



Multi-Temperature Controller RTEMP8

■ Brief description

RTEMP8 is a highly accurate, cost effective 8-channel temperature controller based on advanced microprocessor technology and featuring a CANbus port as well as a local Expansion Bus (E-Bus).

Due to capabilities such as *setpoint decrease and heating/cooling with four alert conditions*, this controller is ideal for efficient temperature control of plastics processing machines, machine tools, packaging machines, thermal balancing equipment and other thermal applications.

Selectable functions such as *startup and setpoint acquisition if sensor fails* help to extend the service life of high-output heating elements (e.g. hot channel tools) and prevent any impact on production processes. The integrated self-optimization capability ensures instant productivity.

- 8 channel controller with in-line terminal housing
- CANbus-CAL/CANopen
- Self-optimizing
- Automatic startup control
- Setpoint acquisition if sensor fails
- Opto-coupler input port for setpoint reduction
- 3 configurable alert output ports

■ Functional Description

Each of the 8 control loops can be regarded as a separate regulator. Thermocouples, PT100 resistance thermometers in two- or three-lead configurations and linear DC voltage transducers can be connected as required to the 8 measurement ports.

Controller and regulator functions

This controller can be configured as a signal device or as a two-point, three-point, cascade or motor step controller. Smooth automatic / manual switching is possible. In ma-

nual mode, the regulator output can be set to any relative duty cycle.

In cascade mode, the slave 'controllers' can be operated as actuators. Their associated actuator outputs are derived from the actuator output of the master controller.

Startup control

During startup, the controller runs up to the startup setpoint at a defined gradient. Shorter switching periods prolong the service life of the heating cartridges. Upon completion of the startup dwell period, the controller enables its main setpoint.

The temperature of high-output heating cartridges with magnesium oxide insulation needs to be raised slowly to remove moisture and to prevent damage.

Setpoint gradient function

The setpoint gradient function can be adjusted parametrically in associated controller configurations.

Whenever the setpoint is changed and upon startup, the function begins at the setpoint and approaches the new setpoint at the defined gradient.

Second setpoint and ramp function

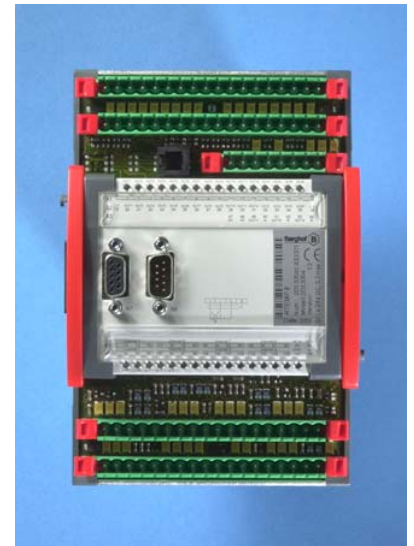
A second setpoint can be enabled by means of an external control signal. The resulting setpoint is approached at a given gradient.

Setpoint acquisition if sensor fails

To make sure that a plant can be kept up and running even in the event of a controller sensor failure, the temperature has to be maintained at the last mean setpoint. A limit can be defined for this setpoint.

The controller reports a 'sensor failure' via CANbus or alarm output. Once the defective sensor has been replaced, the controller identifies a valid reading and automatically resumes control.

When power is cycled or when the controller is reconfigured, the mean setpoint is set to 0%.



Self-optimization capability

The self-optimization capability for the automatic identification of control parameters is a standard feature of this controller. This procedure is activated upon request (via the CANbus); it uses the delay period and the rate of change of the temperature control range to compute the optimum parameters for the fast and transient-free establishment of the temperature setpoint.

In three-point controller mode, the 'cooling' parameters are identified separately. The self-optimization capability remains active in startup control mode.

■ Control loop monitoring & alerts

Defective control loop

For each of the 8 control loops, the control monitor detects failures, incorrect polarity of thermocouples and short circuits in resistance inputs.

For control loop failures, the following controller output responses can be selected:

- Issue preselected setpoint
- Issue last mean setpoint
- Disable output

Adjustment of measuring circuit readings

The reading adjustment function can be used to correct or scale readings. This adjustment function is designed for zero offsets and for amplification adjustments (gradient).

The controller uses given pairs of values for actual readings and setpoints of two reference points to compute the amplification and the zero offset.

Heating current monitoring and heating current alert

For all connected heating lines, the controller provides an input port for connecting and external current transformer. Any detected limit violation can be reported to one of the alert relays or queried via the CANbus.

Leakage current monitoring

Leakage currents on heating elements (e.g. due to moisture) are monitored via an external current differential relay and are reported to the temperature controller as a digital signal (+24 V).

Alert functions

There are 3 alert outputs. The controller monitors both actual values and threshold violations. Triggered alarms control the alert outputs and can be queried via the CANbus. 4 limits (2 low / 2 high) can be set for each control channel.

The 3 alert outlets can be configured as:

- Relative reading alert (threshold violation)
- Absolute reading alert (actual value)
- Relative reading alert with alarm suppression in response to a setpoint change
- Sensor failure alert
- Heating current alert
- Digital output monitoring

■ I/O

Input functions

The controller provides 4 digital input ports. Each of these can also be configured as an output port. When used in input mode, these ports perform defined functions:

- Change parameter set
- Disable all controllers
- Input port for leakage current monitoring
- Activate 2nd setpoint

Monitoring the heating/cooling output ports

The controller provides 16 short-circuit protected output ports. These ports are separated through optocouplers. The state of these ports is indicated by LEDs. The ports are monitored periodically through feedback via internal input. If a fault is detected, a signal can be sent to one of the 3 alert output ports. The controller output ports can be disabled.

Alert output

In addition to the switching output ports, the controller provides 3 optocoupler ports for reporting alarm alerts.

The alert output port can be selected programmatically for each controller canal.

When an alarm output is used multiple times, the messages are included in an OR operation. The switching function (NCC/NOC) can be configured for each output port.

Configuration, parameterization, operation

The controller can be configured, parameterized, and operated by means of a PC and the supporting CANtrol software tools via a serial (RS232C) RJ45 interface or via the CANbus.

At a glance - a brief overview

General			
Name	RTEMP8	8-channel temperature controller with CANbus and PC port	
Item no.:	13354		
Enclosure WxHxD [mm]	124 x 170 x 85,5 mm block dimension B= 113/118,5)	Snaps to mounting rail NS 35/7,5	DIN EN 50022
Status Display	LED- status display	device and communication functions, I/O states	
Connection method	Phoenix: MSTBV 2,5/18-GEH-5,08	Connection by: screw terminals, crimp connectors, spring latch terminals. The associated terminal strips are not included in the scope of supply.	
Regulatory	CE symbol	Electromagnetic compatibility, RFI emission complies with EN 50081-2, RFI immunity EN 50082-2	89/333/EWG
Power supply	24 VDC (+24V, GND)	Voltage range 18-30 VDC; Power input: approx. 5 VA (internal consumption), Configuration data will be retained when power supply fails (stored in EEPROM)	DIN 19240
Program memory	EPROM or optional firmware download in FLASH		
Environmental conditions			
Temperature range	Operating temperature.: 0°C .. 55°C Storage/transportation: -20°C .. 60°C		
Climatic conditions	Rel. humidity: ≤ 75% annual average	Non-condensing	DIN 40 040
Vibration and shock	Vibration Fc (10..150Hz)	1g resp. 0,075 mm = Operating 2g resp. 0,150 mm = Non-operating	DIN 68-2-6
	Shock test Ea (15g, 11ms)		DIN IEC 68-2-27
Measuring inputs			
Temperature measurements			
Scan rate	625 ms	for all PT-100 resp. thermocouple input ports	
Current transformers	input transducers: 0..30 mAAC, Ri approx. 170 Ω	e.g. for standard current converter 0..30 A/0..30 mA	
Thermocouples	Types L, J, K, N, S, R	Range: 0°C ... 900°C / 1700°C (depends on type,) display in °C or °F; Input resistance: 1 MΩ Measuring error: ≤ 3 K ±1 digit, error for type L,J,K,N up to 1350°C: ≤2 K 1 digit Additional error: ≤ 1 K pro 10 K change in terminal temperature Failure monitoring: Current through sensor ≤1μ A; Polarity monitoring: At 30 °C response below measurement range; Built-in temperature compensation (sensor or compensation line to controller)	DIN IEC 584
Resistance thermometer	Pt100 Ω	Range: -99,9°C... 850,0 °C with linearization. Reading error: ≤ 2 K ±1 digit Three-lead connection without balancing resistance, two-lead connection with balancing resistance. Measurement current: ≤ 0.3 mA measurement circuit monitored for sensor or line failure/rupture or short circuit	DIN IEC 751
DC voltage	0..100 mV linear Input resistance ≥ 1MΩ	scalable through reading correction	

Digital I/O			
Logic input ports	4 digital input ports, opto-decoupled (can also be configured as output ports) Nominal voltage +24 VDC, external	The digital input ports are electrically isolated from the temperature input ports.	Voltage sink IEC 1131 Typ 1
Logic output ports	12 digital output ports for the direct connection of solid state relays; 4 digital ports configurable either for input or for output. (see logic inputs) 3 digital alert output ports Switching voltage +24 VDC	The output ports are short-circuit protected and opto-decoupled, +24VDC switching Output voltage range: 18 V - 30 VDC; nominal output current: ≤ 70 mA The output ports are periodically checked for short circuits or failures.	DIN 19240
Connection method	vertical three-wire front wiring with push-on terminal strips of screw, spring or crimp connection Connector plug: 1 x 8 pole, 4 x 18 pole		
Digital interfaces			
Field bus (only RTEMP8)	CAN Bus; 9-pin. Sub Min-D (2x)	CAL/CANopen protocol	
Application interface	SIO port RJ45 connector (RS232C)	Configuration, parameterization by PC using CCU software (CANtrol Configuration Utility)	
Controller			
Control modes	Actuation with 0...100% duty cycle	Can be configured as a signalling device with 1 or 2 output ports Two-point DPID mode controller; Three-point DPID/DPID mode controller, (three-point controller with optional water cooling). Actuator function in manual mode of three-point, motor step and cascade controller	
Control parameters	Self-adjusting or adjustable parameters	see 'control modes'; Signalling device actuation differential 0.2 %	
Alert functions	Alert 1 and 2	Configurable as relative or absolute reading alert; Relative reading alert with alert suppression. Sensor failure alert heating current alert; output signal alert; Operating function: relay cuts out or in on alert	
Heating current monitoring	Heating current measurement by external current transformer (e.g. 30 A / 30 mA) Reading range selectable from: 1.0...99.9 A. Adjustable to other current transformers	Heating current limit can be set within reading range (error ± 5 %). Monitoring for actuator undercurrent or short circuit Treshold limit for current monitoring ≥ 3 % of selected range. (for 30 A range: 30 A: ≥ 0,9 A).	
Setpoint	Upper and lower setpoint limits selegable within measurement range.		