. Cover the open ends of the conduit to prevent contamination by liquid or dust particles.

Special Care of Sentinel

If the Sentinel (liquid sampling sensor) is needed at the new site or must be stored, follow the instructions below.

1. Detach the conduit from the Sentinel.
2. Take note of your type of sampling technology, as follows:
   - Standard Port—Remove the screws at the back of the Sentinel.
   - Slip Stream—Disconnect the flow cell from the process loop without removing the Sentinel.
3. Cover the back of the Sentinel immediately.

Warning:	Do not touch the back of the Sentinel or allow the contact of any liquid or dust particles.

4. Clean the sensor of the sampling technology with a solvent that will dissolve the product.
5. Package the sampling technology, separately, and store in a cool dry place.

Packaging Specifications for Shipment

- Complete the procedures in the previous sections under "Shutdown" and "Special Care of Sentinel".
- To maximize protection of the ReactIR 247 during transport, we highly recommend that the instrument be shipped in a crate or case that can be purchased as an option from METTLER TOLEDO. Figure 6-1 shows the ReactIR 247 NL case provided by METTLER TOLEDO at a nominal fee. Retain this case for future transport.

Figure 6-1 ReactIR 247 NL case

Reinstalling the ReactIR 247

Follow the "Installation Instructions" beginning on page 37.

ReactIR 247 Relocation, Packaging, and Storage

A

Checklists and Worksheets

This appendix includes checklist forms and worksheets to use before and during installation, for operational testing, and for regular maintenance.

Pre-Installation

Checklist of pre-installation steps that includes site preparation:

- "Pre-Installation Checklist" on page 84

Installation and Operation

Checklists for the installation and operation of the ReactIR 247 system in a non-regulatory environment. Copy the checklist forms as often as needed, such as if you move the system or want to perform operational tests. The two forms are designed to print back-to-back on a single sheet.

- "ReactIR 247 Installation Qualification (IQ)" on page 85
- "ReactIR 247 Operational Qualification (OQ)" on page 86

Maintenance

Checklists for regular maintenance tasks:

- "Daily Maintenance Checklist" on page 87
- "Monthly Maintenance Checklist" on page 88
- "Annual Maintenance Checklist" on page 89

Note: Retain the completed forms in a readily accessible location for reference during system service or maintenance.

Pre-Installation Checklist

Use this checklist to verify that all prerequisite steps have been completed before a scheduled ReactIR 247 system installation. Items on this checklist must be completed prior to the arrival of a METTLER TOLEDO Field Service Engineer (FSE) on site for startup of the instrument.

Check	Pre-Installation Task
☐	**1. Site Preparation—Space Requirement in Area of Intended Use** Verify that location for installation accommodates the size (page 23) and weight (page 22) specifications of the instrument. For HL configurations, include the breakout box (page 25).
☐	**2. Site Preparation —Utilities (Electric)** ■ Verify that a dedicated electric line is accessible in the area of intended with a minimum capacity of 4 Amperes. ReactIR 247 power ratings are on page 22. ■ Have a 12AWG ground strap available.
☐	**3. Site Preparation—Utilities (Air)** If using the K4 Mirror Conduit sampling technology, verify that necessary air supply is in place to purge the conduit (page 30).
☐	**4. Site Preparation—Utilities (Communication)** Verify that connection points are available for communication to your LAN (NL configuration—Ethernet connection, HL configuration—Fiber optic connection). Refer to "Communications" on page 31.
☐	**5. Software Preparation—Computer** Ensure that the control computer for the instrument is acquired (if applicable) and ready for software installation. ■ iC Process as the control software—Be sure the computer or server meets the minimum specifications in the "iC Process Software Installation Guide," and ensure you have the required media converter (10/100 MultiMode ST Fiber-to-Ethernet). ■ iC IR as the control software—Be sure the computer meets at least the minimum specifications in the "iC IR Software Installation Guide." Contact iC@mt.com for the latest recommended specifications.
☐	**6. Software Preparation—IT** ■ Arrange that a representative from your IT department is available to administer the user and group access according to your current Domain or non-Domain best practices. ■ Review the "iC Process Software Installation Guide" section on Setting Up Security and become familiar with the SecurityGroups.xml file for the Web application software.
☐	**7. Internal Paperwork and Approval for Installation** Complete all necessary internal paperwork and approvals required within your organization for installation and start up of the ReactIR 247 system, if applicable.

ReactIR 247™ Installation Qualification (IQ)

Company:	Order Number:
Department:	Contact:
Address:	
Phone:	Email:

ReactIR 247 Serial No: _____ **Configuration:** (NL, HL—NRTL, or HL—ATEX) _____ **Voltage:** _____

SITE REQUIREMENTS

☐ All items from the Pre-Installation Checklist in hardware manual are complete.

HARDWARE CONFIGURATION / ORDER VALIDATION

Sampling Technology:	**Sentinel:** Probe Diameter _____ Probe Length _____ Sensor Type _____ Seal Type _____
	Extended-Length Sentinel: Probe Diameter _____ Probe Length _____ Sensor Type _____ Seal Type _____
	Other: _____
	Wetted Materials: _____ **Pressure/Temperature Rating:** _____
	Conduit: ☐ K4 ☐ Direct Optical Conduit
Hardware:	☐ ReactIR 247 Base Unit…Circle one: NL, HL—NRTL, HL—ATEX ☐ Jog Assembly
Hardware (HL only):	☐ Full Power and Communications Breakout Box…Circle one: 100-120VAC 200-240VAC ☐ Electrical Conduit…Circle one: NRTL ATEX
Other:	☐ Country-Specific AC Power Cord (NL only) ☐ Storage Case (if applicable)
Software:	☐ iC IR Software ☐ iC Process Software
Optional Software:	☐ iC Quant ☐ iC ConcIRT Pro ☐ iC Kinetics
Documentation:	☐ Certificate of Conformity for Sampling Technology ☐ Declaration of Conformance for ReactIR 247

SOFTWARE CONFIGURATION AND SERVICE AGREEMENT

Software Configuration:	iC IR Version:	_____	**Service Agreement (if applicable):**	ReactIR 247 Coverage Type: _____	Expiration Date:	____/____/_____
	iC Process Version:	_____		Sensor Coverage Type: _____	Expiration Date:	____/____/_____

SYSTEM CONNECTIONS

☐ ReactIR 247 base unit securely mounted in area of intended use	☐ Sampling technology connected to ReactIR 247
☐ Power connected from customer supply to base unit OR breakout box	☐ Sampling technology connected to customer's sampling point
☐ Data communication connected from base unit OR breakout box to LAN	☐ Purge line connected to sampling technology (if applicable)

SYSTEM START UP

☐ Power / TCIP LED is ON (Green)	☐ Software installs and launches
☐ Scan LED is ON (Green)	☐ Software communication established
☐ Fault LED is OFF	☐ Software Add-ONs installs and launches (optional)

Non-conformances (include action to resolve):

Mettler-Toledo AutoChem, Inc. Field Service Engineer: (Completed in due and proper manner) Name:		Responsible ReactIR 247 User: (Copy of this check record received) Name:	
Date: ___/____/____	Signature:	Date: ___/____/____	Signature:

ReactIR 247™ Operational Qualification (OQ)

Company:	Order Number:
Department:	Contact:
Address:	
Phone:	Email:

ReactIR 247 Serial No: _____ **Configuration:** (NL, HL—NRTL, or HL—ATEX) _____ **Voltage:** _____

System Readiness

❑ Power / TCIP LED is ON (Green) ❑ Scan LED is ON (Green) ❑ Fault LED is OFF	❑ iC Process launched (if applicable) ❑ iC IR software launched	❑ Software control confirmed (iC Process—**Test** and **Initialize** in Configuration, iC IR—Instrument Configuration) ❑ System ON for more than 4 hours

Configure System in Software

❑ Establish and Record Hardware Settings

Hardware Type _____ Detector _____

Probe Interface _____ Probe Tip _____

IP Address _____

❑ Establish and Record Software Settings

Resolution _____ Spectral Range _____

Gain _____ Apodization _____

Scans Option _____

Alignment

❑ Sampling technology aligned (if necessary)

❑ Verify the probe is clean

❑ Record the following values in Align Mode (iC IR) or Service Mode (iC Process)

Peak Height _____ Peak Location _____

Contrast _____

Functional Testing

Record Performance Values for Sampling Technology 1:

Sampling Technology Type _____

❑ Average Signal-to-Noise (SNR) _____

❑ Average Acetone Peak Height _____

Average Acetone-to-Noise Ratio (ANR)_____

Record Performance Values for Sampling Technology 2 (if necessary):

Sampling Technology Type _____

❑ Average Signal-to-Noise (SNR) _____

❑ Average Acetone Peak Height _____

Average Acetone-to-Noise Ratio (ANR)_____

Record Stability Test Results:

❑ Result @ 1000 cm^{-1} Min _____ Max_____

❑ Result @ 3000 cm^{-1} Min _____ Max_____

Non-conformances (include action to resolve):

Mettler-Toledo AutoChem, Inc. Field Service Engineer: Completed in due and proper manner Name:		Responsible ReactIR User: Copy of this check record received Name:	
Date: ___/____/_____	Signature:	Date: ___/____/_____	Signature:

Maintenance

This section provides forms for the following checklists:

"Daily Maintenance Checklist" (below)
"Monthly Maintenance Checklist" on page 88
"Annual Maintenance Checklist" on page 89

Daily Maintenance Checklist

Task	Remarks	Check
Check fiber optic or Ethernet connection	Verify that the fiber optic ST connectors are attached to the ReactIR 247 fiber optic port. If using Ethernet connection, verify the RJ45 connector is attached to your LAN port. (See diagrams under "8. Establish Software Communications" beginning on page 51.)	**Fiber Optic Connection** [ ] Connected [ ] Disconnected
Perform visual inspection of the ReactIR 247 instrument	Verify that sampling technology and base unit are securely connected at the sampling point.	**Visual Inspection** [ ] Conduit arm connected to base unit [ ] Conduit connected to Sentinel [ ] Sentinel connected to sampling point [ ] Disconnected If any disconnection, note the location: _____
Check Operational Status LED indicators on base unit front panel	LED lights should be in the following state if fully operational. Fault—Not illuminated Scan—Flashing or solid GREEN Power/TCIP—Solid GREEN (See"ReactIR 247 LED Indicators" on page 58.)	**Operational Status** [ ] Fault [ ] Scan [ ] Power/TCIP Record any variance and contact METTLER TOLEDO service.
Record Peak Height and Contrast	To get an exact value, enter the Service mode to record the most recent value using a clean, dry sensor. NOTE: If the values are 20% less than the magnitude at time of installation then contact METTLER TOLEDO service. (See instructions in "2. Check System Performance" on page 61.)	**Peak Height** Value_____ **Contrast** Value_____

Contact METTLER TOLEDO if any checklist items require service.

Monthly Maintenance Checklist

This checklist assumes that the daily maintenance tasks have been performed.

Task	Remarks	Check
Run three iterations of the Performance test and record Signal-to-Noise (SNR) of clean, dry sensor.	Compare the average of the monthly SNR values to the SNR factory specification for your sampling technology and type of detector (see factory specifications in instructions). It is not necessary to run all 10 iterations—Run three and record the average SNR value. **In iC Process**: ■ Log on to the ReactIR 247 instrument as an Administrator or Service user and run the Performance Test. See instructions in "2. Check System Performance" on page 61. ■ Compare to factory specifications in Table 5-2 on page 63. See "2. Check System Performance" on page 69. **In iC IR**: ■ Go to the Test Instrument task pane in the Toolbox, and run the Performance Test. See instructions in "2. Check System Performance" on page 69. ■ Compare to factory specifications in Table 5-4 on page 72.	**Performance Test** [ ] Three iterations performed. [ ] Signal-to-Noise (SNR) value is equal to or greater than at time of installation. SNR average value: _____
Visually check ZnSe lens	Lens should be clear.	[ ] Lens is clear. [ ]Lens is cloudy.

Contact METTLER TOLEDO if any checklist items require service.

Annual Maintenance Checklist

Use the upcoming checklist to manage annual maintenance tasks. This section contains tasks that only qualified personnel or METTLER TOLEDO service personnel should perform. It requires that the person use a voltage meter of some type and operate an oscilloscope to record and measure voltages in the system.

Caution—If not performed properly, shock hazard and or injury may occur.

Task	Remarks	Check
Assess components per replacement schedule	Call METTLER TOLEDO Service for a complete list of component replacements.	**Parts Replacement Schedule** See list on page 79.

Contact METTLER TOLEDO if any checklist items require service.

Maintenance

B

Switching Control Software

Note: Even though a ReactIR 247 instrument can be controlled by iC IR or iC Process software, only **one software system can control the instrument at the same time**.

iC Process is the primary control software for a ReactIR 247 instrument. However, iC IR software can be used in the laboratory to develop models and trends that transfer Critical Control Parameters (CCP) from the laboratory to the production environment. Use the procedures in this appendix to switch control between the two software systems, if applicable.

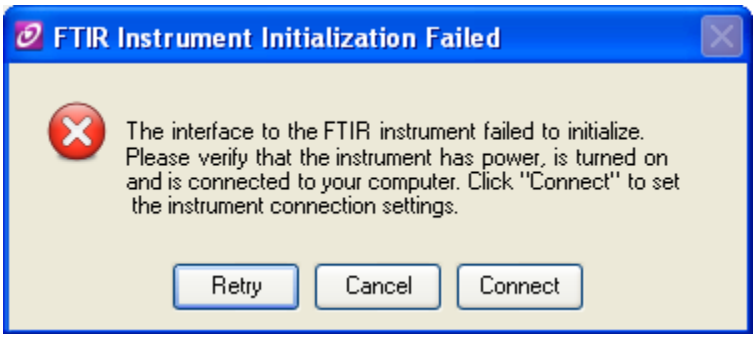
Switch from iC Process to iC IR

To switch control of the ReactIR 247 from iC Process software to iC IR, it is necessary to stop the iC Process service and connect to the instrument through iC IR.

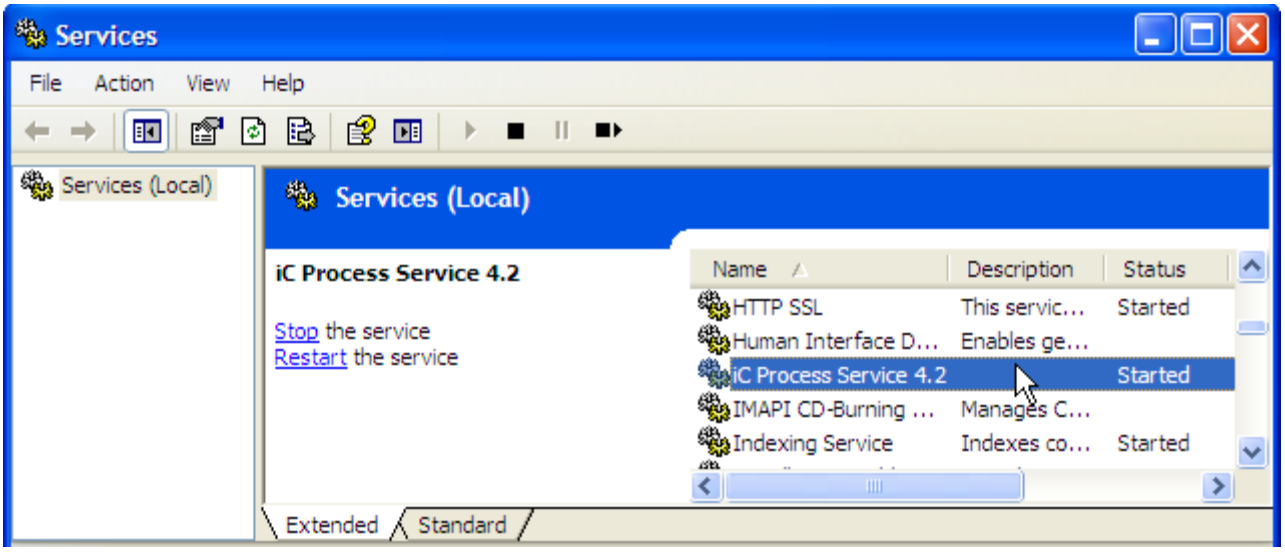
Follow the procedures to switch control to iC IR software.

Note: You will need the IP address of the ReactIR 247 instrument to transfer control. Refer to the iC Process Instrument Configuration page.

The following message appears in iC IR when you attempt to control a ReactIR 247 instrument currently under iC Process control. Leave this message open and proceed to Administrative tools to stop the iC Process Service.

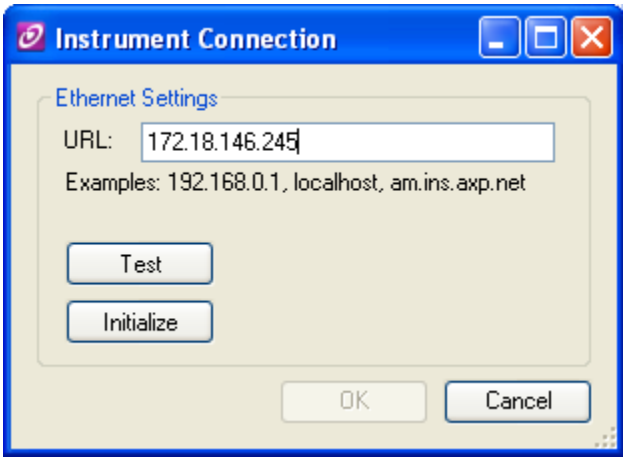


1. Go to the Services for the iC Process control computer. (In WIndows XP, the location is Control Panel > Administrative Tools > Services.)
2. Select iC Process Service 4.x.
3. Click **Stop**.



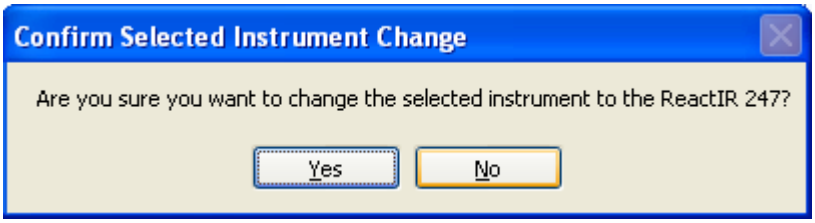
4. Return to the open iC IR "FTIR Instrument Initialization Failed" message.

5. Click **Connect** and enter the instrument's IP address in the URL field.



   a. Click **Test** to 'ping' the instrument at the specified address.
   b. Then, click **Initialize** to take control of the instrument in iC IR.

6. Click **Yes** in the confirmation box.

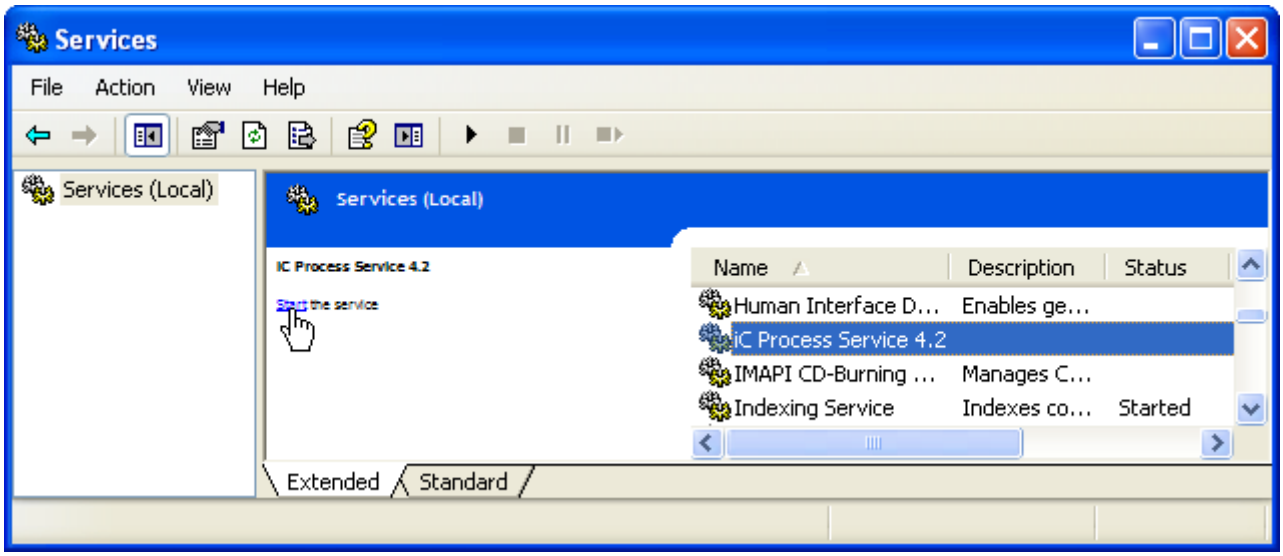


Switch from iC IR to iC Process

If the ReactIR 247 is under the control of iC IR and you want to change to control by iC Process, follow the procedure below.

Note: This instruction assumes the ReactIR 247 instrument has already been added to iC Process and configured. Refer to the "iC Process Software User Guide or the iC Process Installation Guide."

1. Close the iC IR software application.
2. Go to the Services for the iC Process control computer. (In WIndows XP, the location is Control Panel > Administrative Tools > Services.)
3. Select iC Process Service 4.x.
4. Click **Start**.



5. Proceed to your Web browser to connect to iC Process as a client.

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