

Thermoregulator TR 2000

Instruction Manual and User's Guide

Please read this manual before operating this product



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The contents of this manual have been verified to correspond to the specifications of the device. However, deviations cannot be ruled out. Therefore, a complete correspondence between the manual and the real device cannot be guaranteed. The information in this manual is regularly checked, and corrections may be made in subsequent versions.

The visualizations shown in this manual are only illustrative.

This manual is an integral part of the purchase and delivery of equipment and its accessories and both Parties must abide by it.

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1. General information

The Thermoregulator TR 2000 is as an additional device for Fluorometer FL 3500. This device controls and regulates temperature of the liquid samples. The core element of the Thermoregulator, the cuvette cooling unit, has to be installed on the top of FL 3500 measuring head and submersed into the measured sample. Therefore, the optimal volume of the sample in the cuvette is 2 ml.

NOTE: Magnetic stirrer ensures proper operation of the thermoregulator module. Don't forget to stir the sample during the regulation.

Controlled temperature range is from +10°C to +60°C. The temperature can be set either manually via the front display or by the protocol using FluorWin software. The actual temperature of the sample is displayed on the front panel of the Thermoregulator.

The Thermoregulator TR 2000 is powered from the +15V/150W Power Source. Both the 110V~(US) and 230V~(EU) are allowed on its input.

2. List of Thermoregulator components

A part of the Thermoregulator module are the following items:

- Power supply with the power cord (Fig 1a)
- Thermoregulator TR 2000 control unit (Fig 1b)
- Cuvette cooling unit (Fig 1c)
- Cuvette cooling unit holder (Fig 1d)
- Serial cable (Fig 1e)

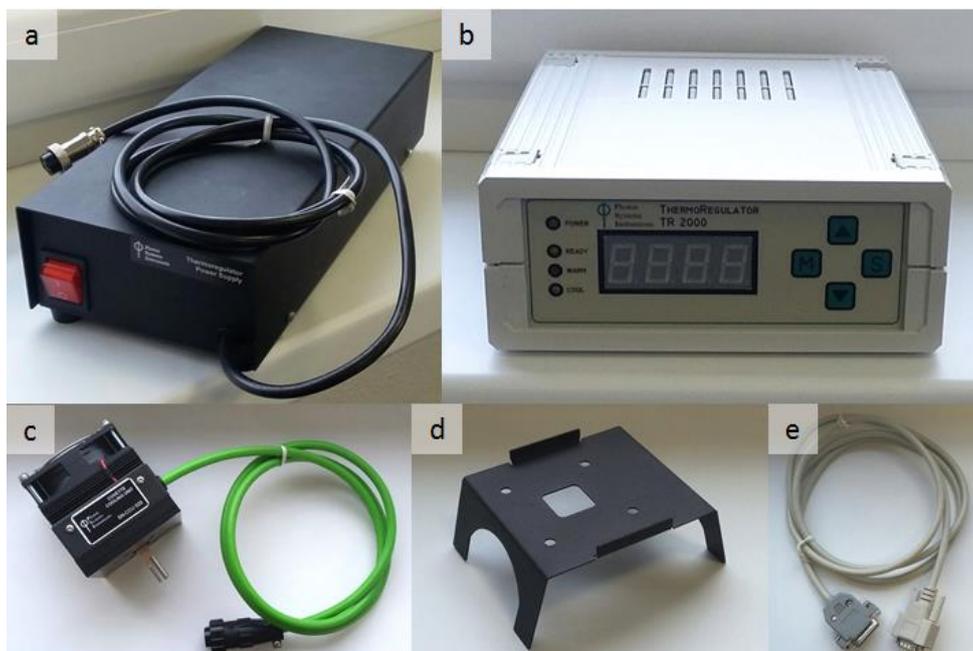


Figure 1. Equipment of Thermoregulator TR 2000: a) Power supply, b) Thermoregulator TR 2000 control unit, c) Cuvette cooling unit, d) Cuvette cooling unit holder, e) Serial cable.

NOTE: If any item is missing, please, contact the manufacturer. Also check the carton for any visible external damage. If you find any damage, notify the carrier and the manufacturer immediately. The carton and all packing materials should be retained for inspection by the carrier or insurer.

For customer support, please write to: support@psi.cz

3. Instalation

1. Connect the output cable of the power supply into POWER connector on the rear side of the Thermoregulator TR 2000 control unit. (Figure 2b)
2. Plug the Cuvette cooling unit cabel into COOLING UNIT connector on the rear side of the Thermoregulator TR 2000 control unit. (Figure 2c)
3. Connect the serial cable into the SERIAL/AUX connector of the TR 2000 control unit and CHANNEL 2 of the Fluorometer FL 3500 control unit. (Figure 2d)
4. Plug the Power supply in AC electricity.
5. Switch ON the Power supply and TR 2000 control unit. (Figure 2a)

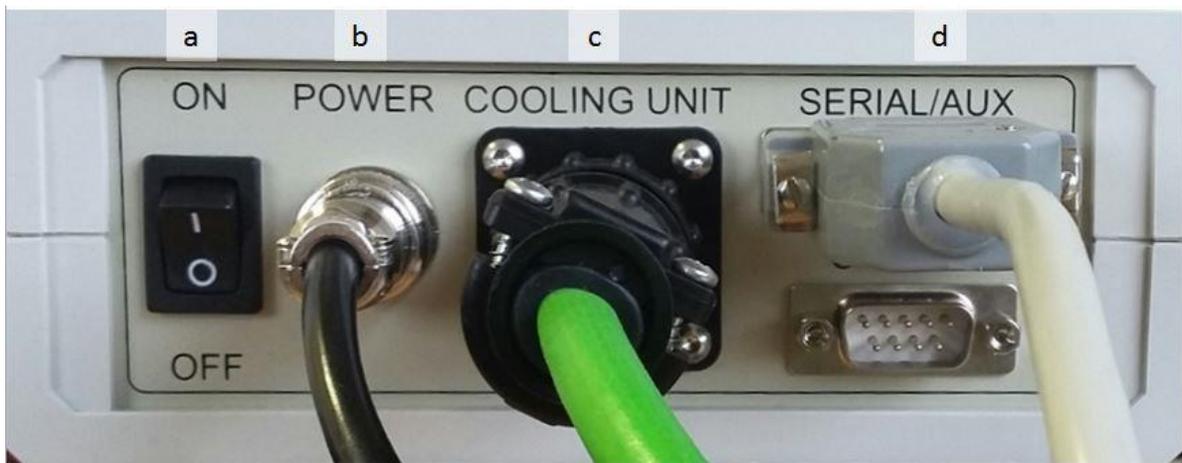


Figure 2. Control unit rear side.

4. Manual control

The front panel of the Thermoregulator control unit contains the Power indicator on the left part and three other status indicating LEDs underneath. (Please note, the main power button is located on the rear side of CU.) The READY LED indicates that the sample reached the pre-set temperature. The WARM LED (red indicator) is active during heating. The COOL LED (blue indicator) is turned on during cooling.

4.1. Main keys

The “M” key is used for listing in the menu.

The “UP/DOWN” keys (▲ ▼) are used to set the appropriate temperature.

The “S” key is used for confirmation of the selected temperature value.

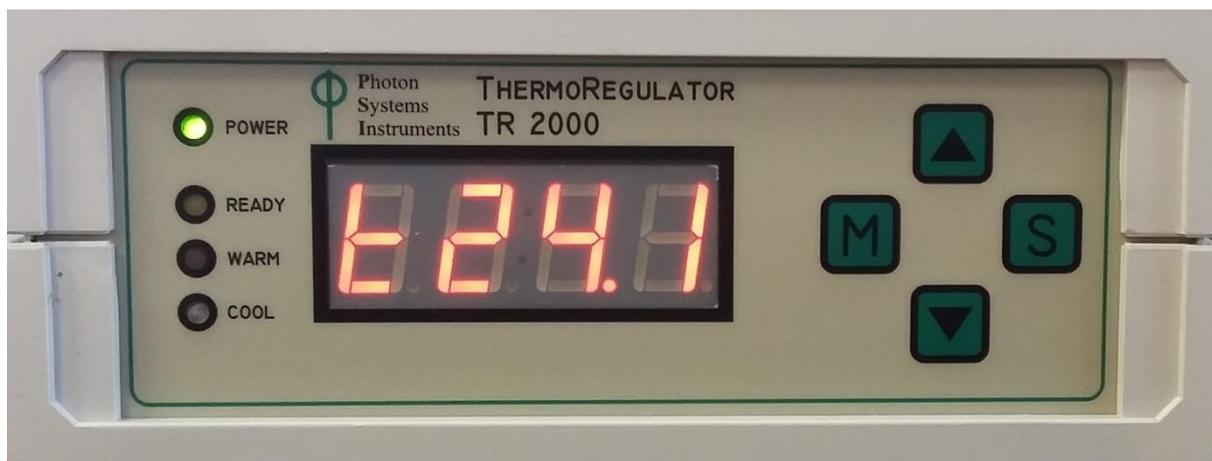


Figure 3. Front side of the control unit.

4.2. Thermoregulator front panel explanation

t - Temperature of the sample (use UP/DOWN and "S" keys to set the temperature of the sample).

r - Automatic Regulation State <On / Off>

5. FluorWin control

For measuring and regulating temperature during the predefined fluorescence protocol choose „Measure temperature on channel 2“ (Figure 4).

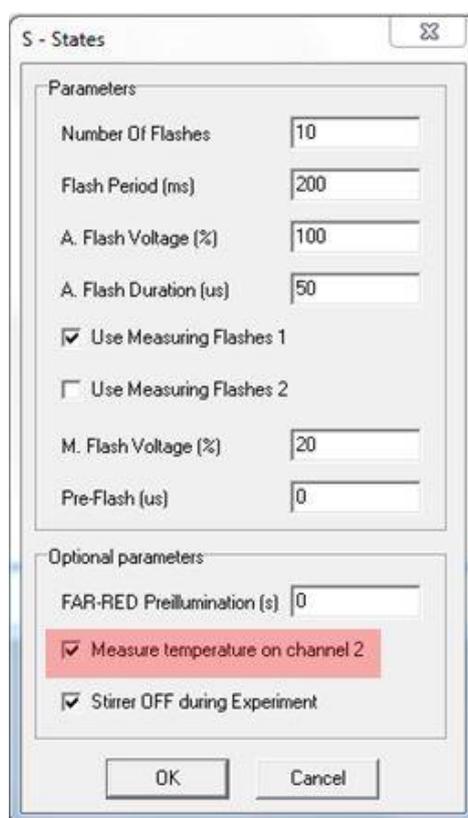


Figure 4. FluorWin Wizard.

The fluorometer protocol has to include the *thermoregulator.inc* in the header. Only than, it makes the thermoregulator macros accesible from the protocol. This command is added in protocol header automatically if the temperature measurement was enabled in protocol Wizard (Figure 5).

```

Current
; S-states - generated by wizard
; Version MS 2.4.0.0
MeasuringFlash=4us
MeasurDelay=3.5us
AuxDuration=0us
ActinicFlash=50us
PreFlash=0us
include default.inc ; include standard options, don't remove it !
include detector.inc
include thermoregulator.inc
M_Voltage=20Num ; Measuring Flash 1 (Red) Intensity[0.0-100.0]
F_Voltage=100Num ; Actinic Flash Intensity[0.0-100.0]
A1_Voltage=0Num ; Actinic light 1 (Red) Intensity[0.0-100.0]
A2_Voltage=0Num ; Actinic light 2 (Blue) Intensity[0.0-100.0]
FAR_RED_Voltage = 100Num ; FAR RED preillumination intensity[0.0-100.0]
:
:
:

```

Figure 5. Protocol header.

The thermoregulator controlled with FluorWin SW can work in two modes:

- (1) Temperature monitoring
- (2) Temperature regulation

1. Temperature monitoring

Use the *m2temp* command for the measuring temperature. The *m2temp* command syntax is the same as for the *m2* command (See the Fluorometer Users Guide). This command is automatically included in the protocol, if the temperature measurement was enabled in protocol Wizard (Figure 6).

```

Actions
If (PreFlash GR 0) Then
<0,Start..Stop>=>mfm1
Else
<0,Start..Stop>=>fm1
End
100ms+<0,100ms..Stop-100ms>=>m2temp
:
:
:

```

Figure 6. Command for temperature measurement in Meter protocol.

Example:

<0,1s..10s>=>m2temp

Means measure temperature on channel 2 each second in time range from 0 to 10sec.

2. Temperature regulation

a) Set temperature

User can set the desired temperature for the sample volume by *SetTemp* command.

Syntax:

```
<time>=>SetTemp(Temperature in degC)
```

Example:

```
<0s>=>SetTemp(20.5)
```

Means set the sample temperature at 20.5°C in time 0s.

b) Start Regulation

Start the temperature regulation (r-On) of the sample volume in the cuvette.

Syntax:

```
<time>=>StartReg
```

c) Stop Regulation

Stop the temperature regulation (r – Off) of the sample volume in the cuvette.

Syntax

```
<time>=>StopReg
```

6. Warranty terms and conditions

- This Limited Warranty applies only to the Thermoregulator TR 2000. It is valid for one year from the date of shipment.
- If at any time within this warranty period the instrument does not function as warranted, return it and the manufacturer will repair or replace it at no charge. The customer is responsible for shipping and insurance charges (for the full product value) to PSI. The manufacturer is responsible for shipping and insurance on return of the instrument to the customer.
- No warranty will apply to any instrument that has been (i) modified, altered, or repaired by persons unauthorized by the manufacturer; (ii) subjected to misuse, negligence, or accident; (iii) connected, installed, adjusted, or used otherwise than in accordance with the instructions supplied by the manufacturer.
- The warranty is return-to-base only, and does not include on-site repair charges such as labor, travel, or other expenses associated with the repair or installation of replacement parts at the customer's site.
- The manufacturer repairs or replaces faulty instruments as quickly as possible; the maximum time is one month.
- The manufacturer will keep spare parts or their adequate substitutes for a period of at least five years.
- Returned instruments must be packaged sufficiently so as not to assume any transit damage. If damage is caused due to insufficient packaging, the instrument will be treated as an out-of-warranty repair and charged as such.
- PSI also offers out-of-warranty repairs. These are usually returned to the customer on a cash-on-delivery basis.
- Wear & Tear Items (such as sealing, tubing, padding, etc.) are excluded from this warranty. The term Wear & Tear denotes the damage that naturally and inevitably occurs as a result of normal use or aging even when an item is used competently and with care and proper maintenance.