

GE Healthcare  
Life Sciences

# MicroCal™ Auto-iTC<sub>200</sub> system

## Operating Instructions

Original instructions





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# 1 Introduction

## About this chapter

This chapter contains important user information, descriptions of safety notices, regulatory information, intended use of MicroCal Auto-iTC<sub>200</sub>, and lists of associated documentation.

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## In this chapter

This chapter contains the following sections:

Section	See page
1.1 About this manual	6
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1.3 Regulatory information	10

---

## 1.1 About this manual

### Purpose of the *Operating Instructions*

The *Operating Instructions* provide the user with the instructions needed to install, operate and maintain MicroCal Auto-iTC<sub>200</sub> in a safe way.

---

### Typographical conventions

Software items are identified in the text by ***bold italic*** text. A colon separates menu levels, thus ***File:Open*** refers to the ***Open*** command in the ***File*** menu.

Hardware items are identified in the text by **bold** text (e.g., **Power** switch).

---

## 1.2 Important user information

### Read this before operating MicroCal Auto-iTC<sub>200</sub>



**All users must read the entire *Operating Instructions* before installing, operating or maintaining the system.**

Always keep the *Operating Instructions* at hand when operating MicroCal Auto-iTC<sub>200</sub>.

Do not operate MicroCal Auto-iTC<sub>200</sub> in any other way than described in the user documentation. If you do, you may be exposed to hazards that can lead to personal injury, you may cause damage to the equipment, and no warranty will apply.

### Intended use of MicroCal Auto-iTC<sub>200</sub>

MicroCal Auto-iTC<sub>200</sub> is an Isothermal Titration Calorimeter system designed for biomolecular interaction studies in research applications.

MicroCal Auto-iTC<sub>200</sub> is intended for research use only and shall not be used in any clinical procedures or for diagnostic purposes.

MicroCal Auto-iTC<sub>200</sub> is not suitable for operation in a potentially explosive atmosphere or for handling flammable liquids.



#### **WARNING**

Do not operate MicroCal Auto-iTC<sub>200</sub> in any other way than described in MicroCal Auto-iTC<sub>200</sub> user documentation.

### Prerequisites

In order to operate MicroCal Auto-iTC<sub>200</sub> safely and according to the intended purpose the following prerequisites must be met:

- You should have a general understanding of the use of a personal computer running Microsoft™ Windows™ in the version provided with your product.

## 1 Introduction

### 1.2 Important user information

- You should be acquainted with the use of general laboratory equipment and with handling of biological materials.
  - You must read and understand the Safety instructions chapter of these *Operating Instructions*.
  - The system must be installed according to the instructions in *Chapter 4 Installation*, on page 36.
- 

## Safety notices

This user documentation contains WARNINGS, CAUTIONS and NOTICES concerning the safe use of the product. See definitions below.

### Warnings



#### **WARNING**

**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury. It is important not to proceed until all stated conditions are met and clearly understood.

### Cautions



#### **CAUTION**

**CAUTION** indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. It is important not to proceed until all stated conditions are met and clearly understood.

### Notices



#### **NOTICE**

**NOTICE** indicates instructions that must be followed to avoid damage to the product or other equipment.

## Notes and tips

**Note:** A note is used to indicate information that is important for trouble-free and optimal use of the product.



**Tip:** *A tip contains useful information that can improve or optimize your procedures.*

---

## 1.3 Regulatory information

### Introduction

This section lists the directives and standards that are fulfilled by MicroCal Auto-iTC<sub>200</sub>.

### Manufacturing information

The table below summarizes the required manufacturing information. For further information, see the EC Declaration of Conformity document.

Requirement	Content
Name and address of manufacturer	GE Healthcare MicroCal Products Group 22 Industrial Drive East, Northampton, Massachusetts, 01060 USA
Date of manufacture and serial number	The serial number contains the code for the year of the manufacture of the instrument. (The serial number takes the form of) xx.yy.zzz where yy = year of manufacture.
Name and ID of notified body for European market	GE Healthcare Bio-Sciences AB Björkgatan 30, SE 751 84 Uppsala, Sweden

### CE Conformity

This product complies with the European directives listed in the table, by fulfilling the corresponding harmonized standards.

A copy of the Declaration of Conformity is available on request.

Directive	Title
2006/42/EC	Machinery Directive (MD)
2006/95/EC	Low Voltage Directive (LVD)
2004/108/EC	Electromagnetic Compatibility (EMC) Directive

## International standards

The standard requirements fulfilled by this product are summarized in the table below.

Standard	Description	Notes
EN ISO 12100	Safety of machinery. General principles for design. Risk assessment and risk reduction.	EN ISO standard is harmonized with EU directive 2006/42/EC.
EN 61010-1, IEC 61010-1, UL 61010-1, CAN/CSA C22.2 No. 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use	EN standard is harmonized with EU directive 2006/95/EC.
EN 61326-1, IEC 61326-1 (Emission according to CISPR 11, Group 1, class A)	Electrical equipment for measurement, control and laboratory use - EMC requirements.	EN standard is harmonized with EU directive 2004/108/EC.

## CE Marking



The CE marking and the corresponding Declaration of conformity is valid for the instrument when it is:

- used as a stand-alone unit, or
- connected to other CE marked instruments, or
- connected to other products recommended or described in the user documentation, and
- used in the same state as it was delivered from GE Healthcare, except for alterations described in the user documentation.

## Instrument safety compliance specifications

GE Healthcare MicroCal Auto-iTC<sub>200</sub> calorimeters carry the CUE (Canada, USA, Europe) safety certification mark, authorized by TÜV America, a division of TÜV SÜD Deutschland, to signify that:



- The instrument has been tested by an accredited certification body and meets applicable Canadian electrical safety standards/requirements (CSA/SCC).
  - The instrument has been tested by an NRTL (Nationally Recognized Testing Laboratory) and meets applicable United States electrical safety standards/requirements (ANSI/UL).
  - The instrument has been tested by a competent and notified body for applicable EU directives and meets applicable safety standards/requirements (EN/IEC).
- 

## Regulatory compliance of connected equipment

Any equipment connected to MicroCal Auto-iTC<sub>200</sub> should meet the safety requirements of EN 61010-1/IEC 61010-1, or relevant harmonized standards. Within EU, connected equipment must be CE marked.

---

# 2 Safety instructions

## About this chapter

This chapter describes safety precautions and emergency shutdown procedures for MicroCal Auto-iTC<sub>200</sub>. The labels on the system and information regarding recycling are also described. **All users must read this chapter before using MicroCal Auto-iTC<sub>200</sub> and observe the safety information at all times during use.**

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## In this chapter

This chapter contains the following sections:

Section	See page
2.1 Safety precautions	14
2.2 Labels	23
2.3 Emergency procedures	26
2.4 Recycling information	27
2.5 Declaration of Hazardous Substances (DoHS)	28

---

## 2.1 Safety precautions

### Introduction

Before installing, operating or maintaining the system, you must be aware of the hazards described in the user documentation. Follow the instructions provided to avoid personal injury or damage to the equipment.

The safety precautions in this section are grouped into the following categories:

- General precautions
  - Using flammable liquids
  - Personal protection
  - Installing and moving
  - System operation
  - Maintenance
- 

### General precautions



#### **WARNING**

Do not operate MicroCal Auto-iTC<sub>200</sub> in any other way than described in MicroCal Auto-iTC<sub>200</sub> user documentation.



#### **WARNING**

Do not use MicroCal Auto-iTC<sub>200</sub> if it is not working properly, nor if it has suffered any damage, for example:

- damage to the power cord or its plug
- damage caused by dropping the equipment
- damage caused by splashing liquid onto it



#### WARNING

Provide proper electrical power to the instrument. This should be 100-240 VAC, 50/60 Hz, with a Ground Fault Circuit Interrupter (GFCI). The power strip supplied with your system, contains a GFCI. All power plugs and cords should be 3-prong, grounded cables or outlets.



#### WARNING

**Protective ground.** MicroCal Auto-iTC<sub>200</sub> must always be connected to a grounded power outlet.



#### WARNING

In case of fire, unplug MicroCal Auto-iTC<sub>200</sub>.



#### WARNING

**Access to power switch and power cord.** The power switch must always be easy to access. The power cord must always be easy to disconnect.



#### WARNING

Use caution when using solutions near the instrument. If any liquid is spilled on or around the instrument, unplug the instrument immediately and wipe it up.

If there is any possibility that liquid may have leaked into the instrument case, contact GE Healthcare immediately. Do not plug the instrument into any electrical outlet until the problem is resolved.



#### WARNING

The MicroCal iTC<sub>200</sub> cells are constructed out of Hastelloy™. Strong acids must be avoided.

## 2 Safety instructions

### 2.1 Safety precautions



#### NOTICE

##### **Electromagnetic and radio frequency interference (EMI/RFI).**

Laboratory tests have shown that electromagnetic and radio frequency waves may affect the performance of MicroCal Auto-iTC<sub>200</sub>.

Electromagnetic and radio frequency interference can come from sources such as mobile phones, mobile two-way radios (such as walkie-talkies), radio stations, TV stations, amateur radio (HAM) transmitters, wireless computer links, microwave signals, paging transmitters, and medium-range mobile transceivers used by emergency vehicles. In some cases, these waves can cause unintended data results.

Please refrain from all use of such equipment and leave cellular telephones in the OFF position.

---

## Using flammable liquids



#### WARNING

**Fire Hazard.** Before starting the system, make sure that there is no leakage.



#### WARNING

A fume hood or similar ventilation system shall be installed when flammable or noxious substances are used.



## Personal protection



### WARNING

**Hazardous substances.** When using hazardous chemical and biological agents, take all suitable protective measures, such as wearing protective glasses and gloves resistant to the substances used. Follow local and/or national regulations for safe operation and maintenance of MicroCal Auto-iTC<sub>200</sub>.



### CAUTION

The tray drawer and tube drawer both have the potential to cause injury by pinching a body part between the face plate and the instrument's frame. Keep hands out of the drawers before instructing the instrument to close the drawers.

## Installing and moving



### WARNING

MicroCal Auto-iTC<sub>200</sub> must be installed and prepared by GE Healthcare personnel or third party authorized by GE Healthcare.



### WARNING

**Power cord.** Only use power cords with approved plugs delivered or approved by GE Healthcare.



### WARNING

Do not block the ventilation inlets or outlets on the system.

## 2 Safety instructions

### 2.1 Safety precautions



#### WARNING

**Access to power switch and power cord.** The power switch must always be easy to access. The power cord must always be easy to disconnect.



#### WARNING

**Installing the controller.** The controller should be installed and used according to the instructions provided by the documentation included in the shipment.



#### WARNING

Replace fuses **ONLY** with the same type and rating as the spare fuses that are provided with the original shipment.



#### WARNING

**Heavy object.** The MicroCal Auto-iTC<sub>200</sub> instrument weighs about 90 kg (200 lbs). Use proper lifting equipment, or use four or more persons when moving the instrument. All lifting and moving must be performed in accordance with local regulations.



#### NOTICE

**Disconnect power.** To prevent equipment damage, always disconnect power from the MicroCal Auto-iTC<sub>200</sub> instrument before an instrument module is removed or installed, or a cable is connected or disconnected.

## System operation



### WARNING

All solutions in the cells must be cooled down below 40°C before removal. Any higher temperature may cause the syringe to break, and will increase the dangers of most hazardous solutions.



### WARNING

Nitrogen is a colorless, odorless gas which can displace oxygen and present an asphyxiation hazard.

- Compressed nitrogen should be stored in a cool, dry, well-ventilated area.
- Containers of nitrogen should be protected from physical damage and heat.
- Use only appropriate gas detection methods and equipment to verify that there are no leaks in the gas transport system.
- The unit should not be operated in tanks or other enclosed areas without proper ventilation.



### WARNING

Methanol is highly volatile and can be hazardous to humans.

- Storage containers should be kept tightly closed.
- Methanol should always be transferred in a well-ventilated area with no ignition sources. The operator should have protective clothing, eye protection and gloves.
- Methanol can be absorbed through the skin. Do not allow methanol to be swallowed or to come in contact with skin or eyes. If accidental exposure occurs, flush the affected area with water. If methanol is swallowed, or there is significant skin or eye exposure, seek medical help.

## 2 Safety instructions

### 2.1 Safety precautions



#### WARNING

Do not place vessels containing liquid on top of the instrument or inside the cabinet. Spilled liquid is an electrical hazard.



#### WARNING

**Hazardous chemicals during run.** When using hazardous chemicals, flush the entire system tubing with distilled water, before service and maintenance.



#### CAUTION

Waste tubes and containers shall be secured and sealed to prevent accidental spillage.



#### CAUTION

In this section, modifications in the plot window templates that are basic to Origin's operation will be performed. In the unlikely event that a mistake is made, which cannot be corrected, simply copy the original template file from the **Custom** folder of the installation CD-ROM. This will correct any problem that may arise.



#### NOTICE

Never allow liquid in the cells to freeze. The expansion of the liquid can distort the cells and rupture the most critical sensor, causing irreparable damage.



#### NOTICE

The MicroCal Auto-iTC<sub>200</sub> system should always be moved in its normal operating orientation. Other orientations will subject delicate sensors inside the instrument to stress.

**NOTICE**

The user interface programs, MicroCal iTC<sub>200</sub> and MicroCal Auto-iTC<sub>200</sub> have to be running for the cell and Autosampler to function properly even though the power switch is in the **on (I)** position. Software instructions can be found in the *MicroCal Auto-iTC<sub>200</sub> System User Manual*.

## Maintenance

**WARNING**

Only personnel authorized by GE Healthcare may perform service, installation, and maintenance of components inside the MicroCal Auto-iTC<sub>200</sub> cabinet.

**WARNING**

The syringe may be contaminated with hazardous residual compounds. Consult your completed Health and Safety Declarations Form to determine if any biologically or chemically hazardous substances have been used in the instrument. Use the appropriate personal protective equipment (PPE) as specified in the MSDS for those substances.

**WARNING**

Replace fuses **ONLY** with fuses of same type and rating. Several spare fuses are provided with the original shipment and the power receptacle is labeled with the correct type.

**WARNING**

Only spare parts and accessories that are approved or supplied by GE Healthcare may be used for maintaining or servicing MicroCal Auto-iTC<sub>200</sub>.

## 2 Safety instructions

### 2.1 Safety precautions



#### WARNING

**Disconnect power.** Always disconnect power from the instrument before replacing any component on the instrument, unless stated otherwise in the user documentation.



#### WARNING

**Hazardous chemicals during maintenance.** When using hazardous chemicals for system cleaning, wash the system with a neutral solution in the last phase or step.



#### WARNING

Contrad 70™ (Decon 90™) is corrosive and therefore dangerous to health. When using hazardous chemicals, avoid spillage and wear protective glasses, gloves, and other suitable personal protective equipment as specified in MSDS.



#### WARNING

MicroCal Auto-iTC<sub>200</sub> is designed with interlocks to prevent operation when the door is open. If these interlocks are disabled and/or any of the cabinet's panels are removed there is a potential for pinch, puncture and electrical injury.



#### CAUTION

The tray drawer and tube drawer both have the potential to cause injury by pinching a body part between the face plate and the instrument's frame. Keep hands out of the drawers before instructing the instrument to close the drawers.

## 2.2 Labels

### Introduction

This section describes the various labels on the MicroCal Auto-iTC<sub>200</sub> system and the MicroCal Auto-iTC<sub>200</sub> instrument and their meaning.

---

### Labels on the MicroCal Auto-iTC<sub>200</sub>

The image below shows the rear panel of the MicroCal Auto-iTC<sub>200</sub> system.




Label explanations

The table below describes the various labels that may be found on the MicroCal Auto-iTC<sub>200</sub> Autosampler and the MicroCal Auto-iTC<sub>200</sub> calorimeter.

Label text	Description
	The system complies with applicable European directives. Refer to <i>International standards</i> , on page 11.
	This symbol indicates that the product contains hazardous materials in excess of the limits established by the Chinese standard SJ/T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronics.
	This symbol indicates that waste electrical and electronic equipment (WEEE) must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.
	The system complies with the requirements for electromagnetic compliance (EMC) in Australia and New Zealand.
	<p>This symbol indicates that the instrument been tested by:</p> <ul style="list-style-type: none"><li>• an accredited certification body and meets applicable Canadian electrical safety standards/requirements (CSA/SCC), and</li><li>• an NRTL (Nationally Recognized Testing Laboratory) and meets applicable United States electrical safety standards/requirements (ANSI/UL).</li></ul> <p>Refer to <i>Instrument safety compliance specifications</i>, on page 12.</p>
	<b>Warning! High Voltage.</b> Always make sure that the system is disconnected from electric power before opening the cabinet doors or disconnecting any electric equipment.
<p>*** WARNING *** REPLACE ONLY WITH THE SAME TYPE AND RATING OF FUSE  5.0A 250 VOLT FAST ACTING</p>	Warning label specifying the type and rating of fuses for the system.



Label text	Description
<b>N<sub>2</sub> Max Pressure</b> <b>30 PSI (200 KPa)</b>	Label specifying the maximal nitrogen gas pressure for the system.
<b>GE Healthcare</b> <b>Model:</b> MicroCal Auto iTC <sub>200</sub> <b>Input:</b> 100 – 240 V 300W 50/60 Hz	Label showing the company name, model number, and the power supply input for the system.
 <b>GE Healthcare</b> 22 Industrial Drive East Northampton, MA 01060 Product: Microcalorimeter Model: MicroCal Auto iTC <sub>200</sub> Serial No: xxxxxxxx Made in U.S.A.	Label showing the company name, product, model and serial number for the system.

## 2.3 Emergency procedures

### Introduction

This section describes what to do in an emergency situation and what will happen in the event of power failure.

---

### Emergency situation

In an emergency situation, do as follows to stop the run:

Switch off the mains power supply by either:

- using the system power switch, or
  - disconnecting the power cord, or
  - switching off the fixed power supply circuit breaker.
- 

### Power failure

The lists below describe what happens in the event of power failure.

#### MicroCal Auto-iTC<sub>200</sub>

- The run is interrupted immediately.
- The data collected up to the time of the power failure is saved.

#### Controller

- The controller shuts down.
  - The MicroCal Auto-iTC<sub>200</sub> run is interrupted immediately.
-

## 2.4 Recycling information

### Introduction

This section contains information about the decommissioning of MicroCal Auto-iTC<sub>200</sub>.

---

### Decontamination

MicroCal Auto-iTC<sub>200</sub> shall be decontaminated before decommissioning and all local regulations shall be followed with regard to scrapping of the equipment.

---

### Disposal, general instructions

When taking MicroCal Auto-iTC<sub>200</sub> out of service, the different materials must be separated and recycled according to national and local environmental regulations.

---

### Recycling of hazardous substances

MicroCal Auto-iTC<sub>200</sub> contains hazardous substances. Detailed information is available from your GE Healthcare representative.

---

### Disposal of electrical components

Waste electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.



## 2.5 Declaration of Hazardous Substances (DoHS)


### Introduction


The following product pollution control information is provided according to SJ/T11364-2006 Marking for Control of Pollution caused by Electronic Information Products.

根据SJ/T11364-2006《电子信息产品污染控制标识要求》特提供如下有关污染控制方面的信息

### Symbols used in pollution control label

电子信息产品污染控制标志说明

Label	Meaning
	<p>This symbol indicates the product contains hazardous materials in excess of the limits established by the Chinese standard SJ/T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products. The number in the symbol is the Environment-friendly Use Period (EFUP), which indicates the period during which the toxic or hazardous substances or elements contained in electronic information products will not leak or mutate under normal operating conditions so that the use of such electronic information products will not result in any severe environmental pollution, any bodily injury or damage to any assets. The unit of the period is "Year".</p> <p>In order to maintain the declared EFUP, the product shall be operated normally according to the instructions and environmental conditions as defined in the product manual, and periodic maintenance schedules specified in Product Maintenance Procedures shall be followed strictly.</p> <p>Consumables or certain parts may have their own label with an EFUP value less than the product. Periodic replacement of those consumables or parts to maintain the declared EFUP shall be done in accordance with the Product Maintenance Procedures.</p> <p>This product must not be disposed of as unsorted municipal waste, and must be collected separately and handled properly after decommissioning.</p>

Label	Meaning
	<p>该标志表明本产品含有超过SJ/T11363-2006《电子信息产品中有毒有害物质的限量要求》中限量的有毒有害物质。标志中的数字为本产品的环保使用期，表明本产品在正常使用的条件下，有毒有害物质不会发生外泄或突变，用户使用本产品不会对环境造成严重污染或对其人身、财产造成严重损害的期限。单位为年。</p> <p>为保证所声明的环保使用期限，应按产品手册中所规定的环境条件和方法进行正常使用，并严格遵守产品维修手册中规定的期维修和保养要求。</p> <p>产品中的消耗件和某些零部件可能有其单独的环保使用期限标志，并且其环保使用期限有可能比整个产品本身的环保使用期限短。应到期按产品维修程序更换那些消耗件和零部件，以保证所声明的整个产品的环保使用期限。</p> <p>本产品在使用寿命结束时不可作为普通生活垃圾处理，应被单独收集妥善处理</p>

List of hazardous substances and  
their concentrations

产品中有毒有害物质或元素的名称及含量

Indication for each major part if substance exceeds limit

Value	Meaning
O	<p>Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.</p> <p>表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要求以下</p>
X	<p>Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.</p> <ul style="list-style-type: none"><li>Data listed in the table represents best information available at the time of publication</li></ul> <p>表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006 标准规定的限量要求</p> <ul style="list-style-type: none"><li>此表所列数据为发布时所能获得的最佳信息</li></ul>

List of hazardous substances

Component name 部件名称	Hazardous substance 有毒有害物质或元素					
	Pb 铅	Hg 汞	Cd 镉	Cr6+ 六价铬	PBB 多溴联苯	PBDE 多溴二苯醚
MicroCalAuto-iTC <sub>200</sub> , Enclosure with Robotics <sup>1</sup>	O	X	O	O	O	O
MicroCalAuto-iTC <sub>200</sub> , Cell Unit <sup>1</sup>	X	O	O	O	O	O
MicroCalAuto-iTC <sub>200</sub> , Controller <sup>1</sup>	O	O	O	O	O	O

<sup>1</sup> The product has not been tested as per the Chinese standard SJ/T11363-2006 *Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Product*.

# 3 System description

## About this chapter

This chapter provides a description of MicroCal Auto-iTC<sub>200</sub> and an overview of its components.

---

## In this chapter

This chapter contains the following sections:

Section	See page
3.1 MicroCal Auto-iTC <sub>200</sub> system	32
3.2 Illustrations	33

## 3.1 MicroCal Auto-iTC<sub>200</sub> system

### Introduction

This section provides a description of the MicroCal Auto-iTC<sub>200</sub> system.

---

### MicroCal Auto-iTC<sub>200</sub> system description

MicroCal Auto-iTC<sub>200</sub> is composed of the calorimeter, a fluidic system, Autosampler, and temperature-controlled tray for storing samples.

A computer controller is provided with the instrument and contains proprietary software and calibration constants specific to the automation and MicroCal iTC<sub>200</sub>.

A set of reagent (water, detergent, and methanol) bottles, a waste bottle, and a nitrogen tank are plumbed to the rear of the Autosampler.

The calorimeter sits in the lower left corner of the Autosampler. Three robotic arms, one holding the titration pipette, and two holding the cannulas for fluid transfer, move within the box. A tube rack drawer at the right side of the box allows the user to insert samples in 30 ml centrifuge tubes. The sample tray at the bottom can hold up to four 96-well plates. Refer to *Primary components of MicroCal Auto-iTC<sub>200</sub>*, on page 34.



#### CAUTION

The tray drawer and tube drawer both have the potential to cause injury by pinching a body part between the face plate and the instrument's frame. Keep hands out of the drawers before instructing the instrument to close the drawers.

Connections on the lower left of the rear panel are provided for pressurized nitrogen, the USB data connection to the controller, power, and reagent and waste bottles (see *Connections on the rear panel of MicroCal Auto-iTC<sub>200</sub>*, on page 35).

---



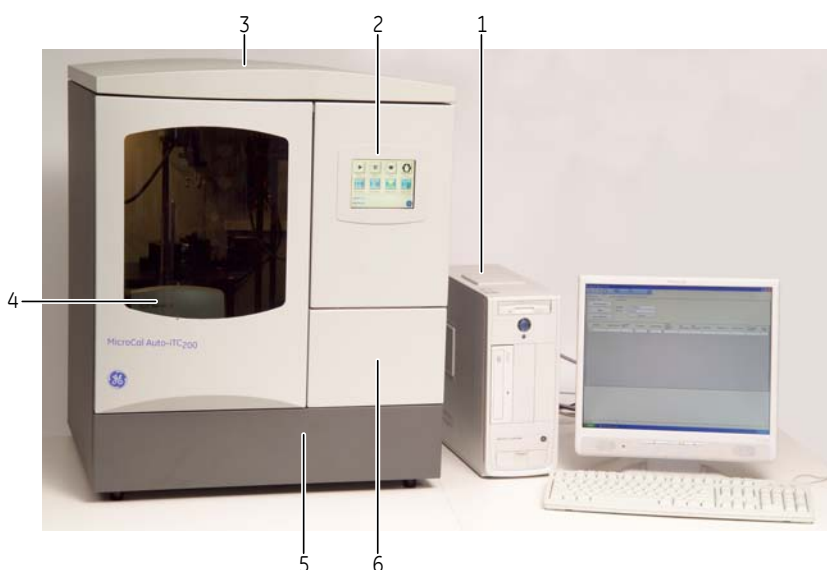
## 3.2 Illustrations

### Introduction

This section provides illustrations of the MicroCal Auto-iTC<sub>200</sub> system.

### MicroCal Auto-iTC<sub>200</sub> system

The illustration below shows the MicroCal Auto-iTC<sub>200</sub> instrument with the controller.



Part	Description
1	Controller
2	Touchscreen
3	MicroCal Auto-iTC <sub>200</sub>
4	MicroCal iTC <sub>200</sub> , inside the cabinet
5	96-well plate tray drawer (can hold four 96-well plates)
6	Tube rack drawer (can hold five 30 ml tubes)

Primary components of  
MicroCal Auto-iTC<sub>200</sub>

The primary components of MicroCal Auto-iTC<sub>200</sub> are illustrated below.



Part	Description
1	Titrant transfer arm
2	Titration pipette arm
3	Cell arm
4	Valve
5	Cannula
6	Pipette
7	iTC <sub>200</sub> calorimeter
8	Tube rack drawer (can hold five 30 ml tubes)
9	96-well plate tray drawer (can hold four 96-well plates)

## Connections on the rear panel of MicroCal Auto-iTC<sub>200</sub>

The connections on the lower left rear panel of the MicroCal Auto-iTC<sub>200</sub> system are illustrated below.



Part	Function
1	Connection for pressurized nitrogen
2	Power switch
3	USB data connection to the controller
4	Power connection
5	Connections to reagent and waste bottles

# 4 Installation

## About this chapter

This chapter provides brief information about the installation of MicroCal Auto-iTC<sub>200</sub>. For a more detailed description about the installation, refer to *MicroCal iTC<sub>200</sub> Service Manual*.

Any equipment connected to the MicroCal Auto-iTC<sub>200</sub> must fulfill applicable standards and local regulations.

---

## Precautions



### WARNING

MicroCal Auto-iTC<sub>200</sub> must be installed and prepared by GE Healthcare personnel or third party authorized by GE Healthcare.



### WARNING

**Power cord.** Only use power cords with approved plugs delivered or approved by GE Healthcare.



### WARNING

Do not block the ventilation inlets or outlets on the system.



### WARNING

**Access to power switch and power cord.** The power switch must always be easy to access. The power cord must always be easy to disconnect.

**WARNING**

**Installing the controller.** The controller should be installed and used according to the instructions provided by the documentation included in the shipment.

**WARNING**

Replace fuses **ONLY** with the same type and rating as the spare fuses that are provided with the original shipment.

**WARNING**

**Heavy object.** The MicroCal Auto-iTC<sub>200</sub> instrument weighs about 90 kg (200 lbs). Use proper lifting equipment, or use four or more persons when moving the instrument. All lifting and moving must be performed in accordance with local regulations.

**NOTICE**

**Disconnect power.** To prevent equipment damage, always disconnect power from the MicroCal Auto-iTC<sub>200</sub> instrument before an instrument module is removed or installed, or a cable is connected or disconnected.

In this chapter

This chapter contains the following sections:

Section	See page
4.1 Site requirements	39
4.2 Transport	43
4.3 Set up	44

## 4.1 Site requirements

### Introduction

This section outlines the site requirements for MicroCal Auto-iTC<sub>200</sub>.

---

### Bench space

The MicroCal Auto-iTC<sub>200</sub> with controller requires about 1.2 meters of normal bench space (approximately 70 cm wide). For more details, See *Chapter 8 Reference information*, on page 79.



#### **WARNING**

**Access to power switch and power cord.** The power switch must always be easy to access. The power cord must always be easy to disconnect.

### Ambient environment

#### **Environmental fluctuations**

It is emphasized that room temperature fluctuations due to the cycling on/off of heating and cooling systems, strong air currents, sunlight directly on the instrument and through space electromagnetic waves may cause subtle performance problems.

The following should be avoided:

- Strong draft
- Room temperature fluctuations
- Intense sunlight
- Vibrations
- Strong electrical or magnetic fields (as may be produced by an NMR, microwave oven, large motors or refrigeration units)

Environmental operating requirements

Specification	Requirement
Temperature	10°C to 28°C
Humidity	0% to 70% RH, non-condensing
Atmospheric pressure	700 to 1060 hPa

Autosampler fluid requirements

Fluid	Requirement
Nitrogen	≥ 20 psi and < 30 psi (pressure regulated) laboratory nitrogen or other compressed inert gas
Water	Distilled
Methanol	≥ 99% pure ("HPLC Grade" is recommended)
Contrad 70, detergent (also known as Decon 90)	20% Contrad 70 (14% Decon 90) concentration in water. See <i>MicroCal Auto-iTC<sub>200</sub> System User Manual</i> for details.



WARNING

Nitrogen is a colorless, odorless gas which can displace oxygen and present an asphyxiation hazard.

- Compressed nitrogen should be stored in a cool, dry, well-ventilated area.
- Containers of nitrogen should be protected from physical damage and heat.
- Use only appropriate gas detection methods and equipment to verify that there are no leaks in the gas transport system.
- The unit should not be operated in tanks or other enclosed areas without proper ventilation.





#### WARNING

Methanol is highly volatile and can be hazardous to humans.

- Storage containers should be kept tightly closed.
- Methanol should always be transferred in a well-ventilated area with no ignition sources. The operator should have protective clothing, eye protection and gloves.
- Methanol can be absorbed through the skin. Do not allow methanol to be swallowed or to come in contact with skin or eyes. If accidental exposure occurs, flush the affected area with water. If methanol is swallowed, or there is significant skin or eye exposure, seek medical help.

Detergent: 20% Contrad 70 from Decon Laboratories, Inc., King of Prussia, PA, USA (or 14% Decon 90 from Decon Laboratories Limited, Hove, East Sussex, UK) is the recommended detergent. Contrad 70 and Decon 90 contain dodecylbenzensulfonic acid, potassium hydroxide, sodium citrate and sodium laurel ether sulfate. It is biodegradable and can be rinsed off easily.

## Electrical power

### General considerations

The mains power source (100-240 VAC) should be properly grounded and free from voltage fluctuations, harmonic distortions, power dips and spikes.



#### WARNING

Provide proper electrical power to the instrument. This should be 100-240 VAC, 50/60 Hz, with a Ground Fault Circuit Interrupter (GFCI). The power strip supplied with your system, contains a GFCI. All power plugs and cords should be 3-prong, grounded cables or outlets.



#### WARNING

**Protective ground.** MicroCal Auto-iTC<sub>200</sub> must always be connected to a grounded power outlet.

The AC power line should be dedicated to MicroCal Auto-iTC<sub>200</sub> and should not share power with additional equipment.

Although the power filtering in the MicroCal Auto-iTC<sub>200</sub> instrument is adequate for most laboratory environments, some disturbances may affect the performance of the instrument and it may be necessary to have the AC mains power source evaluated (see table below) or install a power conditioner.

Since power source problems can be manifested in many different ways, it is not possible to recommend a power conditioner for all situations. It is recommended that you test a power conditioner, at your location, before you purchase it.

If you believe you are experiencing power source related problems, please contact a GE Healthcare field engineer.

Power supply requirements

Specification	Requirement
Voltage Regulation	100-240 VAC
Frequency	50/60 Hz
Power	MicroCal iTC <sub>200</sub> : 70 W MicroCal Auto-iTC <sub>200</sub> : 300 W
Fuses	MicroCal iTC <sub>200</sub> : (2 fuses) 4.0A, 250V, time delay; MicroCal Auto-iTC <sub>200</sub> : (2 fuses) 5.0A, 250V, fast acting
Protective Earth Terminals	Internal/external labeled

## 4.2 Transport

### Introduction

This section outlines important information that must be considered when transporting MicroCal Auto-iTC<sub>200</sub>.

---

### Moving when unpacked



#### **WARNING**

**Heavy object.** The MicroCal Auto-iTC<sub>200</sub> instrument weighs about 90 kg (200 lbs). Use proper lifting equipment, or use four or more persons when moving the instrument. All lifting and moving must be performed in accordance with local regulations.

Before moving the system:

- 1 Disconnect power cord.
  - 2 Disconnect all cables and tubing connected to peripheral components and liquid containers.
  - 3 Remove all items from the top of the system.
  - 4 Move the instrument using proper lifting equipment, or four or more persons.
- 

### Unpacking

Unpack MicroCal Auto-iTC<sub>200</sub> from the crate.

Document any damage and contact your local GE Healthcare representative.

---

# 4.3 Set up

## Introduction

This section describes how to set up MicroCal Auto-iTC<sub>200</sub> before use.

## Controller installation

To install the controller to the MicroCal Auto-iTC<sub>200</sub> instrument, follow the steps described below:

Step	Action
1	Connect one end of the USB data cable to the USB port on the rear panel of the Autosampler.
2	Connect the other end of the USB data cable to the USB port on the controller.
3	Start the software by following the instruction in <i>Chapter 5 Operation, on page 46</i> .

## Nitrogen supply

The pressure relief valve shipped with the instrument must be connected between the pressure regulator from the nitrogen supply and the nitrogen feed line to the MicroCal Auto-iTC<sub>200</sub> system. This is highly recommended to prevent injury to personnel or damage to the instrument. Pressure must be kept between 20 and 30 psi.



### WARNING

Nitrogen is a colorless, odorless gas which can displace oxygen and present an asphyxiation hazard.

- Compressed nitrogen should be stored in a cool, dry, well-ventilated area.
- Containers of nitrogen should be protected from physical damage and heat.
- Use only appropriate gas detection methods and equipment to verify that there are no leaks in the gas transport system.
- The unit should not be operated in tanks or other enclosed areas without proper ventilation.

## Sample containers

The Autosampler uses 96-well plates and 30 ml centrifuge tubes. Replacements may be purchased through GE Healthcare, or directly from a supplier. Using supplies other than ones recommended here may lead to improper performance, potential Autosampler damage, and may void the warranty.

The recommended sample containers are:

- Tube, Oak Ridge Centrifuge; Part No. 28428970



- 96-Well Plates: Nunc 96 DeepWell Plates; Mfr.#260252; Part No. 28429091



- Well Plate Covers: Excel Scientific EZ-Pierce Zone-Free Microplate Film; Cole-Parmer# R-13024-66; Part No. 28429092



# 5 Operation

## About this chapter

This chapter provides the information required to safely operate the MicroCal Auto-iTC<sub>200</sub>.

---

## Precautions



### WARNING

All solutions in the cells must be cooled down below 40°C before removal. Any higher temperature may cause the syringe to break, and will increase the dangers of most hazardous solutions.



### WARNING

Nitrogen is a colorless, odorless gas which can displace oxygen and present an asphyxiation hazard.

- Compressed nitrogen should be stored in a cool, dry, well-ventilated area.
- Containers of nitrogen should be protected from physical damage and heat.
- Use only appropriate gas detection methods and equipment to verify that there are no leaks in the gas transport system.
- The unit should not be operated in tanks or other enclosed areas without proper ventilation.

**WARNING**

Methanol is highly volatile and can be hazardous to humans.

- Storage containers should be kept tightly closed.
- Methanol should always be transferred in a well-ventilated area with no ignition sources. The operator should have protective clothing, eye protection and gloves.
- Methanol can be absorbed through the skin. Do not allow methanol to be swallowed or to come in contact with skin or eyes. If accidental exposure occurs, flush the affected area with water. If methanol is swallowed, or there is significant skin or eye exposure, seek medical help.

**WARNING**

Do not place vessels containing liquid on top of the instrument or inside the cabinet. Spilled liquid is an electrical hazard.

**WARNING**

**Hazardous chemicals during run.** When using hazardous chemicals, flush the entire system tubing with distilled water, before service and maintenance.

**CAUTION**

Waste tubes and containers shall be secured and sealed to prevent accidental spillage.

**NOTICE**

Never allow liquid in the cells to freeze. The expansion of the liquid can distort the cells and rupture the most critical sensor, causing irreparable damage.



**NOTICE**

The MicroCal Auto-iTC<sub>200</sub> system should always be moved in its normal operating orientation. Other orientations will subject delicate sensors inside the instrument to stress.

**In this chapter**

This chapter contains the following sections:

Section	See page
5.1 Procedure before a run	49
5.2 Creating a method	52
5.3 Perform a run	54
5.4 Procedures after a run	56



## 5.1 Procedure before a run

### Introduction



This section describes the procedures needed to prepare MicroCal Auto-iTC<sub>200</sub> for a run.

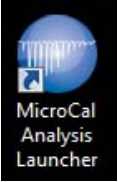
### Turning the MicroCal Auto-iTC<sub>200</sub> instrument on

Once the MicroCal Auto-iTC<sub>200</sub> instrument has been connected to the controller, it is ready to use. At the rear of the instrument unit is a power on/off switch, which functions as the master power switch and must be in the **on (I)** position. It can be turned to **off (O)** when the MicroCal Auto-iTC<sub>200</sub> instrument will not be used for long periods of time, for example weekends, holidays, etc.

### Software description

The MicroCal Auto-iTC<sub>200</sub> is delivered with three software components as outlined in the table below.

Software component	Icon	Description
MicroCal Auto-iTC <sub>200</sub> software	 The icon for MicroCal Auto-iTC <sub>200</sub> software, featuring a blue sphere with a white grid pattern and the text 'Auto-iTC200' below it.	This is used to operate MicroCal iTC <sub>200</sub> together with the Autosampler. Automated data analysis is performed after each experimental run completes.
MicroCal iTC <sub>200</sub> software	 The icon for MicroCal iTC <sub>200</sub> software, featuring a red and white wave pattern on a black background with the text 'ITC200' below it.	This software is used to control MicroCal iTC <sub>200</sub> .

Software component	Icon	Description
Origin™		Origin is supplied for manual data analysis.

The MicroCal Auto-iTC<sub>200</sub> software controls the Autosampler and communicates with the MicroCal iTC<sub>200</sub> software to control the MicroCal iTC<sub>200</sub> calorimeter. The software and hardware should be started in sequence or errors may occur requiring that the system and software be restarted.

### Starting the software

To start the MicroCal Auto-iTC<sub>200</sub> software, follow the steps described below:

Step	Action
1	Start the computer and log in to Windows.
2	Turn on MicroCal Auto-iTC <sub>200</sub> using the <b>Power</b> switch at the rear of the unit.
3	Start the MicroCal iTC <sub>200</sub> software by clicking on the MicroCal iTC <sub>200</sub> icon.
4	Once the MicroCal iTC <sub>200</sub> software has initialized, start the MicroCal Auto-iTC <sub>200</sub> software by clicking on the MicroCal Auto-iTC <sub>200</sub> icon.
5	To open an instance of Origin for real-time data display, select <b>System:Establish DDE Link To Origin</b> in the MicroCal iTC <sub>200</sub> software.

**Note:**

*It is normally not necessary to start Origin for real-time data display, since real time data can be viewed directly in the MicroCal Auto-iTC<sub>200</sub> software.*

For more information, see *MicroCal Auto-iTC<sub>200</sub> System User Manual*.



#### NOTICE

The user interface programs, MicroCal iTC<sub>200</sub> and MicroCal Auto-iTC<sub>200</sub> have to be running for the cell and Autosampler to function properly even though the power switch is in the **on (I)** position. Software instructions can be found in the *MicroCal Auto-iTC<sub>200</sub> System User Manual*.

## Leaving the power on

During frequent operations, the master power may be left on as long as the user interface program, iTC<sub>200</sub>, is running. The software automatically ensures that the system does not incur any damage and keeps the MicroCal iTC<sub>200</sub> cell ready.

---

## Periods of inactivity

When the system will not be used for extended periods of time it is recommended to:

- close the MicroCal iTC<sub>200</sub> application
- close the MicroCal Auto-iTC<sub>200</sub> application
- switch off the mains power

GE Healthcare recommends that the MicroCal iTC<sub>200</sub> and the MicroCal Auto-iTC<sub>200</sub> application be closed and the master power be turned off, when the system will not be used for extended periods of time.

---

## 5.2 Creating a method

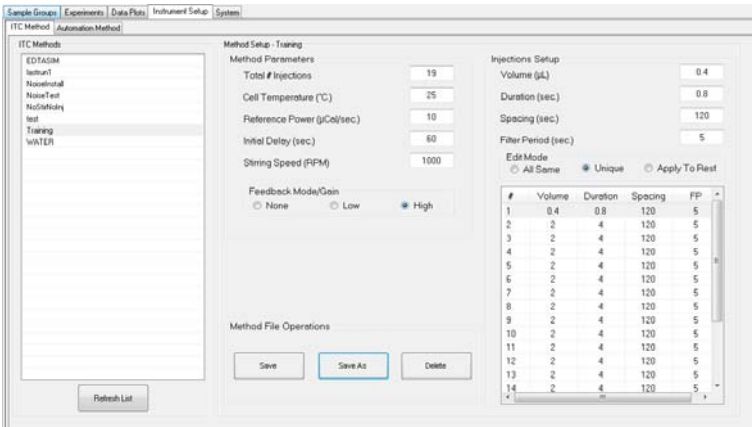
### Introduction

This section describes how to create an ITC method in the MicroCal Auto-iTC<sub>200</sub> software. An example 19-injection experiment is set up that has 18 injections of 2.0 µl each with 150 s between the injections and one initial, small injection, which is later disregarded to minimize any impact from diffusion during equilibrium of the instrument.

### Creating the method

To create the example method, follow the steps described below:

Step	Action
1	Click on the <b>Instrument Setup</b> tab and the <b>ITC Method</b> subtab.



**Step Action**

- 2 Enter the following **Method Parameters**.

Parameter	Value
<b>Total # Injections</b>	19
<b>Cell Temperature (°C.)</b>	25
<b>Reference Power (μCal/sec.)</b>	10
<b>Initial Delay (sec.)</b>	60
<b>Stirring Speed (RPM)</b>	1000

- 3 Set the **Feedback Mode/Gain** to **High**.

- 4 Enter the following parameters for **Injections Setup** with the **All Same** radio button clicked under **Edit Mode**.

Parameter	Value
<b>Volume (μL)</b>	2
<b>Duration (sec.)</b>	4
<b>Spacing (sec.)</b>	150
<b>Filter Period (sec.)</b>	5

- 5 Change the parameters of the first injection:

- 1 Select the first injection in the table to the right in the **Method Setup** workspace.
- 2 Select **Unique** under **Edit Mode**.
- 3 Change the following parameters under **Injections Setup**:

Parameter	Value
<b>Volume (μL)</b>	0.4
<b>Duration (sec.)</b>	0.8

- 6 Click the **Save As** button and save the method as **Training**. The method will appear on the **ITC Methods** list to the left.

## 5.3 Perform a run

### Introduction

This section describes how to start, monitor and end a run using MicroCal Auto-iTC<sub>200</sub>.

### Basics of performing a run

To perform a basic ITC titration experiment, follow the steps described below:

Step	Action
1	Load the samples for transfer to the cell (370 µl) and syringe (110 µl) into the plates.
2	Configure the run parameters in the control software's <b>Experiments</b> tab.
3	Use the buttons on the MicroCal Auto-iTC <sub>200</sub> touchscreen to open and close the tray and rack drawer, and load the plates and/or tubes into the Autosampler.



**CAUTION**

The tray drawer and tube drawer both have the potential to cause injury by pinching a body part between the face plate and the instrument's frame. Keep hands out of the drawers before instructing the instrument to close the drawers.

4	Make sure the lid is all the way in position before using the touchscreen or software to close the drawer again.
---	--

Step	Action
------	--------

5	Make sure the reagent bottles have the required volume.
---	---



**WARNING**

Methanol is highly volatile and can be hazardous to humans.

- Storage containers should be kept tightly closed.
- Methanol should always be transferred in a well-ventilated area with no ignition sources. The operator should have protective clothing, eye protection and gloves.
- Methanol can be absorbed through the skin. Do not allow methanol to be swallowed or to come in contact with skin or eyes. If accidental exposure occurs, flush the affected area with water. If methanol is swallowed, or there is significant skin or eye exposure, seek medical help.

6	Click <b>Validate</b> to confirm the run parameters, and acknowledge the validation report.
---	---

7	Click <b>Start</b> .
---	----------------------

**Note:** *Proper sample preparation is described in the MicroCal Auto-iTC<sub>200</sub> System User Manual and will not be described here.*

## 5 Operation

### 5.4 Procedures after a run

## 5.4 Procedures after a run

MicroCal Auto-iTC<sub>200</sub> was designed to have its power on for extended periods of time. This will keep the system electronics at the normal operating temperature. It is recommended to switch off the power to MicroCal Auto-iTC<sub>200</sub> during extended periods of down time, such as holidays and vacations. The system will automatically clean itself after each run, so it will be left clean.

If you want a quick start up, keep the MicroCal Auto-iTC<sub>200</sub> system switched on.



# 6 Maintenance

## About this chapter

This section provides the user with basic information on the proper maintenance of the instrument. For a more detailed description of maintenance procedures, see *MicroCal Auto-iTC<sub>200</sub> System User Manual*.

The maintenance procedures described both here and in the *MicroCal Auto-iTC<sub>200</sub> System User Manual* may be performed by the user. When performing any of those procedures, be mindful of the cautionary remarks displayed below.

In addition, annual preventive maintenance should be performed by a trained GE Healthcare service technician.

---

## Precautions



### WARNING

Only personnel authorized by GE Healthcare may perform service, installation, and maintenance of components inside the MicroCal Auto-iTC<sub>200</sub> cabinet.



### WARNING

The syringe may be contaminated with hazardous residual compounds. Consult your completed Health and Safety Declarations Form to determine if any biologically or chemically hazardous substances have been used in the instrument. Use the appropriate personal protective equipment (PPE) as specified in the MSDS for those substances.



### WARNING

Replace fuses **ONLY** with fuses of same type and rating. Several spare fuses are provided with the original shipment and the power receptacle is labeled with the correct type.



### WARNING

Only spare parts and accessories that are approved or supplied by GE Healthcare may be used for maintaining or servicing MicroCal Auto-iTC<sub>200</sub>.



### WARNING

**Disconnect power.** Always disconnect power from the instrument before replacing any component on the instrument, unless stated otherwise in the user documentation.



### WARNING

**Hazardous chemicals during maintenance.** When using hazardous chemicals for system cleaning, wash the system with a neutral solution in the last phase or step.



### WARNING

Contrad 70 (Decon 90) is corrosive and therefore dangerous to health. When using hazardous chemicals, avoid spillage and wear protective glasses, gloves, and other suitable personal protective equipment as specified in MSDS.



### WARNING

MicroCal Auto-iTC<sub>200</sub> is designed with interlocks to prevent operation when the door is open. If these interlocks are disabled and/or any of the cabinet's panels are removed there is a potential for pinch, puncture and electrical injury.



### CAUTION

The tray drawer and tube drawer both have the potential to cause injury by pinching a body part between the face plate and the instrument's frame. Keep hands out of the drawers before instructing the instrument to close the drawers.

## In this chapter

This chapter contains the following sections:

Section	See page
6.1 Cleaning the cell	60
6.2 Refilling the reference cell	62
6.3 Replacing the syringe plunger tip	63
6.4 Replacing and cleaning the titration syringe	68

## 6.1 Cleaning the cell

### Introduction

Cleanliness of the cell has a significant impact on data quality. A dirty cell typically manifests itself in poor loading of the cell.

---

### Basic cleaning

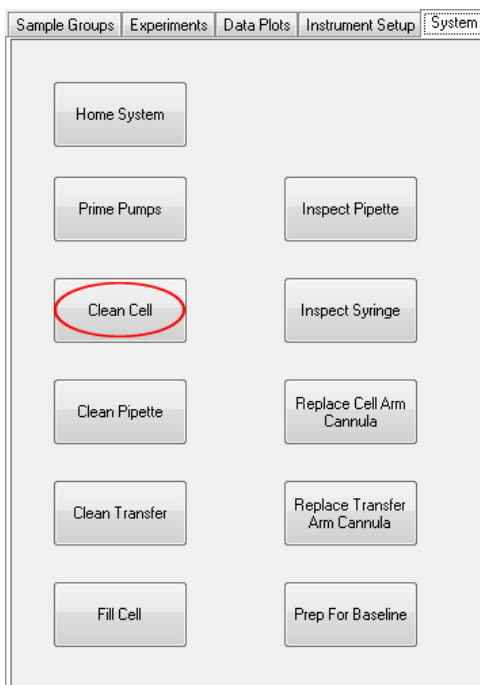
The most basic cleaning procedure using detergent (20% Contrad 70 (or 14% Decon 90) in deionized water) involves briefly soaking the cell with detergent and then flushing with water. The **Plates** automation method, for example, and any method using the **Detergent Clean** cell cleaning script performs this operation.

---

### Extra Clean

The **Extra Clean** cell cleaning script loads the cell with detergent, raises the cell temperature to 60°C, soaks for one hour, and then rinses the cell with water. Clicking the **Clean Cell** button in the **System tab** in the MicroCal Auto-iTC<sub>200</sub> software also performs this operation.

---



## Recommended cleaning routines

Interval	Cleaning Instructions
After every run	Clean the cell with detergent (i.e., <b>Plates</b> automation method).
Weekly or If poor data is evident	Perform a rigorous cell cleaning by selecting the <b>Clean Cell</b> button in the <b>System</b> tab (see above) or by running an experiment that uses the <b>Plates Clean</b> automation method.  Detergent rinses followed by water rinses are rigorous enough to remove all the detergent.

## 6.2 Refilling the reference cell

### Introduction

The MicroCal Auto-iTC<sub>200</sub> has two cells, the sample cell and the reference cell. The Autosampler cleans and refills the sample cell before each run. However, the reference cell must be refilled manually, approximately once a week. An underfilled reference cell can manifest itself as a starting baseline position **greater** than specified in the iTC Method.

---

### Procedure

To refill the reference cell, follow the steps described below:

Step	Action
1	Tap <b>Open Door</b> on the touchscreen.
2	Gently insert the glass Hamilton syringe into the reference cell until it touches the bottom.
3	Aspirate the liquid by pulling up the syringe plunger.
4	Pull approximately 300 µl of degassed, distilled water into the empty syringe.
5	Insert the syringe into the cell and gently touch the bottom of the cell with the tip of the syringe needle. Raise the needle tip about 1 mm off the bottom of the cell, and hold it there until finished filling.
6	Inject the solution slowly into the cell until it spills out the top of the cell stem. Dislodge any trapped bubbles with several abrupt spurts of the solution.
7	Lift the tip of the syringe to the cell port (just below the visible portion of the cell port) and remove the excess solution.

---

## 6.3 Replacing the syringe plunger tip

### Introduction

The plunger tip forms a seal with the syringe glass. Consequently, it spins along with the syringe glass while the metal plunger itself remains stationary.

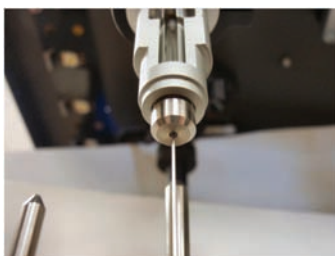
As the plunger drives titrant out of the syringe glass, wear on the plunger tip can occur. Too much wear can manifest itself as poor data. If left unreplaced, the plunger can drive itself through the tip.

Best practice is to replace the tip at the first sign of wear (PTFE shavings along plunger shaft, above tip) or about every 300 experiments. Practice this a few times so as to become comfortable with the routine.

### Removing the titration syringe

To remove the syringe plunger tip, follow the steps described below:

- | Step | Action  |
|------|---|
| 1    | Cover the cell using a cell cap or any other means.   |
| 2    | On the <b>System</b> tab of the MicroCal Auto-iTC <sub>200</sub> software, click the <b>Inspect Pipette</b> button.<br><br>The pipette arm swings around to a position above the cell where the pipette and syringe can be easily accessed. |
| 3    | Loosen and remove the securing nut from bottom of the pipette.  |

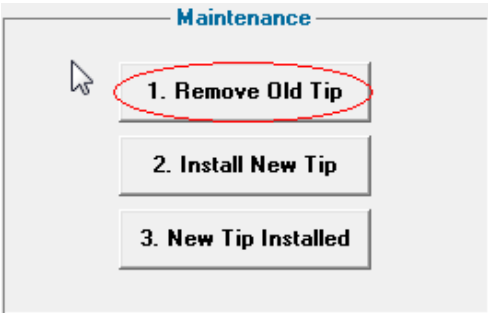


I

6 Maintenance

6.3 Replacing the syringe plunger tip

Step	Action
4	In the MicroCal iTC <sub>200</sub> software, click on the <b>Instrument Controls</b> tab and click <b>1. Remove Old Tip</b> in the <b>Maintenance</b> section.



5	The software prompts to remove the old tip.
---	---

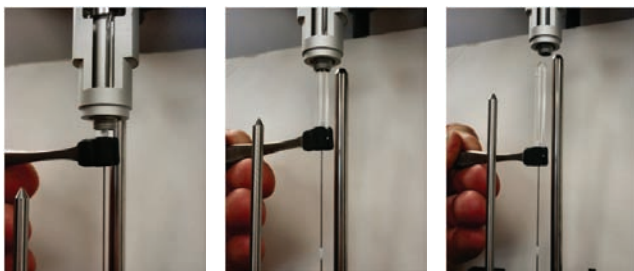


6	Click <b>OK</b> . Without the nut, the syringe moves down with the plunger.
---	--





Step	Action
7	Grab the syringe barrel firmly and pull straight down to remove the syringe from the pipette. The soft-grip tweezers can be used to help grip the syringe without damaging it. Set the syringe aside.



## Removing and replacing the syringe plunger tip

To remove and replace the syringe plunger tip, follow the steps described below:

Step	Action
1	Insert the tip puller into the pipette until the tip of the puller grabs the plunger tip.



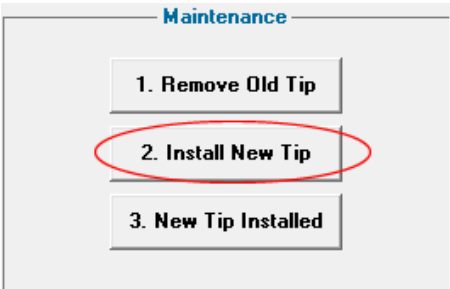
6 Maintenance

6.3 Replacing the syringe plunger tip

Step	Action
2	Gently extract the tip puller (along with the plunger tip) from the pipette.



- 3 In the MicroCal iTC<sub>200</sub> software, click on the **Instrument Controls** tab and click **2. Install New Tip** in the **Maintenance** section.



The plunger moves downward and displays the following message:



- 4 Click **OK**.
- 5 Insert a new plunger tip inside the tip pusher tool.

Step	Action
6	The tip pusher tool has a hole on one side. Insert the plunger tip inside that hole with the plunger tip hole facing outward.



7	Insert the tip pusher and the new plunger tip into the pipette and press the plunger tip into place.
---	--

**Note:**

*Do not push too hard. Resistance should be felt initially.*



Once the plunger tip slips over the barbed plunger, remove all pressure.

## Reinstalling the titration syringe

To reinstall the syringe, follow the steps described in *Installing the titration syringe*, on page 70.

## 6.4 Replacing and cleaning the titration syringe

### Introduction

The syringe must be removed, cleaned and carefully inspected as a part of preventive maintenance. To inspect the upper section of the syringe, it must be removed from the pipette.

A broken syringe will not operate in the wash/load station properly, will likely result in poor experimental results, and could contaminate the cell with broken glass. A dirty syringe is not nearly as common as a dirty cell but can also result in poor data.

Detergent cleaning of the syringe between runs is recommended if performing reverse titrations (protein is loaded into the syringe). If poor data persists after extensive cell cleaning, remove the syringe for cleaning.



#### WARNING

The syringe may be contaminated with hazardous residual compounds. Consult your completed Health and Safety Declarations Form to determine if any biologically or chemically hazardous substances have been used in the instrument. Use the appropriate personal protective equipment (PPE) as specified in the MSDS for those substances.

**Note:** *If the inspection of the syringe shows a break at or near the fill port, inspect the fill port adaptor, fill port plunger and the syringe-fill port plunger carefully.*

### Inspecting the titration syringe

Once the syringe has been removed from the pipette, inspect it carefully for cracks, chips and breaks.

- If the syringe shows any signs of damage, it must be replaced.  
Always examine the fill port adaptor closely following the identification of a damaged syringe.
- If the syringe will continue to be used, clean the top section carefully with the syringe brush.

## Removing the titration syringe

To remove the titration syringe, follow the steps described in *Removing the titration syringe*, on page 63.

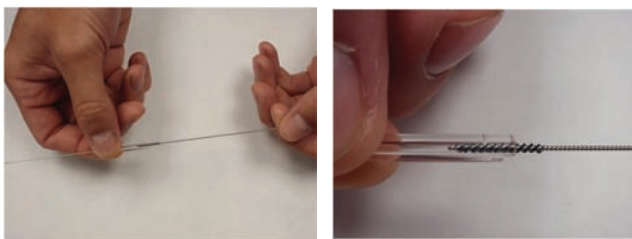
---

## Cleaning the titration syringe

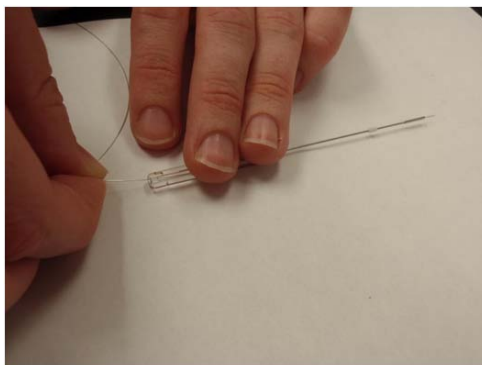
To clean the titration syringe, follow the steps described below:

Step	Action
------	--------

- |   |   |
|---|---|
| 1 | Slide the syringe brush in gently as far as it will go and then withdraw it. If the syringe is particularly dirty, use Contrad 70 detergent on the brush and repeat as many times as necessary until the syringe is completely clean. |
|---|---|



- |   |   |
|---|---|
| 2 | Once the top section is clean, run the small piece of wire through the channel in the syringe while watching for exiting material at the bottom of the syringe. It may take a few attempts to thread the wire into the channel. |
|---|---|



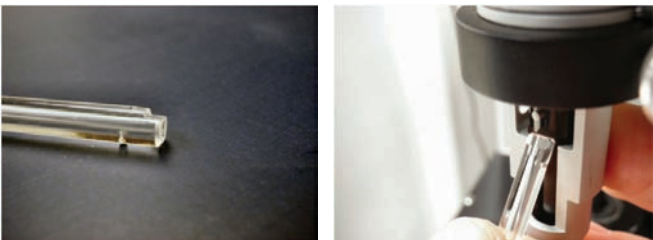
- |   |   |
|---|---|
| 3 | Rinse the syringe well. Replace the syringe if any material remains in the syringe that cannot be removed by this method. |
|---|---|

Step	Action
4	Once the syringe is clean, carefully inspect the topmost section for evidence of cracks. Cracks tend to originate at the fill port, which is the horizontal hole where the fill port plunger slides into the syringe. Inspect that area carefully while slowly rotating the syringe to look for the cracks.

## Installing the titration syringe

### General information

The top portion of the syringe is keyed to slide into the pipette in only one way. The groove in the glass is keyed to slide into the small stop pin in the syringe holder.

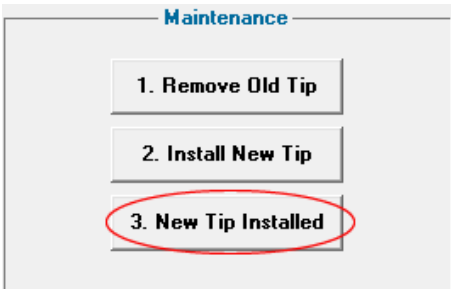


**Tip:** Syringes designed for MicroCal Auto-iTC<sub>200</sub> may be used in the MicroCal iTC<sub>200</sub>. The pin is absent in the MicroCal iTC<sub>200</sub>, so the opposite is not true.

### Reinstallation procedure

To insert a titration syringe, follow the steps described below:

Step	Action
1	In the MicroCal iTC <sub>200</sub> software, click on the <b>Instrument Controls</b> tab and click <b>3. New Tip Installed</b> in the <b>Maintenance</b> section.



This ensures the plunger is in the topmost position.

Step	Action
2	<p>Rotate the pin in the pipette forward and gently push the new syringe up into the pipette.</p> <p>Use the index finger of one hand to keep some pressure on the back side of the pipette to keep it from rotating. Keep the small metal pin facing forward and centered in the opening in the pipette while sliding the syringe up and into the pipette.</p>



- 3 Push until the syringe comes to a stop, usually with about 4 mm of syringe glass exposed below the metal.
- If it seats directly then there will be about 2 mm of glass exposed and the pipette and syringe can no longer be moved independently.



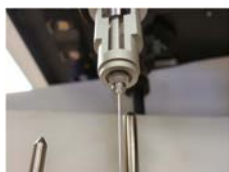
## 6 Maintenance

### 6.4 Replacing and cleaning the titration syringe

Step	Action
4	Hold the pin with the index finger while rotating the syringe with the other hand. When the notch in the syringe aligns with the pin in the holder, slide the syringe up approximately another 2 mm.



- 5 Make sure that the syringe is properly seated. When the syringe is properly seated, the syringe and the syringe holder in the pipette are locked together. The syringe is not properly seated if the syringe can spin without spinning the syringe holder.



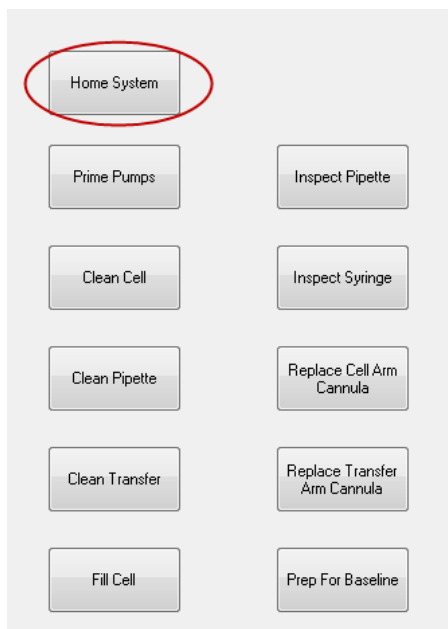
- 6 Replace and tighten the bottom nut. Be careful not to bend or otherwise damage the paddle when reinstalling the bottom nut. The bottom nut should be snug but easily removed.





Step	Action
------	--------

- |   |  |
|---|--|
| 7 | Click the <b>Home System</b> button in the <b>System tab</b> in the MicroCal Auto-iTC <sub>200</sub> software. |
|---|--|



# 7 Troubleshooting

## About this chapter

This section contains tips and information for troubleshooting the MicroCal Auto-iTC<sub>200</sub> system.

---

## In this chapter

This chapter contains the following sections:

Section	See page
7.1 How to get help	75
7.2 Troubleshooting chart	77

## 7.1 How to get help

### Introduction

Many problems in instrument loading and cleaning show characteristic baseline and titration abnormalities, and knowing which system is affected can greatly speed up the resolution of the issue.

Some problems can easily be corrected by the average user; some may be corrected by the more advanced user, and some require the expertise of a GE Healthcare service technician. The GE Healthcare service department is happy to provide any advice, parts, or service that may be necessary.

---

### Contact information

Please contact GE Healthcare for any instrument or data analysis questions or issues you may have.

For contact information for your local office, please visit: [www.gelifesciences.com/contact](http://www.gelifesciences.com/contact) or for MicroCal-specific information, please visit: [www.gelifesciences.com/microcal](http://www.gelifesciences.com/microcal)

---

### Include data file

When e-mailing for technical assistance, if possible, please attach a recent data file(s) (\*.itc raw ITC data file) that demonstrates the problem. Also, please include all details that may be relevant to the problem. Where the problem or question relates to post run data analysis, it is best to attach the raw data file (\*.itc).

---

### Problem categories

There are two general categories of troubleshooting for MicroCal Auto-iTC<sub>200</sub> and its operation.

Problem category	Description
1 (severe)	The system is not working at all. Problems that prevent the operation of the instrument require immediate consultation with a GE Healthcare technician. Customers should not attempt to repair the hardware or software unless instructed to do so by a GE Healthcare service representative.

Problem category	Description
2 (moderate)	<p>The MicroCal Auto-iTC<sub>200</sub> instrument is functioning, but is not operating within its normal performance specifications.</p> <p>Large baseline drifting, non-repeatable control peaks (water/water) and/or an increase in short term noise level are examples of performance problems. These problems may be corrected by the operator in most cases. For these types of performance issues, GE Healthcare recommends that customers perform a few diagnostic steps prior to requesting service.</p>

Diagnosing the problem

Perform the following minimum diagnostic steps prior to requesting service:

Step	Action
1	Run a thorough cleaning routine.
2	Load one row in a 96-well plate with 400 µl of degassed distilled water.
3	Set up a run of 6 identical titrations.
4	Start the run. If possible, observe the cleaning and loading routines.

If, after completion of the steps listed above, the MicroCal Auto-iTC<sub>200</sub> performance is not corrected, please contact the service department for help. The water runs should be provided to the MicroCal service technician for evaluation. Following the evaluation, a representative from the service department will contact you with comments and recommendations.

## 7.2 Troubleshooting chart

For a troubleshooting chart, see the table below:

Error symptom	Corrective action
Instrument not running; Touchscreen dark	Check that power is plugged in and switched on.
Instrument not running; touchscreen shows GE logo	<ul style="list-style-type: none"> <li>• Check that the USB cable is properly connected.</li> <li>• Check that MicroCal iTC<sub>200</sub> software and the MicroCal Auto-iTC<sub>200</sub> software are running and properly initialized.</li> </ul>
Software reports networking errors	Unplug the network port from controller, reboot, and reload the control software.
Instrument not working properly	<ul style="list-style-type: none"> <li>• Visually check that the cannulas and the syringe are straight, nothing is obviously dripping, and the sample containers are properly inserted.</li> <li>• Watch a cleaning and loading cycle for any obvious problems.</li> <li>• Check that the fill port adapter that connects to the titration syringe is not damaged; watch it dock during a cleaning and loading cycle.</li> </ul>
Control software reports initialization errors, communication problems, or hardware errors not covered in this manual	Contact your GE Healthcare service representative.

## 7 Troubleshooting

### 7.2 Troubleshooting chart

Error symptom	Corrective action
Data shows problems	<ul style="list-style-type: none"> <li>• Check that the nitrogen supply is properly attached; if using a bottle, check that it is not empty</li> <li>• Check that the reagent bottles are not empty and are properly attached to the correct port</li> <li>• Refill the reference cell (see <i>Section 6.2 Refilling the reference cell, on page 62</i>)</li> </ul> <p>If these steps do not resolve the problem, see <i>Section 7.1 How to get help, on page 75</i></p>
Cannula is bent	See <i>Section 6.4 Replacing and cleaning the titration syringe, on page 68</i> for replacement
Titration syringe is damaged	See <i>Section 6.4 Replacing and cleaning the titration syringe, on page 68</i> for replacement

## 8 Reference information

### About this chapter

This chapter provides reference information that may become useful when installing, operating, maintaining and troubleshooting MicroCal Auto-iTC<sub>200</sub>. It also contains ordering information.

---

### Performance specifications

Property	Value
Operating temperature range	2°C to 80°C
Sample storage temperature range	4°C to ambient
Acoustic noise level	< 70 dB A
Response time	10 s
Cell volume	200 µl, coin-shaped
Titration syringe	40 µl
Maximum usable volume	38 µl
Smallest injection size	0.1 µl
Stirring rate	500 to 1500 rpm

### Physical specifications

Property	Value
Cell material	Hastelloy Alloy C-276
Weight (fully assembled):	
Autosampler without calorimeter	84.4 kg
Autosampler with calorimeter	90.7 kg
Calorimeter	6 kg

Property	Value
Dimensions (W x H x D):	
Fully assembled	61 × 76 × 58 cm
Calorimeter	17 × 16 × 36 cm
Autosampler	61 × 76 × 58 cm

Electrical specifications

Electrical specifications are for the calorimeter and Autosampler only. Autosampler specifications, where different, are enclosed in parentheses.

Property	Value
Electrical ratings:	
Voltage	100-240 VAC grounded
Frequency	50/60 Hz
Power	70 W (300 W)
Fuses, 2 in total	4.0 A, (5.0 A), 250 V, time delay (fast acting)
Output	Secondary/Data connection only
Protective earth terminals	Internal/external labeled (internal labeled)
Mode of operation	Continuous
Classification	Class I



## Site requirements

Property	Value
Benchspace	<ul style="list-style-type: none"> <li>• <math>\geq 125</math> cm (4 ft) of lab bench,</li> <li>• <math>\geq 80</math> cm (30 in.) in depth,</li> <li>• no obstructions for at least 80 cm (32 in.) above bench,</li> <li>• rated for at least 115 kg (250 lbs).</li> </ul> <p>These include the clearances. Service functions will require an additional 12 in. (31 cm) overhead clearance.</p>
Clearance	<ul style="list-style-type: none"> <li>• <math>\geq 15</math> cm (6 in.) behind the Autosampler,</li> <li>• <math>\geq 40</math> cm (15 in.) in front of the Autosampler.</li> </ul>
Pressure	<p><math>\geq 20</math> psi and <math>&lt; 30</math> psi (pressure regulated) laboratory nitrogen or other compressed inert gas (if using tank, tank must not infringe on Autosampler clearances). Connection is made with a 1/4" NPT fitting.</p>



### WARNING

Nitrogen is a colorless, odorless gas which can displace oxygen and present an asphyxiation hazard.

- Compressed nitrogen should be stored in a cool, dry, well-ventilated area.
- Containers of nitrogen should be protected from physical damage and heat.
- Use only appropriate gas detection methods and equipment to verify that there are no leaks in the gas transport system.
- The unit should not be operated in tanks or other enclosed areas without proper ventilation.

Atmospheric specifications

Property	Value
Operating:	
Temperature	10°C to 28°C
Humidity	0% to 70% RH, non-condensing
Atmospheric pressure	700 to 1060 hPa
Storage (no liquid in cells):	
Temperature	-25°C to 60°C (no liquid in cells)
Humidity	10% to 90%, non-condensing
Atmospheric pressure	500 to 1060 hPa

Additional information

For additional information, visit: [www.gelifesciences.com/microcal](http://www.gelifesciences.com/microcal)

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