Grant-bio

Thermo-shaker for microtubes and PCR plates

PCMT Plus

Operating Manual

Contents

1. About this edition of user manual

1.1. The current edition of the user manual applies to the following models:

Model	**Version**
PCMT Plus, thermo-shaker for microtubes and PCR plates	V.1GW

2. Safety precautions

Caution! Make sure you have fully read and understood the present manual before using the equipment. Please pay special attention to sections marked by this symbol.

Caution! Hot surface! Platform surface becomes very hot during use. Always use protective cotton gloves to install or remove samples when the temperature is set higher than 60°C.

2.1. General safety

- Use only as specified in the user manual provided.
- Save the unit from shocks or falling.
- Store and transport the unit in a horizontal position (see package label) at ambient temperatures between -20°C and +60°C and maximum relative humidity of 80%.
- After transportation or storage keep the unit under room temperature for 2-3 h before connecting it to the electric circuit.
- Use only original parts and accessories, provided by manufacturer for this product.
- Before using any cleaning or decontamination methods except those recommended by the manufacturer, check with the manufacturer that the proposed method will not damage the equipment.
- Do not make modifications to the design of the unit.

2.2. Electrical safety

- Connect only to the external power supply with voltage corresponding to that on the serial number label.
- Use only the external power supply provided with this product.
- Ensure that the power switch and external power supply are easily accessible during use.
- Do not plug the unit into an ungrounded power socket, and do not use an ungrounded extension lead.
- Disconnect the unit from electric circuit before moving.
- If liquid penetrates into the unit, disconnect it from the external power supply and have it checked by a repair and maintenance technician.
- Do not operate the unit in premises where condensation can form. Operating conditions of the unit are defined in the Specifications section.

2.3. During operation

- Do not leave the operating unit unattended.
- Do not impede the platform motion.
- Do not operate the unit in environments with aggressive or explosive chemical mixtures. Please contact manufacturer for possible operation of the unit in specific atmospheres.
- Do not operate the unit if it is faulty or has been installed incorrectly.
- Do not use outside laboratory rooms.
- Do not check the temperature by touch. Use a thermometer.

2.4. Sound signals

- Two short notes after establishing Bluetooth connection.
- One short note after loosing Bluetooth connection.
- Frequently repeating short notes after finishing the operation (see **5.6.3**).
- Infrequently repeating short notes if an error occurred (see **8.5**)

2.5. Biological safety

- It is the user's responsibility to carry out appropriate decontamination if hazardous material is spilt on or penetrates into the equipment.

3. General information

PCMT Plus thermo-shaker is designed for intensive mixing of samples in microtest tubes or PCR plates in a temperature controlled environment. The model has the function of cooling samples down to +4°C. **Bluetooth**® connectivity to PC allows for data management, data logging, parameter control and profiling in the dedicated software. Features of thermo-shakers meet the highest expectations of users according to many parameters:

- Fast reaching of specified mixing speed and maintenance of equal amplitude of rotation throughout the thermo-shaker block;
- Stability of maintaining the set temperature in a wide range throughout the block surface of thermo-shakers;
- With the help of the temperature calibration function, the user can calibrate the unit approximately ±6% of the selected temperature to compensate differences in the thermal behaviour of tubes from different manufacturers;
- LCD display indicates pre-set and current values of temperature, speed and time of operation;
- Quiet motor operation, compact size, prolonged service life;
- Sensor error handling and diagnostics;
- Bluetooth® connectivity, control and profiling from computer.

Functions of heating and mixing can be performed either simultaneously or independently, that allows using the unit as three independent devices:

1. Thermostat;
2. Shaker;
3. Thermo-shaker.

We offer five heating and cooling blocks for each model, including a block with a plastic lid for PCR-plates. Within one model of thermo-shaker, the blocks are mutually interchangeable and can be easily installed.

The devices are applicable in:

- genetic analyses – in extraction of DNA, RNA and further sample preparation;
- biochemistry – for studying of enzymatic reactions and processes;
- cellular biology – extraction of metabolites from cellular material.

4.1. **Unpacking**. Remove packing materials carefully and retain for future shipment or storage of the unit. Examine the unit carefully for any damage incurred during transit. The warranty does not cover in-transit damage. Warranty covers only units transported in the original package.

4.2. **Complete sets**.

4.2.1. Standard set

- **PCMT Plus** thermo-shaker ..... 1 pce
- External power supply ..... 1 pce
- Power cable ..... 1 pce
- Spare rubber belt ..... 2 pcs
- Bluetooth® adapter for PC ..... 1 pce
- Operating manual ..... 1 copy
- Control software and software manual ..... 1 copy

4.2.2. Optional accessories

- HC18C thermoblock for microtubes ..... on request
- HC32 thermoblock for microtubes ..... on request
- HC24 thermoblock for microtubes ..... on request
- HC24N thermoblock for microtubes ..... on request
- HC96 thermoblock for microplate and hex-key ..... on request

HC-18

HC-32

HC-24

HC-24N

HC-96

4.3. **Setup**.

- Place the unit upon even horizontal stable non-flammable surface 30 cm away from any flammable materials, and clear 20 cm around the device on all sides for ventilation. Remove protective film from the display;
- Plug the external power supply into the socket at the rear side of the unit;
- Connect the power cable to the external power supply.

4.4. **Thermoblock installation** (if a thermoblock is not installed).

Caution! Thermoblock installation and replacement have to be performed only when the **Power** switch is turned off and external power supply is disconnect from the device.

- Choose the thermoblock, connect the plug to the contact terminal according to the scheme on fig. 1/1 on the underside of the thermoblock. Make sure that the connector is mounted tightly.
- Align the thermoblock so that the warning label is facing the front of the unit (fig. 2).
- Secure with the four knurled screws (fig. 2/1) or four hex screws.

4.5. **Changing blocks**.

- Disconnect the external power supply from the device.
- Remove the four knurled screws or four hex screws (in microplate thermoblocks).
- Lift the block without damaging the cable and disconnect the plug (fig. 1/1).
- Select the new thermoblock and install it according to the paragraph 4.4.

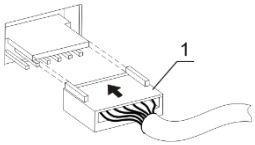

Figure 1. Thermoblock connection

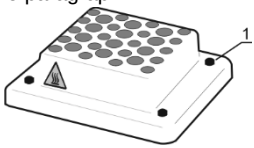

Figure 2. Thermoblock setup

4.6. **Bluetooth® connection**. To connect the unit to the PC, follow the Software manual enclosed with the software.

Recommendations during operation

- Please check the tubes/microplates before using, be sure that tubes and micro plates are heat-resistant. Do not heat the microplates over the melting point of the material they are made of.
- We recommend filling tubes and plate wells up to 75% of rated volume for efficiency.

Caution! Platform surface becomes very hot during use. Please, take necessary care and use protective cotton gloves to install or remove test samples when set temperature is higher than 60°C.

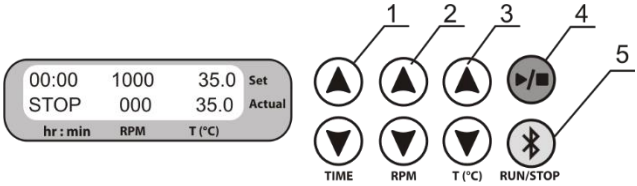

Figure 3. Control Panel

5.1. Connect external power supply to a grounded power socket and set the power switch, located on the rear panel of the unit, to position I (ON).

5.2. The display will turn on with the upper line (Set) showing time, speed and temperature set earlier and the lower line (Actual) showing current status: STOP indication, 000 rpm speed and platform temperature in °C.

5.2.1. Simultaniously press and hold the ►/■ **RUN/STOP** and ᛒ **RUN/STOP** keys (fig. 3/4 and 3/5) to view the programming version (PV-XX), last four digits of MAC address (MAC-XXXX) on the top line. If the unit is paired with a PC, display shows the Bluetooth® symbol ᛒ in the top right corner and the 14-digit serial ID number of the unit in the bottom line.

5.3. If a temperature is set, then the platform temperature that automatically rises to that temperature. The time of temperature stabilization depends on the room temperature. If the heating of is turned off by setting the temperature below 4°C, top line shows indication OFF.

5.4. **Working with PC**. Install the software, connect and operate the unit according to the instructions given in the enclosed software manual.

Note. When the unit is controlled by PC, it blocks all keys on the unit except the power switch.

5.5. **Setting the parameters.** Use the readings in the upper line of the display (Set), while setting the required parameters. Pressing the key for more than 3 s will increase the increment rate. Speed and temperature can be changed during operation.

5.5.1. **Setting time (TIME).** Using the ▲ and ▼ **TIME** keys (Fig. 3/1) set the required working time interval in hours and minutes (increment 1 min).

5.5.2. **Setting speed (RPM).** Using the ▲ and ▼ **RPM** keys (Fig. 3/2) set the required speed (increment 10 rpm).

5.5.3. **Setting temperature (T, ºC).** Using the ▲ and ▼ **T, ºC** keys (Fig. 3/3) set the necessary temperature (increment 0.1°C).

Caution! Heating/temperature maintenance process does not stop when the timer is finished. Platform thermal regulation can be turned off only by setting the required temperature below 4°C (the display shows OFF indication). In this mode, thermoshaker can be used in the cold rooms as a mixing device without thermoregulation.

5.6. **Program execution.** After the thermal stabilization of the thermo-shaker, i.e. when the set and current temperature readings become the same:

5.6.1. Place samples on the platform.

Caution! Do not fill microtubes or microplates directly inside the unit.

5.6.2. Press the **►/■ RUN/STOP** key (fig. 3/4). The platform will start rotating and the timer indicator will start counting up the time interval (with 1 min precision).

Note. If the rotation speed is set to zero, pressing **►/■ RUN/STOP** key will start the timer but the platform will not move.

5.6.3. After finishing the program (after the set time elapses) the platform motion will stop and the timer will show the flashing reading STOP accompanied by the repetitive sound signal until the **►/■ RUN/STOP** key is pressed.

5.7. If the working time is not set (or is reset) and the timer indicator in the upper line shows 00:00, pressing the **►/■ RUN/STOP** key will start continuous operation of the device with countdown timer in the lower line (Actual) until the **►/■ RUN/STOP** key is pressed again.

5.8. The platform motion can be stopped at any time by pressing the **►/■ RUN/STOP** key. In this case the program realization and the platform motion will stop and the timer will switch into the STOP mode saving previously set time. Press the **►/■ RUN/STOP** key to repeat the operation with the same time and speed.

Caution! At the end of the set time period the platform movement is stopped automatically, but the heating can be turned off only by setting the required temperature below 4°C (the display shows OFF indication).

Caution! The platform remains hot after use. Please, take necessary care and use protective cotton gloves to install or remove test samples when set temperature is higher than 60°C.

5.9. After finishing the operation, set the **Power** switch, located on the rear panel of the unit, in position **O** (Off) and disconnect the external power supply from electric circuit.

6.1. The device is precalibrated at the factory (calibrating coefficient is 1.000) for operation with temperatures measured by a sensor in the heating block.

6.2. To change the calibration coefficient, hold the **RUN/STOP** key pressed for more than 8 s to activate calibration mode, as shown on figure 4).

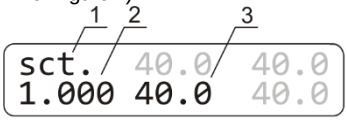

Figure 4. Display in calibration mode: 1. Calibration mode indicator; 2. Calibration coefficient; 3. Temperature with current coefficient

Note. Values marked in grey on figures 4 and 5 are not used in calibration and are meant for service engineers.

6.3. **Restoring factory settings.** Set 1.000 value using the ▲ and ▼ **T, °C** keys as shown on fig. 4/1 to restore the factory settings. Press the ►/■ **RUN/STOP** key once to save the changes and exit the calibration mode.

Note. Coefficient value changes are recommended after the unit has reached 30°C temperature.

6.4. **Calibration procedure**. To calibrate the unit, use an independent sensor with 0.5°C accuracy, which can fit in the cell of the block.

6.4.1. Install the sensor into a cell of the block.

6.4.2. Set the required temperature in operation mode (e.g. 40°C).

6.4.3. After the unit reaches the set temperature (when the set and current temperature readings equal), leave the unit for 30 min for thermal stabilization.

6.4.4. Let us assume that the readings of independent sensor is 39°C, but the display's actual temperature is 40°C. Then, it is necessary to add 1°C correction.

6.4.5. Hold the **RUN/STOP** key pressed for more than 8 s to activate calibration mode (figure 4).

6.4.6. Using the ▲ and ▼ **T, °C** keys, change the calibration coefficient (fig. 5/1) so that the new temperature value (fig. 5/2) corresponds to the independent sensor temperature. In our example, the calibration coefficient will be 0.974.

Note. Calibration coefficient can be changed in range from 0.936 to 1.063 (±0.063), with increment of 0.001. This calibrating coefficient will correct temperature through all the operation range.

Note. Coefficient value changes are recommended after the unit has reached 30°C temperature.

1.1.1. Press the ►/■ **RUN/STOP** key once to save the changes and exit the calibration.

6.5. The display will show calibrated temperature as shown on fig. 6/1 and the unit will continue thermal stabilization according to the previously set temperature.

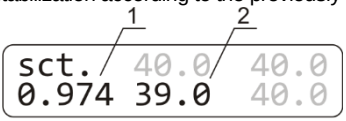

Figure 5. Changing the coefficient: 1. Calibration coefficient; 2. Temperature with current coefficient

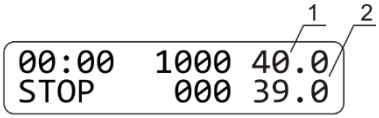

Figure 6. Display after calibration: 1. Set temperature; 2. Current calibrated temperature

7. Specifications

The unit is designed for operation in cold rooms, incubators (excluding CO_2 incubators) and closed laboratory rooms at ambient temperature from +4°C to +40°C in a non-condensing atmosphere and maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.

Grant is committed to a continuous programme of improvement and reserves the right to alter design and specifications of the equipment without additional notice.

7.1. Temperature parameters

Setting range ..... +4°C to +100°C
Control range ..... 15°C below RT[1] to +100°C
Setting resolution ..... 0.1°C
Stability[2], at +37°C ..... ±0.1°C
Maintaining accuracy[2], at +37°C ..... ±0.5°C
Uniformity over the platform[2],
- at +4°C ..... ±0.6°C
- at +37°C ..... ±0.1°C
- at +100°C ..... ±0.3°C

Average heating speed from +25°C to +100°C ..... 5°C/min
Average cooling speed
- from +100°C to +25°C ..... 5°C/min
- from +25°C to +4°C ..... 1.8°C/min

Calibration option ..... yes
Calibration coefficient range ..... 0.936...1.063 (± 0.063)

7.2. General parameters

Speed range ..... 250-1400 rpm
Speed setting resolution ..... 10 rpm
Maximal speed deviation
- for 250 rpm 2%
- for 1400 rpm 0.7%

Orbit ..... 2 mm
Digital time setting ..... 1 min - 96 h
Time setting and countdown resolution ..... 1 min
Maximal continuous operation time[3] ..... 168 h
Display ..... 16x2 symbols, LCD
Dimensions ..... 220x240x130 mm
Input voltage and current / power consumption ..... 12 V, 4.9 A / 60 W
External power supply ..... in AC 100-240 V, 50/60 Hz, out DC 12 V
Weight, accurate within ± 10%. ..... 3.7 kg

[1] Room temperature
[2] Data for 75% filled tubes or microplates
[3] Recommended interval between prolonged operation sessions not less than 1 hour

8. Ordering information

8.1. Models and versions available:

Model	Version
PCMT Plus	V.1GW

8.2. To inquire about or order the optional accessories or replacement parts, contact Grant or your local Grant representative.

8.2.1. Optional accessories:

Model	Description	Weight[1], kg
HC18	For 20x0.5 ml + 12x1.5ml tubes	0.7
HC32	For 20x0.2 ml + 12x1.5ml tubes	0.7
HC24	For 24x2.0 ml microtubes	0.6
HC24N	For 24x1.5 ml microtubes	0.7
HC96	For 96-well microplate for PCR, w/o skirt, with half skirt, low and high profile	0.7

8.2.2. Replacement parts

Replacement part	Description
Rubber belt	122x6x0.6 mm
Bluetooth adapter	For USB port

[1] Accurate within ± 10%.

9. Guarantee and Service

9.1. **Guarantee**. When used in laboratory conditions and according to this Operating Manual, this product is guaranteed for TWO YEARS (excluding items mentioned in **8.2**) against faulty materials or workmanship.

9.2. **Service**. There are no user-serviceable parts inside the unit. For all maintenance and repairs (except as defined below) return to our service department in the UK or in other countries, our distributor.

9.3. **Cleaning and disinfection**.

9.3.1. Use mild soap and water with a soft cloth or sponge for cleaning the unit. Rinse remaining washing solution with distilled water. Wipe dry the excess water with clean soft cloth or sponge.

9.3.2. To disinfect the unit, use a DNA/RNA removing solution (e.g. Grant PDS-250). After disinfecting, wipe the surfaces dry.

9.3.3. The unit and its accessories are not autoclavable.

9.4. **Rubber belt replacement**. For maintenance of reliable operation of the device, the manufacturer recommends replacing rubber belts after 1.5 years or 2000 hours of operation time.

- Disconnect the external power supply from the device.
- Remove 4 fixation screws on the device bottom and remove the bottom plate.
- Replace the rubber belt (fig. 7).
- Reassemble the device.

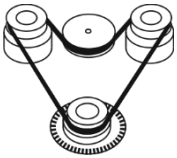

Figure 7. Rubber belt replacement

9.5. **Error codes in case of a defect**. Some malfunctions trigger an error code to appear on display, accompanied by a sound signal every 8 s. Press the **►/■ RUN/STOP** key to turn off the signal. Error code format is letters ER and a single digit. Disconnect the unit from the electric circuit and report the error code to Grant or your local Grant representative.

9.6. The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by Grant is under license.

EU Declaration of Conformity

All the products covered by this Manual comply with the requirements of the EU harmonised legislation verified using the following standards

Low Voltage Directive (2014/35/EC) for Electrical safety.	LVS EN 61010 Part 1 LVS EN 61010 Part 2-010 LVS EN 61010 Part 2-051
EMC directive (2014/30/EC) for Electromagnetic compatibility	LVS EN 61326-1
RoHS Directive (Directive 2011/65/EC including 2015/863) for Hazardous substances	LVS EN50581

UK Declaration of Conformity

All the products covered by this Manual comply with the requirements of UK statutory requirements verified using the following standards.

Electrical Equipment (Safety) Regulations 2016	BS EN 61010 Part 1 BS EN 61010 Part 2-010 BS EN 61010 Part 2-051
Electromagnetic Compatibility Regulations 2016	BS EN 61326-1
The Restriction of the Use of Certain Substances in Electrical and Electronic equipment Regulations 2012	BS EN50581

Waste Electrical and Electronic Equipment (WEEE)

All the products covered by this Manual are marked with the crossed-out wheelie bin symbol indicating they must not be disposed of with unsorted waste. Safe recycling of WEEE helps conserve natural resources and protect human health.

Grant Instruments complies fully with the UK Waste Electrical & Electronic Equipment (WEEE) regulations 2013. We are a member of the B2B compliance scheme (Scheme Approval Number WEE/MP3338PT/SCH), which handle our WEEE obligations on our behalf. Grant Instruments have been issued with a unique registration number by the Environmental Agency, this reference number is WEE/GA0048TZ.

For information regarding WEEE collections in the UK please contact our B2B Compliance Scheme directly on 01691 676 124 or **www.b2bcompliance.org.uk**

In the EU, Grant Instruments complies with WEEE Directive 2012/19/EU.
Contact your local equipment supplier for WEEE collections.

REACH Regulations

This product does not contain any Substances of Very High Concern (SVHCs) at greater than 0.1% that have to be identified in accordance with Regulation (EC) No 1907/2006 and therefore does not have an entry in the SCIP database.

Grant-bio

Grant Instruments
(Cambridge) Ltd
Shepreth
Cambridgeshire
SG8 6GB
UK
Tel: +44 (0) 1763 260811
Email: salesdesk@grantinstruments.com
www.grantinstruments.com

Representative in the European Union
Grant Instruments Europe B.V
Strawinskylaan 411
WTC, Tower A, 4th Floor
1077 XX Amsterdam
The Netherlands
Email: grant@eu.grantinstruments.com