


# minispec

- Temperature Unit TC6  
User Manual  
Version 002



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# 1 About This Manual

**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

It is the policy of Bruker 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. Support engineers are advised to regularly check with Bruker for updated information.

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

## 1.2 Symbols and Conventions

Safety instructions in this manual 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.**

### 1.3 Font and Format Conventions

Type of Information	Font	Examples
<b>Shell Command, Commands,</b> “All what you can enter”	Arial bold	Type or enter <b>fromjdx</b> <b>zg</b>
<b>Button, Tab, Pane and Menu Names</b> “All what you can click”	Arial bold, initial letters capitalized	Use the <b>Export To File</b> button. Click <b>OK</b> . Click <b>Processing...</b>
<b>Windows, Dialog Windows, Pop-up Windows Names</b>	Arial, initial letters capitalized	The Stacked Plot Edit dialog will be displayed.
<b>Path, File, Dataset and Experiment Names</b> <b>Data Path Variables</b> <b>Table Column Names</b> <b>Field Names (within Dialog Windows)</b>	Arial Italics	<i>\$tshome/exp/stan/nmr/</i> <i>lists</i> <i>expno, procno,</i>
<b>Parameters</b>	Arial in Capital Letters	VCLIST
<b>Program Code</b> <b>Pulse and AU Program Names</b> <b>Macros</b> <b>Functions</b> <b>Arguments</b> <b>Variables</b>	Courier	go=2 au_zgte edmac CalcExpTime() XAU(prog, arg) disk2, user2
<b>AU Macro</b>	Courier in Capital Letters	REX PNO

Table 1.1: Font and Format Conventions



## 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

---

### 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

---

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

---

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

---

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

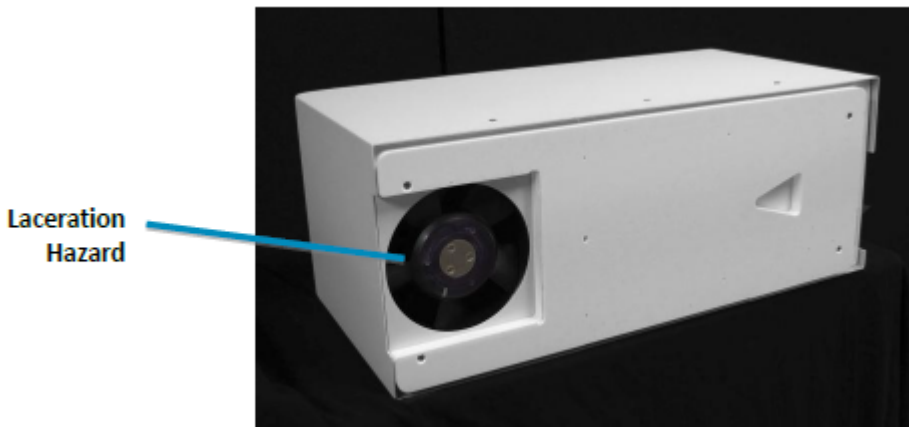


Figure 3.1: Bottom View with Filter Drawer Removed

## 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**


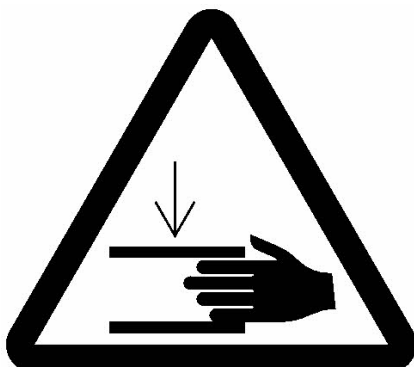


### **Chemical Hazards**

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 Caution and Warning Notices

	<p>Warning symbol marked on device.</p> <ul style="list-style-type: none"> <li>• This symbol means “Attention! Refer to the manual.</li> </ul>
	<p>Crush Hazard / Pinch Point.</p> <ul style="list-style-type: none"> <li>• Keep hands clear of moving parts. X, Y, Z axis movement may crush hand.</li> </ul>



	<p>Puncture Hazard – Moving parts can cause severe injury.</p> <ul style="list-style-type: none"> <li>• Do not put hand under the gripper assembly!</li> </ul>
	<p>Lifting Hazard – Single person lift could cause injury.</p> <ul style="list-style-type: none"> <li>• Use assistance when moving or lifting.</li> </ul>

Table 3.1: Explanation of Caution and Warning Notices

## 3.2 Electromagnetic Interference

### 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

---



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.

# 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

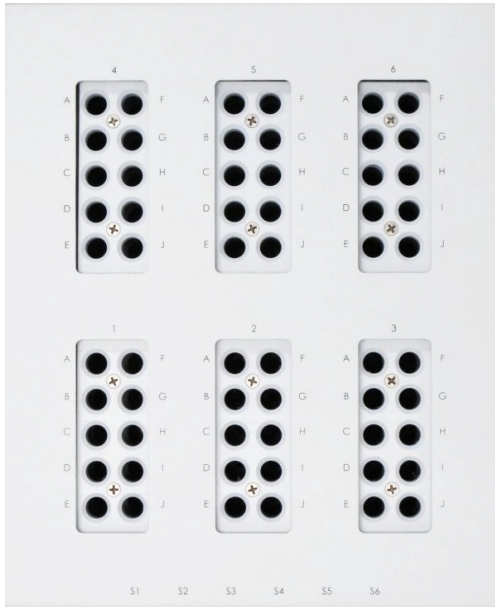
Power	Input: AC voltage, frequency, and current 100-240 V ~, 50-60 Hz, 5 A maximum Installation category: CAT II (line voltage in appliance and to wall outlet)
RS232	RS-232 serial connection to the sample changer (max ±12V DC, 8 mA)
RS485	TIA/EIA-485 (use only for connection to another temperature unit,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

## 6.1 Site Selection

---

Follow the guidelines in the sample changer *Operator's Manual* to choose a location for the system. Keep in mind that:

- You will need to be able to access the back of the system to install cables and tubing.
- Place the sample changer within 1.2 meters of a power outlet.
- Allow at least 5 cm behind the power supply for cable egress, ventilation, and access to the power switches. Always position the equipment so that it is easy to disconnect the power cord.

## 6.2 Installing the Unit on the Base

---

### 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.

### WARNING



#### Pinch/Puncture Hazard

Ensure the AC power is off before proceeding with installation. If the power is left on, motors may move unexpectedly and cause injury.

The temperature unit is positioned by means of two spring-loaded pins:

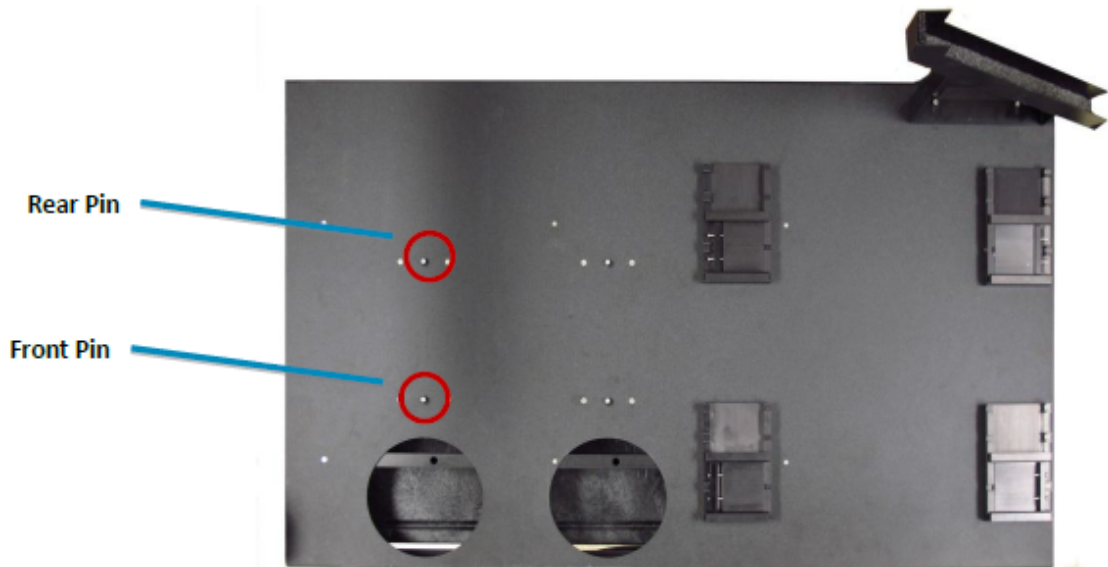


Figure 6.1: Base of the Sample Changer



Figure 6.2: Bottom of the Temperature Unit

- If using a version which is equipped with an air filter, remove the filter drawer from the front of the temperature unit. This provides an additional lifting point.  
With the help of an assistant, place each temperature unit on the base of the sample changer slightly toward the front edge of the base.
- Keep the bottom of the temperature unit parallel to the base, so that the corners don't gouge the finish on the base.
- Slide the temperature unit back until the pins engage the holes. You should hear or feel a click.

**Note:** You can mount the temperature unit on a bench top or table using the optional table adapter:

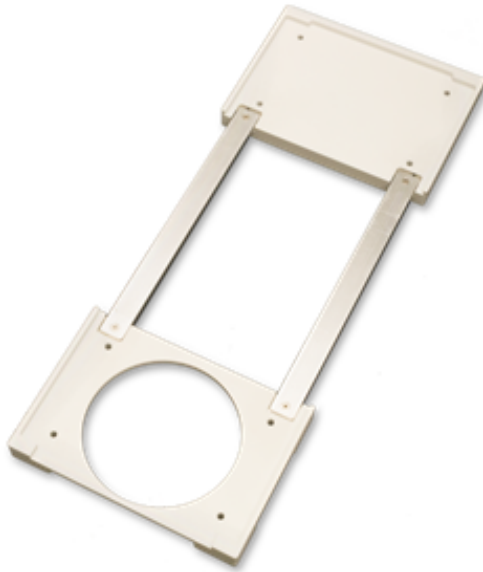


Figure 6.3: Optional Table Adapter

### 6.3 Connecting the Cables to the Sample Changer

- Connect the 9-pin serial cable to the COM 2 port on the sample changer.

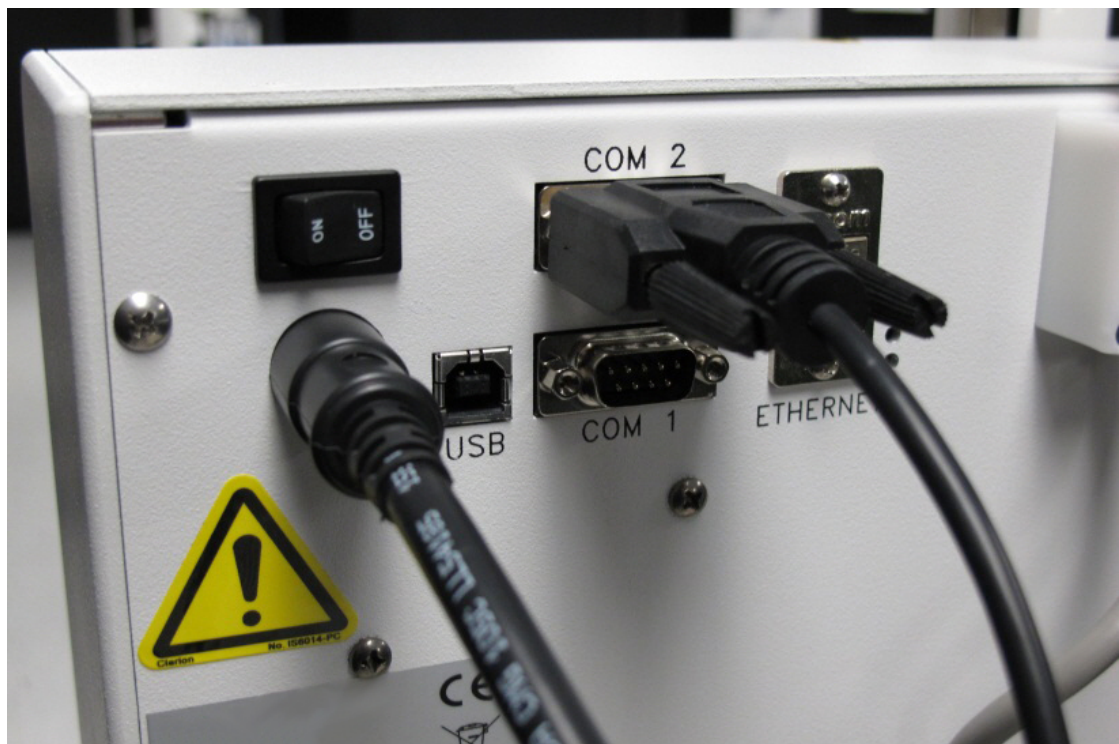


Figure 6.4: Serial Cable Connected to the Back of the Sample Changer.

- Connect the other end of the serial cable to the RS232 port on the unit.

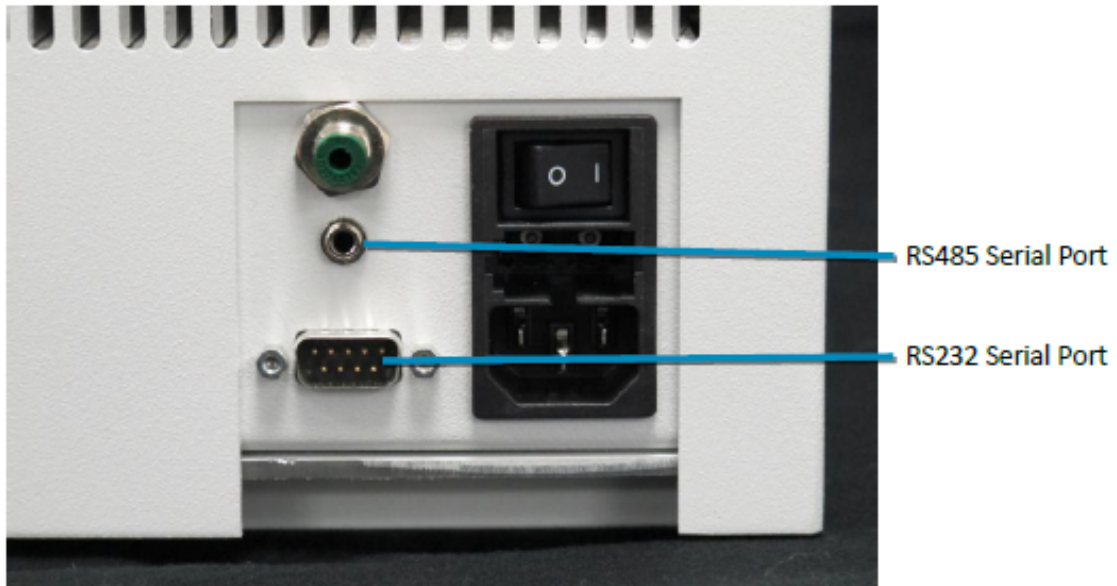


Figure 6.5: Serial Connector on the Unit

- Connect the sample changer to the host computer as described in the sample changer *Operator's Manual*.
- If using a TC3 and TC6 temperature unit together, connect the supplied RS-485 serial cable between the two temperature units.

### 6.4 Connecting to a Power Source

- Turn the power switches on the sample changer and power supply OFF.
- Check the plug on the power cord to verify that it is of the correct type for your country. Contact the manufacturer if you need a different power cord.

#### **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.

- Locate the proper fuse for your voltage, then install the fuse in the fuse holder.
- Push the fuse holder in until it clicks into place.
- Plug the power cord into the back of the unit.

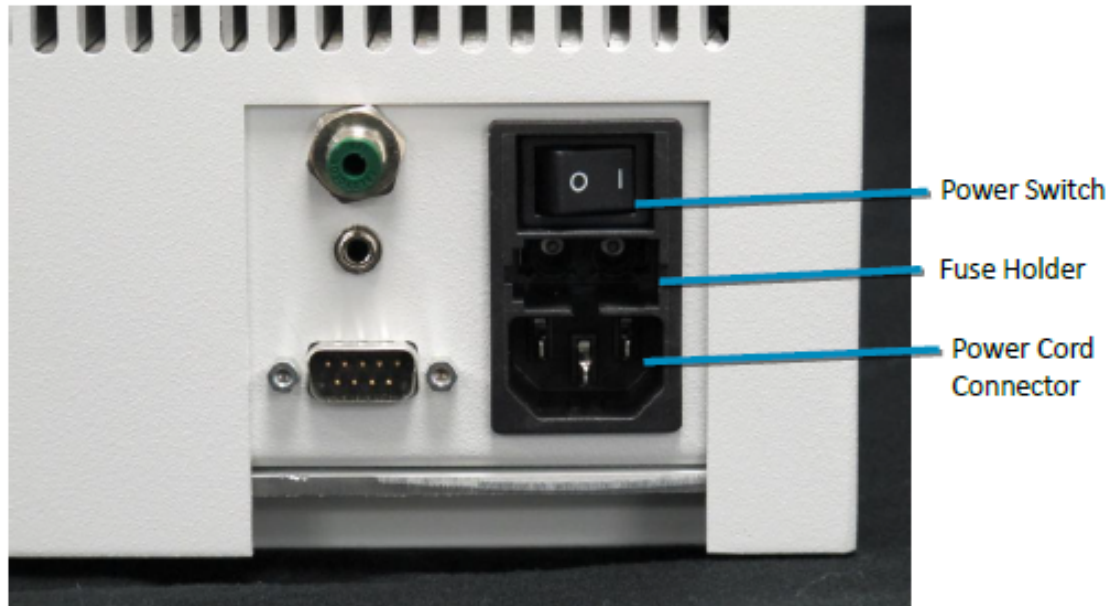


Figure 6.6: Power Connections for the TC6

- Plug the power cord into a power outlet.

It is important to use the appropriate power cord for your country. See [Power Cord Set Requirements](#) [▶ 11].

## 6.5 Connecting the Nitrogen Supply

A source of low-pressure nitrogen may be connected for purging the unit. The nitrogen displaces air within the unit to prevent condensation.

**Use a regulator.** The nitrogen source must supply a pressure of no more than 35 kPa (5 psi, 0.35 bar). A typical gas flow of 0.5 liter/minute shall apply.

Use as little nitrogen as is needed to prevent condensation.

If the pressure exceeds 35 kPa, the excess nitrogen will be vented and you will hear a hissing sound.



Figure 6.7: Nitrogen Connection for the Unit

# 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

---

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

## 7.4 Understanding the LEDs

---

There are two kinds of LEDs on the temperature unit:

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

### 7.4.1 Power Indicator

---

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.

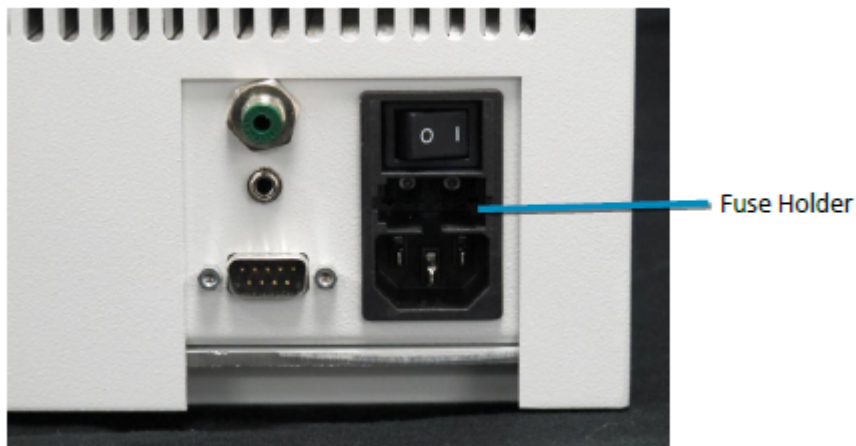


Figure 8.1: Fuse Holder for the TC6

- 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.

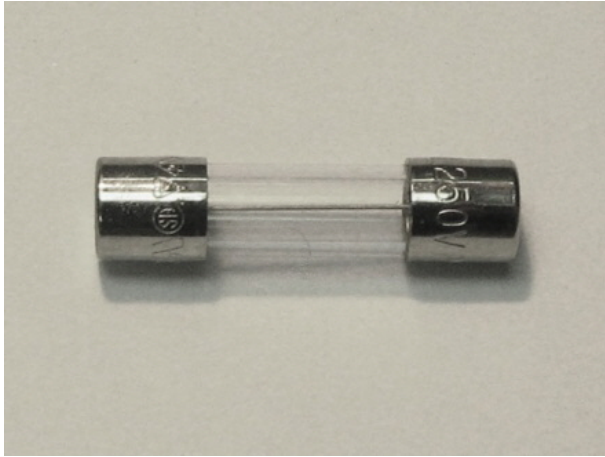


Figure 8.2: Fuse

- 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.

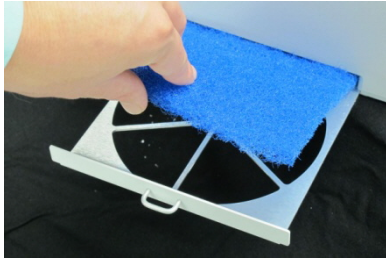


Figure 8.4: Removing and Installing the Filter

- 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.



## 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 Safety

#### WARNING



##### **Danger of injury from electrical shock!**

A life threatening shock may result when the housing is open during operation.

- ▶ Only qualified personnel should open the housing.
- ▶ Disconnect the device from the electrical power supply before opening the device. Use a voltmeter to verify that the device is not under power!
- ▶ Be sure that the power supply cannot be reconnected without notice.

#### WARNING



##### **Danger of injury due to improper dismantling!**

Stored residual energy, angular components, points and edges on and in the device or on the tools needed can cause injuries.

- ▶ Ensure sufficient space before starting work.
- ▶ Handle exposed, sharp-edged components with care.
- ▶ Dismantle the components properly.
- ▶ Secure components so that they cannot fall down or topple over.
- ▶ Consult the manufacturer if in doubt.

### 9.2 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.

### 9.3 Disposal

After the lifespan of the product, Bruker takes responsibility for disassembly and disposal in accordance with the European Directive WEEE 2012/19/EC. Bruker BioSpin will take back the components free of charge upon request by the customer. If the customer wants to arrange disposal on their own, then this must be stated when the product is ordered.

#### European Waste Electrical and Electronic Equipment Directive (WEEE 2012/19/EC)

**Do not dispose in domestic household waste.**



The affixed label indicates that it is prohibited to discard this electrical/electronic product in domestic household waste, in compliance with the European Waste Electrical and Electronic Equipment Directive (WEEE 2012/19/EC).

For instructions on how to return end-of-life equipment, producer-supplied electrical accessories or auxiliary items for proper disposal contact the supplier or importer. If the supplier cannot be reached, contact the manufacturer.

#### **NOTICE**

##### **Danger to the environment from incorrect handling of pollutants!**

Incorrect handling of pollutants, particularly incorrect waste disposal, may cause serious damage to the environment.

- ▶ Always observe local environmental regulations regarding handling and disposal of pollutants.
- ▶ Take the appropriate actions immediately if pollutants escape accidentally into the environment. If in doubt, inform the responsible municipal authorities about the damage and ask about the appropriate actions to be taken.

# 10 Contact

**Manufacturer:**

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E-Mail: [minispec.SLS@bruker.com](mailto:minispec.SLS@bruker.com)  
<http://www.bruker.com>  
WEEE DE43181702

**Bruker BioSpin Hotlines**

Contact our Bruker BioSpin service centers.

Bruker BioSpin provides dedicated hotlines and service centers, so that our specialists can respond as quickly as possible to all your service requests, applications questions, software or technical needs.

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

<http://www.bruker.com/service/information-communication/helpdesk/magnetic-resonance.html>



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