Hardware Manual

October 2011

MK-PB-0090-AC Rev A

DCN 527

FlowIR™

Real-Time Analysis of Continuous Reactions

METTLER TOLEDO

14 October 2011

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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.

Contents

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Introduction

FlowIR™ is a dedicated flow chemistry monitoring system designed to operate in real time using *in situ,* mid-infrared measurements and connect to standard flow chemistry using Omnifit fittings. Designed with the flow sensor component integrated in the FlowIR base unit, the FlowIR system is easy for the flow chemist to monitor continuous flow chemistry.

This document contains instructions for site preparation, technical specifications, instrument installation and operational checklists, system configurations, routine operation, safety information, as well as care and maintenance information and troubleshooting tips.

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 6.

If you are viewing this document electronically, click any blue-colored link to go to the related information and instructions.

Related Documents

Documents listed below are in the iC IR™/ReactIR product documentation portfolio.

- "FlowIR StarterPac" (MK-PB-0091-AC)
- "iC IR Installation Guide" (MK-PB-0020-AC)—Release 4.3 or higher software
- Quick Reference—"Experiment Setup in iC IR" (MK-PB-0013-AC)
- Quick Reference—"Data Review and Analysis with iC IR" (MK-PB-00012-AC)
- "ReactIR Sampling Technology Guide" (MK-PB-0008-AC).

General Policies

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

Installation Policy

Site preparation for the FlowIR system equipment is the user's responsibility. Structural installation details should be prepared and supervised by a certified and registered professional engineer who is properly qualified to assure a safe installation at your site.

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 and 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 FlowIR system. 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 FlowIR 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 6. Non-iCare subscribers may request a quote for an upgrade by contacting their local salesperson or Customer Care.

Training Programs

Training for FlowIR systems is available from the AutoChem Community Web site and through your METTLER TOLEDO TAC. Contact **AutoChemCustomerCare@mt.com**. For information on training programs, see the users' Web site, http://community.autochem.mt.com. Access to the site requires a login and password that you can request at the site.

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. For specific application assistance at any time, contact a METTLER TOLEDO Technology and Applications Consultant (TAC) through the toll-free number below.

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

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Product Description

This chapter describes the FlowIR system and the system configurations to provide chemists and engineers with real-time, *in situ* measurement of chemistry in a continuous flow process. A FlowIR system configuration consists of a compact base unit, sampling technology (sold separately) and iC IR™ control software. Designed to be simple and easy to use, the system sampling technology consists of an interchangeable FlowIR Sensor with sensor material suitable for chemistry and a Flow Cell Head. The head is available in a heated or non-heated model with options for the internal volume.

Figure 2-1 FlowIR—Base unit with sensor and heated flow cell head

Overview of FlowIR System

FlowIR™ is a dedicated flow chemistry monitoring system designed to operate in real time using *in situ,* mid-infrared measurements. Designed with interchangeable Sensor and Flow Cell Head, the FlowIR system is easy for the flow chemist to use because connecting to flow chemistry is a simple process. Chemists can quickly and easily gather information that assists with what they want to do…study chemistry! No more spending time with an expert

or going through a long setup to get valuable, data-rich information about reaction initiation, progression, and endpoint determination. With FlowIR system information, the flow chemist can reduce the time and number of experiments required to optimize reaction yield and purity. Additionally, the ability to measure *in situ* and in real time offers immediate feedback on the flow chemist's theoretical reaction mechanism and pathway.

Valuable characteristics of the FlowIR system include:

- Ergonomics—Small footprint with no obstruction to daily workflow, easier to monitor every reaction (System dimensions are on page 22.)
- No alignment—Highest quality data assurance without user input
- Plug-n-Play sampling—Reproducible measurements
- Enhanced understanding of flow chemistry—Monitor reaction temperature simultaneously with chemical changes

Note: Sensor material (DiComp or SiComp) specified at time of order

Standard items included with the FlowIR system base unit are:

- Deuterated Triglycine Sulfate (DTGS) detector
- iC IR 4.3 or later software
- Power supply
- Ethernet communications cable
- One Year System Warranty (includes standard sampling technologies) purchased with system). System warranty ends one year after installation or fifteen months after shipment.

Not included but necessary for routine operation are,

- PC or Laptop for iC IR software
- FlowIR Sensor of specified sensor material
- Flow Cell Head (heated or non-heated model in choice of two internal volume models)
- Heater Controller (included with heated Flow Cell Head)

The FlowIR system uses METTLER TOLEDO proprietary software, iC IR, to assure 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 user interface. As a wizard-based application, iC IR guides you through the experience of collecting, analyzing, and visualizing data for real time insight into your chemistry. In essence, iC IR allows chemists to focus on solving chemistry problems instead of instrumentation and analysis procedures

See Chapter 3, "Safety" for safety-related information.FlowIR System Diagram

The block diagram below identifies the components necessary to buildup a FlowIR system, essentially what hardware the customer purchases from METTLER TOLEDO or provides according to specifications to install and implement the system. Components include the base unit, computer, communication cable, power supply, sampling technology.

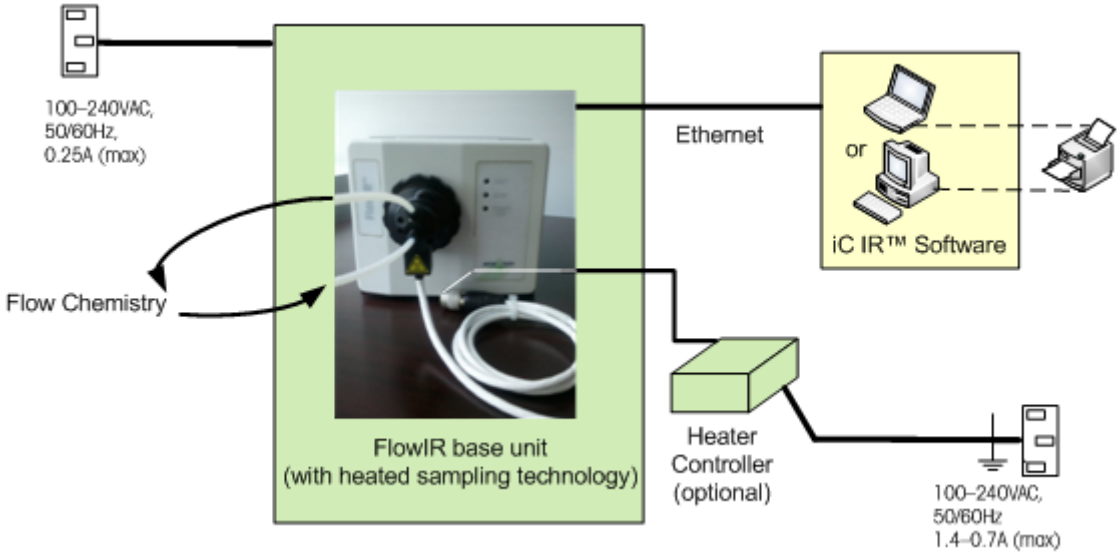

Figure 2-2 FlowIR system diagram

Definition of Terms

FlowIR systems use the following terminology:

iC IR—User interface software for the FlowIR system. As a wizard-based application, iC IR guides a user through the experience of collecting, analyzing, and visualizing data important to gaining real time insight into reaction chemistry.

Sampling technology—An interchangeable FlowIR Sensor that connects to the FlowIR base unit plus a Flow Cell Head that connects to the Sensor. Flow chemistry tubing connects to the FlowIR Flow Head via the end user's standard Omnifit-style fittings (see Table 2-3 for more definitions).

Single beam—A single beam is the energy profile (intensity versus wavenumber) of the FlowIR with or without a sample in contact with the sensor. Single beam can refer to a background (without chemistry sample) or a sample (with chemistry). A single beam spectrum is later "ratioed" against a background to create an infrared fingerprint (absorbance versus wavenumber).

StarterPac—FlowIR installation document with initial installation procedures and operational checks performed by a METTLER TOLEDO Field Service Engineer in a standard installation.

IPac—Abbreviations for the FlowIR Instrument Qualification Package (IPac) service available at a nominal fee. IPac service delivers comprehensive test procedures and verification records on installation and operation to assist you in meeting regulatory requirements.

FlowIR Sensor— Interchangeable assembly with sensor (DiComp or SiComp) that connects to Sample Interface Module (SIM) opening on the front of the FlowIR base unit.

Flow Cell Head—Interchangeable head through which flow chemistry comes in contact with the sensor. Head connects to Flow Sensor and receives the Omnifit-style fittings and flow chemistry tubing. Once assembled, the flow cell will be either 10 or 50µL.

FlowIR Base Unit

Table 2-1 describes the internal components of a FlowIR base unit. Definitions are included for an understanding of the components that METTLER TOLEDO representatives discuss with you during initial training, follow-up service, or potential repair. By design, the FlowIR will not require the user to know the location for alignment or replacement of these components.

Table 2-1 FlowIR Internal Components

Component	Description
DTGS Detector	Senses the amount of infrared radiation after passing through a sample.
IR Source	Supplies the mid-infrared radiation to the sample
Micro Modulator	Mechanical device that affords full spectrum infrared measurements of high sensitivity in a shorter period of time than traditional dispersive spectroscopy methods. Also known as the interferometer or heart of the Fourier Transform Infrared (FTIR) measurement. Produces source radiation specific to the FTIR.
Power supplies	Supplies electrical power to internal FlowIR components.
Laser	Class 1 InGa/AsP/InP laser diode that is an integral component of the modulator.

FlowIR LED Indicators

Table 2-2 describes the FlowIR LED states. Highlighted rows indicate a normal operating condition.

Table 2-2 FlowIR LED Indicators

LED	Color	State
Fault	**OFF**	No faults and system communicating with software application
	Amber	No communication with software application
	Red	System fault
Scan	**OFF**	System not scanning
	Blue (blinking)	Scanning, but not sending data to software application
	Blue (solid)	Data collection
Power / TCP/IP	**OFF**	System off
	Amber	System powered on / No network link established
	Blue	System on and network link established **IMPORTANT!** Wait until the Power LED is blue before starting the software application.

FlowIR with Sampling Technology

FlowIR system sampling technology is an interchangeable Sensor plus a Flow Cell Head where reaction chemistry flows directly in and out to monitor chemical changes.

Figure 2-3 FlowIR base unit with non-heated flow cell head

Monitoring and control of the flow cell head temperature is available. Table 2-3 shows the system with the heated flow cell head and heater controller. Figure 2-4 shows the heated model flow cell head that includes a heater controller and power supply (not shown).

Figure 2-4 FlowIR base unit with heated flow cell head

Figure 2-5 shows the two internal volume options (10 and 50µL) for flow cell heads (heated models shown).

Figure 2-5 FlowIR volume heads—10µL (left) and 50µL (right)

Table 2-3 describes all the FlowIR Sampling Technology Options.

Sampling Technology Configurations

The FlowIR base unit is ordered with the combinations of Sensor and Flow Cell Head components as described in Table 2-3. Add sampling technology components at any time to suite your flow chemistry requirements.

Table 2-3 FlowIR Sampling Technology Options

Component		Options	Details	Function
FlowIR Sensors 		**SiComp—Gold**	Silicon sensor with Gold seal	Interchangeable assembly with sensor that connects to Sample Interface Module (SIM) opening on the front of the FlowIR base unit.
		SiComp—Teflon	Silicon sensor with Teflon seal	
		DiComp—Gold	Diamond sensor with Gold seal	
		DiComp—Teflon	Diamond sensor with Teflon seal	
Flow Cell Heads	Temperature	**Non-Heated** 		Interchangeable head through which flow chemistry comes in contact with the sensor. Head plugs in to Flow Sensor and receives end user's Omnifit-style fittings and flow chemistry tubing.
		Heated 		Interchangeable head that also connects to an external heater controller (included) for temperature-dependant reactions. 
	Volume	**10µL**	Inlet/Outlet ID: 1mm	Internal volume
		50µL	Inlet/Outlet ID: 2mm	Internal volume

Note: Omnifit-style fittings and grippers are customer-provided (see recommendations on page 23).

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Safety

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

WARNING—Use of this product in a manner not specified by the manufacturer may result in serious injury and/or damage to equipment, and will void the warranty of the system.

This chapter contains the following sections:

Safety Symbols

Three levels of information relate to equipment and user safety. To help you recognize information, the following symbols appear throughout this manual. Please pay particular attention to the sections marked by these symbols.

Table 3-1 Warnings, Cautions, and Notes

	**Caution**—Important information that tells you how to prevent damage to equipment, or to avoid a situation that may cause minor injury.
	**WARNING**—Important safety information—Failure to observe the warning may result in serious personal injury or equipment damage.
Note:	Information to read carefully.

The following symbols identify safety information on the FlowIR system:

Table 3-2 Safety Symbols on System

	**Caution**—Risk of danger
	**WARNING—**Hot surface The front of the FlowIR heated Flow Cell Head bears this symbol to indicate that it can get hot.
	**Direct Current**
	This mark shows that the equipment complies with all applicable EU directives.

Equipment Specifications

Table 4-1, on page 21, provides detailed equipment information and safety-related specifications that include power, temperature, and pressure.

Product Safety

FlowIR systems comply with the directives and laser classifications described below.

CE Compliance

FlowIR systems have been tested and comply, as required, with the Electromagnetic Capability (EMC) Directive and Low Voltage Directory (LVD).

- **EMC Directive 2004/108/EC**
  CISPR 11:2006 EN 61000-3-2:2005; EN 61000-3-3:1995: A1 (2001): A2 (2005); EN 61326-1:2006
- **Low Voltage Directive 2006/95/EC**
  EN61010-1:2001 Safety requirements for electrical equipment for measurement, control, and laboratory use

FlowIR instrument testing may not cover local regulations that are not in accordance with other standards. The end user is responsible for compliance with local regulations.

Caution—The CE mark applies only to unmodified instruments supplied by METTLER TOLEDO.

FCC/Industry Canada Compliance

- **FCC Part 15 (10/2009), Class A**

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

- **ICES-003**

Note: This Class A digital apparatus complies with **Canadian ICES-003**: Interference-Causing Equipment Standard ICES-003.

Cet appareil numérique de la Classe A est conforme à la norme **NMB-003** du Canada.

Laser Classification

All FlowIR instruments are in compliance with the U.S Department of Health and Human Services (DHHS) Radiation Performance and in accordance with International Standards.

Class 1 Laser Product

Compliant with **21 CFR 1040.10** and **1040.11**

except for deviations per Laser Notice 50, dated June 24, 2007

and

Compliant with **IEC 60825-1**

Grounding the Heater Controller Power Supply

WARNING—Make sure to plug the power cable supplied with the Heater Controller into power supply outlets that are grounded. A technical fault could otherwise result in death or serious injury.

Operational Safety

Positioning FlowIR Base Unit

Caution—For ease of disconnecting and for proper heat sink dissipation, ensure adequate space between the FlowIR base unit and surrounding surfaces.

Pressure

Caution—Do not exceed the maximum pressure for the FlowIR sensor and head assembly: **7 barg (100psig)**

Volume

Caution—Use the appropriate flow cell head for the volume of flow chemistry to be monitored. Do not exceed the volume specifications (**10µL** or **50µL**)

Flammable Chemistry

Caution—Use diligence when setting heater controller temperatures. Temperature settings must be at least 25°C (77°F) below flammable set point for the flow chemistry.

Service

Caution—Never open the enclosure of the FlowIR system or any of its components. Contact a certified METTLER TOLEDO AutoChem Field Service Engineer (FSE) for all service needs.

General Caution

Exclude the following environmental influences:

- powerful vibrations
- direct sunlight
- atmospheric humidity greater than 90%
- temperatures below 15°C and above 120°C
- powerful electric or magnetic fields

Over-Temperature Protection

Note:	The FlowIR heated head has a built-in thermal cut-off fuse set to blow at temperatures above 120°C (248°F).

No Over-Pressure Protection

Caution—Over-pressure protection is the end user's responsibility. The FlowIR system includes no over-pressure protection. Ensure that flow pressure is within the FlowIR sampling technology specifications. Pressure that exceeds specifications may cause injury and damage the instrument.

System Handling

WARNING—A warning label on the heated head reminds you that it can be hot, so handle with caution. A built-in thermal cut-off switch is set to shut down at temperatures above 120°C (248°F).

Caution—Follow the basic safety steps outlined below.

- When moving the FlowIR system over distance, it is highly recommended to use a cart or similar type device. The system is compact and can be hand-carried, but a cart is recommended to avoid accidentally dropping the instrument.
- DO NOT hand-carry the system with the flow tubing attached. Remove the tubing first before moving the unit.

Product Safety

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Specifications

This chapter provides specifications for the FlowIR system in the following sections:

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

Manufacturer—METTLER TOLEDO AutoChem, Inc.

Manufacturer's Address—7075 Samuel Morse Drive Columbia, Maryland USA 21046

Product—FlowIR™

Trademark—METTLER TOLEDO FlowIR™

Intended Use—The use of this product is to provide unattended, *in situ* data collection and simultaneous data analysis of chemical reactions. This product is designed to be used in a ventilated fume hood. Alternatively, this system can be used on a bench top with the flexible fiber optic conduit positioned inside the fume hood where the reactor is located.

FlowIR Base Unit

Table 4-1 FlowIR System Specifications

Specification	Details
Power	**AC**: 100–240VAC, 50–60Hz, 0.25A (max) **DC**: (supplied): 12–13.6VDC, 2A (max)
Resistive Temperature Detector (RTD)	PT 100, integrated
Temperature Range	**Operating**: 19°C to 25°C (66°F to 77°F) Recommended range for proper system stability **Ambient (max)**: 30°C (86°F) Invalidates performance specification
Humidity	Ambient: <90% non-condensing
Detector	Deuterated Triglycine Sulfate (DTGS)

FlowIR Base Unit

Table 4-1 FlowIR System Specifications (continued)

Specification	Details
Communications	Ethernet cable between base unit and computer, 2m (7 feet)
Resolution	$4cm^{-1}$ maximum
Weight	28 kg (6 lbs)
Dimensions (W x H x D)	137 x 116 x 241 mm (see Figure 4-1) (5.4 x 4.6 x 9.5 inches)

Materials of Construction

FlowIR base unit has the materials of construction specified in the upcoming table. Refer to "FlowIR LED Indicators" on page 10 as a visual aid to identify items below:

Table 4-2 FlowIR Materials of Construction

Specification	Details
Material	Aluminum Alloy 606–T6
Enclosure finish	Front panel: Iridite and Paint Polane-T Rear heat sink: Black anodized Side cover: Plastic and paint
Labels	Poly carbonate
Pressure Seals	Alloy C-276 spring-energized graphite-filled PTFE

FlowIR System Dimensions

Figure 4-1shows the dimensions of a FlowIR base unit (includes Sensor, without flow cell head).

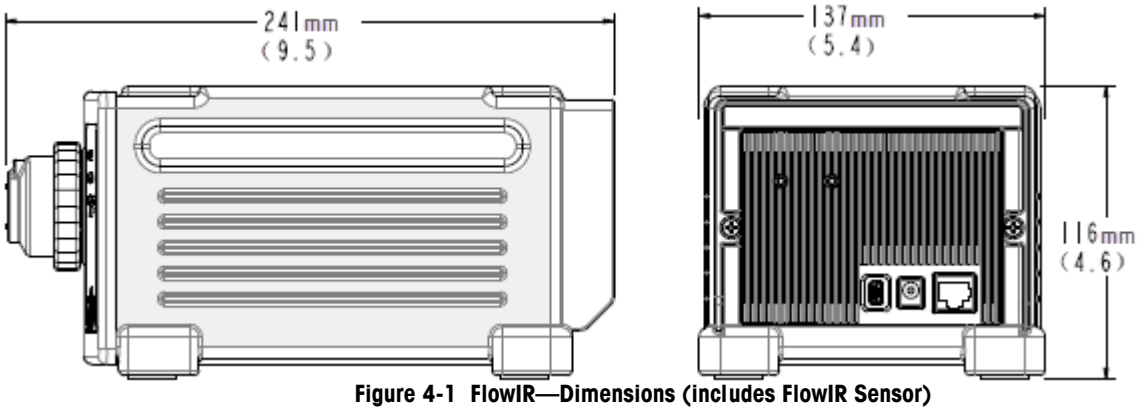

Figure 4-1 FlowIR—Dimensions (includes FlowIR Sensor)

FlowIR Sampling Technology

The flow cell sampling technology for a FlowIR is comprised of an interchangeable Sensor and an interchangeable Flow Cell Head in configuration options specified on page 10.

Table 4-3 FlowIR Sampling Technology Specifications

Specification	Details
FlowIR Sensor	Alloy C-22
Optical Range	4000 to 650 cm^{-1} maximum
pH Range	**DiComp**: 1 to 14, **SiComp**: 1 to 10
Wetted materials	Alloy C-22 Sensor: Diamond or Silicon Seal: Gold or Teflon
Flow Cell Head	Alloy C-22
Internal Volume	**10µL**—Inlet/Outlet ID: 1mm or **50µL**—Inlet/Outlet ID: 2mm
Inlet and Outlet Ports	For use with 1/4–28 flat-bottom, Omnifit style fittings (customer-provided, see recommendations below) **Maximum Pressure: 7 barg (100psig)**
Wetted O-rings	Kalrez 4079, K#903 (o-ring size) 7.65 I.D. x 1.63mm dia. (0.301 I.D. x 0.064in. dia.)
Allen key	3/32″ to tighten/loosen interchangeable heads
Temperature Range (Heated only)	Ambient °C to 120 °C (248 °F)
Pressure Range	1 to 7 barg (14.5 to 100 psig) FlowIR includes **no** over-pressure safety devices.

Omnifit-Style Fittings and Grippers

Table 4-4 describes the recommended fittings and grippers for use with the FlowIR system. Although any Omnifit-style fitting and gripper can be used, ensure the specifications correspond to those described below.

Table 4-4 Recommended Omnifit-Style Fittings for FlowIR

Omnifit Part Number	Details
For 1/16"OD tubing	
002119	PEEK™ Natural 1/4-28
002122	PEEK™ Natural 1/4-28

Table 4-4 Recommended Omnifit-Style Fittings for FlowIR (continued)

Omnifit Part Number	Details
002310 (10 each)	One-piece PTFE ferrule for 1/4-28 fitting nuts
For 1/8" OD tubing	
002219	PEEK™ Natural 1/4-28
002222	PEEK™ Natural 1/4-28
002312 (10 each)	One-piece PTFE ferrule for 1/4-28 fitting nuts

The recommended fittings described in Table 4-4 have a higher maximum pressure rating than that allowed for the FlowIR sampling technology. Follow the pressure rating for the FlowIR system.

Caution—Do not exceed the maximum pressure for the FlowIR sensor and head assembly: **7 barg (100psig).**

iC IR Computer

System requirements for the PC or laptop that runs iC IR 4.3 or higher software for the FlowIR system are in the beginning of the "iC IR Installation Guide." Since requirements can change with new software releases, please refer to the current installation guide.

Heater Controller

An external heater controller is included with the heated Flow Cell Head to maintain the temperature of the flow chemistry during the monitoring practice. The heated model FlowIR flow cell head connects to the heater controller. Instructions for settings the temperature are under "E. Use Heater Controller (if applicable)" on page 28.

Table 4-5 FlowIR Heater Controller

Specification	Details
Power Supply	**AC Input**: 100–240V~, 50/60Hz, 1.4–0.7A **DC Output**: (supplied) 24VDC, 2.9A, Max 69.9W
Heat Range	Ambient (+/–5°C) to 120°C (+/–1°C)
Weight	0.82 kg (1.8 lbs)
Dimensions (W x H x D)	157 x 62 x 200 mm (6.2 x 2.5 x 7.8 inches)

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Routine Operation

FlowIR operation is checked during the final phase of initial installation according to the Installation Checklist in your 'FlowIR StarterPac.' The StarterPac also includes basic functional tests. Refer to your StarterPac, as needed.

This chapter describes the routine operation of a FlowIR system by outlining the steps you follow to easily implement the product. Instructions include the most efficient way to use the FlowIR to monitor chemistry.

The FlowIR instrument is ready for routine operation after all items in the 'FlowIR StarterPac Installation Checklist' are complete, including resolution of any nonconformance. You can start monitoring flow chemistry with confidence the data and information accurately reflect changes in chemistry.

WARNING—Use of this product in a manner not specified by the manufacturer may result in serious injury and/or damage to equipment, and will void the warranty of the system.

1. Prepare FlowIR System for Use

Caution—For ease of disconnecting and for proper heat sink dissipation, do not place the back of a FlowIR unit against a wall.

The procedures below assume the FlowIR system is installed and the instrument communication with the iC IR software has been established.

A. Ensure FlowIR is Powered Four Hours Before Monitoring Chemistry

IMPORTANT / CRITICAL!	**FROM A COLD START**: You must allow a minimum of **four (4) hours warm-up time** before monitoring chemistry or making any gain adjustments to the system. DO NOT PROCEED until the unit has been allowed to warm up.

B. Launch the iC IR Software

1. Turn on the iC IR computer.
2. Start the iC IR software from the Start menu or by clicking the desktop icon.

C. Switch Flow Heads (as applicable)

A FlowIR Flow Cell Head is available with one of two volume options—10 or 50 microliters and in heated or non-heated models (see "Sampling Technology Configurations" on page 13).

	**Caution**—Use the appropriate flow cell head for the volume of flow chemistry to be monitored. Do not exceed the volume specifications (**10µL** or **50µL**).

If the current flow cell head is appropriate for the flow chemistry, skip this section and go to "D. Install Flow Tubing and Fittings in Prescribed Flow Direction" on page 27.

To switch one flow cell head for another (as necessary):

1. Loosen the two screws that hold the head to the Sensor using the 3/32" allen key, provided. The screws are captive on the heated head and non-captive for a non-heated head.

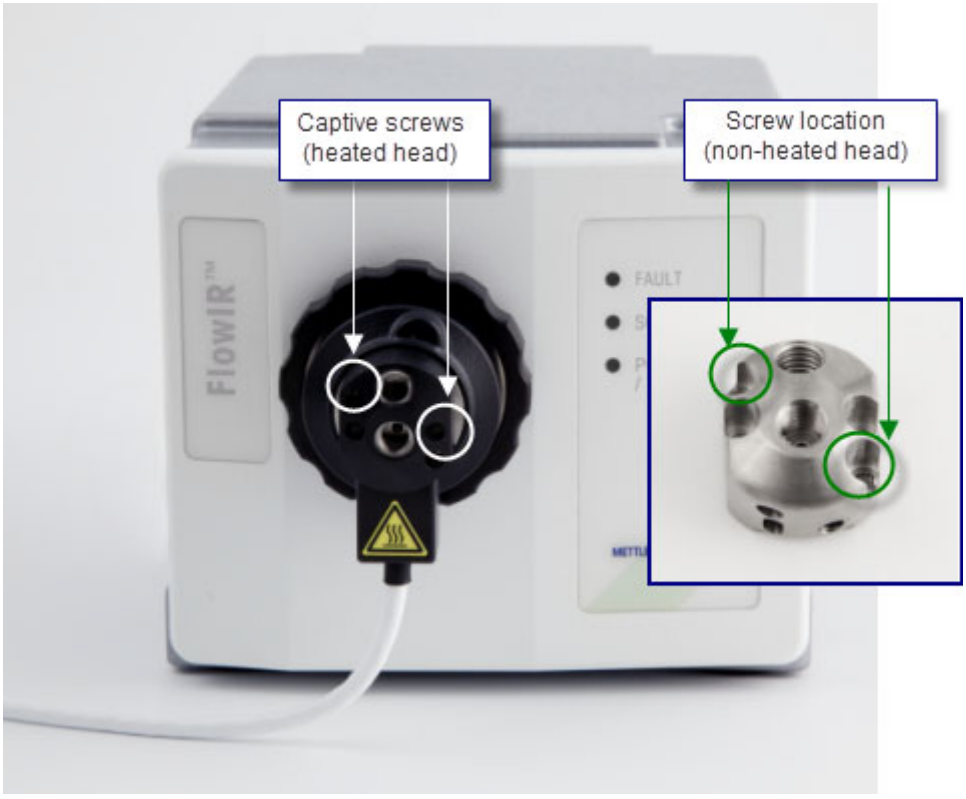

Figure 5-1 FlowIR Flow Cell Heads—Captive and non-captive screws

2. Carefully pull the flow cell head straight off the vertical dowel pins in the FlowIR Sensor and store it in the original container. When removing a non-heated head, take care to store the non-captive screws.

> **Note:** **Switching FlowIR Sensor**—If you need to switch to another FlowIR Sensor due to changes in your flow chemistry, this is the point where you remove the sensor and replace it with one that is made of the appropriate material (DiComp or SiComp as described on page 13).
>
> Follow the steps under 'Connect Sampling Technology' in your 'FlowIR StarterPac.'

3. Insert the new Flow Cell Head into the Sensor, taking care to align the two vertical holes on the head with the vertical dowel pins on the Sensor.

Figure 5-2 FlowIR Sensor—Locating dowel pins receive flow cell head

D. Install Flow Tubing and Fittings in Prescribed Flow Direction

Once a flow cell head is connected to the Sensor at the front of the FlowIR base unit, the next step is to connect your flow chemistry to the flow cell head in the prescribed flow direction. A specific direction of flow to the FlowIR Flow Cell is required to ensure the chemistry comes in proper contact with the sensor. Figure 5-3 shows the correct direction for incoming and outgoing flow.

1. Connect your Omnifit-style fittings securely to the flow cell head.

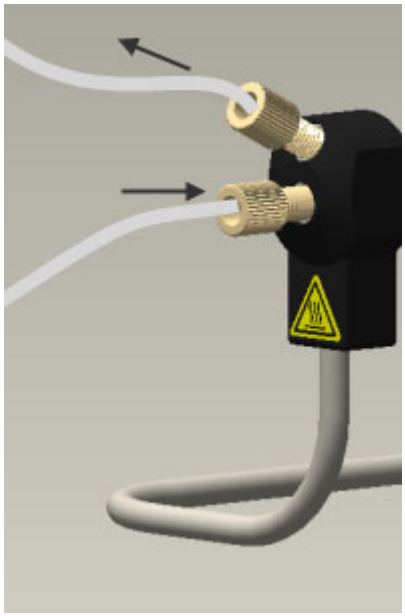

Figure 5-3 FlowIR Flow Cell Head (heated)—With Omnifit-style fittings

2. Connect your flow tubing to the fittings in the following direction:
   - Incoming flow enters at the center of the flow cell head.
   - Outgoing flow exits from the top fitting.

If you have the heated model, set the heat to the desired temperature as described next, and monitor the chemical spectroscopy though iC IR software.

E. Use Heater Controller (if applicable)

The temperature for a FlowIR Heated Flow Cell Head is factory set at a low temperature. Before using the heated model, set the temperature according to the flow chemistry being monitored. Once heated, the flow cell head can be extremely hot.

	**Caution**—Use diligence when setting heater controller temperatures. Temperature settings must be at least 25°C (77°F) below fire point of flammable liquids.

	**WARNING**—A warning label on the heated head reminds you that it can be hot. Do not touch until the heated head has had adequate time to cool down from a high temperature setting. The heated head has a built-in thermal cut-off switch set to shut down at temperatures above 120°C (248°F).

Use the buttons on the front of the heater controller to set the temperature required for your flow chemistry, as follows:

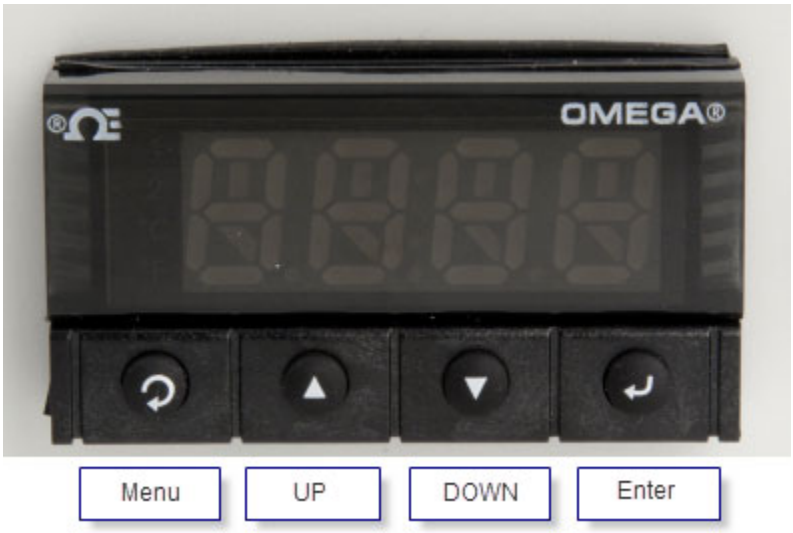

Figure 5-4 Heater Controller—Setting buttons

1. Press the **Menu** button and cycle to the **SP1** menu option.

2. Press the **Enter** button to go into temperature setting mode.

3. Press the temperature **UP** and **DOWN** buttons to cycle to the required temperature.FlowIR temperature control can range from ambient (+/–5°C) to 120°C (+/–1°C).

4. Press **Enter** to save the temperature setting.

5. Press **Menu** again to return to the default menu setting.

2. Configure Instrument in Software

Specific settings in iC IR software drive the FlowIR to collect data in a manner appropriate for the product configuration and chemistry monitoring objective. At initial installation, the METTLER TOLEDO Field Service Engineer (FSE) set up the instrument configuration in the iC IR software. If the instrument and sampling technology have not changed, you can skip this section and go to"Simple Steps to a Successful Experiment" on page 31. However, changes in the sampling technology or computer require the Instrument Configuration in the software be changed so the infrared fingerprints are accurate representations of chemical changes. The software provides recommended default configuration settings to speed the process.

A. Establish Instrument and Probe Settings

1. Click **Configure Instrument** on the Start Page.
2. Set the following parameters to match the configuration of the FlowIR, if not already done at the factory. Record these settings in the 'StarterPac Installation Checklist.'
   - Instrument—Select **FlowIR**
   - Probe Interface—FlowIR Sensor (sampling technology)
   - Probe Tip—**SiComp** or **DiComp**

B. Establish Acquisition Settings

1. Click **Configure Instrument** on the Start Page.
2. Set the following parameters in the 'Probe acquisition' section to the 'normal' selection. Record these settings in the 'StarterPac Installation Checklist.'
   Resolution—Normal (8 wavenumbers)
   - Spectral Range—Preset with the probe interface and probe tip settings
   - Gain Adjustment—**232**
3. Set the Scan/Sample parameter to **128 scans**.
4. Set the Apodization Method to Happ-Genzel through the **Edit** button in the 'Instrument' section.

C. Complete Configure Instrument Wizard

1. Click **Next** in the Configure Your FlowIR (hardware and software settings) window.
2. Click **Next** in the Prepare to Clean Probe window.
3. Click **Next** in the Align Probe window.
4. Click **Collect Background** in the Collect Clean Reference Background window.
5. Click **Finish**.

Simple Steps to a Successful Experiment

Getting the most out of your FlowIR requires simple steps that lead to the monitoring of your chemistry. The data will then be of the highest quality for easy conversion to chemical information that you can use for better understanding of the reaction dynamics. A successful experiment centers around gaining maximum performance of the FlowIR through the iC IR software tools. When you follow the experiment steps, you can be certain that the infrared fingerprints accurately reflect chemical changes pertinent to your chemistry.

Below are the steps:

"1. See An Overview of the Process" on page 31

"2. Interface Sampling Technology with Flow Chemistry" on page 31

"3. Start New Experiment" on page 32

"3. Clean the Sensor" on page 34

"4. Collect a Background" on page 37

"5. Set the Data Collection Parameters" on page 41

Refer to "Best Practices" on page 42 for additional guidelines.

1. See An Overview of the Process

The following useful references are available to help you learn more on this subject:

- "Experiment Setup in iC IR" (MK-PB-0013-AC)—Included in your iC IR product documentation available through iC IR Help > Show Documentation Portfolio. This is a Quick Reference guide that provides instructions on the basics of FlowIR hardware and iC IR software for starting an experiment.
- "iC IR Guided Tour"—A link to the tour is in the More Information section of the iC IR software Start Page. The tour is a video that provides a concise overview of the software with special attention to efficiently collecting data and converting it to information. To review a specific part of the tour, click the small 'Jump to' link above the tour window and select from the drop-down list.

Figure 5-5 Guided Tour segment selection link

2. Interface Sampling Technology with Flow Chemistry

Interfacing the sampling technology with your chemistry will lead to data and information about the flow chemistry reaction. Start by placing the FlowIR within reach of the flow chemistry tubing.

FlowIR Sensor and Flow Cell Head

Monitoring flow chemistry requires injection of solvent or reagents or the flow of the liquid solution into the FlowIR Flow Cell sensor. Establish connections to the cell using the specified Omnifit-style fittings (not provided). Mate the opposite end to the reaction chemistry to allow continuous flow. Alternately, create a shorter length of tubing to afford easy injection of solvent and reagents.

Ensure that the flow direction is as shown in Figure 5-6:

- IN through the straight horizontal inlet at the center of the flow cell head
- OUT through the upward angled outlet near the top of the flow cell head

Note: Be sure to collect an 'air background' before introducing liquid reaction chemistry into the FlowIR Flow Cell Head.

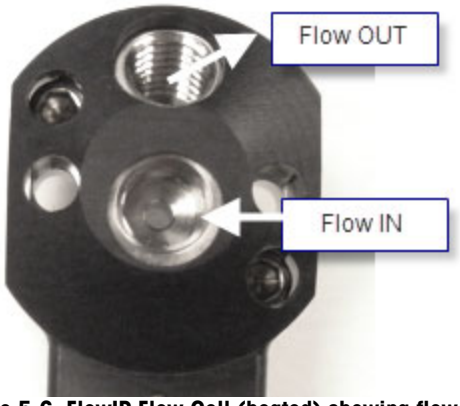

Figure 5-6 FlowIR Flow Cell (heated) showing flow direction

3. Start New Experiment

When you start a new experiment in iC IR software, a wizard-guided process presents recommended checks and procedures.FlowIR systems are factory-aligned, however, we recommend checking alignment through the New Experiment wizard before each experiment. The purpose is to assure the energy of the system (source) properly travels from the origin to the sample and then to the detector. By aligning maximum energy through this optical pathway, the FlowIR will yield an infrared fingerprint characteristic of the chemistry in contact with the sampling technology (sensor).

Use the following steps to access and implement the wizard.

1. Click **New Experiment** on the iC IR Start Page.
2. If necessary, configure the instrument per the instructions in "2. Configure Instrument in Software" on page 30. If the sampling technology has remained the same since the last instrument configuration, it is not necessary to repeat the process.

3. Name the experiment or accept the default name.
4. Select 'Trend RTD' if applicable, and click **Next**.
5. Set parameters in Experiment Duration window and click **Next**.
6. Choose 'No Reference Spectra Needed' option in Reference Spectra Needed window, and click **Next**.
7. Click Next in 'Prepare to Clean' probe window.
8. Check the Peak Height and Contrast bars at the top of the Align Probe window.

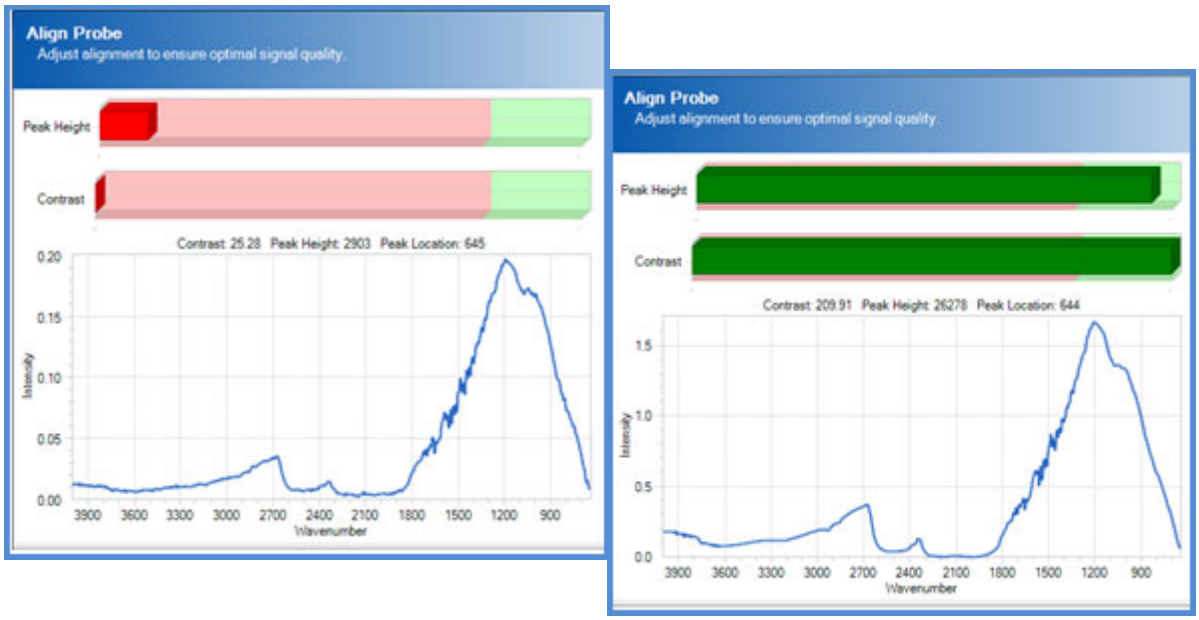

Figure 5-7 Align Probe wizard—Red to Green indicator bars

- If the indicator bars are both Green, then alignment is OK.
- If any indicator bar is Red, check the following:
  - **a.** FlowIR Sensor to ensure it is securely attached to the SIM on the front of the FlowIR base unit.
  - **b.** Instructions to "C. Switch Flow Heads (as applicable)" on page 26 to ensure the Sensor and head are properly installed.
  - **c.** Instruction on Gain setting ("B. Establish Acquisition Settings" on page 30).

  Repeat the New Experiment process. If Peak Height and Contrast bars are still red in the Align Probe window, contact METTLER TOLEDO using the information on page 6.

3. Clean the Sensor

Cleaning the FlowIR Flow Cell is recommended after each experiment. This action eliminates any chance of observing infrared fingerprints from a previous flow chemistry or sample measurement, thus assuring an accurate representation of the reaction of interest. After reviewing the information below, follow the instructions starting on page 36 to properly clean the sensor.

Note: IMPORTANT: Only clean the sensor surface when the FlowIR Sensor is attached to the base unit.

Although you will clean the 'wetted' surfaces of the FlowIR Flow Cell, the most important part is the FlowIR Sensor (DiComp or SiComp) since it is the true sampling surface when measuring flow chemistry.

Figure 5-8 FlowIR Sensor

The iC IR 'Clean Probe' wizard dramatically speeds the cleaning process. Once in the wizard, you can quickly determine whether cleaning is necessary, as well as observe the impact of the clean method. The following images show possible types of 'dirty' sensors and the desirable end result.

Peaks pointing in the positive direction indicate one of two situations.

- **Sensor has materials present on the surface** relative to the last background measurement, likely taken immediately after cleaning the sensor. This is a common occurrence if the probe has not been cleaned following an experiment. Enough residual

reaction mixture is on the sensor to yield an infrared fingerprint. If you do not clean before the next experiment the residue can cause inaccurate measurement of reaction component trends.

- **Residual cleaning solvent is present on the sensor surface.** Wait for the solvent to dry, assuming no residue will result, or wipe with a clean kimwipe. If a residue persists, choose another solvent for a final rinse.

Dirty Sensor Examples

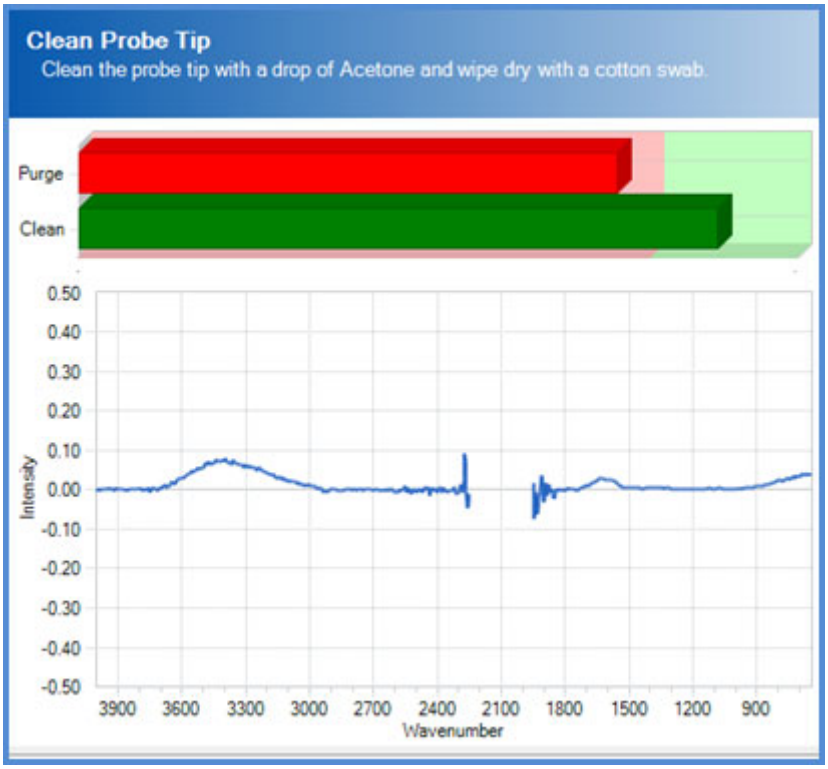

Figure 5-9 'Dirty' sensor—Prior reaction mixture or insufficient drying time of cleaning solvent

Figure 5-10 'Dirty' sensor—Poor cleaning method and subsequent collection of new background

Peaks pointing in the negative direction are a result of cleaning a residue off the sensor relative to the last background measurement. For example, not cleaning the residue from the a previous experiment (as above) and collecting a new air background will essentially include the residue in the background spectrum. When you finally clean the sensor, the negative peaks will appear since the residue is no longer present on the sensor relative to the original background spectrum.

When the sensor is 'dirty,' repeat the following steps until you see green indicator bars and a flat spectrum line:

1. Clean the sensor free of any visible residue.

Note:	IMPORTANT: Only clean the sensor surface when the FlowIR Sensor is attached to the base unit.

2. Check sensor cleanliness using 'Clean Probe' wizard.

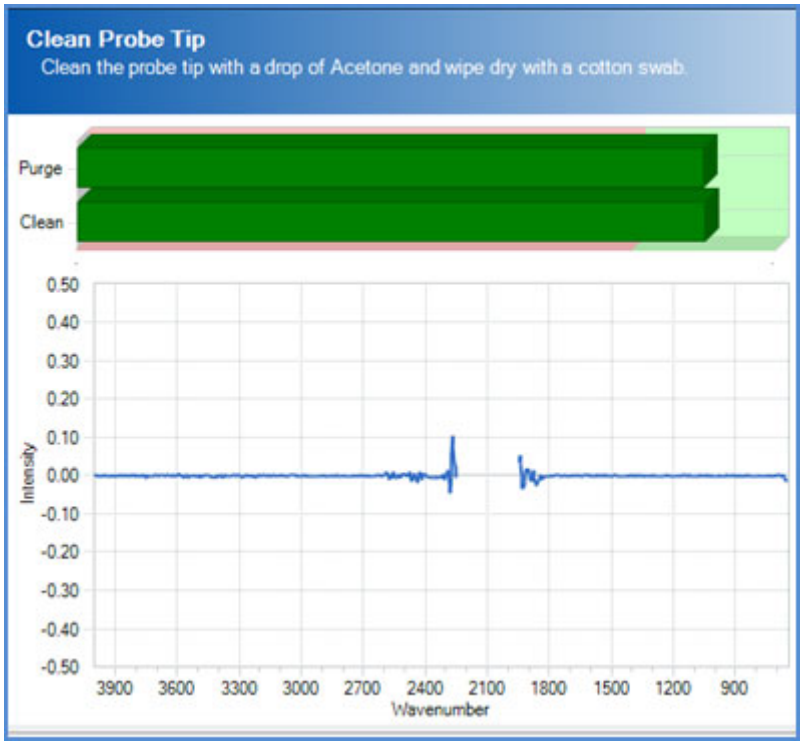

Figure 5-11 'Clean' sensor—Green indicator bars and flat spectral line

- If positive peaks are present, repeat the cleaning process until green indicator bars appear and a flat spectral line is present, proceed through the wizard.
- If negative peaks are present:
  - **a.** Collect a new background by clicking **Back** in the New Experiment wizard until you reach the 'Name Experiment File' window.
  - **b.** Click **Configure Instrument**.
  - **c.** Click **Next** to reach the 'Collect Clean Reference' window.
  - **d.** Click **Collect Background** to apply the new background to the 'Clean Sensor' wizard.
  - **e.** Click **Next** and then **Finish** to return to New Experiment wizard.
  - **f.** Proceed to 'Clean Probe' window.
  - **g.** If negative peaks persist then repeat the process or change cleaning solvent until green indicator bars appear and a flat spectral line is present.

4. Collect a Background

The collection of an air background prior to each experiment is the single-most important step in getting high quality infrared data out of a fully functional FlowIR. Every sample measurement following this step will use the background to 'ratio out' all infrared absorbing

materials in the optical path and the source intensity profile. The end result is an infrared fingerprint of absorbance versus wavenumber of only the flow chemistry components. A flat baseline will appear at whatever wavenumbers are non-absorbing by the chemistry.

For example, water vapor will always be present in the FlowIR at a very small and constant concentration, and the air background will show the characteristic fingerprint. Subsequent collection of air samples will also contain the water vapor in the raw single beam (intensity versus wavenumber). However, subsequent ratio of sample to background single beam eliminates the water vapor to produce a flat zero absorbance in air. Note in Figure 5-12 that all other absorbing features (sensor, source energy profile) also ratio out of the sample spectrum. This processing is a routine step in an infrared spectroscopy measurement that the software performs automatically.

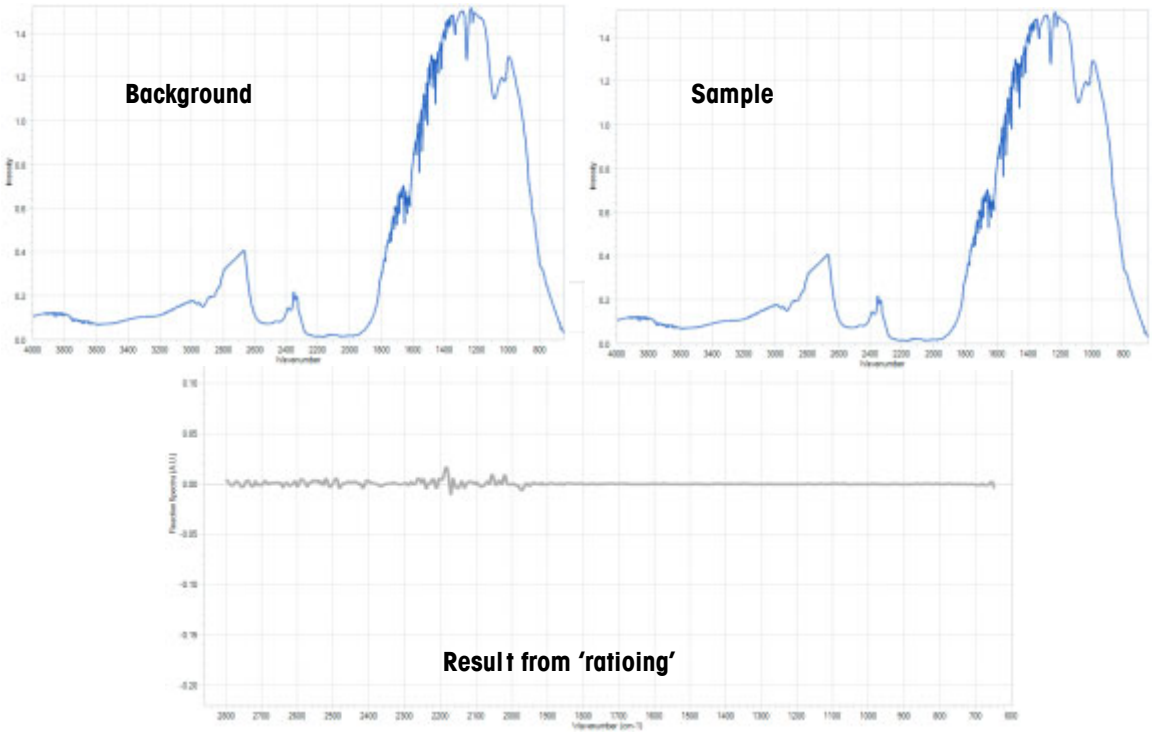

Figure 5-12 Water Vapor in background and sample (plus the result of 'ratioing')

Results from Infrequent Background Collection

Infrequent collection of air backgrounds will produce infrared fingerprints that lack the peak definition to properly trend reaction components. You can identify these cases by observing the shape of the infrared fingerprints, specifically in the baseline.

The following images show common examples of baseline 'wag,' negative peaks, and abnormal peaks:

Figure 5-13 shows baseline 'wag' due to change in optical alignment or no collection of air background from experiment to experiment. This normally occurs when you start a new experiment without collecting a new background.

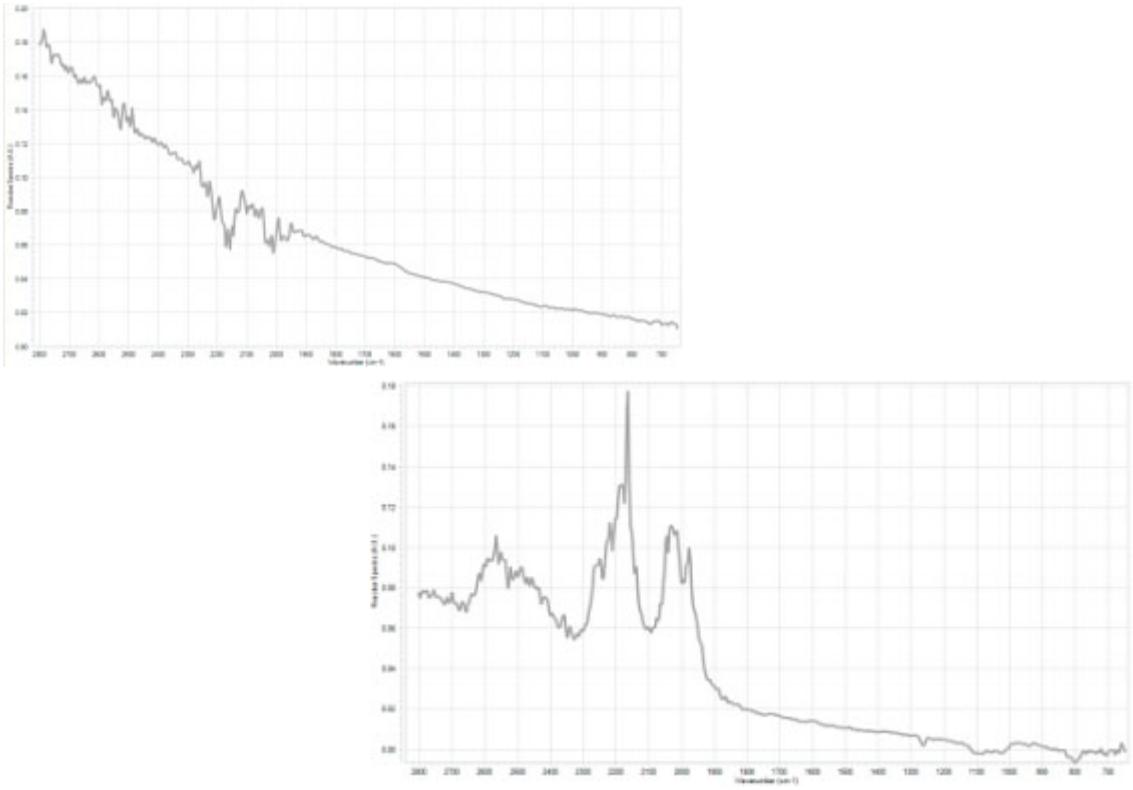

Figure 5-13 Baseline 'wag'

Below is an example of negative peaks that result from an unclean sensor.

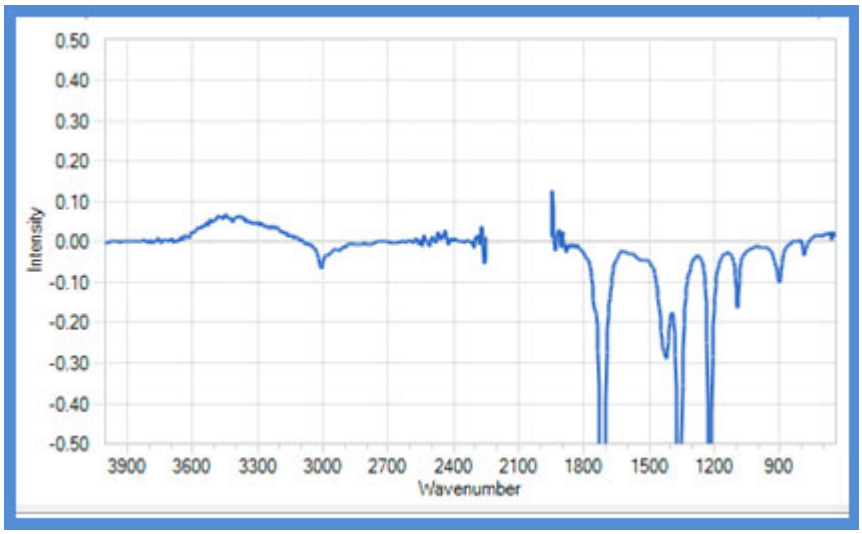

Figure 5-14 Negative peaks due to unclean sensor

The following example shows abnormal peaks due to a change in the type of sensor (DiComp to SiComp) without collecting a new air background:

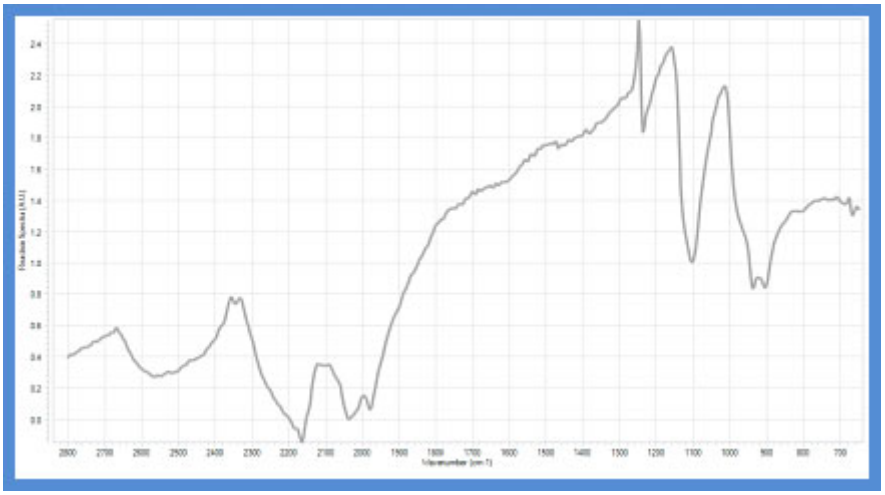

Figure 5-15 Abnormal peaks from changed sensor without new background

Background Collection Procedure

1. Collect a new background prior to each experiment by clicking the **Collect Background** button in the New Experiment wizard. The button is located on the Collect Background wizard window.

2. When the background spectrum turns green, collection is complete.

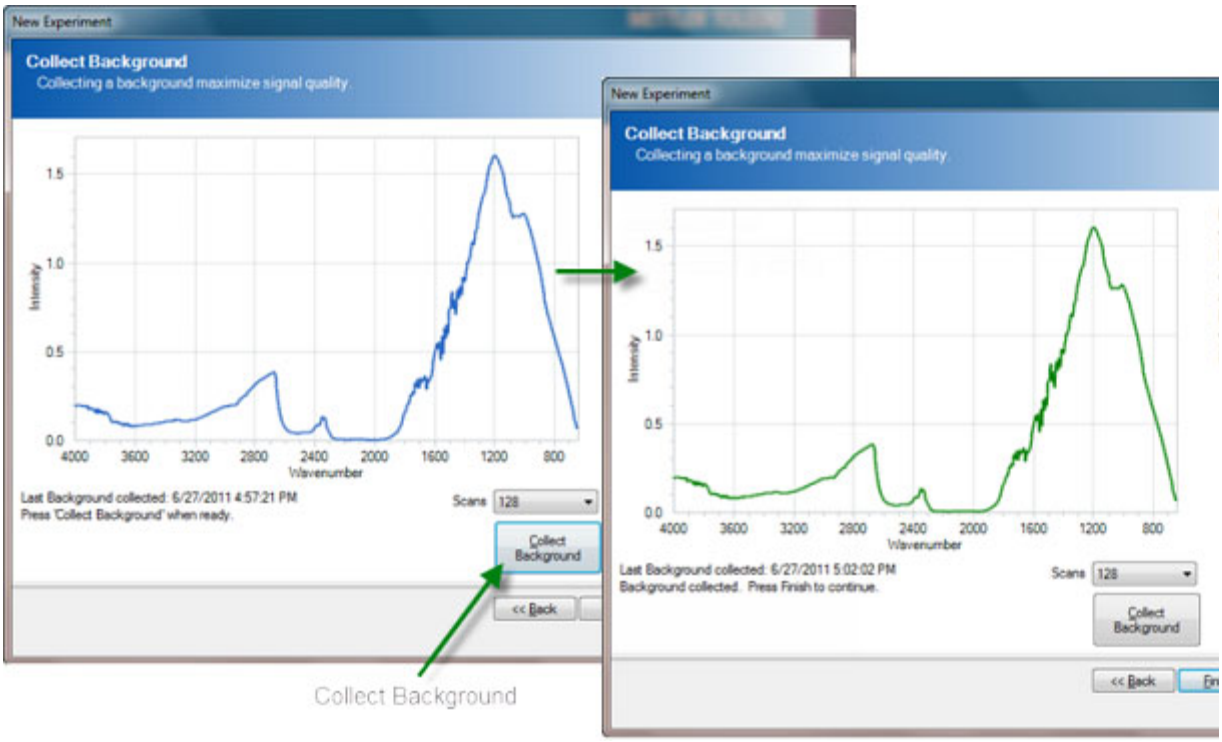

Figure 5-16 Reference background

5. Set the Data Collection Parameters

There are a number of data collection parameters worthy of attention to potentially maximize mid-infrared measurement sensitivity and chemical trend information. Keep in mind that iC IR establishes default parameters that account for the most common applications to speed the experiment collection workflow, but you can choose to adjust the settings. Here are the more common parameters and how they impact the infrared measurements during an experiment. The software prompts you for these parameters in New Experiment process.

Scans/Sample

The number of scans per sample is an automatic setting depending on your choice of Interval and Resolution. Users can alter the parameter to a maximum allowable setting to gain the best contrast of infrared fingerprints, which leads to the best possible identification of peaks to trend reaction components.

Phases

Add and edit phases for the experiment. Define each phase with a specific duration and measurement interval. Phases enable you to vary the sampling interval at different times throughout the experiment. Phases execute in sequence.

Collection Interval

You may choose to shorten or lengthen the collection interval to match the chemistry kinetics. Use a short interval during active portions of the experiment to capture fast changes. With this feature, you can monitor long experiments while keeping file sizes small.

Experiment Duration

Choose the total time for the experiment or each phase with this parameter. We recommend extending the total time for the experiment beyond normal expectations during the investigation of new flow chemistry to gain maximum information. Data is cheap!

Best Practices

- **Identify Correct Sampling Technology**—Make sure concentration of the species of interest is within the detection limits of the FlowIR system and sampling technology in use with your system. A good rule for a FlowIR and standard sampling technology is a detection limit of 0.1wt% for a moderate infrared absorber.
- **Measure Pure Reaction Components**—Whenever possible, measure the mid-infrared fingerprints of pure reagents and products. This speeds the identification of specific peaks in the reaction mixture that allow accurate trending of a particular component over time. An alternate approach is to add reagents one-at-a-time (see below).
- **Check Flow Rate**—The flow cell must be in contact with the reaction mixture at all times to properly measure infrared fingerprints. Check that the flow is on and rate is appropriate for your chemistry.
- **Begin Experiment with Solvent Only**—After collecting an air background, add the solvent only and begin the measurement of infrared fingerprints. Wait for several measurements before adding reagents to get a clear identification of fingerprints for solvent and distinguishable peaks for reagents.
- **Add Annotations**—Label the beginning and end of additions, results from grab samples, modifications in reaction parameters, and observations regarding the physical changes in the reaction mixture. Any one or all of these events help explain the infrared fingerprint changes for a better understanding of the chemistry.
- **Add Reagents One-at-a-Time**—The addition of reaction components should occur in sequence whenever possible. Collect at least four spectra between each addition to clearly identify infrared fingerprint features specific to the component that will later help define peak trends.
- **Correlate Offline Analysis**—FlowIR produces infrared fingerprints that show component absorbance, which is proportional to concentration. This fact offers correlation to offline analysis of grab samples to create concentration trends for component peaks that are isolated. Full quantitative analysis is also an option for overlapping peaks with the use of iC Quant, a methods development software tool.

6

Care and Maintenance

The FlowIR system care and maintenance chapter includes the following sections:

Service Contracts

METTLER TOLEDO offers service contracts for your FlowIR product to assist you with maintaining maximum functionality and performance. Contact your Mettler-Toledo AutoChem, Inc. representative anytime to discuss the details using the METTLER TOLEDO part number below .

FlowIR Base Unit:

14696669	IPac, FlowIR
14690654	Extended Warranty, FlowIR, Two Years
14690655	Extended Warranty, FlowIR, Three Years
14690656	Contract, FlowIR, Preventive Maintenance
14690657	Contract, FlowIR, Full Coverage Service
14690658	Contract, FlowIR, Full Coverage Service, Two Years
14690659	Contract, FlowIR, Full Coverage Service, Three Years

FlowIR Sensor:

14690691	Extended Warranty, FlowIR Sensor, Two Years
14690692	Extended Warranty, FlowIR Sensor, Three Years
14690693	Contract, FlowIR Sensor, Add-On Full Coverage Service
14690694	Contract, FlowIR Sensor, Full Coverage Service
14690695	Contract, FlowIR Sensor, Full Coverage Service, Two Years
14690696	Contract, FlowIR Sensor, Full Coverage Service, Three Years

Cleaning the Sensor

Note: FlowIR Sensor must be connected to the base unit while cleaning.

The FlowIR sensor in the Sensor contains a diamond or silicon composite sensor (DiComp or SiComp) that samples the reaction mixture to produce infrared fingerprints of the molecular composition. Cleaning the sensor eliminates any chance of observing infrared fingerprints from a previous reaction or sample measurement, thus assuring an accurate representation of the reaction of interest. The process is simply to clean the sensor and check cleanliness using the iC IR software.

Note: Ensure the probe is not in contact with any chemicals (exposed only to air) before proceeding.

Clean the FlowIR Flow Cell sensor from the previous experiment using the most appropriate solvent(s) to dissolve the reaction species. A final cleaning with reagent grade acetone is recommended. A virgin cotton swab on a wooden stick makes an ideal cleaning tool for the sensor tip.

Note: Q-tips and similar type swabs have lubricants and are not the best choice for a cleaning tool.

Figure 6-1 Sensor window on FlowIR Sensor

1. Clean the sensor, as described above.
2. Click **Configure Instrument** on the iC IR Start Page
3. Proceed through the wizard by clicking **Next** until you reach the 'Collect Clean Reference Background.'
4. Click **Collect Background** to collect a reference background to prepare the wizard for a sensor cleanliness check and click **Next**.
5. Click **Finish**. This action skips the 'water vapor' collection and exits the wizard.
6. Click **New Experiment** on the iC IR Start Page.
7. Click **Next** and click **Next** again to reach the 'Reference Spectra Needed?' wizard window.
8. Select 'Collect reference spectra (recommended)' and click **Next**.
9. Click **Next** and click **Next** again to reach the 'Clean Probe' wizard window.

10. Observe the two colored bars that indicate if the sensor is clean or dirty.

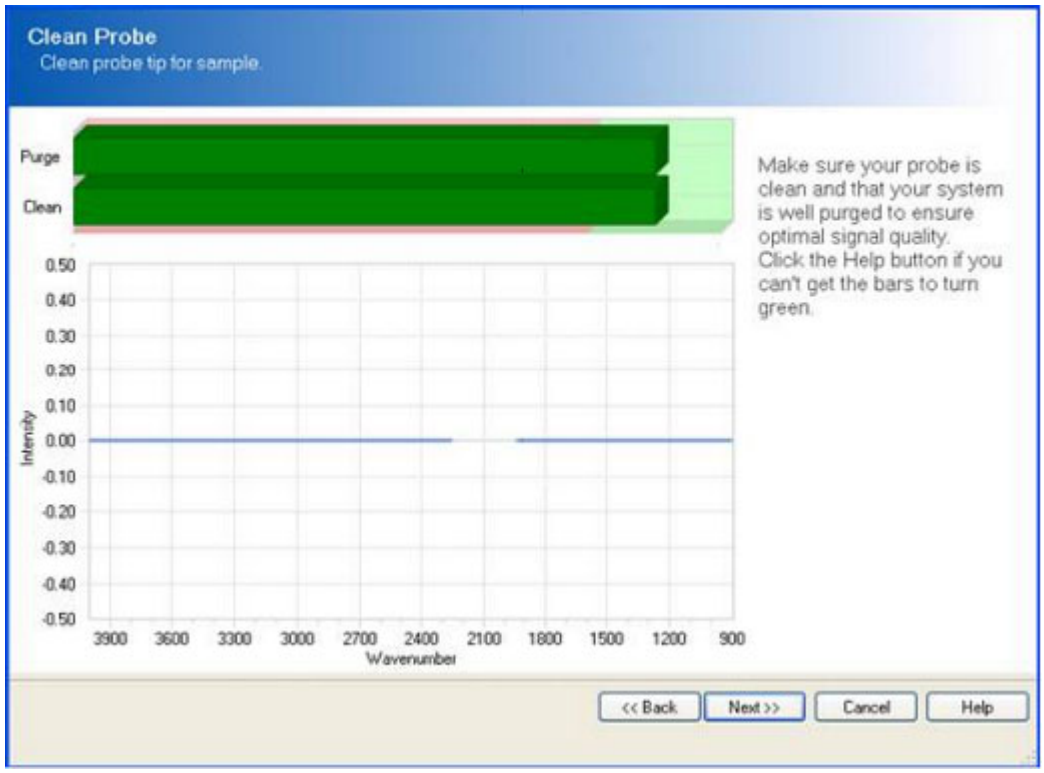

Figure 6-2 Collect Clean Reference Background in iC IR

- If the bars are green, the sensor is ready for monitoring chemistry.
- If the bars are red and in the red area of the purge and clean zone, the probe surface or FlowIR Flow Cell need further cleaning.

Note: The Intensity versus Wavenumber image will appear as a relatively flat line when the sensor is clean and the indicator bars are green.

11. If the clean sensor check indicates the probe is not ready, repeat the clean procedure and take another 'Background' until the bars turn green. At this point the sensor is ready for monitoring chemistry.

12. Click **Finish**.

13. Check off this action in the 'StarterPac Installation Checklist' if performing an initial installation, or using the form to re-qualify the performance.

Maintaining a FlowIR System

Follow the cleaning instructions below for FlowIR base units.

- Ensure the unit is powered off before doing any cleaning.
- Clean all exterior surfaces only with water and mild detergent.

- Do not use any alcohols, acids, bases or any flammable material to clean any part of the system.
- Be careful not to submerse any parts of the system with washing liquid.
- Be certain to dry all surfaces of the system after washing to avoid pooling of any liquid.
- Leave system powered off for at least 30 minutes after washing to avoid accidental short circuit of the electronics.

The customer assumes responsibility for maintaining a logbook to record and monitor the operation and performance of the FlowIR. Reproduce the checklist forms in Appendix A on page 51 as needed.

Maintaining FlowIR Flow Cell Heads

As part of a regular maintenance schedule, perform the following maintenance on the Flow Cell Heads:

- Clean the points where the chemistry flows into the Flow Cell head at the Omnifit-style fittings. Figure 1 on page 28 and Figure 5-3 on page 28 show the flow direction.
- Replace the o-ring in the Flow Cell head with the Kalrez o-ring specified under "FlowIR Sampling Technology" on page 23.

Customer-Replaceable Parts

Table 6-6 contains all the available customer-replaceable parts. Contact METTLER TOLEDO to order any of these items.

Table 6-6 Customer-Replaceable Parts

Item	Part Number	Part
1	**14170398**	AC Power Cord, NA
2	**14705932**	External Ethernet Cable
3	**14124048**	O-ring—Flow Cell Head
4	**14430686**	Heater Controller Unit
5	**14124051**	Power Supply—Heater Controller Unit
6	**14474457**	FlowIR Power Supply
7	**14545809**	FlowIR Sensor retaining ring
8	**14474445**	FlowIR Sensor, DiComp
9	**14474446**	FlowIR Sensor, SiComp
10	**14430685**	Flow Cell Head, 10µL, non-heated
11	**14430684**	Flow Cell Head, 10µL, heated
12	**14430683**	Flow Cell Head, 50µL, non-heated
13	**14430682**	Flow Cell Head, 50µL, heated

FlowIR Relocation, Packaging, and Storage

To prevent and minimize damage to the FlowIR, follow the instructions below to prepare the base unit and sampling technology for relocation, shipment, or storage.

Shutdown

1. Close the iC IR software application and shutdown the computer according to normal operating procedures.
2. Disconnect the power cord and Ethernet communications cable from the rear panel of the base unit as well as from the wall socket and computer. Store with the base unit.
3. Remove the sampling technology from the front of the unit and store it with the base unit in the factory-supplied box.
4. Transport for relocation or storage taking precautions similar to any electronic device to avoid damage to the base unit and sampling technology.
5. For long-term storage, choose a secure, cool, dry location.

Reinstalling the FlowIR

Follow the installation instructions in the FlowIR StarterPac, or contract METTLER TOLEDO to arrange a reinstallation, based on your service contract.

FlowIR Relocation, Packaging, and Storage

7

Troubleshooting

This section highlights the most common troubleshooting issues for the FlowIR system.

Table 7-1 Troubleshooting

Problem	Cause	Solution
Power LED light is OFF	■ Power cable disconnected	■ Connect power cable.
	■ Power cable faulty	■ Contact METTLER TOLEDO
Scan LED light is OFF	■ Ethernet cable disconnected from base unit or computer	■ Connect Ethernet cable.
	■ Ethernet cable faulty	■ Contact METTLER TOLEDO
iC IR not communicating with base unit	■ Ethernet cable disconnected	■ Connect Ethernet cable
	■ IP address incorrect	■ Set IP address to 192.168.1.2 (Refer to the "FlowIR StarterPac.")
	■ Ethernet cable faulty	■ Contact METTLER TOLEDO
Align bars are RED	■ Using an 'old' background	■ Clean FlowIR sensor and take a new background (page 34 and page 37).
Negative peaks present in infrared data	■ Unclean sensor surface	■ Clean FlowIR sensor and take a new background
User manipulation of 3D Surface Viewer in iC IR is slow to respond	■ Video graphics card driver insufficient to support action	■ Verify graphics card meets System Requirements shown in "iC IR Installation Guide."
		■ Set Surface Viewer Preference to "Use alternate rendering" in iC IR Tools > Preferences.

Refer to "Best Practices" on page 42 for useful tips.

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