



**Anton Paar**

# TCU 1000

Temperature Control Unit

::: Innovation in Materials Science





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# TCU 1000

Temperature Control Unit

Instruction Handbook

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# 1. Introduction

Anton Paar GmbH thanks you for buying the TCU 1000 temperature control unit, a powerful instrument of compact design and high reliability.

Modular design and simple configuration allow fast and optimum adaptation to the specific demands of each application.

The TCU 1000 is optimized for work with the HTK 1200 by Anton Paar GmbH.

The TCU 1000 controller and power unit are installed in a 19" rack which can also be used as table housing.

The temperature control unit can be operated either by using the front panel buttons or through the RS 232C serial port.

To ensure reliable operation of the TCU 1000, Anton Paar GmbH recommends the accessory part as follows:

70067 FLOW CONTROLLER

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## 2. Safety instructions

- This handbook does not purport to address all of the safety issues associated with the use of the TCU 1000 and samples. It is the responsibility of the user to establish health and safety practices and determine the applicability of regulatory limitations prior to use.
- Before using the TCU 1000 read this handbook completely.
- Installation procedures may only be carried out by authorized personnel who are familiar with the installation instructions.
- Anton Paar GmbH only warrants the proper functioning of the TCU 1000 if no unauthorized adjustments have been made in mechanical parts, electronic parts and software and the following points are adhered to.
- Follow all hints, warnings and instructions in the handbook to ensure the correct and safe functioning of the TCU 1000.
- Do not use the TCU 1000 for any purpose other than described in the handbook.
- Do not use any accessories other than those supplied or approved by Anton Paar GmbH.
- The installation procedure should only be carried out by authorized personnel who are familiar with the installation instructions.
- Do not operate the TCU 1000 if a malfunction is suspected, or damages, injuries or loss of life cannot be excluded under all circumstances.
- The TCU 1000 is not an explosion-proof instrument, and therefore must not be operated in areas where there is a risk of explosion.
- Service and/or maintenance procedures which involve removing outside covers and working with the power on may only be performed by authorized service personnel.
- Ensure that all operators are fully trained in the correct use of this instrument and its safe operation.
- Due to the nature of the measurement, the measuring results not only depend on the correct use and functioning of the TCU 1000, but may also be influenced by other factors. We therefore advise that the analysis result are plausibility tested the before consequential actions are taken.

- 
- Repair and service procedures may only be carried out by authorized personnel or by Anton Paar GmbH.
  - CAUTION: During operation and even after turning off the TCU 1000 (while the heating phase is on), temperatures at the HTK 1200 sample holder range from room temperature to +1200°C. Make sure that the sample holder is at room temperature before handling it.
  - Follow the precautions below for the handling and measurement of inflammable samples and cleaning materials:
    - Do not store inflammable material near the TCU 1000.
    - Do not leave sample containers uncovered.
    - Clean all spills immediately.
    - Ensure that the TCU 1000 is located in a sufficiently ventilated area, free from inflammable gases and vapours.
    - Connect the TCU 1000 to the mains via a safety switch located a safe distance from the TCU 1000. In an emergency, turn off the power using this switch. Do not use the TCU 1000 power switch.
    - Keep a fire extinguisher at hand.
    - Do not leave the TCU 1000 unattended while in use.



Do not touch areas marked with this sign while the power is turned on.



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### 3. Symbols in the handbook

The following symbols are used in the handbook:



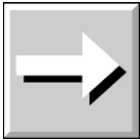
*Warning:*

The "Warning" sign indicates a hazard. It calls attention to a procedure, practice, etc. which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a "Warning" sign until the indicated conditions are fully understood and met.



*Important:*

The "Important" sign indicates a hazard. It calls attention to an procedure, practice, etc. which, if not correctly performed or adhered to, could result in damage or destruction of the instrument or parts of it. Do not proceed beyond an "Important" sign until the indicated conditions are fully understood and met.

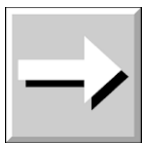


*Hint:*

The "Hint" sign calls attention to any additional information, which might be of use to the operator.

---

## 4. Supplied items

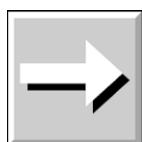


### Hints:

- The TCU 1000 Control unit has been tested and packed carefully before shipment. However, damage may occur during transport.
- If the TCU 1000 or a supplied item has been damaged during transport, contact the transport firm as well as your local **Anton Paar GmbH** representative. Keep the packing material for examination by the transport firm or an insurance representative.
- If a part is missing, please contact your local Anton Paar GmbH representative.

### Supplied items:

Pcs.	Item	Cat. No.
1	TCU 1000 Temperature Control Unit	75755
1	Mounting set for use as plug-in unit	
1	Connection cable to the HTK 1200 sample spinner	
1	Mains cable	
1	Instruction handbook	



### Hint:

- Always use the original packing material when transporting the instrument and parts. Therefore, store the packing material carefully for later use!

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## 5. Design of the instrument

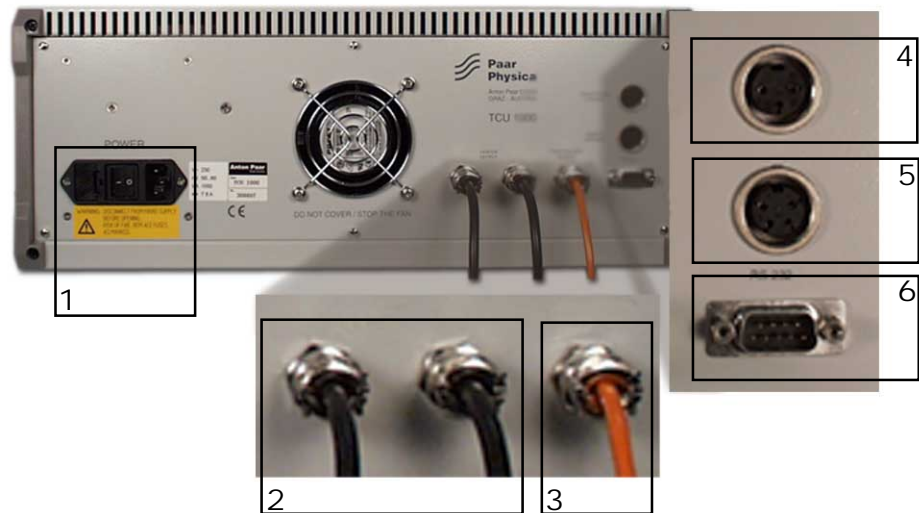
### 5.1 Front view



- 1 EUROTHERM controller
- 2 Heater button and LEDs to show ON/OFF status
- 3 Cooling water cycle LEDs to show ON/OFF status
- 4 Speed control for sample spinner

---

## 5.2 Rear view



- 1 Mains connector with mains fuses
- 2 Connection cables to the HTK 1200 heater
- 3 Connection cable for temperature measurement
- 4 Connector for water flow controller
- 5 Connector for sample spinner
- 6 RS 232 C serial port

---

## 6. Installation of the TCU 1000

The TCU 1000 control unit can be either installed in a 19" rack or used as table housing.

If the instrument will be installed into a rack, the supplied guide bars have to be used.

The instrument should be protected from humidity.



*Hint:*

- *Allow sufficient time for the instrument to reach room temperature before starting the operation (danger of condensation).*

### 6.1 Installation

#### 6.1.1 Use as table housing

Make sure, that there is enough space for the connecting cables at the rear of the instrument.

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## 6.1.2 Installing into a 19" rack

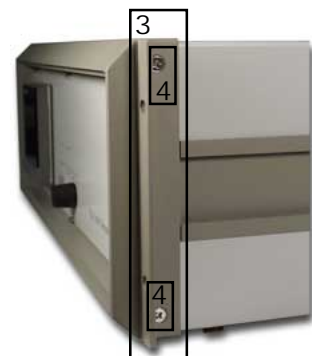
For using the TCU 1000 into a 19" rack, the supplied guide bars have to be attached.

To mount the guide bars, proceed as follows:

1. Loosen the screws (2) on both sides of the instrument's bottom.
2. Remove the covers (1)



3. Mount the guide bars (3) on both sides of the instrument by using the four screws (4) which are supplied with the mounting set.

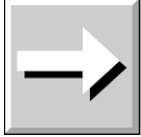


4. Make sure, that the guide rails are assembled in the 19" rack to avoid damage when mounting the instrument into the rack.

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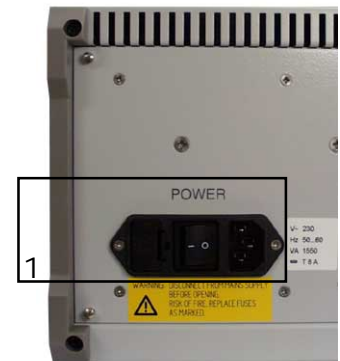
## 6.2 Mains connection

The mains connector (1) is located at the rear of the instrument.  
The TCU 1000 is operated on 230 VAC  $\pm$ 10%.  
Maximum power consumption is 1750 VA.



*Hint:*

- *The protective conductor of the instrument has to be connected to ground!*



*Warning:*

- *Turn the power off and unplug the instrument before replacing the mains fuses.*

## 6.3 Connecting the HTK 1200 camera

Connect the cables from the heater output and temperature sensor, which are at the rear of the instrument to the appropriate terminals and connectors of the HTK 1200.

For further instructions see HTK 1200 Handbook, chapter 7.3



*Hint:*

- *Connect the "HEATER OUTPUT" cables before connecting the "TEMPERATURE SENSOR" cable.*

## 6.4 Connecting the flow controller

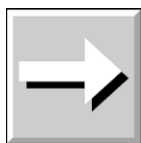
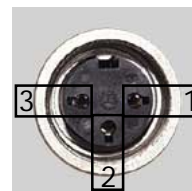
The flow controller has to be connected to the "WATERFLOW CONTROL" connector (1) at the rear panel.

A suitable flow controller (Cat. No. 70067) is available from Anton Paar GmbH



PIN-assignment of connector WATER FLOW CONTROL:

Pin	
1	Connected to flow controller magnetic switch
2	Not connected
3	Connected to flow controller magnetic switch



*Hint:*

- A well-functioning cooling water cycle through the HTK 1200 chamber combined with the flow controller is a precondition for reliable TCU operation.

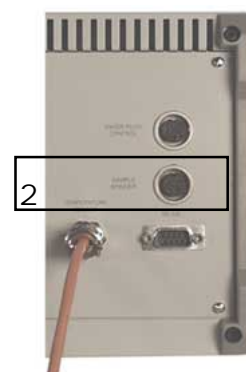
*Therefore, the flow controller has to be connected in any case.*

*To check the display for the cooling water cycle function and the operation*

*of the flow controller, periodically disconnect the cooling water supply.*

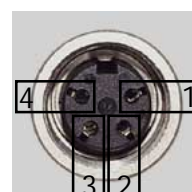
## 6.5 Connecting the sample spinner

If the HTK 1200 is equipped with the sample spinner, the appropriate cable has to be connected to the "SAMPLE SPINNER" connector (2) at the rear panel.



PIN-assignment of connector SAMPLE SPINNER:

Pin	
1	Power supply for sample spinner +
2	Power supply for sample spinner - (no GND)
3,4	Not connected





---

## 6.6 Interfacing a computer

The RS 232 C serial port at the rear panel allows to interface a computer for controlling the EURO THERM controller .

According to EN60950 standards, the RS 232 C serial interface represents a SELV circuit which therefore is allowed to be connected exclusively to SELV or SELV-E circuits.

Pin-assignment of the plug:

PIN	
2	RX
3	TX
5	GND
4 and 6	short-circuited
1, 7-9	not connected

Default parameters:    Baude rate:            9600  
                          Character format:    7 ASCII/1 start bit/1 stop bit  
                          Parity:                even  
                          Address:                1

---

## 7. Operation of the TCU 1000

### 7.1 Working with the EUROTHERM controller

The EUROTHERM controller is located at the front panel of the TCU 1000.

All configuration and control options can be performed by using the 7 keys on the front panel of the EUROTHERM controller. Also the actual status of the TCU 1000 is shown on the display.



To turn on the TCU 1000, press the mains switch at the rear panel of the instrument.

The green LED for "WATERFLOW" and the green LED for "HEATER" goes on.

The following message appears on the display:



#### *Warning:*

- *When executing the CONFIG MODE, all settings affecting the controller functions are changeable!*

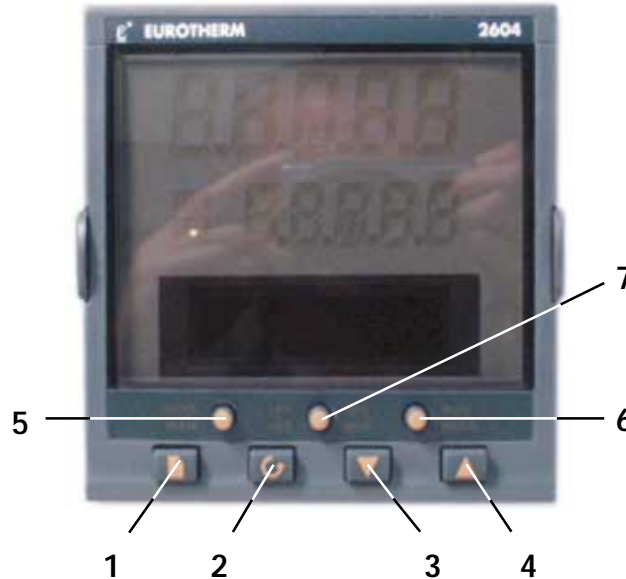
*The EUROTHERM controller's configuration is protected by password and accessible only for authorized personnel.*

*Anton Paar GmbH assumes no liability for damages resulting from unauthorized modifications or misuse.*

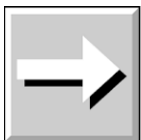
- *Once the TCU 1000 is on, the preselected set temperature is 25°C.*

### 7.1.1 Keypad and key functions of the EUROTHERM controller.

All configuration and control operations can be performed by using the 7 keys on the front panel of the EUROTHERM controller.



No.	Key	Function
1	Page Key	To change between the parameter and access screen press first the page key and then the scroll key (see below for definition).
2	Scroll Key	Press to select a new parameter.
3	Down Key	Decreases the value of the currently selected parameter.
4	Up Key	Increases the value of the currently selected parameter.
5	Auto/Manual Key	No function
6	Loop Key	No function
7	Run/Hold Key	No function

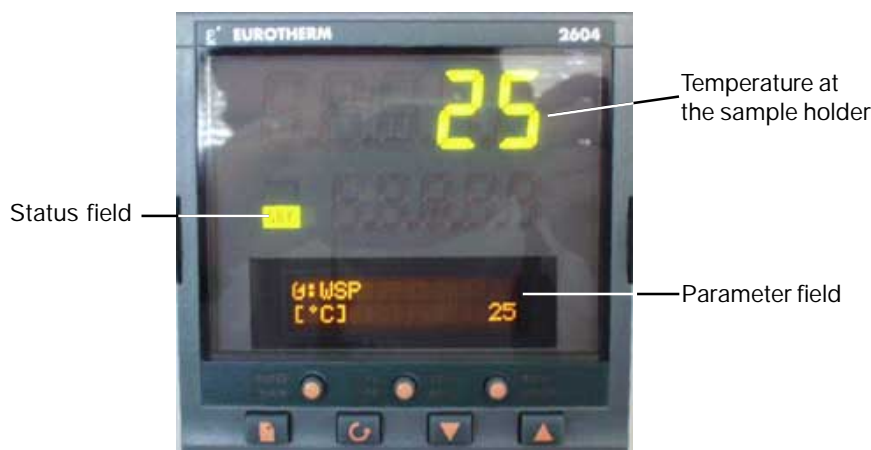


*Hint:*

- *Parameter screen: shows the current measuring parameters. Access screen: parameters are protected under different levels of access for which security codes may be necessary. There are different levels of access for the operating parameters available in the controller.*
- *All parameters for operating the TCU 1000 with the HTK 1200 are predefined by Anton Paar GmbH.*

---

## 7.1.2 User interface of the controller



### 7.1.2.1 Temperature at the sample holder

The current temperature at the sample holder is shown. If the temperature display reads "S.br." (sensor break), either the connection cable for temperature measurement is not connected or the temperature sensor at the sample holder is defective.

### 7.1.2.2 Parameter field

Use the scroll key to select the desired field.

**SP** Set Point. To enter the set point value, use the "UP" or "DOWN" key to select a temperature between 25 and 1200 °C.

**WSP** Working Set Point. Reads the working set point. This value is just for your information and cannot be changed.

**OP** Output Power. Reads the output power in %. This value is just for your information and cannot be changed.

**SPR** Set Point Rate. You can enter the set point rate value [°C/min] for the ramp mode. This value can be changed only if SRL is "ON". Use the "UP" or "DOWN" key to select a set point rate between 0 and 99999 °C/min.

**SRL DISABLED**  
Set Point Rate Limit. Use the "UP" or "DOWN" key to select SRL disabled "YES" or "NO".

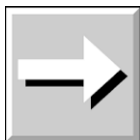
---

### Comm. Protocol

Shows the current communication protocol type.

This value is just for your information and cannot be changed.

If you use the EUROTHERM software "iTools" you have to change the protocol from factory setting "EI-Bisynch" to "Modbus". For further information see the Anton Paar instruction you get with "iTools"



#### *Hint:*

- **EI-Bisynch** is a proprietary EUROTHERM protocol based on ANSI X3.28-25 A4 standard for message framing.  
**Modbus** is a serial communication protocol defined by "Gould Inc.", which is used to communicate with "iTools".
- Press the Page and the Scroll Key together, to get back to the SP-Parameter from each position.

### 7.1.2.3 Status field

The current condition of the controller is shown.

No display.

Normal operation.

SBY (green)

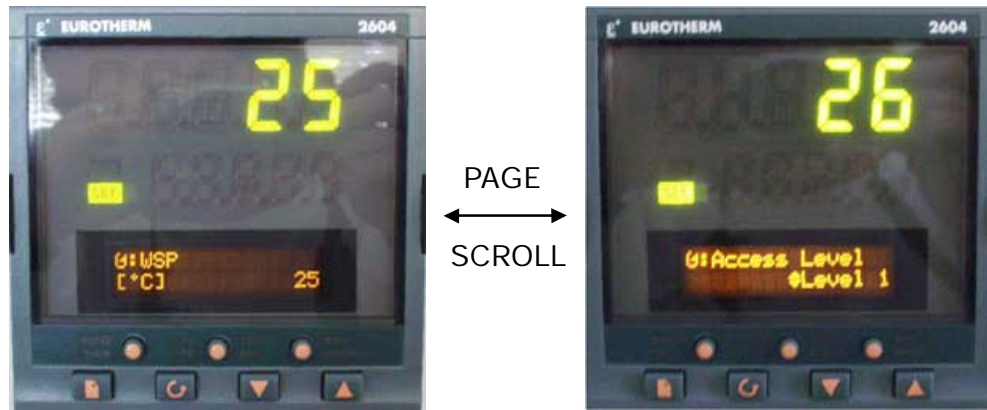
Standby. This mode occurs due to a system fault and changes the setting of the heating power (OP) to 0 %.

ALM (red)

LBR Loop Break. This mode occurs if the preselected target value is not reached within a specified period (default: 4 min) and the heating power (OP) is 0 %. The set point (SP) will not be reset.

### 7.1.2.4 Access levels

Press the PAGE button and then the SCROLL button to actuate the "ACCESS LEVELS".



Using the "DOWN" key you can select the "Config" menu. After entering the password, modifications are possible for authorized personnel only! To get back to the parameter-menu press the PAGE key and SCROLL key together.

## 7.2 Function of the heater button

The Heater button (1) allows to stop manual heating and selects standby mode (Heating power OP = 0%; Set point = 25°C). The yellow Led for heating is flashing.

Press the button once to actuate "ON" for select the gain shed (SCH) of the EUROTHERM controller.



### Warning:

- Always make sure, that the heating current is off and the sample holder has room temperature when working with it - DANGER OF BURNING! To turn off the heating current, press the heater button.

---

## 7.3 Sample spinner

If a sample spinner is connected, use the speed control knob (1) to select the desired speed.



---

## 8. Performing a measurement

The TCU 1000 is designed for controlling the temperature of the HTK 1200 High Temperature Camera.

1. Install the TCU 100, as described in chapter 6.
2. For the installation of the High Temperature Camera, please refer to the HTK 1200 Instruction Handbook.
3. Mount the sample, as described in the HTK 1200 Instruction Handbook.
4. Switch on the water flow.
5. Turn the main switch on.



*Important:*

- *If there is no or too little water flow, the heater is switched off.*

6. Use the scroll key to select the set point rate (SPR) in the parameter field. Use the "UP" or "DOWN" keys to select a set point rate between 0 and 200 °C/min.  
To switch of the Set Point Rate (SPR) limit, select "SRL Disabled YES".



*Important:*

- *The factory setting for the set point rate is 100 °C/min.*

7. Use the scroll key to select the set point (SP) in the parameter field. Use the "UP" or "DOWN" keys to select a set point temperature between 25 and 1200 °C.
8. The set point temperature will be held until the set point is changed or the heater button is pushed (switching off the heater).



---

## 9. Troubleshooting

### 9.1 Heating

If there is a problem, the TCU 1000 selects the manual mode. For a short time the message LBR appears in the status field of the EUROTHERM controller. This is then replaced by man. (Heating power = 0 %)

Possible sources of error:

- The heating current fuse is defective
- The heating is defective
- The heating connections are defective

After troubleshooting, press the HEATER button twice to actuate "OFF" and then "ON" (manual reset).

### 9.2 Temperature measurement

If there is a problem, the temperature display flashes and reads "S.br." (sensor break) and the message SBY appears in the status field of the EUROTHERM controller (heating power OP = 0 %).

Possible sources of error:

- The temperature sensor is defective
- The temperature sensor is not connected

After troubleshooting, press the HEATER button twice to actuate "OFF" and then "ON" (manual reset).

### 9.3 EUROTHERM controller

Error messages appear in the status field of the EUROTHERM controller. For detailed information, refer to the EUROTHERM controller manual, "Appendix 1".

---

## 9.4 Cooling water cycle

If there is a problem concerning the cooling water cycle or if the flow controller is not connected, the TCU 1000 selects the standby mode. The flow controller (yellow LED) flashes and the message SBY appears in the status field of the EUROTHERM controller (heating power OP = 0%).

Possible sources of error:

- The flow controller is not connected
- The flow controller is defective
- There is insufficient or no cooling water flow

After troubleshooting, press the HEATER button twice to actuate "OFF" and then "ON" (manual reset).

---

## 10. Maintenance

The TCU 1000 temperature control unit is maintenance-free.

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## 11. Appendix A - Specifications

Voltage:	230 VAC $\pm$ 10%
Frequency:	50 ... 60 Hz
Power consumption:	1750 VA
Fuses:	2 x T8 A
Control range:	25 to 1200 °C
Voltage output to sample spinner	1.5V up to 3V
Thermocouple:	Pt-10%RhPt
Resolution:	1 °C
Control accuracy:	1 °C
Heating power:	1575 VA (45V,35A/AC)
Dimensions:	450 x 410 x 180 mm (L x W x H)
Weight:	23 kg
Class of overvoltage:	II according to EN 61010
Class of contamination:	2 according to EN 61010

### **Electromagnetic compatibility (89/336/EWG)**

Applied standards (when using the TCU 1000):

Electromagnetic compatibility, RF-Emissions: EN50081-1:1993

Electromagnetic compatibility, RF-Susceptibility: EN50082-1:1993

### **Directive on Low-Voltages (73/23/EWG)**

Applied standards (when using the ..... Temperature Control Unit):

Safety requirements for electrical equipment for measurement,  
control and laboratory use: EN61010-1:1993

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## 12. Appendix B - Warranty

The warranty regulations for the TCU 1000 are in accordance with the „General Terms of Delivery“ of the Austrian Electrical and Electronic Industry.

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