

# Electronic Temperature Controller

## MCU 1000, MCU 1000 CAN

Instruction Manual  
Version 1.01.00



**Dear Customer,**

Thank you for buying our product. In this manual you will find all necessary information about this M&C product. The information in the manual is fast and easy to find, so you can start using your M&C product right after you have read the manual.

If you have any question regarding the product or the application, please don't hesitate to contact M&C or your M&C authorized distributor. You will find all the addresses in the appendix of this instruction manual.

For additional information about our products, please go to M&C's website [www.mc-techgroup.com](http://www.mc-techgroup.com). There you can find the data sheets and manuals of our products in German and English.

This Operating Manual does not claim completeness and may be subject to technical modifications.

© 06/2024 **M&C TechGroup** Germany GmbH.

Reproduction of this document or its content is not allowed without permission from **M&C**.

Version: 1.01.00



Contents

1 General information .....4
2 Declaration of conformity.....4
3 Safety instructions.....5
4 Intended use.....5
5 Reasonably foreseeable misuse .....5
6 Necessary qualification for personnel.....6
7 Warranty.....6
8 Used terms and signal indications .....6
9 Introduction.....7
10 Application .....7
11 Technical data .....7
12 Description .....9
13 Receipt of goods and storage .....10
13.1 Product label and serial number .....10
14 Dimensions .....11
15 Assembly, location and mounting requirements .....11
15.1 Mounting the temperature controller .....12
16 Ventilation requirements .....12
17 Electrical connections .....13
18 Initial starting .....14
18.4 Configuration menu .....16
18.5 Functional test .....20
19 Error messages .....20
20 Decommissioning .....20
21 Maintenance and repair .....20
22 Proper disposal of the device .....20
23 Appendix.....20

List of Illustrations

Figure 1: LCD display description.....9
Figure 2: Product label MCU 1000 .....10
Figure 3: Product label MCU 1000 CAN .....10
Figure 4: Dimensions .....11
Figure 5: Mounting the MCU 1000 into a front panel .....12
Figure 6: Electrical connections on the rear: MCU 1000 .....13
Figure 7: Electrical connections on the rear: MCU 1000 CAN .....13
Figure 8: Unlock the device .....14
Figure 9: Setpoint view .....15
Figure 10: Setting the setpoint .....16
Figure 11: Access the configuration menu and set the codes .....17



## Headquarters

M&C TechGroup Germany GmbH ♦ Rehhecke 79 ♦ 40885 Ratingen ♦ Germany

Phone: +49 - 2102 - 935 - 0

E - mail: [info@mc-techgroup.com](mailto:info@mc-techgroup.com)

Website: [www.mc-techgroup.com](http://www.mc-techgroup.com)

## 1 GENERAL INFORMATION

The product described in this instruction manual has been built and tested in our production facility.

All M&C products are packed to be shipped safely. To ensure the safe operation and to maintain the safe condition, all instructions and regulations stated in this instruction manual need to be followed. This instruction manual includes all information regarding proper transportation, storage, installation, operation and maintenance of this product by qualified personnel.

Follow all instructions and warnings closely.

Read this manual carefully before commissioning and operating the device. If you have any questions regarding the product or the application, please don't hesitate to contact M&C or your M&C authorized distributor.

## 2 DECLARATION OF CONFORMITY



The product described in this operating manual complies with the following EU directives:

### EMC Directive

The requirements of the EU directive 2014/30/EU "Electromagnetic compatibility" are met.

### Low Voltage Directive

The requirement of the EU directive 2014/35/EU "Low Voltage Directive" are met.  
The compliance with this EU directive has been examined according to DIN EN 61010.

### RoHS Directive

The requirements of the RoHS2 ('Restriction of Hazardous Substances 2') directive 2011/65/EU and its annexes are met.

### Declaration of Conformity

The EU Declaration of conformity can be downloaded from the **M&C** homepage or directly requested from **M&C**.

### 3 SAFETY INSTRUCTIONS

**Follow these safety precautions during installation, commissioning and operation of the device:**

- Read this operating manual before starting up and use of the equipment. The information and warnings given in this operating manual must be heeded.
- Any work on electrical equipment is only to be carried out by trained specialists as per the regulations currently in force.
- Attention must be paid to the requirements of VDE 0100 (IEC 364) when setting high-power electrical units with nominal voltages of up to 1000 V, together with the associated standards and stipulations.
- Check the details on the type plate to ensure that the equipment is connected to the correct mains voltage.
- Protection against touching dangerously high electrical voltages:  
Before opening the equipment, it must be switched off and hold no voltages. This also applies to any external control circuits that are connected.
- The device is only to be used within the permitted range of temperatures.
- Check that the location is weather protected. It should not be subject to either direct rain or moisture.
- The device must not be used in hazardous areas.
- Installation, maintenance, monitoring, and any repairs may only be done by authorized personnel with respect to the relevant stipulations.

### 4 INTENDED USE

The **MCU 1000** is intended to be used as a built-in device for measuring and controlling temperature. Use the device in the permitted range of the electrical and environmental specifications only. See table technical data for details. Do not use the device if it is damaged or visibly not in good conditions.

Do not install and operate the device in hazardous areas.

If the device is used improperly or not for its intended purpose, its operational safety may be impaired. The manufacturer is not liable for damages resulting from such improper use.

### 5 REASONABLY FORESEEABLE MISUSE

Do not connect or operate the device outside the specifications stated in the technical data table. Pay attention to the electrical connection diagram. Do not switch the electrical terminals. Always operate the **MCU 1000** inside another device enclosure.

## 6 NECESSARY QUALIFICATION FOR PERSONNEL

Qualified personnel are necessary to install, use and maintain the device. This personnel needs at least to be a trained technician, who has appropriate knowledge about handling temperature controllers.

## 7 WARRANTY

In case of a device failure, please contact immediately M&C or your M&C authorized distributor.

We have a warranty period of 12 months from the delivery date. The warranty covers only appropriately used products and does not cover the consumable parts. Please find the complete warranty conditions in our terms and conditions.

The warranty includes a free-of-charge repair in our production facility or the free replacement of the device. If you return a device to M&C, please be sure that it is properly packaged and shipped with protective packaging. The repaired or replaced device will be shipped free of delivery charges to the point of use.

## 8 USED TERMS AND SIGNAL INDICATIONS



**Danger**

This means that death, severe physical injuries and/or important material damages **will occur** in case the respective safety measures are not fulfilled.



**Warning**

This means that death, severe physical injuries and/or important material damages **may occur** in case the respective safety measures are not fulfilled.



**Caution**

This means that minor physical injuries **may occur** in case the respective safety measures are not fulfilled.

**Caution**

Without the warning triangle means that a material damage may occur in case the respective safety measures are not met.



**Note**

These are important information about the product or parts of the operating manual which require user's attention.

**Qualified Personnel**

These are persons with necessary qualification who are familiar with installation, use and maintenance of the product.



High voltages!  
Protect yourself and others against damages which might be caused by high voltages.

## 9 INTRODUCTION

The digital electronic temperature controller **MCU 1000** is used for simple temperature control. It is designed in a compact construction and is suitable for panel-mounting.

The **MCU 1000 CAN** is equipped with a CAN bus.

## 10 APPLICATION

The **MCU 1000** is a device used for controlling temperature of gas coolers and heaters. The **MCU 1000** can be built into front panels of gas cooling devices and heating devices.

## 11 TECHNICAL DATA

Temperature Controller Type	MCU 1000	MCU 1000 CAN
Part No.	04E1000	04E1100
<b>Electrical data</b>		
Supply voltage	100 – 240 V AC -15 %/+10 %	
Frequency	50 – 60 Hz	
Electrical Safety	DIN EN 61010-1, OVC II, pollution degree 2	
Protection rating	Class II	
Power consumption	< 3 W	
Electrical connection	Terminals with push-in spring connections on the back of the device, nominal wire cross-section AWG24 - AWG16 (0.2 - 1.5 mm <sup>2</sup> )	
<b>Electrical interface</b>		
Status relay output	SPST-NO, 240 V AC, 30 V DC, 4 A	
Control output	Binary, 5 V, 100 Ohm output resistance	
CAN bus	No	CANopen (250 kbit/s)
Permitted cable lengths	Temp. sensor < 3 m [≈ 9.8 ft] length Control output < 3 m [≈ 9.8 ft] length CAN bus < 100 m [≈ 328 ft] length	
<b>Environmental conditions</b>		
Operating ambient temperature	-20 to +65 °C [-4 to 149 °F], non-condensing	
Storage temperature	-40 to +70 °C [-40 to 158 °F]	
Max. installation altitude	2000 m [≈ 6561.7 ft] above sea level	
Humidity	< 90 % rel., non-condensing	
Degree of ingress protection (IEC 60529)	IP20	
EMC	EN 61326-1:2013 Residential and industrial areas Interference emission: Group 1, Class B Interference immunity: Class A Max. frequency 48 MHz	
<b>Controller data</b>		
Adjustable temperature range in °C	-40 to +999 °C [-40 to 1830.2 °F]	
Display range in °C/Resolution	-99 to +999 °C [-146.2 to 1830.2 °F]/3 digits/1 decimal point	
Relay status indicator	Red LED	



<b>Temperature Controller Type</b>	<b>MCU 1000</b>	<b>MCU 1000 CAN</b>
<b>Part No.</b>	<b>04E1000</b>	<b>04E1100</b>
Control type	PID, indicator yellow LED	
<b>Temperature Input</b>		
Temperature sensor input	Pt100 or thermo couple type K	
Accuracy	Pt100: $\pm 1$ K, thermo couple type K: $\pm 3$ K	
<b>Housing</b>		
Mounting type	Panel mounting according to DIN 43700, 45 x 22.5 mm [ $\approx 1.8'' \times 0.9''$ ]	
Mounting clearance	15 mm [ $\approx 0.6''$ ] horizontal, 10 mm [ $\approx 0.4''$ ] vertical	
Housing material	Polyamide PA6	
Dimensions (W x H x D)	49 x 32 x 99.5 mm [ $\approx 1.9'' \times 1.3'' \times 3.9''$ ]	
Weight	80 g [ $\approx 0.18$ lb]	



## 12 DESCRIPTION

The **MCU 1000** measures temperature signals via a Pt100 or a thermocouple interface. The user-friendly three-digit 7-segment display and the two status LEDs on the front display show the status of the temperature controller. Four capacitive buttons allow a configuration of the device.

An alarm relay on the output side indicates whether the temperature value is within a user-definable range around the set point or not. Depending on the measured temperature a binary control signal with the voltage levels of 0 V and 5 V is generated. The control signal is used by a component with a digital input, which is designed to alter the measured temperature.

In addition, a digital CAN interface with the signals CAN-H, CAN-L is available. With the CAN bus the measured temperature and the device load can be monitored or the settings can be adjusted.

The temperature controller has no ground wire connection.

The **MCU 1000** has a housing protection degree of IP 20. For higher housing protection the temperature controller should be built into another device enclosure.



- ① Indication for channel 1 (K1) or channel 2 (K2)
- ③ ESC and OK button to cancel or confirm a setting

- ② Three-digit 7-segment display
- ④ UP and DOWN buttons to navigate through the menus

**Figure 1: LCD display description**

### 13 RECEIPT OF GOODS AND STORAGE

- Immediately after arrival, remove the controller and eventual accessories carefully from the packing and check the articles for completeness against the packing list.
- Check the goods for any damage during transportation and, if required, inform your shipping insurance immediately of the damage found.



The controller should be stored in a weather-protected and frost-free area!

#### 13.1 PRODUCT LABEL AND SERIAL NUMBER

The product label with the serial number is placed on the top of the device.



Figure 2: Product label MCU 1000



Figure 3: Product label MCU 1000 CAN

14 DIMENSIONS

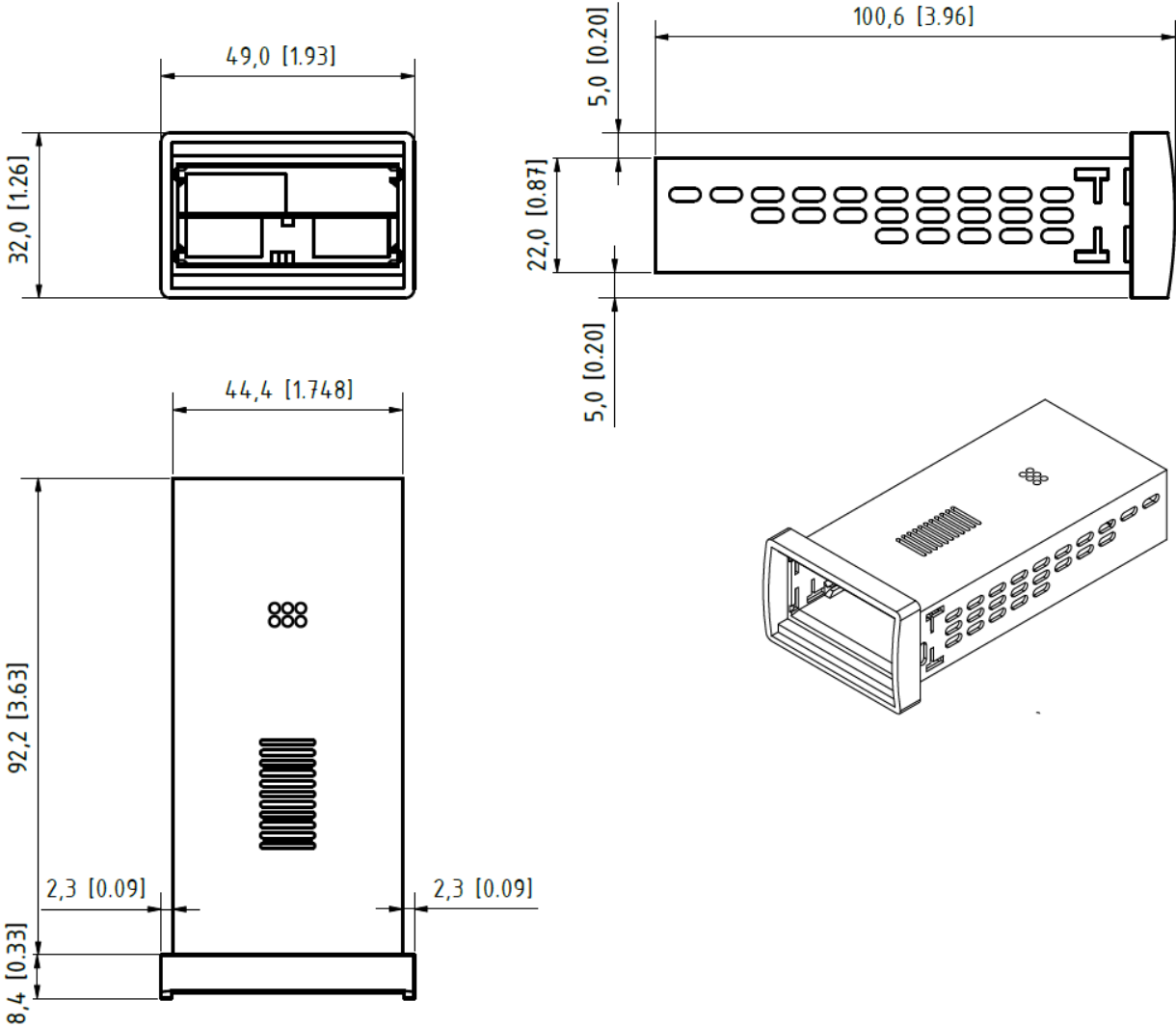


Figure 4: Dimensions

15 ASSEMBLY, LOCATION AND MOUNTING REQUIREMENTS

The device is completely assembled. It consists of the device body and a mounting frame. To mount the device, the mounting frame needs to be removed from the device body.



Note

The minimum spacing of panel cut-outs for tight-to-tight mounting is 15 mm [≈ 0.6"] horizontal and 10 mm [≈ 0.4"] vertical.

The controller is designed for panel-mounting. The following cut-out dimensions are required for mounting the device: width 45 mm [≈ 1.8"] with +0.6 mm [≈ 0.02"] tolerance, height 22.2 mm [≈ 0.9"] with +0.3 mm [≈ 0.01"] tolerance.

## 15.1 MOUNTING THE TEMPERATURE CONTROLLER

Insert the device (1) from the front into the panel cutout.

Push the mounting frame (2) from the rear of the control panel onto the device body so that the springs press against the rear of the control panel.

Press the fastening frame against the back of the control panel until the latching notches snap into the grooves provided for this purpose. The snap-in action ensures adequate fastening.

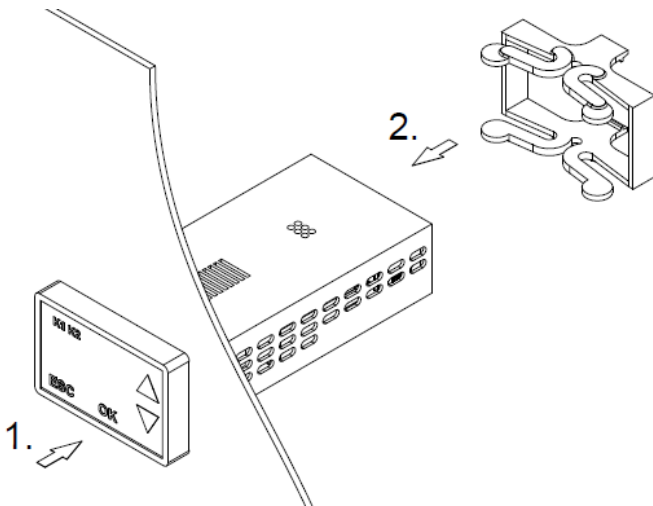


Figure 5: Mounting the MCU 1000 into a front panel

## 16 VENTILATION REQUIREMENTS

There are minimum spacing between panel cut-outs for the MCU 1000 to ensure sufficient ventilation. The minimum spacing of panel cut-outs for tight-to-tight mounting is 15 mm [ $\approx 0.6$ "] horizontal and 10 mm [ $\approx 0.4$ "] vertical.

17 ELECTRICAL CONNECTIONS



Warning

A wrong mains voltage can destroy the device. Please ensure that the supply voltage is identical to the indication on the type plate.



Warning

When setting high-power electrical units with nominal voltages of up to 1000 V, attention must be paid to the requirements of VDE 0100 together with the associated standards and stipulations!

A main switch must be provided externally.



The main circuit of the instrument must be equipped with a fuse corresponding to the nominal voltage (over current protection); for electrical details see technical data.

To connect the device electrically, use the screw terminals on the back of the housing.

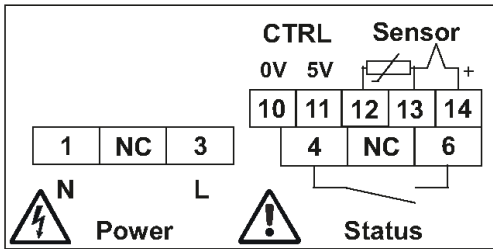


Figure 6: Electrical connections on the rear: MCU 1000

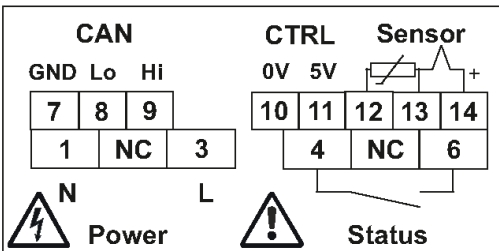


Figure 7: Electrical connections on the rear: MCU 1000 CAN



Relay

Mains voltage may be applied to the relay. The user is responsible for ensuring that the maximum current is not exceeded. By providing a fuse or an appropriately high impedance (or both).

## 18 INITIAL STARTING

The **MCU 1000** is operated via 4 buttons (OK, ESC, UP and DOWN) and a 3-digit 7-segment display. In the basic state, the display shows the current temperature in °C.

1. Connect the temperature sensor Pt100 to the terminals **12** and **13**. Connect the actuator to the control output terminals **10** and **11**.
2. Connect the mains voltage terminals identified with **L** and **N** to the supply voltage.

For starting the controller, it is necessary to make some configurations beyond those adjusted at works. For this purpose, the set point (SP) must be determined, and the temperature input must be selected. Additionally, it is possible to adjust a high and a low value for alarming. The alarm is displayed in the controller's display in case these values are increased or decreased.

### 18.1 DEVICE SECURED BY PIN

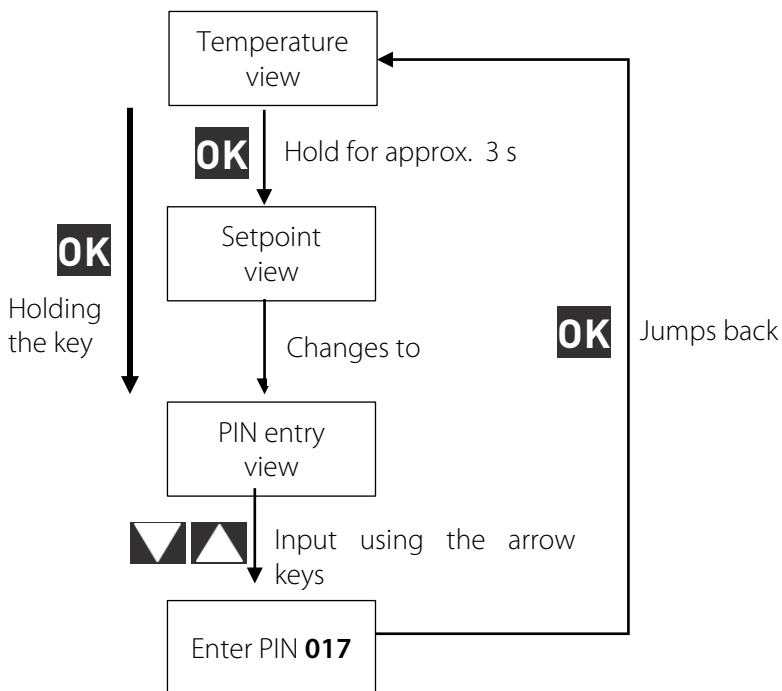
In the delivery state, the device is secured by a PIN.

The pin request appears when the OK key is held down for longer than 2-3 seconds. A flashing "000" will be displayed. This display can be adjusted between -99 and 999 with the arrow keys. To unlock the device, the display must be set to "**017**" and then confirmed with **OK**.



**Note**

Basically, all flashing displays are adjustable. Press ESC to cancel the input process.



**Figure 8: Unlock the device**

### 18.2 OPERATING THE DEVICE

In normal operation, the display shows the measured temperature (temperature view). The ESC key and the arrow keys (UP and DOWN) have no function in the temperature view. While tapping on the OK key, the adjusted setpoint is displayed. The factory setting of the setpoint is "5.00". After releasing the key, the display immediately returns to the temperature view. The setpoint is only visible when the key is touched.

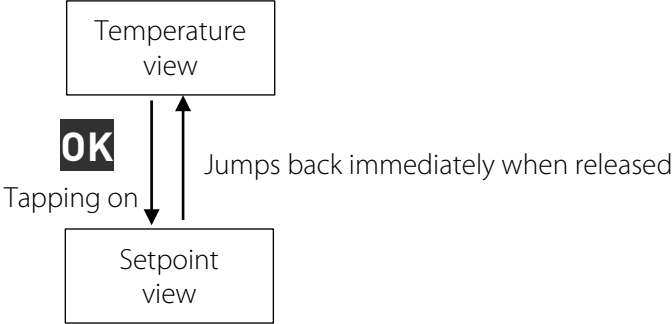


Figure 9: Setpoint view

### 18.3 CHANGING THE SETPOINT

In the unlocked state, the setpoint can be adjusted by pressing and holding the OK key in the temperature view. First the set setpoint value is displayed. After 2-3 seconds, it starts to flash.

Is the display showing a flashing "000" the device needs to be unlocked. Use the arrow keys to enter the PIN code "017" and confirm the entry with OK. The display jumps back to the temperature view.

The setpoint can be adjusted with the arrow keys while the display is flashing. With OK, the new setpoint is accepted. Press ESC to discard the current changes. In both cases, the display jumps back to the normal temperature display after actuation.

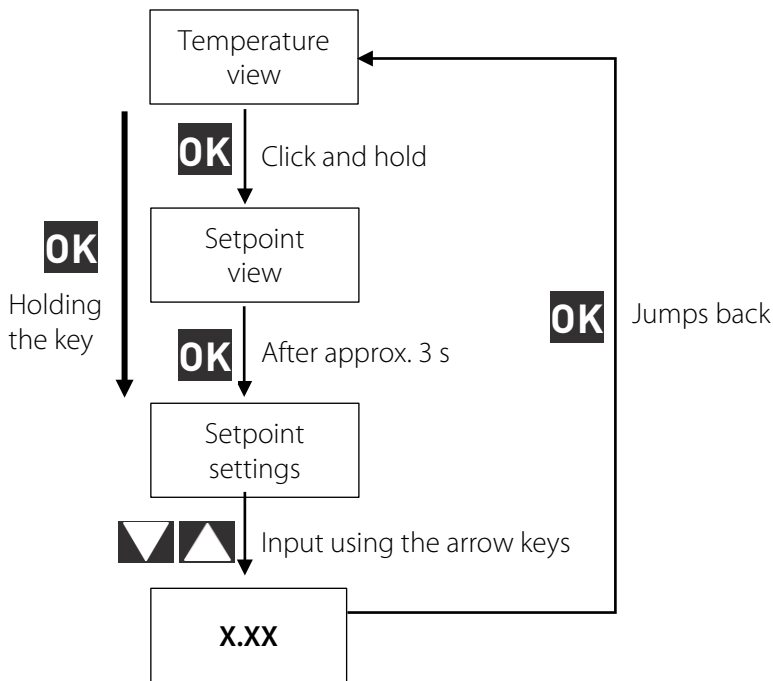


Figure 10: Setting the setpoint

### 18.4 CONFIGURATION MENU

Follow these steps to enter the configuration menu:

1. Press and hold the OK key, until the display changes to "C", followed by two digits. The digits represent the configuration code, and they are blinking.



**Note**

You will enter the setpoint setting during this procedure, please continue to hold the OK button.

2. Use the UP and DOWN keys to select a configuration code. The table below shows the possible settings and configurations.
3. Press the OK button to confirm the selection or tap on the ESC key to cancel and leave the configuration menu without selection.
4. Use the UP and DOWN keys to choose the desired value.
5. Confirm the value by pressing on the OK key.



- 6. To leave the configuration menu tap on the ESC key at any time. The display will go back to the current temperature value.

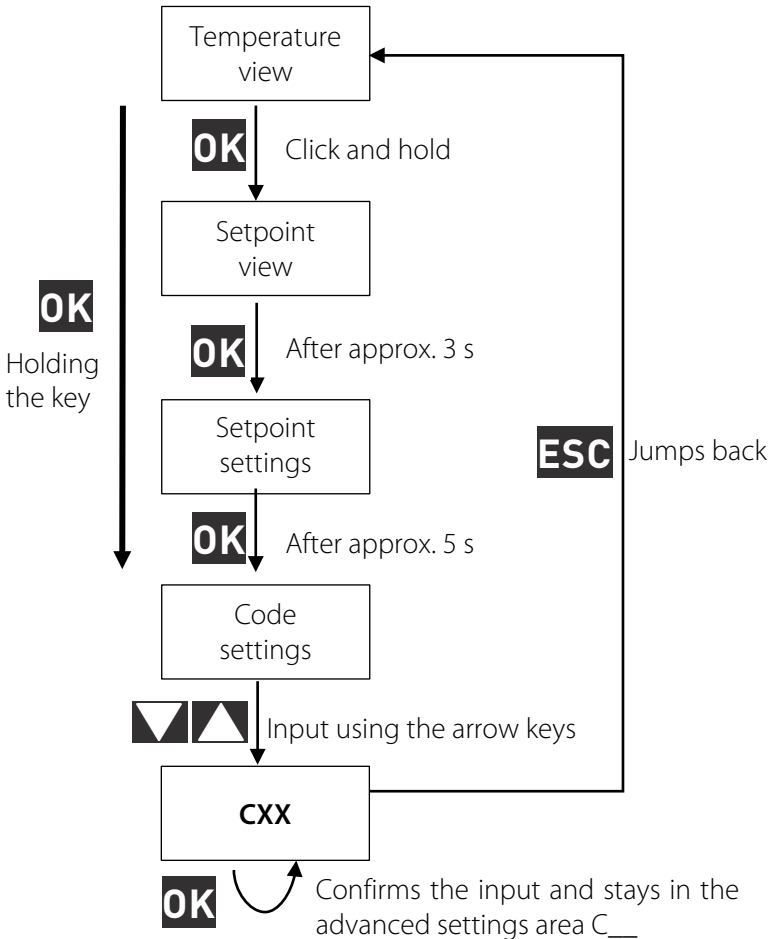


Figure 11: Access the configuration menu and set the codes



Note

Press ESC to cancel the input process. The changed values are not accepted.

No.	Description	Range	Note
C08	Activating the PIN request	Values: <b>0</b> or <b>1</b>	<b>0</b> : No PIN request <b>1</b> : PIN request activated PIN <b>017</b> must be entered to unlock the device. The PIN entry is reset approx. 5 minutes after the last button operation or after a restart.
C11	Offset correction of the temperature measurement	Min. -20 °C Max. 20 °C	To adjust the offset of the temperature measurement

No.	Description	Range	Note
C20	Temperature threshold HIGH	Min. 1 °C + (0,5 x alarm threshold hysteresis)  Max. 50 °C	<p>Interval between the setpoint temperature and the upper temperature alarm in °C.</p> <p>Temperature alarm triggers at  <math>T_{\text{MEASURED}} &gt; T_{\text{SET}} + \text{temperature threshold HIGH} + (0.5 \times \text{alarm threshold hysteresis})</math></p> <p>Temperature alarm is resolved at  <math>T_{\text{MEASURED}} &lt; T_{\text{SET}} + \text{temperature threshold HIGH} - (0.5 \times \text{alarm threshold hysteresis})</math></p> <p><b>Example:</b> setpoint 5 °C,  temperature threshold HIGH 3 °C,  alarm threshold hysteresis 2 °C,  temperature alarm triggers at temperatures above 5 °C + 3 °C + (0.5 x 2 °C) = 9 °C,  temperature alarm is resolved at temperatures below 5 °C + 3 °C - (0.5 x 2 °C) = 7 °C.</p>
C21	Temperature threshold LOW	Min. 1 °C + (0,5 x alarm threshold hysteresis)  Max. 50 °C	<p>Interval between setpoint temperature and the lower temperature alarm in °C.</p> <p>Temperature alarm triggers at  <math>T_{\text{MEASURED}} &lt; T_{\text{SET}} - \text{temperature threshold LOW} - (0.5 \times \text{alarm threshold hysteresis})</math></p> <p>Temperature alarm is resolved at  <math>T_{\text{MEASURED}} &gt; T_{\text{SET}} - \text{temperature threshold LOW} + (0.5 \times \text{alarm threshold hysteresis})</math></p> <p><b>Example:</b> setpoint 6 °C,  temperature threshold LOW 2 °C,  alarm threshold hysteresis 1 °C,  temperature alarm triggers at temperatures below 6 °C - 2 °C - (0.5 x 1 °C) = 3.5 °C,  Temperature alarm is resolved at temperatures above 6 °C - 2 °C + (0.5 x 1 °C) = 4.5 °C.</p>

No.	Description	Range	Note
C22	Alarm threshold hysteresis	Min. 1 °C Max. 50 °C	<p>Hysteresis between triggering and resolving an alarm. Applies to interval alarm - temperature threshold HIGH and alarm - temperature threshold LOW.</p> <p><b>ATTENTION:</b> If the temperature threshold HIGH and temperature threshold LOW are smaller than the minimum value dependent on the alarm threshold hysteresis, the temperature thresholds are automatically increased to the new minimum value and saved.</p> <p><b>Example:</b> set point 5 °C, temperature threshold HIGH 3 °C, alarm threshold hysteresis 2 °C, temperature alarm triggers at temperatures above <math>5\text{ °C} + 3\text{ °C} + (0.5 \times 2\text{ °C}) = 9\text{ °C}</math>, temperature alarm will be resolved at temperatures below <math>5\text{ °C} + 3\text{ °C} - (0.5 \times 2\text{ °C}) = 7\text{ °C}</math>.</p>
C23	Polarity of the alarm relay in the event of an alarm	Values: <b>0</b> or <b>1</b>	<p><b>1:</b> In the operational state, the relay is closed and conductive (default setting). In the event of an alarm, the relay opens and becomes non-conductive. The alarm state corresponds to the de-energized, switched-off state.</p> <p><b>0:</b> In the event of an alarm, the relay closes and becomes conductive. In the operational state, the relay opens and becomes non-conductive. The operational state cannot be distinguished from the switched off/defective state.</p> <p><b>ATTENTION:</b> Safety First only with the standard setting.</p>

## 18.5 FUNCTIONAL TEST

Principally, it must be checked after the initial starting whether the controller is switching according to the adjusted values and whether the determined operating temperature is reached.

The first function test has to be performed as follows:

1. Switch on the power supply.
2. After the set point temperature is being reached, the alarm status changes to OK → the red LED is extinguished.

## 19 ERROR MESSAGES

Display	Cause/remedy or instruction for action
---	Check temperature sensor. If problem persists, send back to M&C Service.

## 20 DECOMMISSIONING

No special measures are to be taken for decommissioning the equipment.

## 21 MAINTENANCE AND REPAIR

The controller **MCU 1000** is working maintenance-free for a long period of time. In case the controller is defective, please send the device to M&C TechGroup for repair.

## 22 PROPER DISPOSAL OF THE DEVICE

At the end of the service life of our products, it is important to take care of the appropriate disposal of obsolete electrical and non-electrical devices. To help protect our environment, follow the rules and regulations of your country regarding recycling and waste management.

## 23 APPENDIX



For further product documentation, please see our website:

[www.mc-techgroup.com](http://www.mc-techgroup.com)