Installation and Operating Instructions for Temperature Controller MTR 1000

Introduction

The microprocessor-based controller MTR 1000 is used for thermostatic temperature control. For this purpose, it has an input for a Pt 100 temperature sensor.
The supply voltage for the controller is 230 V AC. The controller has a changeover contact as its output.

Description

By setting the appropriate parameters, the controller can be programmed to execute many different functions.
The controller is programmed in three levels with the aid of the buttons on its front panel. Access to parameters which affect the safety of the system is deliberately made difficult.
The first level permits access only to the setpoint and the alarm acknowledgement.
All regulation parameters (P2 - P32) can be set in the second level.
The third level permits programming of the basic functions (A1 - A82) of the controller.

△	UP button (red arrow)	
▽	Down button (blue arrow)	This button is used to acknowledge an alarm.
SET	SET button	Pressing this button displays the set value. If the button is not depressed, the actual value is displayed.

Settings

First operating level

Displaying and adjusting the setpoint
The setpoint S1 can be displayed by simply pressing the SET button.
With the Set button held down, the setpoint can be adjusted with the UP and DOWN buttons.
By setting the appropriate parameters (see A81), the switching input E1 can be used to change the setpoint ("night reduction" function).
If this is done, the modified setpoint S1' is used when the switching input E1 is closed. Pressing the SET button then displays the setpoint S1'.
S1' may be defined as an absolute setpoint (factory setting) or as an offset from the setpoint S1 (see parameter A33).

General note

All values are stored in the non-volatile memory and are retained there even in the case of a power failure. When setting any value, always release the UP or DOWN button before releasing the SET button. This applies to the setpoint and all other parameters.

Parameter	Function	Setting range	Default value	Your setting
S1	Setpoint 1	P4...P5	0.0 °C	
S1'	Offset from setpoint S1 (A33=1) (setpoint display blinks)	-99.0...999.0 K	(0.0 K)	
	Absolute setpoint S1' (A33=2) (setpoint display does not blink)	P4...P5	0.0 °C	

Second operating level

Setting the regulation parameters - P
Pressing and holding the UP and DOWN buttons together for at least four seconds displays a list of regulation parameters (starting with P2). This list can be rolled up and down with the UP and DOWN buttons.

To display the value for a selected parameter, press the SET button. With the SET button depressed, the value can be adjusted with the UP and DOWN buttons. When all buttons are released, the new value is saved permanently. If no button is pressed within 60 seconds, the controller reverts to its normal state.

Parameter	Function	Setting range	Default value	Your setting
P2	Hysteresis K1	0,1...99.9 K	1.0 K	
P4	Lower setpoint limit	-99 °C...P5	-10 °C	
P5	Upper setpoint limit	P4...999 °C	120 °C	
P6	Actual value correction	-20.0...+20.0 K	0.0 K	
P19	Disable setpoint adjustment	0: Enabled 1: Disabled	0	

The following parameters are active only if the basic function A1 is set to the alarm function K1.

P30	Lower limit for alarm	-99...999 °C	-10 °C	
P31	Upper limit for alarm	-99...999 °C	120 °C	
P32	Hysteresis for alarm This hysteresis is always asymmetrical	0.5...99.9 K	1.0 K	

Parameter descriptions

P2 Hysteresis K1
The hysteresis is symmetrical (factory setting) with respect to the setpoint.

P4/P5 Lower/upper setpoint limit
The setpoint S1 can be set only within the limits defined here.

P6 Actual value correction
The value set here is added to the measured value from the sensor. The resulting value is displayed and acts as the basis for regulation.

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P19 Disable setpoint adjustment
If this parameter is active, the setpoint cannot be adjusted with the buttons on the front panel. Any attempt to adjust the setpoint results in the message "---" on the display.

P30/P31 Upper/lower limit value
Contact K1 (A1 = terminal 2/3) can be used as a limit-value alarm or a bandwidth alarm. An asymmetrical hysteresis value can be defined for the limit values (see parameter P32).
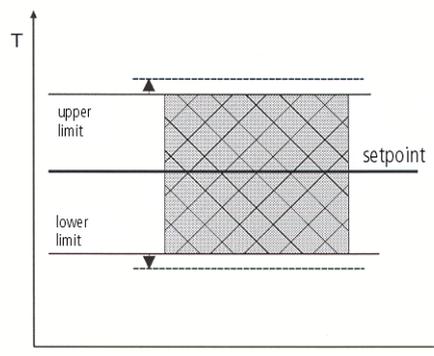
Use as a limit-value alarm
If the actual value lies outside the defined limit values, i.e. above the upper limit value or below the lower limit value, contact K1 is activated.

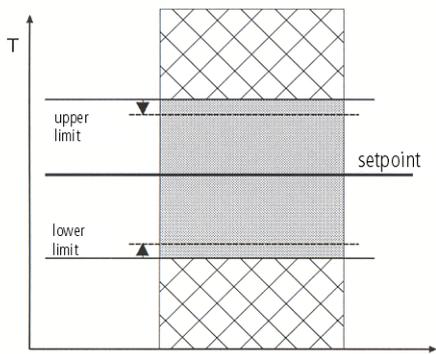## Use as a bandwidth alarm
Contact K1 is activated if the actual value lies between the two limit values.
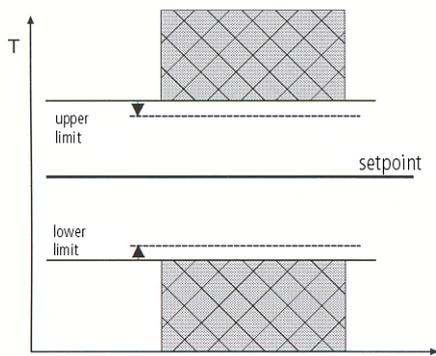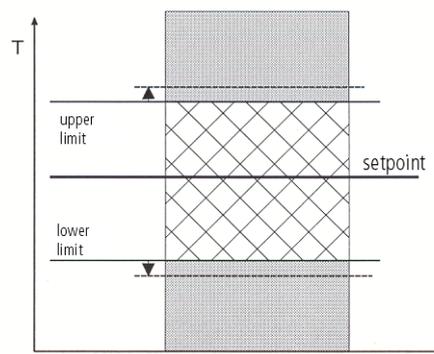

Fig. 1:   Limit-value alarm, alarm contact normal
        A30=0: relative limits
        A30=1: absolute limits

Fig. 2:   Bandwidth alarm, alarm contact normal
        A30=2: relative limits
        A30=3: absolute limits

Fig. 3:   Limit-value alarm, alarm contact inverted
        A30=0: relative limits
        A30=1: absolute limits

Fig. 4:   Bandwidth alarm, alarm contact inverted
        A30=2: relative limits
        A30=3: absolute limits

Legend:
- alarm, horn on
- relay active
- alarm, horn on and relay active
- hysteresis (P32)

Third operating level

Setting the regulation parameters - A

The third operating level can be accessed from the second level by scrolling through the parameter list until the last parameter (d3) is displayed and pressing the UP button for at least 10 seconds. The message "PA" then appears on the display.

Pressing the UP and DOWN keys together for at least four seconds then displays the parameter list for the third operating level (starting with A1).

The parameter values are displayed and adjusted exactly as in the second level.

The list can be rolled up and down with the UP and DOWN buttons.

To display the value for a selected parameter, press the SET button. With the SET button depressed, the value can be adjusted with the UP and DOWN buttons. When all buttons are released, the new value is saved permanently. If no button is pressed within 60 seconds, the controller reverts to its normal state.

Para-meter	Function	Setting range	Default value	Your setting
A1	Switching function of K1	**0: Heating contact** 1: Cooling contact 2: Alarm function K1 3: Alarm function K1, inverted	0	
A3	Function of K1 in case of sensor fault	**0: Off on fault** 1: On on fault	0	
A8	Actual-value display mode (all other parameters are displayed with a resolution of 0.1K)	**0: Integer** 1: Resolution 0.5 K 2: Resolution 0.1 K	0	
A10	Value displayed for 0 V (linear sensor only)	-99...999 °C	0 °C	
A11	Value displayed for 10 V (linear sensor only)	-99...999 °C	100 °C	
A19	Parameter locking	0: No locking **1: A-parameter locked** 2: A- and P-parameters locked	1	
A30	Type of alarm function	0: Limit-value alarm, relative limits **1: Limit-value alarm, absolute limits** 2: Bandwidth alarm, relative limits 3: Bandwidth alarm, absolute limits	1	
A31	Special function on alarm (buzzer and display)	0: None **1: Display blinks** 2: Buzzer sounds 3: Display blinks + buzzer sounds	1	
A32	Type of display	**0: Actual value** 1: Setpoint	0	
A33	Type of setpoint S1'	0: No function 1: Offset from setpoint S1 **2: Absolute**	2	
A40	Hysteresis mode K1	**0: Symmetrical** 1: Asymmetrical	0	
A50	Minimum K1 "On" time	0…400 s	0 s	
A51	Minimum K1 "Off" time	0…400 s	0 s	
A54	K1 delay after power on	0…400 s	0 s	
A56	K3 alarm suppression after power on	0…60 min	20 min	
A60	Temperature sensor	11: Pt100 – two-wire **12: Pt100 – three-wire**	12	
A70	Software filter	1: inactiv **average value with** : **8: 8 measuring values (ca. 2,4s)**	8	

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Para-meter	Function	Setting range	Default value	Your setting
A80	Temperature scale	0: Fahrenheit and AUS **1: Celsius and AUS** 2: Fahrenheit and OFF 3: Celsius and OFF	1	
A81	Function E1	0: No function 1: Controller on/off (standby) **2: Setpoint S1´ active**	2	
A82	Function of key standby	**0: No function** 1: Controller on/off (standby)	0	Key nonexistent
Pro	Programme version	-	-	

Parameter descriptions

A1 Switching function of K1

The output contact K1 can be set to act as a heating contact or a cooling contact. If set as a heating contact, the contact closes if the actual temperature is less than the setpoint. For use as a cooling contact, the function is inverted.

It is also possible to set the contact to act as an alarm contact. If this parameter is set to 2, the contact closes if the limits are exceeded and opens when the temperature is within the limits.

If the parameter is set to 3, the switching function is inverted.

A3 Function of K1 in case of a sensor fault

Contact K1 switches to the position specified here in the case of a sensor fault. If a fault is detected in the parameter memory, which means that the saved settings cannot be used, output contact K1 is switched to a state where no current flows.

A8 Display mode

The actual value can be displayed as an integer or with one digit after the decimal point (resolution 0.5 K). All parameter settings and setpoints are always displayed with a resolution of 0.1 K.

If integer display is selected, the actual value is rounded up or down.

A19 Parameter locking

With the setting A19=0, all parameters are accessible.

With the setting A19=1, all A-parameters are locked except for A19 itself (factory setting).

With the setting A19=2, all A-parameters and all P-parameters are locked.

When parameters are locked, they cannot be changed with the buttons on the front panel. Any attempt to do this results in the message "---" on the display.

A30: Function of the output contact and lamp 3

This parameter determines how the controller reacts when the limit values defined in parameters P30 and P31 are reached.

Limit-value alarm means that an alarm is generated if the actual value lies outside the limit values.

Bandwidth alarm means that an alarm is generated when the actual value lies between the limit values.

Relative means that the values set in parameters P30 and P31 are offsets from the setpoint.

Absolute means that the values set in parameters P30 and P31 are absolute values.

A31: Special function for limit-value or bandwidth alarm

With this parameter, special functions can be activated in the case of a limit-value or bandwidth alarm. The display can be switched to blinking mode and/or an internal buzzer can be activated. The buzzer can be switched off by pressing the DOWN button.

A32 Type of display

Either the actual value (A32 = 0) or the setpoint (A32=1) can be displayed.

A33 Type of setpoint S1'

A33=0: No function

A33=1: The modified setpoint S1' is defined as an offset from setpoint S1 (i.e. it is relative to S1). Its absolute value thus changes accordingly if the value of S1 is changed.

A33=2: The modified setpoint S1' is defined as an absolute value which is independent of S1.

A40 Hysteresis mode K1

This parameter permits selection of a symmetrical or asymmetrical hysteresis at the switching point. An asymmetrical hysteresis lies below the setpoint for the heating function and above the setpoint for the cooling function. A symmetrical hysteresis is effective on both sides of the setpoint, regardless of the selected switching function.

A50 Minimum K1 "On" time
A51 Minimum K1 "Off" time

These parameters make it possible to ensure that the output contact remains on or off for a specified time in order to reduce the switching frequency. The time specified here is the total minimum time for the on or off state of the contact.

A54 K1 delay after power on

With this parameter, activation of the output contact can be delayed for a specific period after the mains voltage is switched on.

A60 Temperature sensor

A60=11: Pt100 with two-wire connection

A60=12: Pt100 with three-wire connection (factory setting).

A70

With several measuring values, it is possible to obtain an average value.

A80 Temperature scale

The temperatures can be displayed in Fahrenheit or Celsius (factory setting). Note that the values and setting ranges for the parameters and setpoints remain unchanged when the scale is changed. If, for example, a controller whose setpoint is set to 0°C is modified to display the temperatures in Fahrenheit, the setpoint is then interpreted as 0 °F, corresponding to a temperature of -18° C. The maximum setting range for the setpoint is then -99...+999 °F.

A81 Function E1

A81=0: The switching input has no function.

A81=1: An external contact E1 can be used to switch the controller on and off (standby).

Closing the contact switches the controller to standby mode. If both A81=1 and A82=1 are set, the two functions act in parallel and the last switching request which was executed applies.

A81=2:(factory setting) The external contact E1 switches from setpoint S1 to the modified setpoint S1' (see A33)

A82 Function "Key standby"

A82=0: Factory setting, key nonexistent

Status messages

Display	Fault	Action
F1L	Sensor fault (short circuit)	Check the sensor
F1H	Sensor fault (open circuit)	Check the sensor
F3L	Limit-value alarm	Temperature is too low
F3H	Limit-value alarm	Temperature is too high
- - -	Parameters are locked	See parameter P19 or A19
Display blinks / buzzer	Temperature alarm (see A31)	
EP	Loss of data in parameter memory	Have the controller repaired

Error messages are saved and are still displayed after the fault has been repaired. They can be deleted by acknowledging them with the DOWN button.

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Technical Data

Measuring input:	**F1:** Temperature sensor Pt100 (DIN IEC 751, three-wire connection), measuring range Pt100 (Class B): -60.0 °C...400 °C (with suitable sensor and < 1 Ohm wire resistance) Accuracy: ± 0.5 K ± 0.5% at 25 °C (not including any sensor errors), ± 1K ± 0.5% over the entire temperature range 0 to 55 °C (not including any sensor errors)
Display and indicators:	Three-digit red LED display, 13 mm high, for temperatures Three LEDs, diameter 3 mm, for status indication LED 1: Status of output K1 LED 2: Status of digital input E1 LED 3: Limit-value or bandwidth alarm indicator. See parameter A30 for settings.
Output:	**K1:** Relay, 250 V~, maximum switched current 10 A, (cosφ=1), (inductive 1,5 A), changeover contact
Input:	**E1:** Switching input for an external, potential-free switch Functions: see parameter A81
Supply voltage:	230 V~ 50/60 Hz, maximum power consumption 4 VA
Terminals:	12-pole screw-terminal strip, spacing 5.0 mm, for cables up to 2.5 mm²
Temperature range:	-99 to 999 °C (factory setting: alarm if actual value is below -10 °C or above 120 °C)
Ambient conditions:	Storage temperature −20 °C...+70 °C Operating temperature 0...55 °C Maximum relative humidity 75%, no condensation
Degree of protection:	IP65 from front, IP00 from rear
Installation:	Designed for panel mounting Front-panel dimensions 84 x 42 mm Panel aperture 67.5 x 31.5 mm Installation depth approx. 85 mm Secured with screw-on bow Install flat gasket between panel and front frame of controller
Weight:	approx. 150 g (without sensor)

Terminal assignments: