Embracing Challenge

Electronic Temperature Controller

701
(Effective from: September 2020, Serial No. 2009143)

Instruction Manual
Version 1.03.00

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. There you can find the data sheets and manuals of our products in German and English.

With the release of this version all older manual versions will no longer be valid.
The German instruction manual is the original instruction manual. In case of arbitration only the German wording shall be valid and binding.

Version: 1.03.00

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List of Illustrations

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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

CE - Certification

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 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.

5 USED TERMS AND SIGNAL INDICATIONS

Danger

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

Warning

This means that death, severe physical injuries and/or important material damage **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 damage which might be caused by high voltages.

6 INTRODUCTION

The digital electronic temperature controller 701 from serial no. 2009143 (valid from: September 2020) is the further developed version of the previous temperature controller.
The digital electronic temperature controller **701** is used for the simple temperature control. It is designed in a compact construction and is suitable for mounting on top hat rails. Dimensions (H x W) are 90 x 22.5 mm [≈ 3.5" x 0.9"].

7 APPLICATION

The electronic temperature controller **701** is especially suitable for the regulation of electrically heated **M&C** sample lines series **3/4/5-N/M/H** and **PSP-4M (-W)** with a contact rating of up to 10 A. Equally, it can be used for regulation of the heating or cooling of other devices.

8 TECHNICAL DATA

Temperature Controller Type	**701** 230 V	**701** 115 V
Part No.	**01B8240**	**01B8240a**
Temperature control range	Adjustable in the range of -200 to +600 °C [-328 to +1112 °F], adjusted at works to 0 to +200 °C [32 to 392 °F]	
Contact rating	250 V AC/10 A ohmic resistance, change-over contact	
Kind of regulation	Two-step regulator	
Temperature sensor input	PT100 DIN; 2-conductors with identification of sensor short-circuit/break protection	
Ambient temperature	0 to +55 °C [32 to 131 °F], in case of close-to-close mounting 0 to +40 °C [32 to 104 °F]	
Storage temperature	-40 to +70 °C [-40 to 158 °F]	
Switching hysteresis	Adjusted at works to 5 °C [41 °F]	
Accuracy of control	PT100: ≤ ±0.25 % from final value of measuring range Thermocouple: ≤ ±1 % from final value of measuring range	
Electrical connection	Terminals 2.5 mm^2	
Mains voltage*/Power consumption	230 V, +10/-15 %, 48-63 Hz 2 VA	115 V, +10/-15 %, 48-63 Hz 2 VA
Mounting type	Rail mount housing, top hat rail sizing: 35 x 7.5 mm [≈ 1.4" x 0.3"] according to DIN IEC 60715	
Housing protection	IP 20 EN60529	
Housing material	Polycarbonate	
Dimensions (H x W x D)	90 x 22.5 x 62 mm [≈ 3.5" x 0.9" x 2.4"]	
Weight	110 g [≈ 0.24 lb]	
Site altitude	Maximum 2000 m [≈ 6561.7 ft] above sea level	
Mounting position	Vertical, close mounting permitted	
Climate resistance	≤ 85 % rel. humidity annual average without condensation	
Electrical safety	DIN EN 61010 Part 1 over voltage category III, contamination degree 2	
Electromagnetic compatibility	DIN EN 61326-1, DIN EN 50121-1/50121-3-2	
Interferences	Class B	
Resistance to jamming	Industrial requirement	
Indications	Dot-Matrix-LCD display with 64 x 80 pixels	

* Galvanic separation to the measuring input

9 DESCRIPTION

The two-step electronic temperature controller **701** has a temperature sensor input for PT100 sensors in two-wire-technique. The temperature controller is equipped with a short-circuit and sensor break protection. The desired temperature is selectable via keys. The actual value and the target value are displayed on a dot-matrix LCD. The LCD display is black and white with backlight and 64 x 80 pixel resolution.

The control function is indicated by a "K1" in the upper left display area. Switching hysteresis, alarm limit values, zero point correction and various other parameters can be set via program functions.

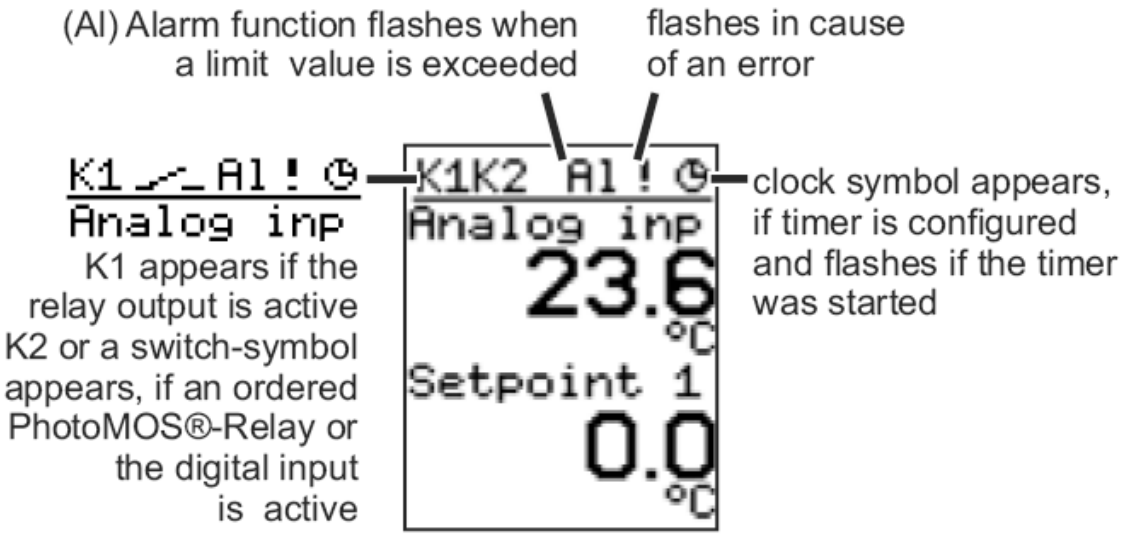
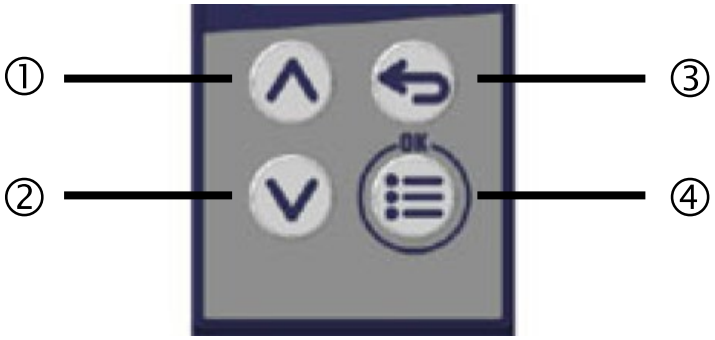


Figure 1 LCD display description



① Increase value/previous menu item

② Decrease value/next menu item

③ Back/cancel change (special function quick return or press and hold key for longer)

④ One level down in the menu/confirm change

Figure 2 Keys description

10 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.

Note

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

10.1 PRODUCT LABEL AND SERIAL NUMBER

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

11 INSTALLATION INSTRUCTIONS AND DIMENSIONS

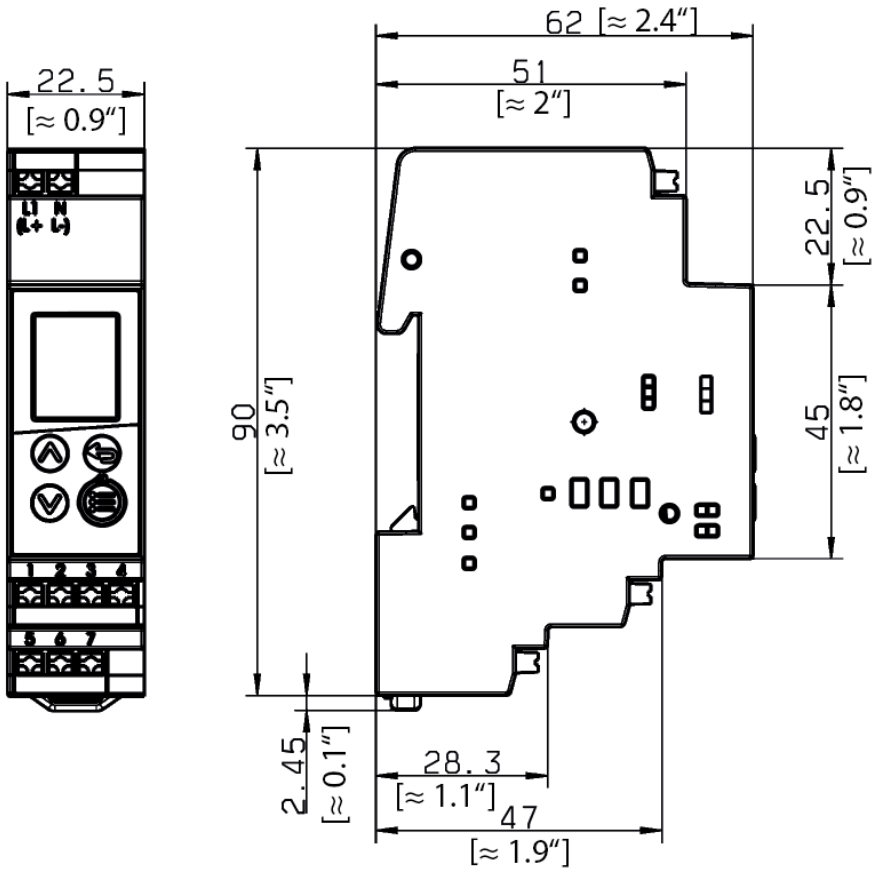


Figure 3 Dimensions and indication of the connection terminals

The controller is designed for mounting on a top hat rail according to DIN IEC 60715.

Maintain the minimum distance of 20 mm [≈ 0.8"] above and below the controller.

1. So that the release slot can be accessed with a screwdriver from the bottom.
2. So that when dismounting, the device can be swiveled upwards and removed from the DIN rail.

Several devices can be mounted right next to each other without a minimum distance.

12 ELECTRICAL CONNECTIONS

The temperature controller **701** can be delivered with a mains voltage of 230 V 48/63 Hz or 115 V 48/63 Hz.

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.

The electrical connection is to be made on the terminal screws on the front side of the housing (see Figure 3).

Warning

The nominal capacity of the connected heated line must not exceed 2300 Watt.

1. Connect the temperature sensor PT100 to the terminals **1** and **2**.

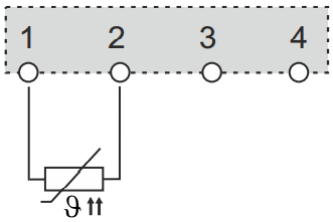


Figure 4 PT100 connection

If a thermocouple is used, terminals **1** and **2** are connected as shown in Figure 5.

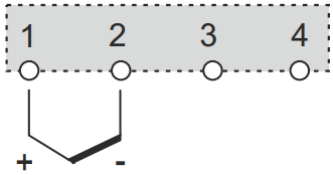


Figure 5 Thermocouple connection

2. Connect the mains voltage terminals identified with **L1** and **N** to the supply voltage being sufficiently protected by fuse.

3. Connect the switching contact for ON/OFF for the consumer to the terminals **5**/**6**/**7** with the functions **NO** (normally open) / **NC** (normally closed) / **COM** (potential).

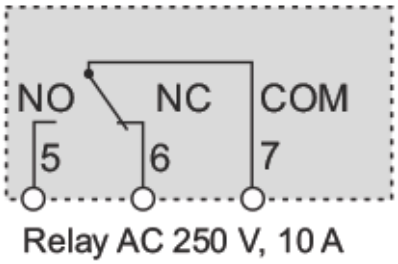


Figure 6 Relay output K1 (zero-current state)

4. Optionally, a multipole coupling socket can be mounted externally that will be wired with the temperature controller according to the pin connection plan (see Figure 6). This enables you to make a simple, easy servicing connection between the heated sample lines **3/4/5-N/M/H** or **PSP-4M (-W)** by means of the multipole coupling connector (standard equipment of the heated sample lines) with the temperature controller.

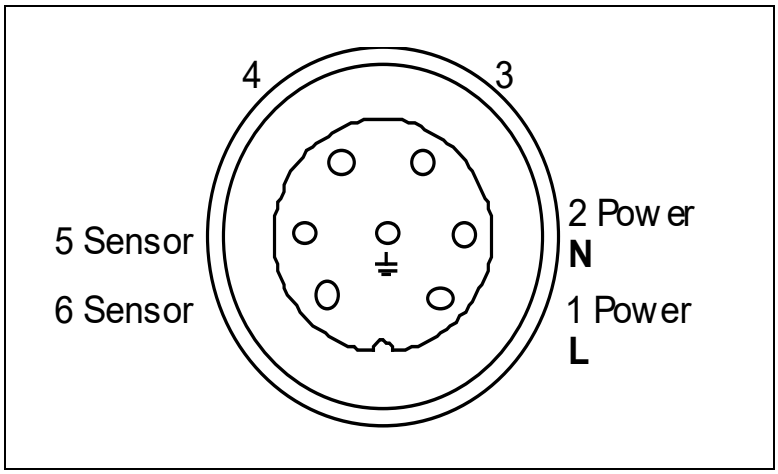


Figure 7 Pin assignment of the heated lines 3/4/5-N/M/H or PSP-4M (-W)

13 SIGNAL TYPES PT100 AND THERMOCOUPLE

The 701 can be connected to signal type PT100 or thermocouple. As standard, the 701 is linearized for a PT100 (factory setting). If you are using a thermocouple, the temperature controller needs to be linearized to the chosen thermocouple type L, J or K.

13.1 LINEARIZATION TO SIGNAL TYPES THERMOCOUPLE L, J OR K

To linearize the 701 to signal type thermocouple follow these steps:

1. Press the menu-button to enter the “User level”.

2. With the “down” arrow -button go one step down to “Configuration”.
3. Press the menu-button to reach the “Configuration”-menu.
4. With the “down” arrow -button go two steps down to menu-item “Analog input”.
5. Press the menu-button again to go to measurement input group 2 (Signal type, thermocouple). Here you can choose between thermocouple types L, J or K.

Linearization	Comment	Measuring range
Fe-CuNi „L“	DIN 43710:1985-12	-200 bis + 900 °C [-328 to 1652 °F]
Fe-CuNi „J“	DIN EN 60584-1:2014	-210 bis +1200 °C [-346 to 2192 °F]
Fe-CuNi „K“	DIN EN 60584-1:2014	-270 bis +1300 °C [-454 to 2372 °F]

6. Select your thermocouple type and confirm your selection by pressing the menu-button.

14 INITIAL STARTING

The thermostat function ➔ Function ➔ Heating is set at the factory.

Note

Relay output K1 is initially inactive at the factory setpoint of 0 °C [32 °F].
Relay output K1 is inactive because the factory setpoint has already been reached or exceeded at a room temperature of 20 °C [68 °F].

For commissioning, the controller must first be configured beyond the factory settings.
For this purpose, the setpoint must be defined and the switching differential must be set. In addition, an upper and lower alarm value can be set. The alarm is indicated in the controller display when these values are exceeded or undershot.

To set the setpoint or the switching differential, proceed as follows (for an overview, see Figure 8)

1. Press the menu key to enter the "User level".
2. Press the down arrow key once to select the "Configuration" entry.
3. Press the menu key to enter the "Configuration" menu.
4. Press the down arrow key to select the "Setpoint 1" or "Switching differential" menu item.
5. Press the menu key again to enter the setpoint or the switching differential.

14.1 OVERVIEW

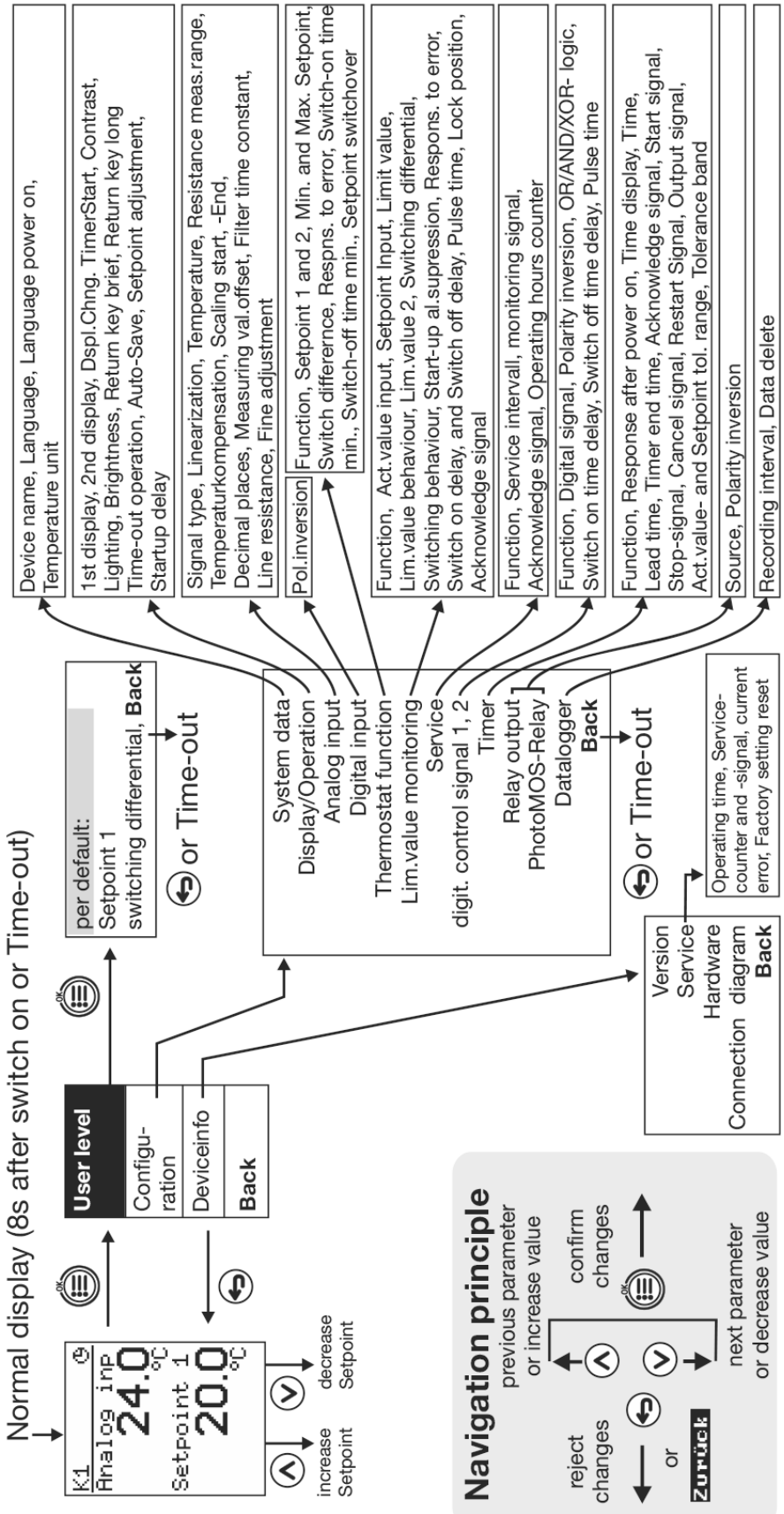


Figure 8 Overview of settings and functions

14.2 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 effected as follows:

1. Switch on the power supply.
2. After the set point temperature is being reached, the controller cuts the heater off ➔ the "K1" indicator in the display is turned off.

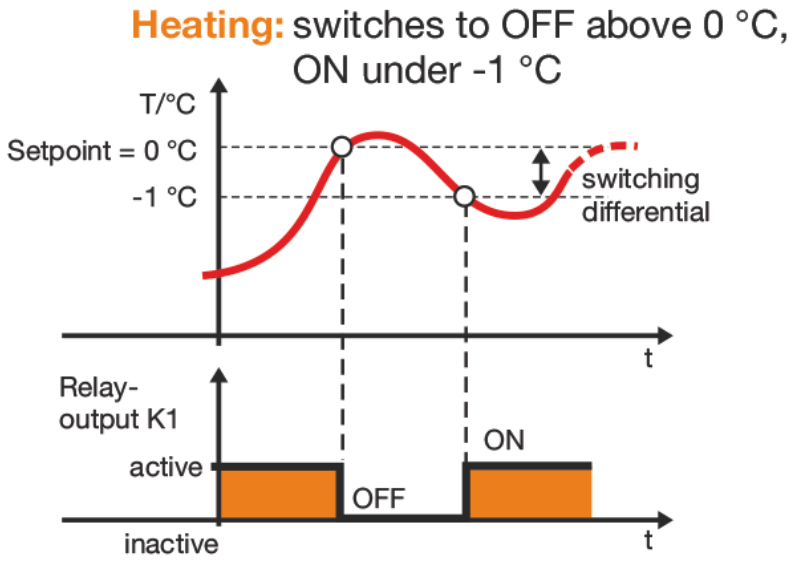


Figure 9 Device function test with setpoint value of 0 °C [32 °F] (example)

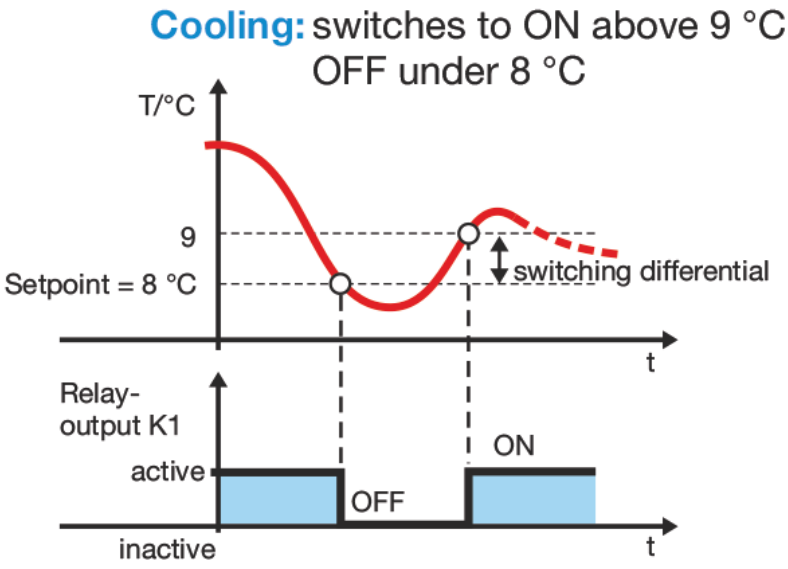


Figure 10 Device function test with setpoint value of 8 °C [46.4 °F] (example)

15 ERROR MESSAGES

Display	Cause/remedy or instruction for action
Device not calibrated	Instruction for action: send the device back to M&C TechGroup.
Measured value	The message cannot be acknowledged until it is within the admissible range again.
USB communication	Instruction for action: restart device. If the error message occurs again, send the device back to M&C TechGroup.
EEPROM	Instruction for action: restart device. If the error message occurs again, send the device back to M&C TechGroup.

16 MEASURED VALUE RECORDING

Display	Cause/remedy or instruction for action
<<<<	Under range/check sensor configuration, check measuring chain
>>>>	Over range/check sensor configuration, check measuring chain
- - - -	Value incorrectly configured (display 1: no selection set). Value invalid, division by zero, probe short circuit or probe break Instruction for action: restart device, otherwise return device
+ + + +	Error when recording the terminal temperature or with compensation signal Instruction for action: restart device, otherwise return device
* * * *	Value cannot be displayed, display overrun Instruction for action: restart device, otherwise return device

17 DECOMMISSIONING

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

18 MAINTENANCE AND REPAIR

The controller **701** 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.

Note

The controller is equipped with a sensor break protection that in case of need cuts off the unit as long as the defective sensor has not been exchanged.

19 PROPER DISPOSAL OF THE DEVICE

At the end of the life cycle 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, please follow the rules and regulations of your country regarding recycling and waste management.

20 APPENDIX

For further product documentation, please see our website:
www.mc-techgroup.com