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Operating Manual

Biometra TSC ThermoShaker

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For a proper and safe use of this product follow the instructions. Keep the operating manual for future reference.

General Information

http://www.analytik-jena.com

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Technical Documentation

Analytik Jena GmbH+Co. KG

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1 Basic information

1.1 About this operating manual

Content

This operating manual describes the Biometra TSC ThermoShaker device.

The device is intended to be operated by qualified specialist personnel who must observe all instructions given in the operating manual.

The operating manual provides information about the design and operation of the device and provides operating personnel with the necessary know-how for safe handling of the device and its components. The operating manual also provides information on maintaining and caring for the unit.

The operating manual applies to devices from serial number S/N 010143-1208-0106.

Conventions

Instructions for actions occurring in chronological order are numbered and combined into action units.

Warnings are indicated by a warning triangle and a signal word. The type, source and consequences of the hazard are stated together with notes on preventing the hazard.

Elements of the control and analysis program are indicated as follows:

- Program terms are in bold (e.g., the **System** menu).
- Menu items are separated by vertical lines (e.g., **System** | **Device**).

Symbols and signal words used in this manual

The user manual uses the following symbols and signal words to indicate hazards or instructions. These warnings are always placed before an action.

WARNING

Indicates a potentially hazardous situation which can cause death or very serious (possibly permanent) injury.

CAUTION

Indicates a potentially hazardous situation which can cause slight or minor injuries.

NOTICE

Provides information on potential material or environmental damage.

1.2 Intended use

The device is used for tempering and mixing of liquids in sealed, heat-resistant microtubes and microplates.

The liquids are generally aqueous solutions. Do not use the device to process any highly flammable organic solvents.

The basic device can be operated with different block modules for sample volumes from 0.2 to 2.0 ml. Only use block modules from Analytik Jena that are intended for the device model.

The device is intended for general laboratory use. The device can be used in laboratories, in incubators or even in cooling chambers, provided that the installation conditions are observed.

The device and its components must only be used for the applications described in the operating manual. Only this specified use is regarded as the intended use, ensuring the safety of the user and the device.

2 Safety instructions

For your own safety and to ensure error-free and safe operation of the device, please read this chapter carefully before commissioning. Comply with all safety instructions listed in this manual.

2.1 Safety labeling on the device

Warning and mandatory action labels have been attached to the device and must always be observed.

Damaged or missing warning and mandatory action labels can cause incorrect actions leading to personal injury or material damage. The labels must not be removed. Damaged warning and mandatory action labels must be replaced immediately!

The following warning and mandatory action labels have been attached to the device:

Warning symbol	Meaning	Comment
	Warning of a danger point	Use care when handling biological and biochemical samples and when working with the device.
	Warning against hot surface	There is a risk of burns from the block module and the heated samples.

2.2 Requirements for the operating personnel

The device must only be operated by qualified specialist personnel instructed in the use of the device. This instruction also include teaching the contents of this user manual and of the user manuals of the connected system components. We recommend training by qualified employees of Analytik Jena or its representatives.

In addition to the safety instructions in this user manual, the general applicable safety and accident prevention regulations of the respective country the device is operated in must be observed and adhered to. The operator must ensure the latest version of these regulations.

The user manual must be accessible to the operating and service personnel.

2.3 Safety instructions for transport and commissioning

Before transporting the device, switch it off properly and disconnect the external power supply unit from the electrical mains supply and the device.

To prevent health damage, the following must be observed when moving the device in the laboratory (lifting and carrying):

- The device has no carrying handles. To transport the device, grip the device firmly at the bottom with both hands and lift it.
- Insufficiently secured components pose a risk of injury. During transport, secure the device components as specified in this operating manual.

- Risk of damage to health due to improper decontamination! Perform a professional and documented decontamination of the device before returning it to Analytik Jena. The decontamination report is available from Service when registering the return. Without a completed decontamination report, the acceptance of the device will be refused. The sender may be liable for damage caused by inadequate decontamination of the device.

2.4 Safety instructions during operation

The operator must make sure that the device and its safety equipment is in sound condition each time before starting up the device. This applies in particular after each modification or extension of the device or its repair.

Observe the following:

- The device may only be operated if all items of protective equipment (e.g. covers in front of electronic components) are in place, properly installed and fully operational.
- The sound condition of the protection and safety equipment must be checked regularly. Any defects must be corrected as soon as they occur.
- Protective and safety equipment must never be removed, modified or switched off during operation.
- Always ensure free access to the main switch and to the emergency shutdown switches and locks during operation.
- Keep all combustible materials away from the device.
- Never fill the liquid samples directly into the recesses in the block module.
- The samples are generally aqueous solutions. Do not use the device to process any highly flammable organic solvents.
- Always fill samples into heat-resistant tubes or microplates that are suitable for temperatures up to 100 °C.
- Only mix and temper samples in sealed tubes and microplates. The closures or foils could open at high temperatures and/or with vigorous shaking. Sample material may then leak out.
  - Only heat the liquid samples to temperatures below the boiling point. If the vapor pressure is too high, the microtubes could open.
  - Check that the sample tubes are tightly closed.
  - When using the block module for 96-well microplates, always put the lid on the block module.
  - Wear personal protective equipment such as safety goggles and protective clothing to protect yourself from hot liquids splashing out.
- During operation, there is a risk of burns from the block module and the samples. The block module and the sample tubes are heated to temperatures of up to 100 °C. When inserting the samples, maintain a safe distance from the block module or wear heat-resistant gloves. Allow the block and sample tubes to cool down before removing the samples.
- Only check the temperature of the block module with a thermometer, not with your bare hand.
- Ensure that no liquid enters the interior of the device, for example at cable connections. There is a danger of electric shock.
- The ventilation equipment on the device must be in good working condition. Covered ventilation grates or slots, etc. can result in malfunctions or device damage.

- Modifications, conversions and extensions to the device are only permitted after consultation with Analytik Jena. Unauthorized modifications can jeopardize the device's operational safety and may lead to limitations regarding the warranty and access to customer service.

2.5 Safety instructions – protection against explosion and fire

The device may not be operated in an explosive environment.

Smoking or handling open flames are prohibited in the room in which the device is operated!

2.6 Electrical safety

Note the following:

- Work on the electronics may only be carried out by the customer service of Analytik Jena and specially authorized technicians.
- The external power supply unit must be connected to a proper power outlet to ensure that the device (ground connector) meets the protection class I. Do not replace the removable power supply unit with a different power supply unit (without protective ground conductor). Extensions of the supply cable are not permitted!
- Before opening the device, the device must be switched off via the main switch and the power plug must be disconnected from the power outlet!
- Unplug the external power supply unit from the power outlet to completely disconnect the device from the electrical power network.

2.7 Handling hazardous substances

The operator is responsible for the selection of substances used in the process as well as for their safe handling. This is particularly important for radioactive, infectious, poisonous, corrosive, combustible, explosive and otherwise dangerous substances.

When handling hazardous substances, the locally applicable safety instructions and instructions in the safety data sheets from the manufacturers of the auxiliary and operating materials must be complied with.

Observe the following:

- The operator is responsible for carrying out suitable decontamination should the device become contaminated externally or internally with dangerous substances.
- Splashes, drops or larger liquid spillages should be removed using an absorbent material such as cotton wool, laboratory wipes or cellulose.
- For biological contamination, wipe the affected area with a suitable disinfectant, such as an Incidin Plus solution. Then wipe the cleaned areas so that they are dry.
- The only suitable cleaning method for the housing is wipe disinfection. If the disinfectant has a spray nozzle, apply disinfectant to a suitable cloth before using it on the device.
  Work particularly carefully and cleanly with infectious material because the device cannot be decontaminated as a whole.

- Before using a cleaning or decontamination procedure other than that prescribed by the manufacturer, the user is required to check with the manufacturer that the intended procedure will not damage the device. Safety labels attached to the device must not have methanol applied.

2.8 Safety instructions – maintenance and repair

The device is generally maintained by the customer service department of Analytik Jena or specialist personnel trained and authorized by them.

Unauthorized maintenance can damage the device. For this reason, only the activities described in the user manual in the "Maintenance and care" chapter may be performed by the operator.

- All maintenance and repair work on the device must only be carried out when the device is switched off (unless specified otherwise).
- Allow the device to cool down before any maintenance work or replacement of system components.
- When changing blocks, take care not to place hot block modules on flammable surfaces.
- Only clean the exterior of the device with a slightly moistened, non-dripping cloth. Use only water and, if required, customary surfactants.
- Do not use organic solvents or abrasives to clean the device. Exercise caution when decontaminating the device with disinfectants containing alcohol. The alcohol can damage the safety labeling on the device.
- Use only original spare parts, wear parts and consumables. These have been tested and ensure safe operation.
- All protective equipment must be reinstalled and checked for proper function when the maintenance or repair work is complete.

2.9 Behavior during emergencies

If there is no immediate risk of injury, switch off the device and the connected system components immediately in hazardous situations or in the event of an accident and/or disconnect the power plugs from the power outlets.

3 Function and design

The Biometra TSC ThermoShaker device is a thermomixer with variable mixing frequency and variable incubation temperature.

The device is suitable for many typical biochemical applications:

- Sample preparation for DNA/RNA analysis and electrophoresis
- Creation of DNA libraries
- Extraction of lipids and other cellular components
- Extraction of metabolites from cellular material
- Investigation of enzymatic reactions

You can use the two basic functions of sample preparation, mixing and tempering of samples, individually or simultaneously.

The device is suitable for sample volumes in the microliter range in sealed microtubes (0.2 to 2.0 ml) and for 96-well microplates.

With the device you can temper samples in a temperature range from room temperature (RT) - 15 °C to 100 °C.

Active cooling with Peltier technology allows temperature adjustment from +4 to +40 °C.

The variable mixing frequency from 250 to 1400 rpm combined with the 2 mm mixing orbit allows gentle to vigorous shaking of samples. The controlled mixing motion ensures uniform mixing of even the smallest sample volumes. Shaking can be configured for continuous or timer operation. After the set period of time has elapsed, an acoustic signal (buzzer) sounds. The mixer switches off automatically. The device maintains the set block temperature.

If you want to insert further samples into the block module during operation, you can pause the timer and mixing function and resume it later.

Fig. 1 Biometra TSC ThermoShaker design

1 Temperature-controlled sample block
2 ThermoShaker TS1 (basic device)
3 Control panel

The device is compact in design and takes up little space with its low profile and small footprint: 205 x 230 x 130 mm. The device's special counter weight technology serves for a stable stand.

The control panel on the front of the device allows for easy operation. The set and actual values for time, mixing frequency and temperature are shown in the 2-line display.

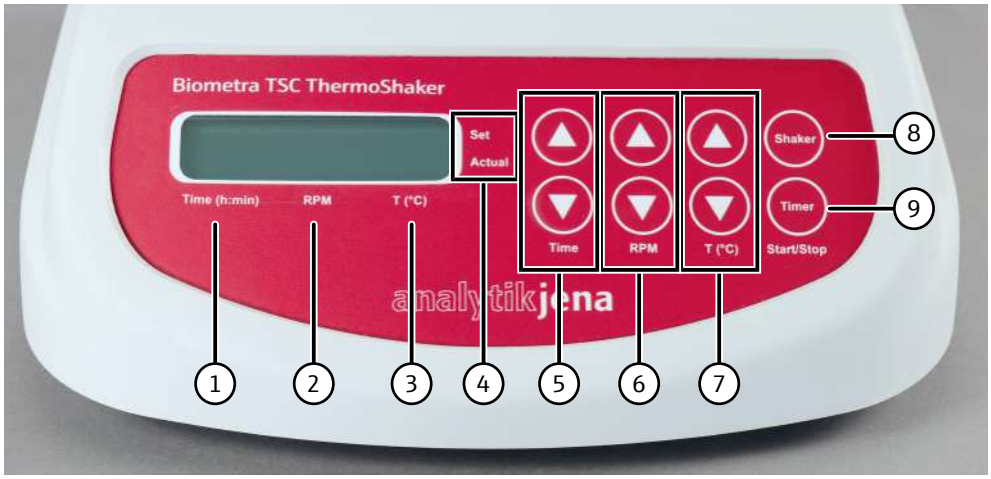

Fig. 2 Control panel with indicators and input keys

1 Timer display
2 Mixing frequency RPM display
3 Temperature display
4 Set value, actual value display
5 Timer adjustment
6 Mixing frequency adjustment
7 Block temperature adjustment
8 Shaker start/stop key
9 Timer start/stop key

The ON/OFF switch and the power connector are located at the rear of the device:

Fig. 3 Rear of the device

1 ON/OFF switch
2 Power connector
3 Fan

The device is supplied with power via an external power supply unit. The power supply unit is a wide range power supply unit. The voltage supply on the primary side is provided by a power outlet with AC voltage (100 to 240 V; 50/60 Hz; 1.4 A). On the secondary side, the power supply unit provides a DC voltage of 12 V; 5.0 A.

Temperature calibration

The device allows the temperature currently shown on the display to be calibrated by ±6 %. Temperature calibration can be used to compensate for differences in the thermal behavior of tubes and PCR plates from different suppliers.

Accessories

Analytik Jena offers five interchangeable block modules for the device. The block modules can be easily changed by the user.

Fig. 4 Range of block modules

1 Block module 20 x 0.2 ml + 12 x 1.5 ml
2 Block module 96 x 0.2 ml or 96-well microplates
3 Block module 20 x 0.5 ml + 12 x 1.5 ml
4 Block module 24 x 1.5 ml
5 Block module 24 x 2.0 ml

The block modules are suitable for samples from 0.2 to 2.0 ml in sealed microtubes or in 96-well microplates.

The block module for 96-well microplates has a lid. The lid protects you from samples splashing out if the foil comes off a microplate during shaking and heating.

Fig. 5 Inserting a microplate into a block module

Scope of delivery

The scope of delivery of the device includes:

- Biometra TSC ThermoShaker basic device (without block module)
- External power supply unit
- 2 replacement rubber belts for the mixer (wearing part, to be replaced after 1.5 years or 2,000 operating hours)
- 4 rubber washers for the 4 block screws
- Operating instructions

Fig. 6 Scope of delivery

1 External power supply unit
2 Basic device
3 4 rubber washers for block screws
4 2 replacement rubber belts for the mixer

The block modules are not included in the scope of delivery of the basic device. The block modules must be ordered separately. For order numbers, see the Analytik Jena website (address stated in the imprint).

Type plate

The type plate contains the following information:

- Device type
- Serial number
- Electrical connection data
- Icons: CE, RoHS, WEEE marking
- Manufacturer and origin

4 Installation and commissioning

4.1 Installation conditions

4.1.1 Ambient conditions

Observe the following when setting up the device:

- This laboratory device is designed for inside use.
- Do not use the device in explosion-hazard environments.
- The installation location must be free of caustic vapors.
- Place the device on a level, stable and heat-resistant surface. Do not position the device near combustible materials.
- Maintain a distance of 20 cm from neighboring objects. Do not place any objects under the device.
- The ventilation equipment on the device must be in good working condition. Covered ventilation grates or slots, etc. can result in malfunctions or device damage.

Climatic conditions

The requirements for the climatic conditions at the installation location are set out in the specifications. The device can be used in laboratories, in incubators or even in cooling chambers, provided that the installation conditions are observed.

4.1.2 Power supply

WARNING

Danger due to electrical voltage

- Only connect the device to a properly grounded socket which complies with the voltage indicated on the device's rating plate.
- Do not use an adapter in the feeder.

The device operates on single-phase alternating current.

The installation of the electrical equipment in the laboratory must comply with the DIN VDE 0100 standard. At the connection point, an electrical current in accordance with the standard IEC 60038 must be available.

4.2 Unpacking and setting up the device

NOTICE

Keep the original packaging

Transport damage can only be avoided if the device is transported in its original packaging.

- Keep the original packaging for transport, e.g., in case the device must be returned to the manufacturer for repair.

NOTICE

Damage to the electronics due to condensation

Significant temperature differences can lead to the formation of condensation which can damage the device's electronics.

- After long-term storage or transport in a colder environment, allow the device to acclimatize at room temperature for at least one hour before switching it on.

Fig. 7 Device in transport carton

- Unpack the device and accessories and check that they are undamaged. Only use an intact device.
- Immediately notify the manufacturer of any damage to the device.
- Place the device on a level surface and allow it to acclimatize.
- Remove the protective foil from the display.
- Keep the original packaging with the foam transport protectors.
- Install the relevant block module.
- Connect the device to a grounded power outlet using the supplied power supply unit.
- Switch on the device using the ON/OFF switch at the rear of the device.

  ✓ The device is ready for operation. The values for time, mixing frequency and temperature that were last set are shown on the display under **Set**.

- If a temperature above 4 °C is set, the device immediately starts to control the temperature of the block module.
- If a temperature below 4 °C is set, the temperature indicator on the display shows **OFF**.

4.3 Installing or changing a block module

NOTICE

Risk of damage to the sensitive electronics

- Switch off the device before installing or changing a block module. Disconnect the power plug from the power outlet.
- Only connect and disconnect the electrical connection cable between the basic device and the block module when the system is switched off.

NOTICE

Risk of damage to the device due to an incorrect block module

The block modules for the Biometra TS1 ThermoShaker and Biometra TSC ThermoShaker device models are not interchangeable. Both the block module and the basic device will be damaged if an unsuitable module is used.

- When ordering the block module, ensure that the module is suitable for the ThermoShaker. Biometra TS1 ThermoShaker: order numbers 846-051-51x, Biometra TSC ThermoShaker: order numbers 846-051-61x.

Installing a block module

- Select a suitable block module.
- Switch off the basic device and disconnect the power plug from the power outlet.
- Align the block module so that the labeling and warning signs face to the front of the basic device.
- Establish the electrical connection between the basic device and the block module using the 10-pin connector. Make sure the connector is firmly plugged in.

Fig. 8 Establishing the electrical connection between the basic device and the block module

- Place the block module straight onto the block module.
- Attach the block module with the four knurled head screws.
  Exception: Attach the block module for 96 x 0.2 ml samples with the four Phillips screws. Before doing this, slide the four rubber washers onto the four screws from below.

  ✓ The block module has been installed. The device can now be put into operation.

Changing a block module

CAUTION

Risk of burns

The device heats the samples up to a temperature of 100 °C. The block module becomes hot during this process.

- Allow the block module to cool down before changing it.
- Do not place a block module that is still hot on a flammable surface.

- Select a suitable block module.
- Switch off the basic device and disconnect the power plug from the power outlet. Allow the block module to cool down.
- Loosen the four knurled head screws or Phillips screws attaching the block module to the base device.
- Lift the block module slightly without damaging the electrical connection cable.
- Disconnect the electrical plug connection. To do this, grasp both sides of the connector and disconnect it by tugging gently. Take care not to break off the connector.

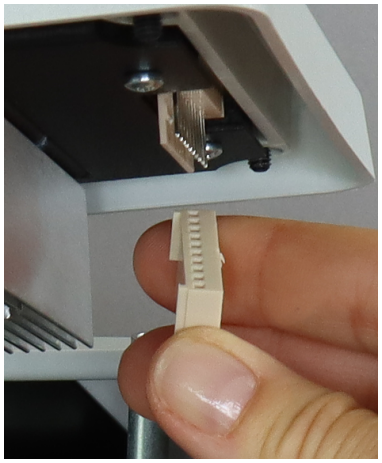

Fig. 9 Disconnecting the plug connection

- Install the new block module as described above.
- Store the removed block module in its original packaging.

✓ The device is ready for operation again after the block has been changed.

5 Operation

CAUTION

Warning of biohazard

The device is used to handle biological and biochemical substances that are potentially pathogenic. Sample material can escape if the tube closures or foils open at high temperatures and/or with vigorous shaking.

- Mix and temper samples only in sealed tubes and microplates.
- Select tightly sealing sample tubes, e.g., Safe-Lock (Eppendorf). Check that the sample tubes are tightly closed.
- When using the block module for 96-well microplates, always put the lid on the block module.
- Wear personal protective equipment such as safety goggles and protective clothing to protect yourself from hot liquids splashing out.
- Only heat the liquid samples to temperatures below their boiling point.

CAUTION

Risk of burns

The block module is heated up to 100 °C during operation. The sample tubes also become very hot during this process.

- When inserting the samples into the hot block module, exercise due care and maintain a safe distance from the block module.
- At temperatures above 60 °C, wear heat-resistant gloves or insert the samples into the block before switching it on.
- Allow the block module to cool before removing the samples.

Switching the device on

▸ Switch on the device using the ON/OFF switch at the rear of the device.

✓ The display lights up and the values for time, mixing frequency and temperature that were last set are shown under **Set**.

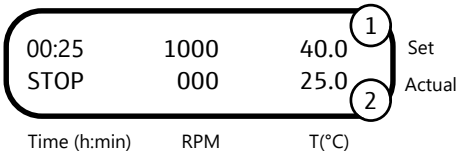

Fig. 10 Display: Indication after power-on

1 Set temperature 2 Current temperature of the sample block

- If a temperature above 4 °C is set, the device immediately starts to control the temperature of the block module.
- If a temperature below 4 °C is set, the temperature indicator on the display shows **OFF**.

Entering parameters

- Use the ▲ and ▼ keys to set the desired values for the time, mixing frequency and temperature parameters. If a key is pressed for a longer period of time (≥3 s), the value increment increases.
  - ✓ The entered parameters are shown in the top line of the display under **Set**.

Parameter	Key field	Input
Time interval	**Time**	Input the desired time in minutes and hours (1 min to 96 h, increment 1 min) The input 00:00 shows the timer is not running. After the program starts, the device works continuously.
Mixing frequency	**RPM**	Input the mixing frequency in revolutions per minute (250 to 1400 rpm, increment 10 rpm) If **000** is entered, the block module does not move. The device functions solely as an incubator.
Block temperature	**T(°C)**	Input the block temperature (+4 to +100 °C, increment 0.1 °C) Switching off the temperature control of the block module: Keep the ▼ key pressed until the display indicates **OFF**. This is the case at 4 °C. When temperature control is switched off, the device functions solely as a mixer.

Note: The time and temperature parameters can also be changed during operation.

The device reaches a stable block temperature when the temperature values of **Set** and **Actual** match. Expect a period of about 15 min for heating from 25 °C to 90 °C and subsequent temperature stabilization.

Operating the device

Start/Stop key	Key function
Shaker	Start the program with the set values for time, mixing frequency and temperature Stop the currently running program
Timer	Set the timer back to 00:00 (reset)

Starting and ending the program

- On the control panel, set the desired values for time, mixing frequency and temperature in **Time**, **RPM** and **T(°C)**.
- Fill the samples into heat-resistant sample tubes or microplates made of polypropylene, for example. To ensure efficient mixing, fill the tubes only ≤75 % full. Close the tubes tightly.
- After the set temperature has been reached, place the prefilled and sealed samples in the block module.
  ⚠ CAUTION! The block module can become very hot.
- Start the program with the **Shaker** start/stop key.
  - ✓ The block module moves and the timer counts up the time in increments of 1 min.

✓ When the set time is reached, the mixer stops. The **STOP** indicator flashes on the display. The acoustic signal (buzzer) sounds until you end the program with the **Shaker** start/stop key. The block module continues to be temperature controlled.

- To switch off the temperature control: Keep the ▼ key pressed until the display indicates **OFF**.
- At the end of operation, switch off the device using the ON/OFF switch at the rear of the device.

Interrupting a running program

- Use the **Timer** start/stop key to reset the timer to **00:00**. Tap the **Timer** start/stop key a second time and start the timer again.
- Or: Interrupt the mixing process with the **Shaker** start/stop key. **STOP** is shown on the display. Tap the **Shaker** key a second time and start the mixing process and timer again.

Special operating modes

- Operate the device **continuously**:
  00:00 enter under **Time**. Enter the desired values for mixing frequency and temperature.
- Operate the device as an **incubator**:
  enter **000** under **RPM**. Enter the desired values for time and temperature.
- Operate the device as a **mixer**:
  Enter a temperature below 4 °C. The display shows **OFF** under **T(°C)**.
  Enter the desired values for time and mixing frequency.
- Start the program with the **Shaker** start/stop key in the desired operating mode and stop it again at the end of the program.

5.1 Temperature calibration

A temperature sensor is integrated in the block module. The device is calibrated at the factory and set to a calibration coefficient of 1.00.

You can calibrate the device using an external temperature sensor (accuracy ±0.5 °C). To do this, insert the temperature sensor into a sample tube. Alternatively, use a special measuring head where the sensors are cast into plastic sample tubes.

Calibration compensates for the different thermal conductivities of sample tubes and microplates from different suppliers. The calibration coefficient can assume values from 0.936 to 1.063 (±0.063).

Thin-walled tubes have a high thermal conductivity and are therefore particularly suitable.

Calibrating a device

- Insert an empty sample tube or an empty microplate into the block module. Insert the temperature sensor into the tube or into a well.
- Or: Insert a special measuring head into the block module.
- Set the desired temperature on the control panel, e.g., 40 °C.

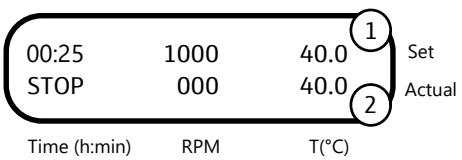

Fig. 11 Control panel - display during operation

1 Set temperature 2 Current temperature of the sample block

- After the current temperature reaches the set temperature, wait 30 min for the block module to reach thermal stability.
- If the temperature indicated by the external temperature sensor differs from the temperature indicated on the display under **T(°C) Actual**, calibrate the device.
- To do this, press and hold the **Timer** start/stop key for longer than 8 s.
  - ✓ The device switches to calibration mode, which can be recognized by the **sct.** display under **Time (h:min) Set**.

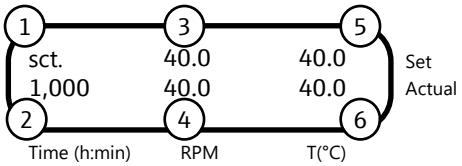

Fig. 12 Control panel – display after the start of calibration

1 Calibration mode
2 Calibration coefficient
3 Temperature, measured with the internal temperature sensor
4 Set temperature multiplied by the calibration coefficient
5 Set temperature
6 Temperature of the internal temperature sensor multiplied by the calibration coefficient

- Adjust the temperature display under 2 (Fig. 13 🖹 22) using the arrow keys in the **T(°C)** key field until the temperature indicated by the external temperature sensor is reached. Example: 39.0 °C.
  - ✓ The calibration coefficient (under 1) adjusts itself, in the example to 0.975.

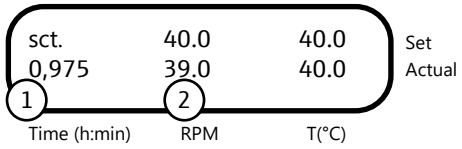

Fig. 13 Control panel - display during calibration

1 Calibration coefficient
2 Set temperature multiplied by the calibration coefficient

- Exit the calibration mode by tapping the **Shaker** start/stop key.
  - ✓ The device saves the determined calibration coefficient and applies it over the entire temperature range.
  - ✓ The display first shows the calibrated temperature value (here: 39.0 °C). The device then tempers the block module to the set temperature.

Restoring the factory settings

- During calibration, set the calibration coefficient back to 1,000 using the arrow keys in the **T(°C)** key field.
- Save the value by tapping the **Shaker** start/stop key.

6 Troubleshooting

In the event of a fault, the device will emit an acoustic signal every 8 s. The display shows an error code, e.g., ER1/ER2 for a defective temperature sensor.

- Make a note of the error code.
- Stop the acoustic signal with the **Shaker** start/stop key.
- Switch off the device and disconnect it from the electrical mains supply.
- Contact the customer service for troubleshooting.

7 Maintenance and care

You may not undertake any service or maintenance work to this device and its components other than that specified and described here.

Observe the instructions in the "Safety instructions" section for all maintenance work. Compliance with the safety instructions is a requirement for the error-free operation of the device.

7.1 Cleaning the device

- Switch off the device and disconnect it from the electrical mains supply before carrying out external cleaning.
- Clean the housing only using a slightly damp, not dripping cloth. Use only water and, if required, customary surfactants. Ethanol (75 %) is suitable for disinfection.
- Do not use organic solvents, concentrated acids or alkalis or abrasive cleaners.
- If samples have dripped or splashed in the block module, clean the block module with a cotton swab that has been previously dipped in ethanol.
- If liquid has entered the inside of the device, take the device out of operation and have it checked by a qualified electrician.

7.2 Changing the rubber belt

On the underside of the device, under the housing, there is a rubber belt that has to be replaced regularly every 1.5 years or after 2,000 operating hours. The rubber belt provides the power transmission between the shaker motor and the block module and thus generates the mixing movement.

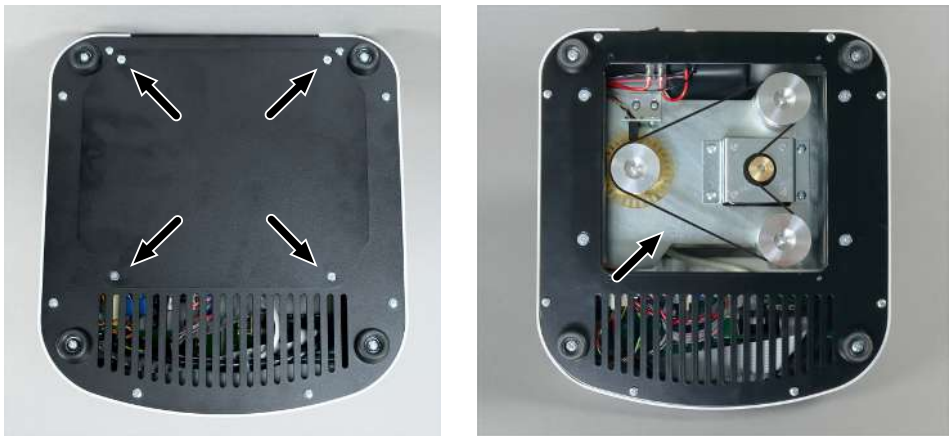

Fig. 14 Changing the rubber belt

- Switch off the device at the ON/OFF switch. Disconnect the plug of the external power supply unit from the connector on the rear of the device.
- Carefully place the device on its side.
- Remove the base plate. To do so, loosen the four Phillips screws.
- Remove the old rubber belt.
- Fit the new rubber belt as shown in the figure.

- Reassemble the base plate. Tighten the four screws one after the other.
- Set the device upright and connect it to the electrical mains supply.
  ✓ The system is ready again for operation.

8 Transport and storage

8.1 Transport

When transporting the device, observe the safety instructions in the "Safety instructions" section.

Transport the device in an upright position, see arrows on the transport box.

Avoid the following during transport:
- Impact and vibration
  Risk of damage due to shock, impact or vibration!
- Large temperature fluctuations
  Risk of condensation!

8.1.1 Moving the device in the laboratory

CAUTION

Risk of injury during transport

Dropping the device poses a risk of injury and damage to the device.

- Proceed carefully when moving and transporting the device.

Observe the following when moving the device within the laboratory:
- Insufficiently secured components pose a risk of injury!
  Before moving the device, remove all loose parts and disconnect all connections from the device.
- As the device does not have carrying handles, grip the device firmly with both hands at the lower end.
- Observe the guide values and adhere to the legally mandated limits for lifting and carrying loads without auxiliary means.
- Observe the installation conditions at the new location.

8.1.2 Preparing the device for transport

NOTICE

Risk of device damage due to unsuitable packaging material

- Only transport the device and its components in the original packaging.
- Empty the device completely and attach all transport locks before transporting the device.
- Add a suitable desiccant to the packaging to prevent damage from moisture.

- ▶ Switch off the device and disconnect it from the electrical mains supply.
- ▶ After cooling, remove all samples from the device.
- ▶ Disassemble the block module. To do this, loosen the four knurled head screws or Phillips screws.
- ▶ Carefully lift the block module. Carefully loosen the connection cable to the basic device on the underside of the block module.

- Pack the basic device and the power supply unit in their original packaging. Use the foam transport protectors for this purpose.

Fig. 15 Basic device with transport protectors

- Pack the block module in its original packaging and secure it at the top and bottom with the transport protectors.

Fig. 16 Block module packed

8.1.3 Returning a device

WARNING

Risk of damage to health due to improper decontamination

- Decontaminate the device professionally and document the cleaning measures before returning the device to Analytik Jena.
- The customer service department will send you the decontamination report when you register the return.

- Clean all device components from biologically hazardous, chemical, and radioactive contamination.

- When registering the return, you will receive a decontamination report from the customer service. Complete the form and attach the signed decontamination declaration to the outside of the shipment.
- Only use the original packaging for the shipment and insert the transport lock. If the original packaging is no longer available, please contact Analytik Jena or your local distributor.
- Attach the warning label to the packaging:
  "CAUTION! SENSITIVE ELECTRONIC DEVICE!".
- Enclose a sheet with the following data:
  - Name and address of the sender
  - Name and telephone number of a contact for inquiries
  - A detailed description of the fault, the precise conditions and situations under which the fault occurs

8.2 Storage

NOTICE

Risk of device damage due to environmental conditions

Environmental influences and condensation can destroy individual components of the device.

- Only store the device in air-conditioned rooms.
- Ensure that the atmosphere is free of dust and corrosive vapors.

If the device is not installed immediately after delivery or not required for longer periods, it should be stored in its original packaging. A suitable desiccant should be added to the equipment to prevent damage from moisture.

The requirements for the climatic conditions of the storage location can be found in the specifications.

9 Disposal

At the end of its service life, the device and its electronic components must be disposed of as electronic waste in accordance with the applicable regulations.

The operator is responsible for correct disposal of biological samples in accordance with statutory regulations.

Dispose of consumables that are contaminated with hazardous substances in accordance with the applicable national and international regulations on safety and environment.

10 Specifications

10.1 Technical data

General characteristics

Designation/type	Biometra TSC ThermoShaker
Dimensions (W x H x D)	205 x 230 x 130 mm
Mass	4.1 kg

Application parameters

Temperature control range	+4 to +100 °C
Temperature minimum	Room temperature (RT) - 15 °C
Temperature maximum	100 °C
Temperature setting increment	0.1 °C
Temperature stability	±0.1 °C
Temperature accuracy	±0.5 °C (37 °C)
Temperature uniformity (across block module)	±0.1 °C (37 °C) ±1.0 °C (100 °C)
Average heating rate (determined for block module 24 x 1.5 ml)	5 °C/min (+25 to +100 °C)
Heating duration	6 min (+25 to +37 °C)
Average cooling rate	5 °C/min (+100 to +25 °C) 1.8 °C/min (+25 to +4 °C)
Cooling duration	12 min (+24 to +4 °C) 14 min (+100 to +25 °C)
Mixing frequency (variable)	250 to 1400 rpm
Increment for setting the mixing frequency	10 rpm
Maximum deviation	2 % (250 rpm) 0.7 % (1400 rpm)
Mixing orbit	2 mm
Duration until maximum mixing frequency reached	≤3 s
Timer function	With acoustic signal (buzzer) 1 min to 96 h
Time setting increment	1 min
Maximum uninterrupted operating time	96 h A pause is recommended after a prolonged operation of 8 h
Temperature calibration option	For the compensation of different thermal conductivities of sample tubes and microplates from different suppliers
Calibration coefficient	0.936 to 1.063 (±0.063)
Display	Two-line LCD display for 16 x 2 characters

Interchangeable block modules

The block modules must be ordered separately. For order numbers, see the Analytik Jena website (address stated in the imprint).

- Block module 24 x 1.5 ml
- Block module 24 x 2.0 ml
- Block module 20 x 0.2 ml + 12 x 1.5 ml
- Block module 20 x 0.5 ml + 12 x 1.5 ml
- Block module 96 x 0.2 ml or 96-well microplates

Electrical variables

Input current	12 V; 5 A
Typical average power consumption	60 VA
External power supply unit data	
Input current	100 to 240 V; 50/60 Hz; 1.4 A
Output current	12 V; 5.0 A

Ambient conditions

Environment	For indoor use only Can be used in laboratories, cooling chambers or incubators
Temperature during operation	+4 to +40 °C
Temperature during storage	-20 to +60 °C
Humidity during operation	80 % (+4 to +31 °C) Decreasing linearly to 50 % (+40 °C)

10.2 Standards and directives

Protection class

The device is protection class I.

Device safety

The device complies with the following safety standards

- EN 61010-1
- EN 61010-2-010
- EN 61010-2-051

EMC compatibility

The device has been tested for radio interference suppression and interference resistance in accordance with EN 55011 and meets the requirements of EN 61326-1.

EU directives

The device meets the requirements of the directive 2011/65/EU.

The device is designed and tested in accordance with standards meeting the requirements of EU directives 2014/35/EU and 2014/30/EU. The device leaves the factory in a sound condition with regard to technical safety. To maintain this condition and to ensure safe operation, the user must strictly observe the safety and operating instructions contained in this operating manual. For accessories delivered with the device and system components from other manufacturers, the information provided in their respective operating manuals has priority.

Guidelines for China

The device contains substances subject to regulation (according to the directive GB/T 26572-2011). Analytik Jena guarantees that, if the device is used as intended, these substances will not leak within the next 25 years and therefore will not pose a threat to the environment or health within this time period.

List of figures