

# minispec

- Temperature Unit TC6  
User Manual  
Version 003



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# 1 About This Manual

This manual enables safe and efficient handling of the device.

This manual is an integral part of the device, and must be kept in close proximity to the device where it is permanently accessible to personnel. In addition, instructions concerning labor protection laws, operator regulations tools and supplies must be available and adhered to.

**Before starting any work, personnel must read the manual thoroughly and understand its contents.** Compliance with all specified safety and operating instructions, as well as local work safety regulations, are vital to ensure safe operation.

The figures shown in this manual are designed to be general and informative and may not represent the specific Bruker model, component or software/firmware version you are working with. Options and accessories may or may not be illustrated in each figure.

## 1.1 Policy Statement

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It is Bruker's policy to improve products as new techniques and components become available. Bruker reserves the right to change specifications at any time.

Every effort has been made to avoid errors in text and Figure presentation in this publication. In order to produce useful and appropriate documentation, we welcome your comments on this publication. Field Service Engineers are advised to check regularly with Bruker for updated information.

Bruker is committed to providing customers with inventive, high-quality, environmentally-sound products and services.

## 1.2 Symbols and Conventions

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Safety instructions in this manual and labels of devices are marked with symbols. .

The safety instructions are introduced using indicative words which express the extent of the hazard.

In order to avoid accidents, personal injury or damage to property, always observe safety instructions and proceed with care.

### DANGER



**DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.**

This is the consequence of not following the warning.

1. This is the safety condition.
  - ▶ This is the safety instruction.

### **WARNING**



**WARNING** indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

This is the consequence of not following the warning.

1. This is the safety condition.
  - ▶ This is the safety instruction.

### **CAUTION**



**CAUTION** indicates a hazardous situation, which, if not avoided, may result in minor or moderate injury or severe material or property damage.

This is the consequence of not following the warning.

1. This is the safety condition.
  - ▶ This is the safety instruction.

### **NOTICE**

**NOTICE** indicates a property damage message.

This is the consequence of not following the notice.

1. This is a safety condition.
  - ▶ This is a safety instruction.

### **SAFETY INSTRUCTIONS**

**SAFETY INSTRUCTIONS** are used for control flow and shutdowns in the event of an error or emergency.

This is the consequence of not following the safety instructions.

1. This is a safety condition.
  - ▶ This is a safety instruction.



This symbol highlights useful tips and recommendations as well as information designed to ensure efficient and smooth operation.

## 2 Introduction

### 2.1 Overview

---

The TC6 temperature unit, also called a dry bath, allows you to control the temperature of samples in an ASX-7000-series sample changer. It heats or chills the samples under the control of a host computer.



Figure 2.1: The TC6 Unit.

The unit holds vials in six temperature-controlled zones. Each zone holds 10 vials. The TC6 has a stage for two non-temperature-controlled sample vial racks.

A power cord and appropriate data cables are also provided.

### 2.2 Features

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#### Temperature Range

Six zones hold samples at  $-1^{\circ}\text{C}$  to  $+66^{\circ}\text{C}$ .

#### Autosampler Compatibility

Use only with an ASX-7600 pick-and-place NMR sample changer.

#### Chemical Compatibility

Exposed surfaces are made of corrosion-resistant stainless steel alloys or anodized aluminum.

### 2.3 Intended Use

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This equipment is designed for use in analytical laboratories performing chemical analysis of samples.





## 3 Safety

Review this product and related documentation to familiarize with safety markings and instructions before you operate the instrument.

### 3.1 Safety Notices

---



#### CAUTION

##### **Injury Hazard**

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

Repair or service that is not covered in this manual should only be performed by qualified personnel.

#### 3.1.1 Power Cord Set Requirements

---

The power cord set supplied with the device meets the requirements of the country where the device was purchased. Power is supplied to the device through the included 24V power supply.

#### 3.1.2 Power Cord Safety Maintenance

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The operator should check the condition of the power/signal supply cord. The device should not be operated if the mains inlet is cracked or broken. Any obvious damage to the case (from a drop or fall) should be checked by service personnel for loose or damaged parts. Refer to the individual part lists, or contact Bruker, for approved replacement parts.

#### 3.1.3 Mains Disconnect

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The power switch on the rear panel is not the mains disconnect. Power mains disconnect is accomplished by unplugging the power cord from the power supply or from the wall outlet. Ensure the power cord is easily accessible and removable, in the event of an emergency which requires immediate disconnection.

## WARNING



### Fire and Shock Hazard

Incorrect installation or use of the power supply may result in a fire or shock hazard.

- ▶ Use only the provided power supply.
- ▶ The power supply must be plugged into an outlet which has a protective ground connection.
- ▶ Ensure that the power cord is disconnected before removing any covers.

## 3.1.4 Mechanical Hazards

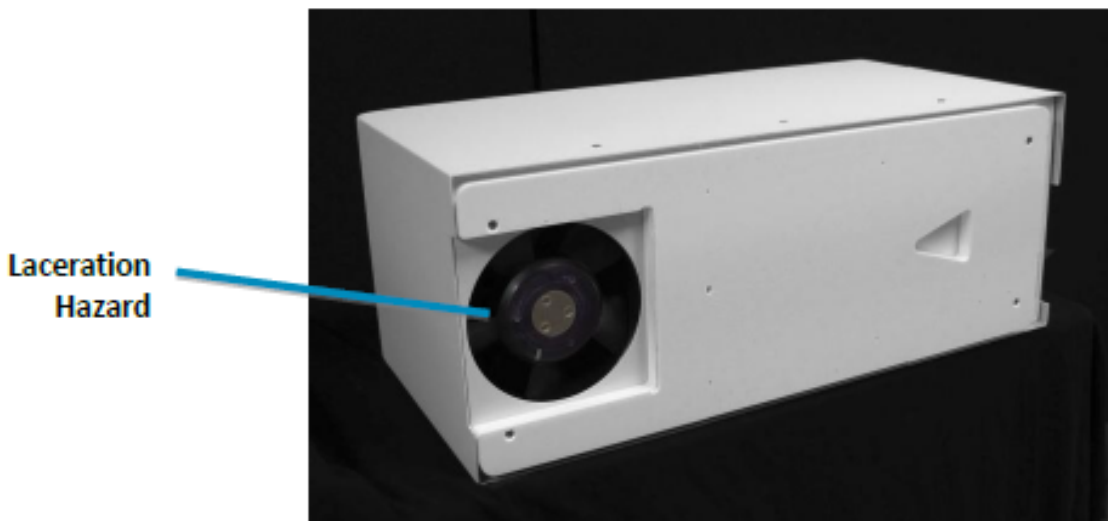


Figure 3.1: Bottom View with Filter Drawer Removed

## WARNING



### Laceration Hazard

If the unit power is left on, the spinning fan blade just above the filter may cause injury.

- ▶ Ensure the AC power is off before removing the filter.

## WARNING



### Lifting Hazard

Lifting without assistance may cause injury.

- ▶ Two people are required to lift the device.
- ▶ Lifting should be done with a person situated on either side of the device.

### 3.1.5 Thermal Hazards

#### WARNING



##### **Burn Hazard**

Incorrect handling of vials or inserting fingers into any holes in the device may result in burn injuries.

- ▶ Do not handle vials from heated zones until they have been given time to cool.
- ▶ Do not attempt to insert fingers into any holes in the device.

### 3.1.6 Operating Environment

#### WARNING



##### **Shock Hazard from Rain or Humidity**

Device exposure to rain or humidity could result in a risk of fire or electrical shock.

- ▶ Do not expose the device to rain or humidity.
- ▶ Do not open the cabinet, all maintenance is to be performed by an authorized service provider.

Protection provided by the device may be impaired if the device is used in a manner not specified by the manufacturer.

#### WARNING



##### **Shock Hazard from Liquids**

Liquid coming in contact with electrical components may result in a serious injury through shock.

- ▶ Do not allow any liquid to enter the device cabinet other than as intended through the specified tubing, or come into contact with any electrical components.
- ▶ The device must be thoroughly dry before you reconnect power, or turn the device on.

#### WARNING



##### **Explosion Hazard**

Explosive atmospheres caused by flammable gases, mists or vapors or by combustible dusts could result in an explosion.

- ▶ Prevent the release of dangerous substances, which can create explosive atmospheres.
- ▶ Prevent sources of ignition.
- ▶ Do not operate the device in an explosive atmosphere.

## WARNING



### Chemical Hazards

Incorrect use of chemicals used in and near the device may result in injury or property damage.

- ▶ Learn about the chemicals which will be used in and near the device, and observe the necessary precautions.
- ▶ Always use appropriate personal protective equipment, including protective eyewear.

### 3.1.7 Explanation of Warning Labels

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Warning symbol marked on device.

- This symbol means "Attention! Refer to the manual."

## 3.2 Electromagnetic Interference

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### FEDERAL COMMUNICATIONS COMMISSION (FCC) NOTICE

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 commercial installation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential environment is likely to cause harmful interference, in which case the user will be required to correct the interference at his expense.

### MODIFICATIONS

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by the manufacturer may void the user's authority to operate the equipment.

### CABLES

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods to maintain compliance with FCC Rules and Regulations.

### CANADIAN NOTICE


This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus" ICES-001 of the Department of Communications.

### AVIS CANADIEN

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques," NMB-001 édictée par le ministre des Communications.

### 3.3 Explanation of Regulatory Marks

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	The CE mark is a registered trademark of the European Community. This CE mark shows that the product complies with all the relevant European Legal Directives.
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# 4 Technical Data

## 4.1 Environmental Characteristics

These environmental characteristics indicate the conditions for safe operation. Instrument performance may depend on the ambient conditions.

Operating Temperature	+5° C to +40° C (+41° F to +104° F)
Non-Operating Temperature	+0° C to +55° C (+32° to +131° F)
Operating Altitude	Up to 2,000 m (6,562 ft.)
Relative Humidity	0% to 80% non-condensing for temperatures up to 31° C, decreasing linearly to 50% at 40° C.
Non-Operating Relative Humidity	0% to 95% non-condensing.
Pollution Degree	Pollution degree 2. Normally no pollution or only dry, non-conductive pollution occurs. The pollution has no influence. Occasionally, however, a temporary conductivity caused by condensation may be expected.

Table 4.1: Environmental Characteristics

For indoor use only.

Avoid sudden, extreme temperature changes which could cause condensation on circuit boards in the device.

## 4.2 Electrical Characteristics

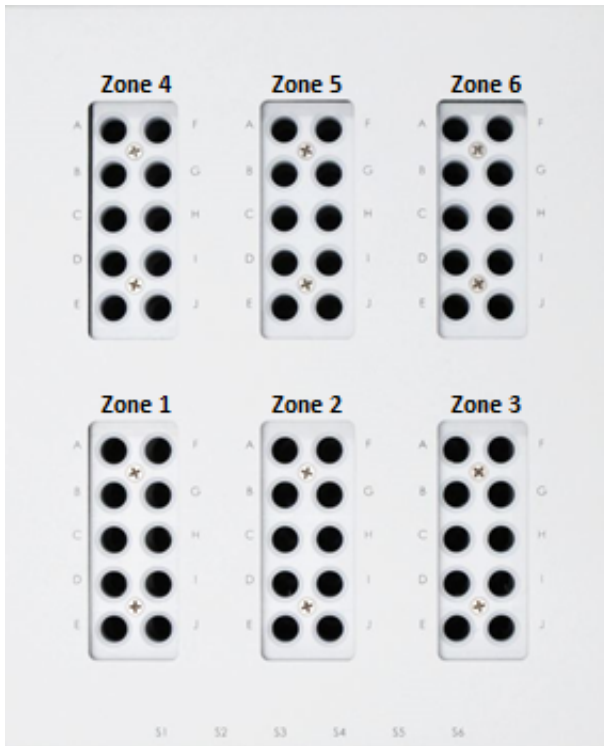
Power	Input: AC voltage, frequency, and current. 100-240 V ~, 50-60 Hz, 5 A maximum. Installation category: CAT II (line voltage in appliance and to wall outlet).
RS232	RS-232 serial connection to the sample changer (maximum ±12V DC, 8 mA).
RS485	TIA/EIA-485 (use only for connection to another temperature unit, maximum ±8V DC, 200 µA).

Table 4.2: Electrical Characteristics

## 4.3 Gas Connection

One fitting is provided for nitrogen purge gas. The nitrogen source must be regulated to a pressure of no more than 35 kPa (5 psi, 0.35 bar). A typical gas flow of 0.5 liter/minute shall apply.

## 4.4 Thermal Characteristics



Zone	Temperature Range
4-6	+9° C to +66° C
1-3	-1° C to +66° C



## 5 Transport, Packaging and Storage

### WARNING



#### Lifting Hazard

Lifting without assistance may cause injury.

- ▶ Two people are required to lift the device.
- ▶ Lifting should be done with a person situated on either side of the device.

Inspect external packaging upon receipt for signs of shipping damage. Inspect all items during unpacking and notify the carrier immediately of any concealed damage. Check for kinked tubing.

If the system is shipped or removed from storage during cold weather, allow the packaged equipment to equilibrate to room temperature before opening and exposing to warm, humid air. It is usually sufficient to provide four to eight hours for this purpose.

### CAUTION



#### Equipment Damage from Condensation

If condensation forms on or inside the unit, allow it to dry thoroughly before connecting it to a power source and operating it. Failure to do so may cause equipment damage.

Remove the packing checklist from the shipping container, and check off items against it. Leave accessories in the packing until you are ready to install them.



**Note:** Keep the factory packaging for use in case the product ever needs to be returned or shipped to another location.



## 6 Installation

Initial installation of the instrument is performed by Bruker Service or personnel authorized by Bruker.



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Installation, initial commissioning, retrofitting, repairs, adjustments or dismantling of the device must only be carried out by Bruker Service or personnel authorized by Bruker. Damage due to servicing that is not authorized by Bruker is not covered by your warranty.

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# 7 Operation

## 7.1 Power-On

---

To turn the system on, first turn the temperature unit switch ON, then the sample changer.

## 7.2 Power-Off

---

To turn the system off, first turn the sample changer power switch OFF, then the temperature unit.

In case of emergency, or before performing maintenance, remove the power cord from the back of the temperature unit and from the sample changer.

## 7.3 Controlling the Temperature

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The host computer sends commands to the sample changer, which then passes the commands through to the power supply.

## 7.4 Understanding the LEDs

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There are two kinds of LEDs on the temperature unit:

- A power indicator.
- Status indicators for each temperature control zone.

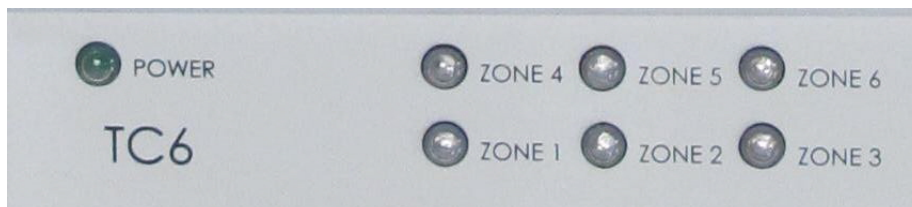


Figure 7.1: LEDs on the TC6

### 7.4.1 Power Indicator

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Green: Lighted green when power is connected.

### 7.4.2 Zone Status Indicators

---

Red: Flashing indicates it is heating and in transition to a set point, solid indicates it is heating and at a set point.

Blue: Flashing indicates it is chilling and in transition to a set point, solid indicates it is chilling and at a set point.



# 8 Maintenance

## 8.1 Replacing the Fuse



### **WARNING**

#### **Fire and Shock Hazard**

Using an incorrect fuse may cause fire or personal injury. .

- ▶ Replace the fuses only with a 10A 250V slow-blow 5x20 mm fuse (T10AL250V).

Two fuses are located in the power supply, just above the power cord connector.

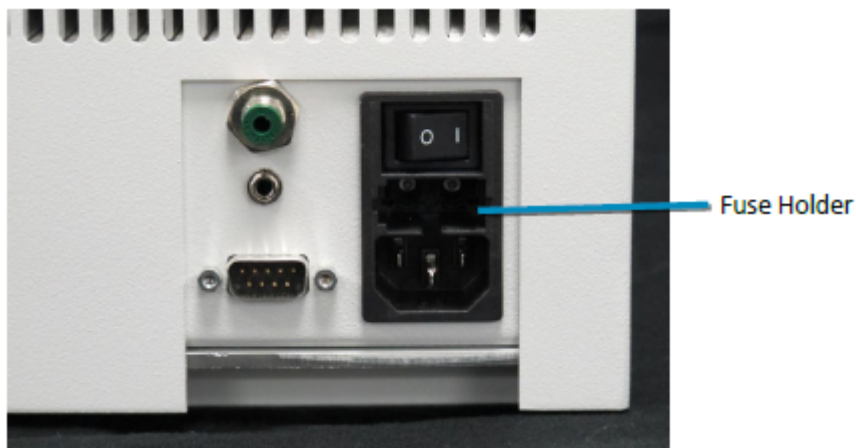


Figure 8.1: Fuse Holder for the TC6

- Disconnect the power cord.
- Inspect all of the equipment which is plugged into the power supply for moisture or other conditions which might pose a hazard and cause the new fuse to blow.
- Using your fingernails or a small, flat-blade screwdriver, squeeze the ends of the fuse holder.
- Pull the fuse holder out.
- Replace the blown fuse with a new one of the same size, type, and rating.

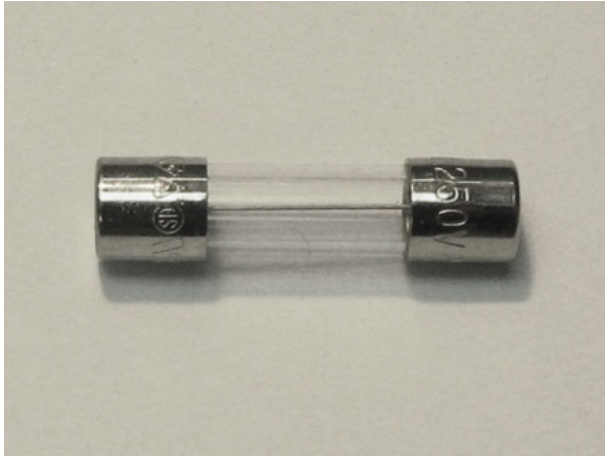


Figure 8.2: Fuse

- Press the fuse holder back in until it clicks into place.
- Plug the power cord back in.

## 8.2 Replacing the Air Filter

The 3-zone 10 mm SFC version of the TC3 includes a user-replaceable air filter. Contact Bruker for information on replacement filters.



### **WARNING**

#### **Laceration Hazard**

If the unit power is left on, the spinning fan blade just above the filter may cause injury.

- ▶ Ensure the AC power is off before removing the filter.

- Turn the power switch off.
- Pull the filter drawer open.



Figure 8.3: Opening the Filter Drawer

- Remove the old filter. If necessary, use your fingers to pull it out of the opening.



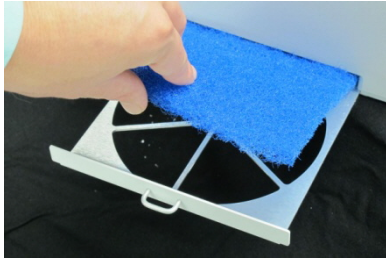


Figure 8.4: Removing and Installing the Filter

- Install the new filter.
- Close the filter drawer.
- Turn the power back on.

### 8.3 Cleaning Instructions

To clean the exterior surfaces of the device, complete the following steps:

- Shut down and unplug the device.
- Wipe the exterior surfaces only using a towel dampened with a lab-grade cleaning agent.
- Repeat the previous step, using a towel dampened with clear water.
- Dry the device exterior using a dry towel.

#### **WARNING**



##### **Shock Hazard from Liquids**

Liquid coming in contact with electrical components may result in a serious injury through shock.

- ▶ Do not allow any liquid to enter the device cabinet other than as intended through the specified tubing, or come into contact with any electrical components.
- ▶ The device must be thoroughly dry before you reconnect power, or turn the device on.

### 8.4 Cleaning Broken Vials

This chapter explains how to thoroughly clean broken glass or debris from the holes in a TC3 or TC6 temperature controller.

#### **Equipment Required**

You will need the following equipment and materials.

- Bottle/cylinder brush.\*
- Micro cleaning attachment for a shop vacuum.\*
- Steel rod, cylindrical pestle, or other tool for crushing glass. This is called a "pestle" in this document.\*



Figure 8.5: Brush, Micro Cleaning Attachment for Shop Vacuum and Steel Rod

- Wet/dry shop vacuum with a disposable filter. A wet/dry shop vacuum is recommended because the temperature controller may contain sample liquids as well as condensed moisture. Use a disposable filter so that all glass shards may be safely disposed of. The vacuum attachment which is supplied in the optional kit fits a vacuum hose with an outer diameter of 1 1/4 inches.
- Isopropyl alcohol.
- Mild detergent.
- Flashlight.
- Personal protective equipment.

\* A brush, micro cleaning attachment, and pestle are available from Bruker as an optional spare parts kit. If you supply your own, these items should be suitable for inserting into a 1.03 cm (0.407 in) diameter hole.

### Precautions



#### **WARNING**

##### **Laceration Hazard**

Coming in contact with broken glass vials may result in a laceration injury.

- ▶ Wear appropriate protective equipment including cut-resistant gloves.
- ▶ Avoid touching broken glass.

Follow your workplace procedure for handling and disposing of broken glassware.

Follow your workplace procedure for handling the sample material and for handling isopropyl alcohol.

### 8.4.1 Cleaning Procedure

- Empty the shop vacuum. Doing so will help you keep shards of glass separate from other waste.
- Remove any unbroken or undamaged vials from the temperature controller. Only the broken vial should remain.

**⚠ WARNING****Laceration Hazard**

Coming in contact with broken glass vials may result in a laceration injury.

- ▶ Be careful not to cut yourself on the broken vial. If sharp edges are exposed, use forceps or wear heavy gloves even when handling the undamaged vials.
- ▶ Follow your workplace safety rules.

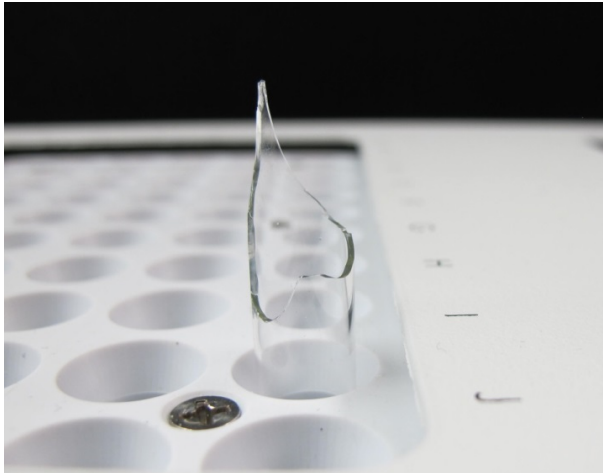
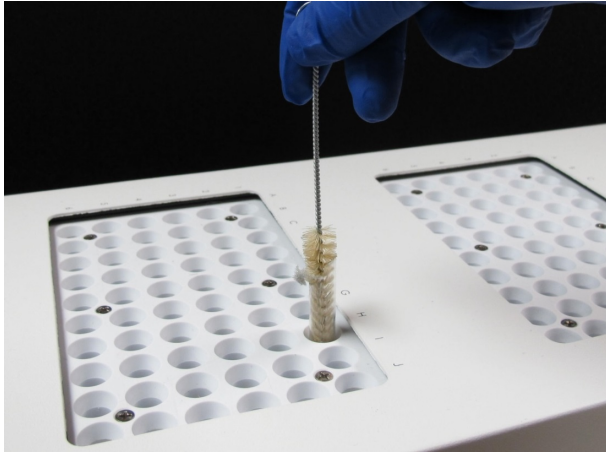


Figure 8.6: Example of a Broken Vial

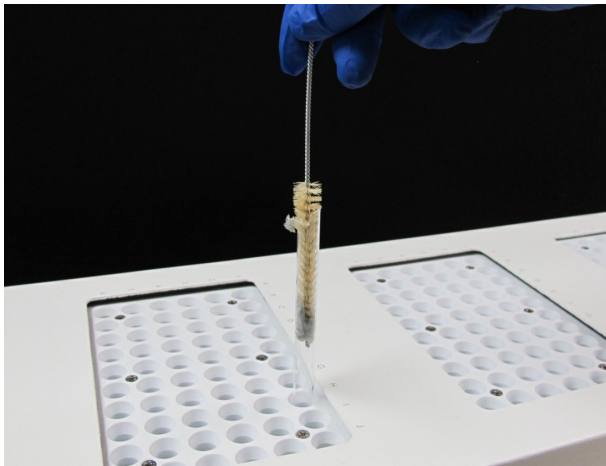
- If there is any portion of the broken vial above the top surface of the temperature controller, insert the brush into the damaged vial to extract it.



Figure 8.7: Bottle/Cylinder Brush



*Figure 8.8: Inserting the Brush into the Broken Vial*



*Figure 8.9: Removing the Broken Vial with the Brush*

- Once the vial has been removed, use the steel rod or pestle to crush the remaining glass within the temperature controller. Repeatedly press down until the glass has been reduced to fine granules. Use the rod/pestle in the surrounding openings in the event any of the breakage spilled into them.



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**Note:** If the module is cooling, set the temperature to 65°C to liquefy any fat which has accumulated at the bottom of the block.

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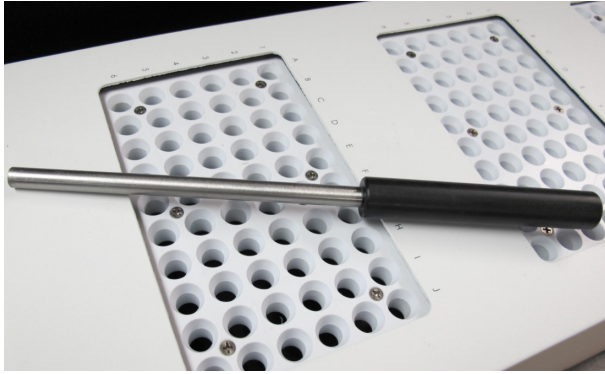


Figure 8.10: Steel Rod

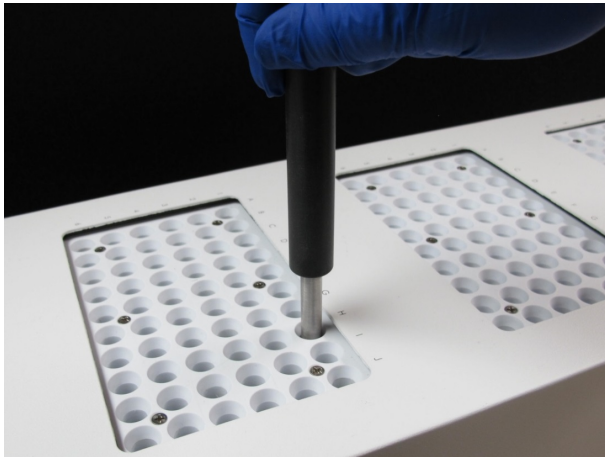


Figure 8.11: Breaking the Remaining Glass into Fine Granules with the Steel Rod

- Use the shop vacuum with the attachment to extract the glass particles. Also clean all of the surrounding holes.

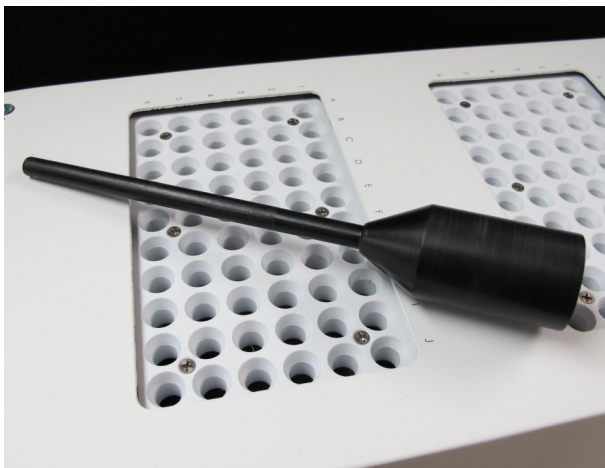


Figure 8.12: Shop Vacuum Attachment

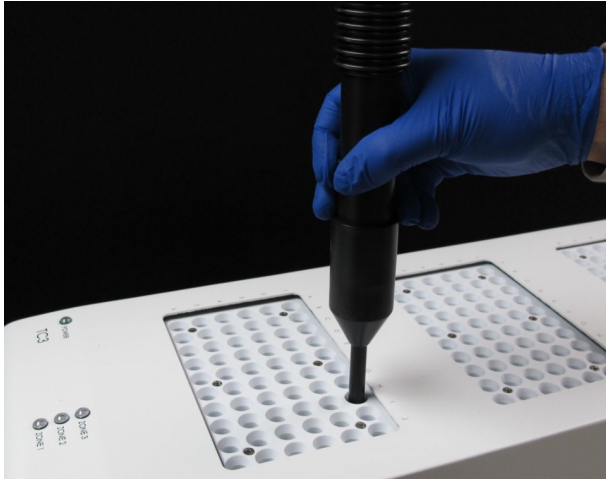


Figure 8.13: Using the Shop Vacuum Attachment to Remove Glass Particles

- Once all the broken glass has been extracted, jet some isopropyl alcohol into the temperature controller. Use warm water and a mild detergent on the brush to clean any fat from the bottom of the heater/chiller block.

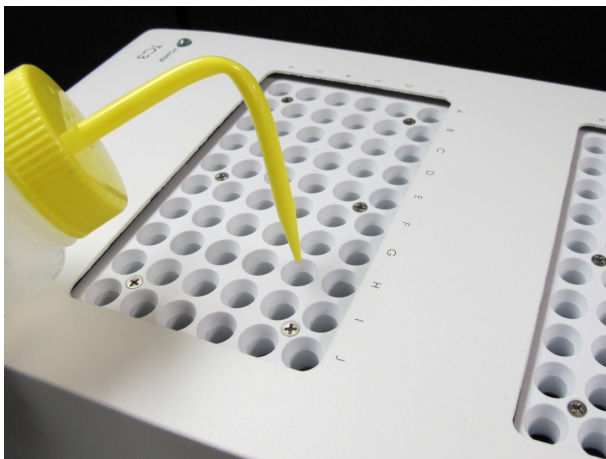


Figure 8.14: Jetting Isopropyl Alcohol into the Heater/Chiller Block

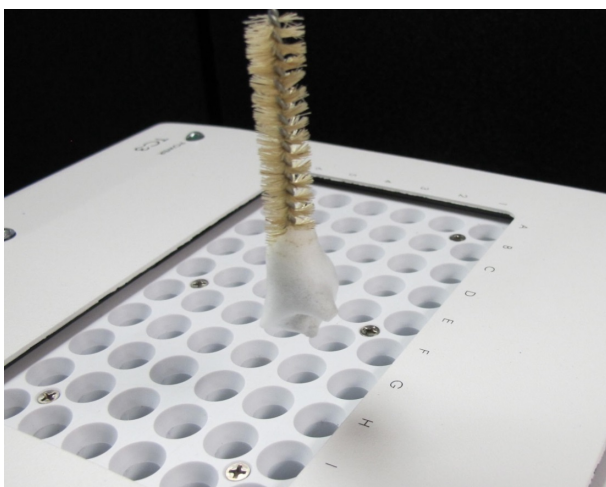
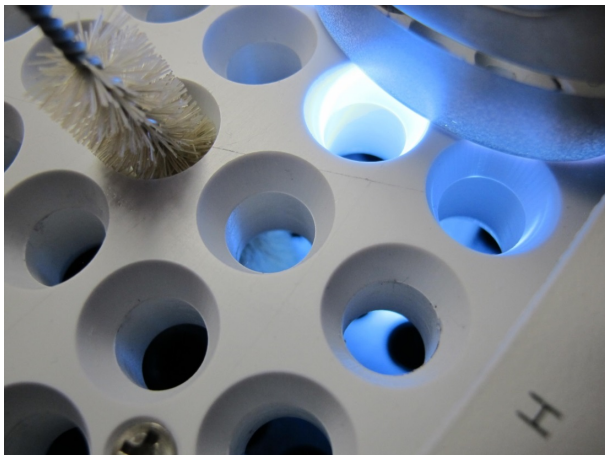


Figure 8.15: Using Warm Water and Detergent on the Brush to Clean the Bottom

- Use a flashlight to check that all glass particles have been removed.



- Use the brush to clean any overlooked debris.







## 9 Dismantling and Disposal

Following the end of its operational life, the device must be dismantled and disposed of in accordance with the environmental regulations.



Installation, initial commissioning, retrofitting, repairs, adjustments or dismantling of the device must only be carried out by Bruker Service or personnel authorized by Bruker. Damage due to servicing that is not authorized by Bruker is not covered by your warranty.

### 9.1 Dismantling

Before starting dismantling:

1. Shut down the device and secure to prevent restarting.
2. Disconnect the power supply from the device; discharge stored residual energy.
3. Remove consumables, auxiliary materials and other processing materials and dispose of in accordance with the environmental regulations.
4. Clean assemblies and parts properly and dismantle in compliance with applicable local occupational safety and environmental protection regulations.

### 9.2 Disposal Europe

**Environmental information for laboratory and industrial customers within the EU (European Union)**



This laboratory product is developed and marketed for Business-to-Business (B2B), so does not fall under article 6 clause 3 of the German Act ElectroG. To meet the demands of the European Directive 2012/19/EU WEEE 2 (Waste of Electrical and Electronic Equipment) and the national Equipment Safety Act, electrical and electronic equipment that is marked with this symbol directly on or with the equipment and/or its packaging must not be disposed of together with unsorted municipal waste or at local municipal waste collecting points. The symbol indicates that the equipment should be disposed of separately from regular industrial/ domestic waste.

Correct disposal and recycling will help prevent potential negative consequences for the environment and risk to personal health. It is your responsibility to dispose of this equipment using only legally prescribed methods of disposal and at collection points defined by government or local authorities in your area.

The WEEE register number can be found on the product label of the equipment. If you need further information on the disposal of equipment or collection and recovery programs available, contact your local Bruker BioSpin sales representative. Local authorities or professional waste management companies may also provide information on specific waste disposal services available in your area.

### **Disposal - End of Life (EoL) information: the common procedure as defined in the sales contract with Bruker BioSpin**

After the lifespan of an electrical and electronic product, Bruker BioSpin takes responsibility for final disassembly and correct disposal in accordance with the European directive 2012/19/EU WEEE 2.

Bruker BioSpin offers to take back the equipment (only for deliveries after 23.03.2006) after termination of use at the customer site upon request by the customer. This request must be affirmed when the equipment is ordered from Bruker BioSpin. Additional costs for dismantling and transport service will apply!

Only 100% pre-decontaminated equipment can and will be accepted by Bruker BioSpin. A release document for decontamination can be inquired from your nearest Bruker BioSpin contact site, also to be used when repairs, going back to Bruker sites, are requested.

In compliance with WEEE II directive: **2012/19/EU**

## **9.3 Disposal USA and Other Countries**

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Disposal of these materials may be regulated due to environmental considerations. For disposal or recycling information, please contact our local office or your local authorities, or in the U.S.A., contact the Electronics Industry Alliance web site at [www.eiae.org](http://www.eiae.org).

# 10 Contact

## Manufacturer

Bruker BioSpin GmbH  
Silberstreifen 4  
D-76287 Rheinstetten  
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## Bruker BioSpin Hotlines

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Please select the service center or hotline you wish to contact from our list available at:

<https://www.bruker.com/service/information-communication/helpdesk.html>



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