thermoscientific

Thermal Mixer

This manual covers following ThermoScientific Thermal Mixers
and parts for them, by the catalog number:
13687711 – Thermal Mixer (US/UK/EU plug)
13687722 – Thermal Mixer (AUS/CHN plug)
13687712 – Thermoblock for 24 x 1.5 ml microtubes (US/UK/EU plug)
13687713 – Thermoblock for 24 x 2.0 ml microtubes (US/UK/EU plug)
13687714 – Thermoblock for 20 x 0.2 ml & 12 x 1.5 ml tubes (US/UK/EU plug)
13687715 – Thermoblock for 20 x 0.5 ml & 12 x 1.5 ml tubes (US/UK/EU plug)
13687716 – Thermoblock for 96-well PCR microplate or 0.2 ml tubes/strips (US/UK/EU plug)
13687717 – Thermal Mixer with thermoblock for 24 x 1.5 ml microtubes (US/UK/EU plug)
13687718 – Thermal Mixer with thermoblock for 24 x 2.0 ml microtubes (US/UK/EU plug)
13687719 – Thermal Mixer with thermoblock for 20 x 0.2 ml & 12 x 1.5 ml tubes (US/UK/EU plug)
13687720 – Thermal Mixer with thermoblock for 20 x 0.5 ml & 12 x 1.5 ml tubes (US/UK/EU plug)
13687721 – Thermal Mixer with thermoblock for 96-well PCR microplate or 0.2 ml tubes/strips (US/UK/EU plug)

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ThermoFisher SCIENTIFIC

Do You Need Information or Assistance on Thermo Scientific Products?
If you do, please contact us 8:00 a.m. to 6:00 p.m. (Eastern Time) at:

1-740-373-4763	Direct
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Our Sales Support staff can provide information on pricing and give you quotations. We can take your order and provide delivery information on major equipment items or arrange to have your local sales representative contact you. Our products are listed on the Internet and we can be contacted through our Internet home page.

Our Service Support staff can supply technical information about proper setup, operation or troubleshooting of your equipment. We can fill your needs for spare or replacement parts or provide you with on-site service. We can also provide you with a quotation on our Extended Warranty for your Thermo Scientific products.

Whatever Thermo Scientific products you need or use, we will be happy to discuss your applications. If you are experiencing technical problems, working together, we will help you locate the problem and, chances are, correct it yourself...over the telephone without a service call.

When service that is more extensive is necessary, we will assist you with direct factory trained technicians or a qualified service organization for on-the-spot repair. If your service need is covered by the warranty, we will arrange for the unit to be repaired at our expense and to your satisfaction.

Regardless of your needs, our professional telephone technicians are available to assist you Monday through Friday from 8:00 a.m. to 6:00 p.m. Eastern Time. Please contact us by telephone or fax. If you wish to write, our mailing address is:

Thermo Fisher Scientific
401 Millcreek Road, Box 649
Marietta, OH 45750

International customers, please contact your local Thermo Scientific distributor.

Table of Contents

Introduction

This Thermo Scientific Thermal Mixer provides mixing and temperature control of samples in micro test tubes or PCR plates. Features of thermal mixers 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 thermal mixer block;
- Stability of maintaining the set temperature in a wide range throughout the block surface of thermal mixers;
- 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;

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

- Thermostat;
- Shaker;
- 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 thermal mixer, 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.

Safety Information

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.

General safety

- Use only as specified in the operating 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 Thermo Fisher Scientific for this product.
- Before using any cleaning or decontamination methods except those recommended by the Thermo Fisher Scientific, check with the Thermo Fisher Scientific that the proposed method will not damage the equipment.
- Do not make modifications to the design of the unit.

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 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.

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 Thermo Fisher Scientific 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.

Biological safety

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

Getting Started

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.

Complete sets

Standard set	Quantity
Thermal Mixer with cooling for microtubes and microplates	1 pce
External power supply	1 pce
Power cable	1 pce
Spare rubber belts	2 pcs
Operating manual, declaration of conformity	1 pce

Blocks, optional or included in the set:

Block capacity	Cat. number
24 x 1.5ml microtubes	13687712
24 x 2.0ml microtubes	13687713
20 x 0.2ml and 12 x 1.5ml microtubes	13687714
20 x 0.5ml and 12 x 1.5ml microtubes	13687715
96-well PCR microplate or 0.2ml tubes/strips	13687716

13687712

13687713

13687714

13687715

13687716

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.

Thermoblock installation

If a thermoblock is not installed, 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.

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.

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.

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 previous paragraph.

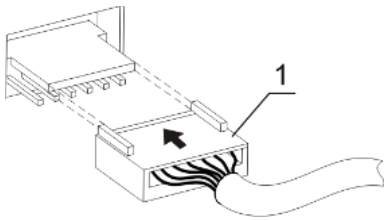

Figure 1. Thermoblock connection

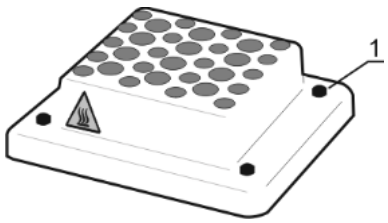

Figure 2. Thermoblock setup

Operation

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.

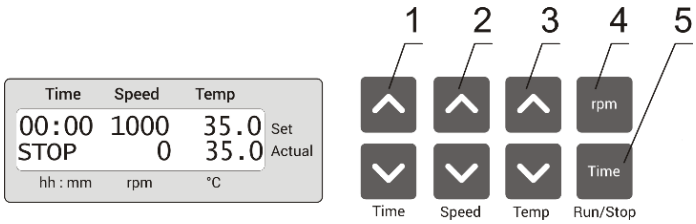

Figure 3. Control Panel

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 25 °C (the display will show OFF - Temp - set point). In this mode, thermal mixer can be used in the cold rooms as a mixing device without thermoregulation.

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

Note! If the rotation speed is set to zero, pressing rpm Run/Stop key will start the timer but the platform will not move.

Starting the unit

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).
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.
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 or 4°C, top line shows indication OFF.

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.
Using the ▲ and ▼ **Time** keys (fig. 3/1) set the required working time interval in hours and minutes (step 1 min).
Using the ▲ and ▼ **Speed** keys (fig. 3/2) set the required speed (step 10 rpm).
Using the ▲ and ▼ **Temp** keys (fig. 3/3) set the necessary temperature (step 0.1°C).

Program execution

After the thermal stabilization of the thermal mixer, i.e. when the set and current temperature readings become the same:
Place samples on the platform.
Press the **rpm Run/Stop** key (fig. 3/4). The platform will start rotating and the timer indicator will start counting the time interval (with 1 min precision).
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 **rpm Run/Stop** key is pressed.
If the working time is not set (or is reset) and the timer indicator in the upper line shows 00:00, pressing the **rpm Run/Stop** key will start continuous operation of the device with countdown timer in the lower line (Actual) until the **rpm Run/Stop** key is pressed again.

Operation

Caution! At the end of the set time period the platform movement is stopped automatically, but the heating can be stopped only manually by reducing the temperature using the ▼ **Temp** key (fig. 3/3 – lower key) till the OFF sign appears in the upper line (**Set**) of the display

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.

If required, there is possibility to restart the timer when it is running. Press the **Time Run/Stop** key once (fig. 3/5) to stop the timer. Press the **Time Run/Stop** key again to restart the timer.
The platform motion can be stopped at any time by pressing the **rpm 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 **rpm Run/Stop** key to repeat the operation with the same time and speed.

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.

Calibration

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

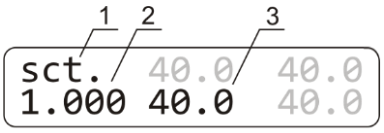

Figure 4. Display in calibration mode:
1. Calibration mode indicator; 2. Calibration coefficient;
3. Temperature with current coefficient

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

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.

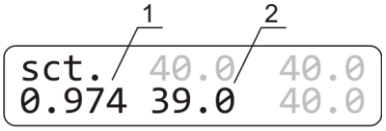

Figure 5. Changing the coefficient: 1. Calibration coefficient;
2. Temperature with current coefficient

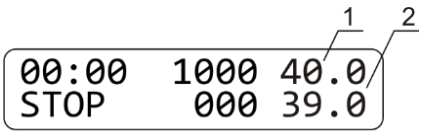

Figure 6. Display after calibration: 1. Set temperature;
2. Current calibrated temperature

The device is precalibrated at the factory (calibrating coefficient is 1.000) for operation with temperatures measured by a sensor in the heating block.
To change the calibration coefficient, hold the **Time Run/Stop** key pressed for more than 8 s to activate calibration mode. The calibration coefficient appears on the display (figure 4).

Restoring factory settings

Set 1.000 value using the ▲ and ▼ **Temp** keys as shown on fig. 4/1 to restore the factory settings. Press the **rpm Run/Stop** key once to save the changes and exit the calibration mode.

Calibration procedure

To calibrate the unit, use an independent sensor with 0.5°C accuracy, which can fit in the cell of a microplate on the platform.
Install the sensor into a celll of the microplate.
Set the required temperature in operation mode, e.g. 40°C.
After the unit reaches the set temperature (when the set and current temperature readings equal), leave the unit for 30 min for thermal stabilization.
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.
Hold the **Time Run/Stop** key pressed for more than 8 s to activate calibration mode (figure 4).
Using the ▲ and ▼ **Temp** 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.
Press the **rpm Run/Stop** key once to save the changes and exit the calibration.
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.

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.
Thermo Fisher Scientific is committed to a continuous program of improvement and reserves the right to alter design and specifications of the equipment without additional notice.

Temperature parameters	
Setting range	+4°C to +100°C
Lower control range	15°C below RT[1]
Upper control range	+100°C
Setting resolution	0.1°C
Stability, at +37°C	±0.1°C
Maintaining accuracy[2], at +37°C	±0.5°C
Uniformity over the platform,	
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)

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[4]	3.7 kg

Table 1. Thermoblocks

Cat. No.	Description	Weight[4], kg
13687712	For 20x0.5 ml + 12x1.5ml tubes	0.7
13687713	For 20x0.2 ml + 12x1.5ml tubes	0.7
13687714	For 24x2.0 ml microtubes	0.6
13687715	For 24x1.5 ml microtubes	0.7
13687716	For 96-well microplate for PCR, w/o skirt, with half skirt, low and high profile	0.7

Table 2. Replacement part

Replacement part	Description
Rubber belt	122x6x0.6 mm, see **Maintenance** section

[1] Room temperature
[2] Data for 75% filled tubes or microplates
[3] Recommended interval between prolonged operation sessions not less than 1 hour
[4] Accurate within ±10%

Maintenance

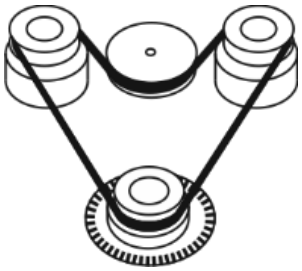

Figure 7. Rubber belt replacement

Service

If the unit requires service maintenance, disconnect the unit from the electric circuit and contact Thermo Fisher Scientific.
All maintenance and repair operations must be performed only by qualified and specially trained personnel.

Cleaning

Standard ethanol (75%) or other cleaning agents recommended for cleaning of laboratory equipment can be used for cleaning and decontamination of the unit.

Rubber belt replacement

For maintenance of reliable operation of the device, the Thermo Fisher Scientific recommends to replace 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.

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 **rpm 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 Thermo Fisher Scientific.

Warranty

The following information will be required in the event that warranty or post-warranty service comes necessary. Complete the table below and retain for your records.

Thermo Scientific Thermal Mixer
Serial number
Date of sale
Purchase or Sales Order Number

Thermo Fisher Scientific guarantees the compliance of unit with the requirements of specifications, if the customer follows operation, storage and transportation instructions. The warranted service life of unit from date of delivery to the customer is 24 months, excluding blocks and replacement parts mentioned in Tables 1 & 2. For extended warranty, contact Thermo Fisher Scientific. Warranty covers only the units transported in the original package.
If any manufacturing defects are discovered by the Customer, an unsatisfactory equipment report shall be compiled, certified and sent to Thermo Fisher Scientific.

EU Declaration of Conformity

This declaration of conformity indicates that the equipment meets the require-ments of the following Directive(s):

EMC Directive 2014/30/EU
Low Voltage Directive 2014/35/EU
RoHS2 2011/65/EU1
WEEE 2012/19/EU

Applied standards:

EN 61326-1	Electrical equipment for measurement, control and laborato-ry use EMC requirements. General requirements.
EN 61010-1	Safety requirements for electrical equipment for measure-ment, control and laboratory use. General requirements.
EN 61010-2-010	Particular requirements for laboratory equipment for the heating of materials.
EN 61010-2-051	Particular requirements for laboratory equipment for mixing and stirring.

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