

# Electronic Temperature Controller

## TRD H1, TRD H3

Instruction Manual  
Version 1.02.01



**Dear Customer,**

Thank you for buying our product. In this instruction manual you will find all necessary information about this M&C product. The information in the instruction 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 manual.

For additional information about our products and our company, please go to M&C's website [www.mc-techgroup.com](http://www.mc-techgroup.com). There you will 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.

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Version: 1.02.01

## Contents

<b>1</b>	<b>General information</b>	<b>4</b>
<b>2</b>	<b>Declaration of conformity</b>	<b>4</b>
<b>3</b>	<b>Safety instructions</b>	<b>5</b>
<b>4</b>	<b>Warranty</b>	<b>6</b>
<b>5</b>	<b>Warning signs and definitions</b>	<b>7</b>
<b>6</b>	<b>Application</b>	<b>8</b>
<b>7</b>	<b>Technical data</b>	<b>8</b>
<b>8</b>	<b>Description</b>	<b>9</b>
<b>9</b>	<b>Description of the Controller Functions</b>	<b>10</b>
<b>10</b>	<b>Operation</b>	<b>11</b>
10.1	Changing parameters	11
10.2	protection against unauthorized access	11
10.3	Automatic scrolling	11
10.4	Error messages	12
<b>11</b>	<b>Programming the temperature controller</b>	<b>12</b>
11.1	Releasing relay mode	13
11.2	Alarm relay mode	13
<b>12</b>	<b>Receiving and storing</b>	<b>13</b>
<b>13</b>	<b>Installation instructions and dimensions</b>	<b>14</b>
<b>14</b>	<b>Electrical connections</b>	<b>17</b>
<b>15</b>	<b>start-up</b>	<b>19</b>
<b>16</b>	<b>Closing down</b>	<b>19</b>
<b>17</b>	<b>Maintenance and repair</b>	<b>19</b>
<b>18</b>	<b>Appendix</b>	<b>19</b>

## List of Illustrations

Figure 1	User interface of the temperature controller	10
Figure 2	Dimensions TRD-H1	14
Figure 3	Dimensions TRD-H3	15
Figure 4	Connector pin assignment : TRD-H1 and TRD-H3	18
Figure 5	Connector pin assignment for TRD-H1 with option 03 B 7099	18

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## 1 GENERAL INFORMATION

The product described in this 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 manual need to be followed. This 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:

### EMV-Instruction

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 directions and instructions regarding installation, commissioning and operation of the device:**

- Read this manual before commissioning and operating the product. Make sure to follow all safety instructions.
- Installation and commissioning of electrical devices must be carried out only by qualified skilled personnel in compliance with the current regulations.
- The installation and commissioning of the device must conform to the requirements of VDE 0100 (IEC 364) 'Regulations on the Installation of Power Circuits with Nominal Voltages below 1000V' and must be in compliance with all relevant regulations and standards.
- Before connecting the device, make sure to compare the supply voltage with the specified voltage on the product label.
- Protection against touching dangerously high electrical voltages: Disconnect the power supply before opening the device for access. The device must be switched off and voltage free. Make sure that all external power supplies are disconnected.
- Operate the device only in the permitted temperature range. For details please refer to the technical data sheet or manual.
- Make sure that you install the device in a weather-protected location. The device should not be exposed to either direct sun, rain or moisture.
- Do not use the device in hazardous areas.
- Installation, maintenance, inspections and any repairs of the devices must be carried out only by qualified skilled personnel in compliance with the current regulations.



## 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 WARNING SIGNS AND DEFINITIONS



**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.

**ATTENTION!**

This means that an unintentional situation or an unintentional status may occur in case the respective note is not respected.



**NOTE!**

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

**SKILLED STAFF**

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.

## 6 APPLICATION

The **TRD...** series are ready-to-plug-in devices. The on – off temperature controller are especially suitable for controlling electrically heated sample lines of the **3/4/5-N/H/M** series.

## 7 TECHNICAL DATA

Temperature controller	TRD H1	TRD H3
Part-No.	03B7100	03B7110
Operating voltage	<b>90...260 VAC, 50/60 Hz</b>	
Power consumption	<b>max. 5 W</b>	
Switching capacity Relay K1	<b>10 A</b>	<b>20 A</b>
Adjustable temperature range	0 to +390 °C [32 to 734 °F] (adjustable)	
Display range / Resolution	-50 to +400 °C [-58 to 752 °F]	
Accuracy	± 1K, ± 2 Digits (-50..400°C [-58 to 752 °F])	
Display indicator	LED, red, 11 mm	
Controller type	On -off controller	
Alarm relay K2	8 A / max. 250 V AC	
Temperature sensor input	PT100 DIN; 2-wires	
Ambient temperature	-25 to +55 °C [-13 to 131 °F]	
Storage temperature	-30 to +60 °C [-22 to 140 °F]	
Electrical connections	2.5 m [≈ 8.2 ft] connection cable with 1.5 mm <sup>2</sup> cross section, power plug	2.5 m [≈ 8.2 ft] connection cable with 2.5 mm <sup>2</sup> cross section, <u>no</u> power plug
Plug for heated gas sample line	7-pin socket: switching power supply voltage and PT100-Sensor	5-pin socket: switching power supply voltage and PT100-Sensor
Housing type / Electrical standard	Wall mount housing / IP 65 EN60529	
Housing material	Polycarbonate (PC)	
Dimensions	See Fig. 1	
Weight	1.2 kg [≈ 2.65 lbs]	
Option	Part-No. 03B7099 power supply of the portable gas sample probe	



## 8 DESCRIPTION

The on - off electronic temperature controller of the TRD... series is mounted inside a wall-mount housing. The multi-pin plug of the heated sample line, which includes wires for the PT100 sensor and the power cable, can simply be plugged into the multi-pin socket inside the controller housing.

The temperature controller is available in two different versions: The **TRD-H1** standard controller with 7-pin socket and connection cable with power plug, can be used for currents up to 10 A. The **TRD-H3** version with 5-pin socket and connection cable without power plug, can be used for heater currents up to 20 A. The temperature sensor input is especially designed for connecting the PT-100 sensor.

The switching element of the heater current circuit is a hybrid relay, which uses a solid-state relay parallel connected to an electro-mechanical relay. When the hybrid relay is turned on, the solid-state relay starts switching and closes the path first. When the heater current is established, the electro-mechanical relay energizes and the contact closes to make a parallel path. Since the solid-state relay is handling the load in parallel, the electro-mechanical relay energizes without voltage across the output contacts. There is no electrical arcing on the contacts. Because the solid-state relay is bypassed by the electro-mechanical relay during normal operation, there is little or no heat build-up inside the relay.

There is also a second electro-mechanical relay in parallel with the hybrid relay to interrupt the heater current in case of failure of the hybrid relay.

## 9 DESCRIPTION OF THE CONTROLLER FUNCTIONS

When the current temperature (P01) falls below the set temperature (P10 minus hysteresis P11), the load relay (hybrid relay) turns the heater on.

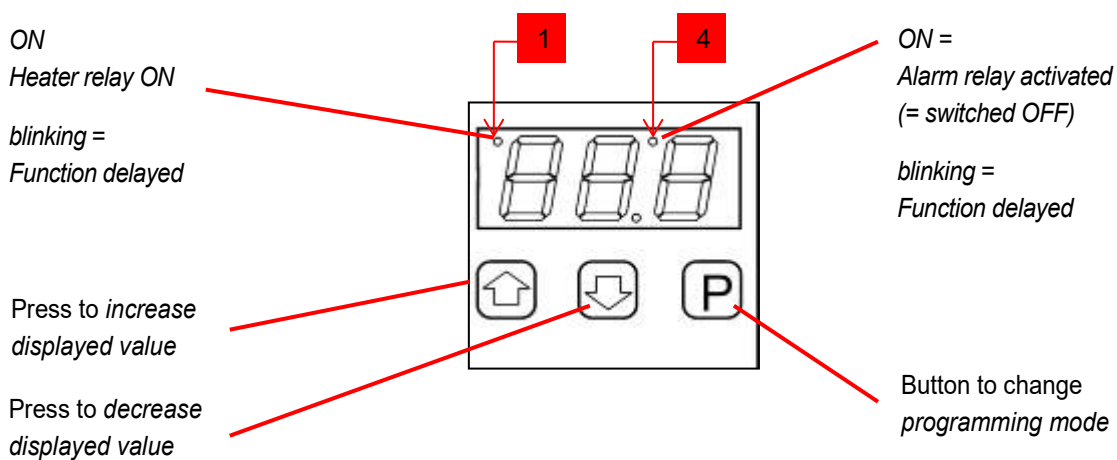
The integrated alarm relay provides error messaging (via SPDT contact) to indicate over-/ under temperature, sensor-interruption or sensor-short circuits.



**HINWEIS!**

**To connect the alarm relay, remove the plug on the right-hand side of the temperature controller, and implement a cable gland size M20.**

If there is a sensor malfunction, the control relay switches the heater line continuously on or off, depending on the configuration of the temperature controller.



**Figure 1** User interface of the temperature controller

## 10 OPERATION

The operation of the temperature controller is very easy. After power-on, the model number of the controller appears (C14) on the display. After approximately 3 seconds; the display shows the actual measured temperature. If you press the 'P' button, the display changes to 'Set' and shows the set temperature value. After approximately 5 seconds the display jumps back to the current temperature. Press the 'P' button for 3 seconds, and the parameter list 'P10' opens. If you press the 'P' button for another 3 seconds, the display shows 'dC' for degree Celsius or 'dF' for degree Fahrenheit.

### 10.1 CHANGING PARAMETERS

Note that only the setpoint can be adjusted within the limits P13 and P14 (largest and smallest adjustable setpoint). For all other changes, a password must be entered (see chapter 10.2).

When commissioning for the first time, it is essential to observe chapter 15.

To access the parameter list, please press the 'P' button for approximately 3 seconds until 'P10' appears.

- Press 'P' for 3 sec  
parameter No. appears
- Press '▲' or '▼' button  
select parameter
- Press P again  
shows parameter value
- Press '▲' or '▼' button  
change parameter value
- Press P again  
new value is saved,  
back to parameter No.
- Press P again until 'P1' appears or T>1 Min.

Exit settings menu

### 10.2 PROTECTION AGAINST UNAUTHORIZED ACCESS

The temperature set value can be changed at any time within the limits which are set by P13 and P14. All other parameters are code protected. If a code is required, the display will indicate 'C00'. Using the arrow keys, enter the appropriate code number (C42). Confirm the code entry by pressing the 'P' button.

If you do not press any key for approximately 1 minute, the access code will be cancelled.

### 10.3 AUTOMATIC SCROLLING

The values scroll automatically, if you hold the ,▲ / ▼'-keys.

## 10.4 ERROR MESSAGES

If an error occurs, the display shows an error code. A sensor error will be displayed with a 20 sec. delay.

### Error Codes

E01	Sensor short circuit or temperature < -60 °C
E02	Sensor interrupted or temperature > 410 °C
E03	Sensor 3rd wire missing/not connected or R >= 10 Ω
C00	protected parameters, code entry required
E07	Error hybrid relay open
E08	Error hybrid relay short circuit
E09	Internal error

Error codes E07...E09 prohibit further operation of the controller.

## 11 PROGRAMMING THE TEMPERATURE CONTROLLER

After power-on, the model number of the controller appears (C14) on the display. After approximately 3 seconds; the display shows the actual measured temperature. If you press the 'P' button, the display changes to 'Set' and shows the set temperature value. After approximately 5 seconds the display jumps back to the current temperature. Press the 'P' button for 3 seconds, and the parameter list 'P10' opens. If you press the 'P' button for another 3 seconds, the display shows 'dC' for degree Celsius or 'dF' for degree Fahrenheit.



**NOTE!**

The following table shows the default values in square brackets [xx].

### Parameters and their descriptions:

P01	Actual sensor temperature in °C	Display only
P10	Control set value	Affects relay 1, range P13...P14, [5 °C]
P11	Switching hysteresis of P10	Range 2...10 K, [2 K]
P12	Min. relay idle time (relay K1)	0..30.0 min., [0.0 min, resolution 0.1 min.]
P13	Highest adjustable set value	Range P14..+390 °C, [+100 °C]
P14	Lowest adjustable set value	Range -50 °C...P13, [0 °C]
P20	Sensor type is disabled	0 = PT100, 3-wire, °C (resolution 1 K) M&C cables are always equipped with a 2-wire PT100
	Sensor type	[1] = PT100, 2-wire, °C (resolution 1 K)
	Sensor type is disabled	2 = PT100, 3-wire, °F (resolution 2 °F) M&C cables are always equipped with a 2-wire PT100
	Sensor type	3 = PT100, 2-wire, °F (resolution 2 °F)
P21	Sensor correction	-30...+10 K, [0]
P30	High temp. alarm threshold	P31...400 °C, [400 °C]
P31	Low temp. alarm threshold	-60...P30, [-60 °C]
P32	Alarm delay during operation	0...99 min., [0.0 min., resolution 0.1 min.]
P33	Alarm delay while unit powers-on	0...500 min., [0 min.]
P34	Alarm relay mode (relay K2)	0 = Relay ON at sensor error
	Alarm relay mode (relay K2)	[1] = Relay OFF at sensor error
	Alarm relay mode (relay K2)	2 = Relay works as releasing relay

## 11.1 RELEASING RELAY MODE

In this operating mode the (P34=2) relay K2 switches independently from P32 and P33, once the actual value falls within the threshold set points of P30 and P31.

## 11.2 ALARM RELAY MODE

P34 = 0 or 1) : If, after initial power on, the actual temperature falls below P31, P33 will be used once as an alarm delay parameter to provide additional time for warm-up. In normal operating conditions, P32 is used as an alarm delay parameter.



**NOTE!**

**If you need to extend the sensor cables, use a shielded cable type with one end of the shield connected to a ground terminal near the controller. Don't install the cable parallel to cables carrying mains voltage. The total cable resistance should not exceed 10 ohms. After switching-on the power, the controller displays the actual sensor temperature.**

## 12 RECEIVING AND STORING

- Please remove the temperature controller carefully from the packaging. Check the scope of the delivery specified on the delivery note. Please make sure that you have received all items stated on the delivery note.
- Please check the unit for any transport damages after receipt and report any complaints to the transport company immediately.



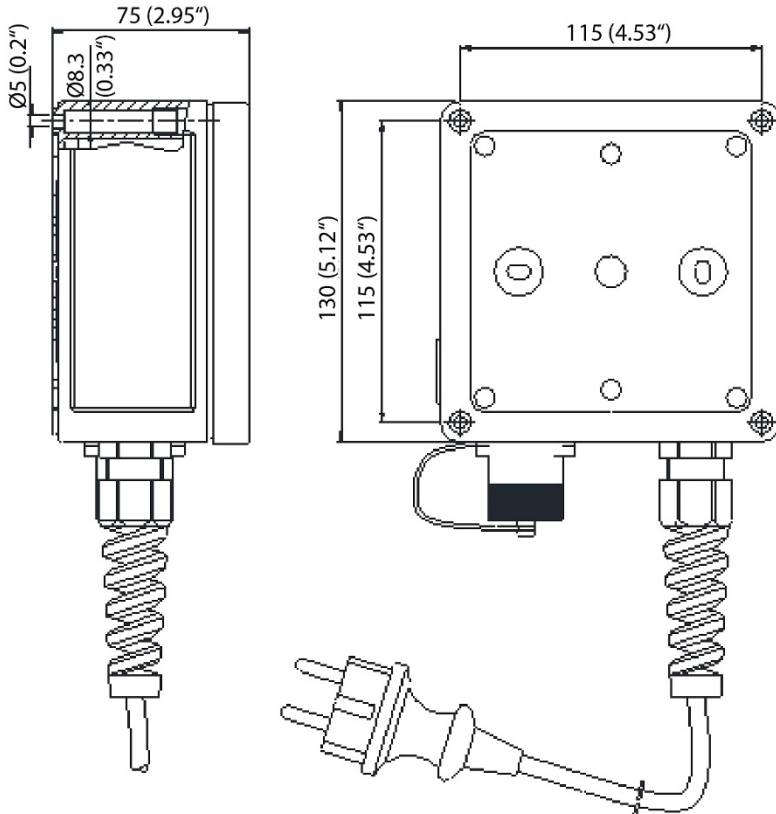
**NOTE!**

**The controller needs to be stored in a weather-protected and frost-free area!**

### 13 INSTALLATION INSTRUCTIONS AND DIMENSIONS

Modell	Electrical connections
TRD H1	Panel jack 7-pin (10 A), Connection cable with a 3-pin plug (CEE 7/7 plug).

#### Dimensions



#### Electrical connections

##### 7-polig/7-pole

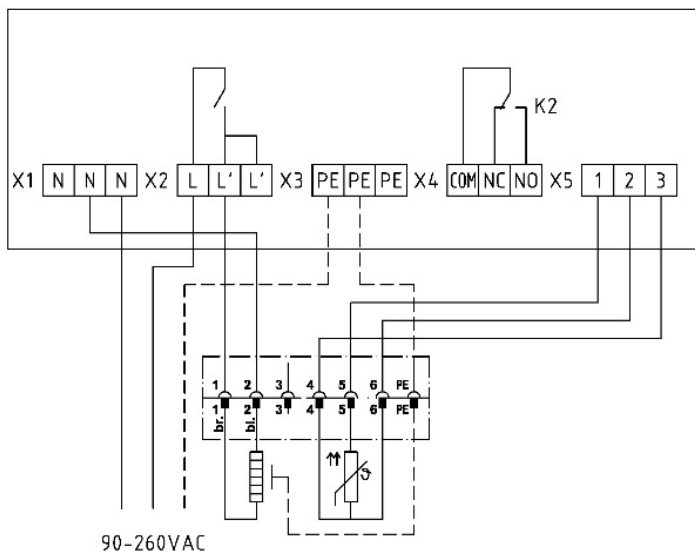
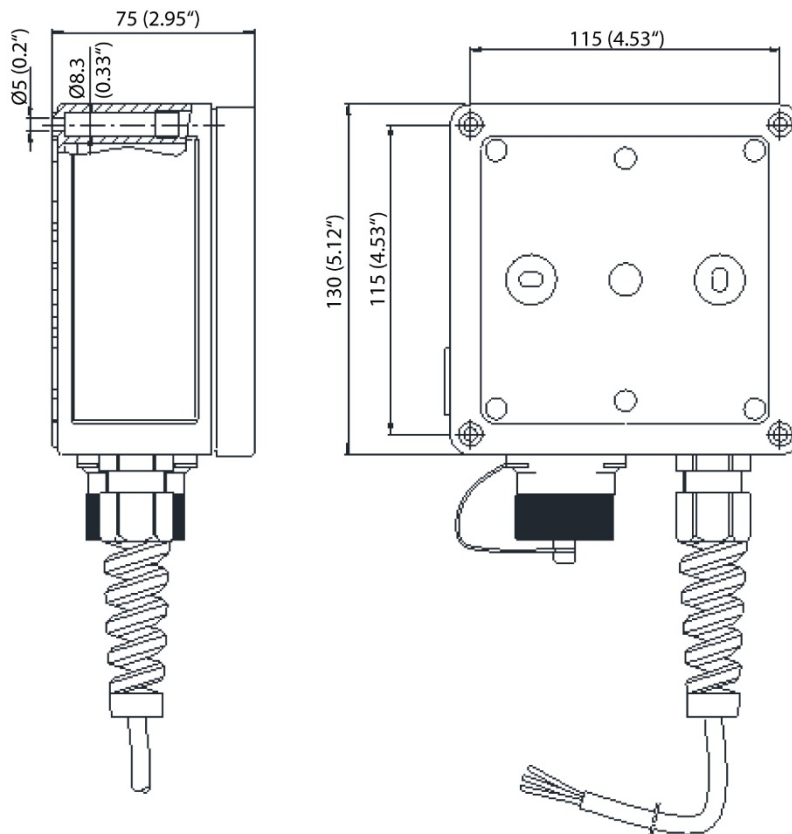


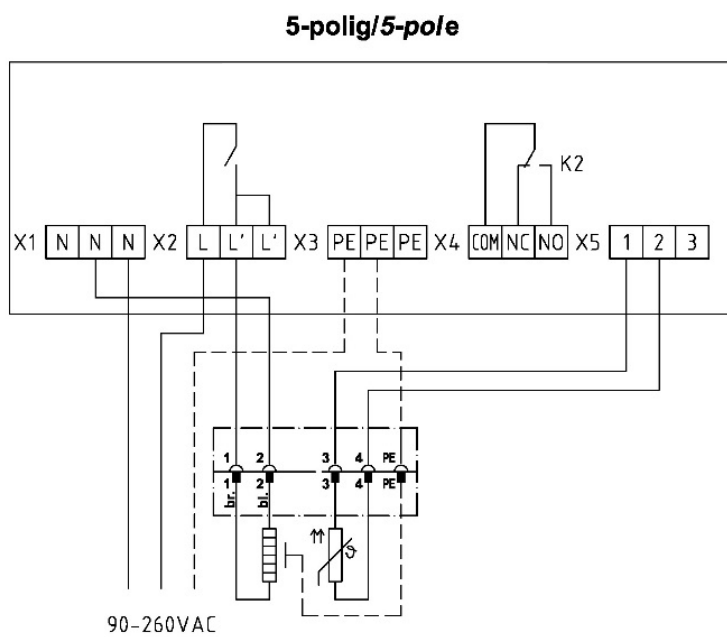
Figure 2 Dimensions TRD-H1

Modell	Electrical connections
TRD H3	Panel jack 5-pin (20 A), connection cable without plug

**Dimensions**



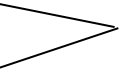
**Electrical connections**



**Figure 3** Dimensions TRD-H3

## Electrical connecting terminals:

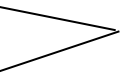
**X1.1**  
**X1.2**  
**X1.3**



Common neutral terminal (N)

**X2.1**            **AC** supply voltage input (L)  
**X2.2**            Connection heating cable A  
**X2.3**            Connection heating cable B

**X3.1**  
**X3.2**  
**X3.3**



Common ground protection terminal (PE)

**X4.1**            Alarm relay COM  
**X4.2**            Alarm relay NC  
**X4.3**            Alarm relay NO

**X5.1**            Connecting terminal PT100 sensor  
**X5.2**            Connecting terminal PT100 sensor  
**X5.3**            Connecting terminal PT100 sensor 3-wire compensation => not required for 2-wire sensor



## 14 ELECTRICAL CONNECTIONS



**WARNING!**

Incorrect voltage may damage the device.

When connecting the equipment, make sure that the supply voltage is identical with the information provided on the product plate.



**WARNING!**

The installation and commissioning of the device must conform to the requirements of VDE 0100 (IEC 364) 'Regulations on the Installation of Power Circuits with Nominal Voltages below 1000 V' and must be in compliance with all relevant regulations and standards.

An external main switch must be provided to switch off the main power supply.

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.



**WARNING!**

Do not exceed the rated power of 2.3 KW for TRD-H1 and 4.6 KW for TRD-H3.

Before start-up, adjust the temperature controller to the corresponding temperature of the heated sample gas line.

**P10 Controller set value**

**CAUTION!**

For safety reasons, the parameter P13, the upper limit of the controller set value, also needs to be adjusted to the used heated sample gas line.

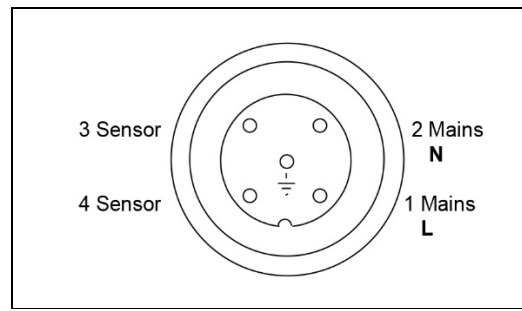
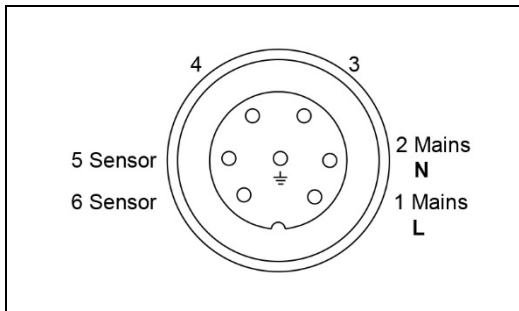
Heated sample gas line type N max. 100 °C [212 °F]

Heated sample gas line type M max. 200 °C [392 °F]

Heated sample gas line type H max. 250 °C. [482 °F]

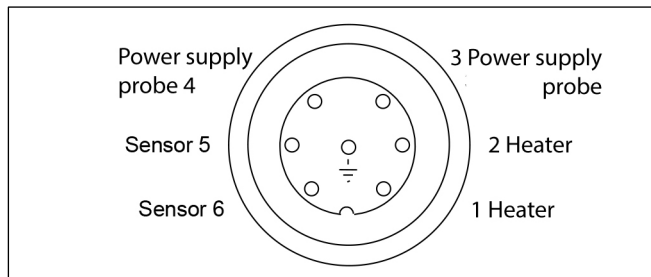
Temperature controllers **TRD-H1**  
with 7-pin coupling socket 10 A

Temperature controllers **TRD-H3**  
with 5-pin coupling socket 20 A



**Figure 4 Connector pin assignment : TRD-H1 and TRD-H3**

Option 03B7099 “power supply for portable gas sample probe PSP 4000” is only available for temperature controller TRD H1 with 7-pin coupling socket.



**Figure 5 Connector pin assignment for TRD-H1 with option 03B7099**

## 15 START-UP

Before start-up, adjust the temperature controller to the corresponding temperature of the heated sample gas line.

P10 Controller set value

### CAUTION!

For safety reasons, the parameter P13, the upper limit of the controller set value, also needs to be adjusted to the used heated sample gas line.

Heated sample gas line type N max. 100 °C [212 °F]

Heated sample gas line type M max. 200 °C [392 °F]

Heated sample gas line type H max. 250 °C. [482 °F]

Only use the temperature controller with a PT-100 sensor.

The **TRD..** series temperature controller are easy to mount and immediately ready to use:

- Connect electrical consumer with the multi-pin plug at the controllers coupling socket. See diagram 2.
- The **TRD-H1** [10 A] temperature controller has a 2.5 m long connecting cable with a 1.5 mm<sup>2</sup> cross section, and a CEE 7/7 plug, which needs to be connected to an adequately protected socket outlet.
- The **TRD-H3** [20 A] temperature controller has a 2.5 m long connecting cable with a 2.5 mm<sup>2</sup> cross section, which needs to be connected to an adequately protected power supply.

See chapter '9 Description of the Controller Functions' for programming the temperature controller.

After start-up, check if the controller switches at the temperature set values, and if the device reaches the set operating temperature.

## 16 CLOSING DOWN

There are no special measures required to close down the device.

## 17 MAINTENANCE AND REPAIR

The **TRD...** temperature controller operates maintenance-free for a long period of time.

In case of controller failure, please send the device to **M&C** for repair.



**NOTE!**

**The controller is equipped with a sensor breakage protection. This protection will shut down the system permanently, in case of a sensor failure. The system can only be re-started, when the defective sensor is replaced.**

## 18 APPENDIX



Further product documentation can be seen and downloaded from our home page:  
[www.mc-techgroup.com](http://www.mc-techgroup.com)