



# TB 40-1 Temperature Limiter

universal line

Applicable for heating and cooling applications  
 For all types of thermocouples and resistance transducers  
 BluePort® Front interface and BlueControl Software  
 Maintenance manager and error list  
 Alarm reset via RESET-key  
 Alarm reset via digital  
 Type tested to the European Pressure Equipment Directive

## APPLICATIONS

- All applications where an over or under temperature fault condition could present fire hazard or other hazard
- Heat generating plants with outflow temperatures up to 120°C (DIN 4751)
- Hot-water plants with outflow temperatures above 110°C (DIN 4752)
- Thermal transfer plants with organic transfer media (DIN 4754)
- Oil-heated plants (DIN 4755)

## DESCRIPTION

### Front interface and Engineering Tool

Via the BlueControl software incl. its simulation functions, and especially the convenient BluePort® front panel interface, the required set-up for a specific control task can be determined without a detailed study of the operating instructions.

### Plug-in module

KS 40-1 controllers are built as plug-in modules. This enables them to be replaced very quickly without tools, and without disturbing the wiring. Off cause almost all adjustments can be done comfortably over the instrument front. (see page 4, BlueControl)

### Password protection

The access to the limit value is protected with a password and the internal security switch.

## TECHNICAL DATA

### INPUTS

#### PROCESS VALUE INPUT INP1

Resolution: > 14 bits  
 Decimal point: 0 to 3 decimals  
 Limiting frequency: 2 Hz  
 Digital input filter: adjustable 0,000...9999 s  
 Scanning cycle: 100 ms  
 Measured value correction: 2-point or offset correction

#### Thermocouples (Table 1)

Input impedance:  $\geq 1 \text{ M}\Omega$   
 Effect of source resistance:  $1 \mu\text{V}/\Omega$

#### Cold junction compensation

Max. additional error  $\pm 0,5 \text{ K}$

#### Sensor break monitoring

Sensor current:  $\leq 1 \mu\text{A}$   
 Operating sense configurable (see page 2)

#### Resistance thermometer

Connection: 3-wire  
 Lead resistance: max.  $30 \Omega$   
 Input circuit monitor: Break and short circuit

#### Resistance measuring range

The BlueControl software can be used to match the input to the sensor KTY 11-6 (characteristic is stored in the controller).

Physical measuring range: 0...4500  $\Omega$   
 Linearization segments: 16

### Current and voltage signals

Span start, end of span: anywhere within measuring range  
 Scaling: selectable -1999...9999  
 Linearization: 16 segments, adaptable with BlueControl  
 Decimal point: adjustable  
 Input circuit monitor: 12,5% below span start (2mA, 1V)

### CONTROL INPUT DI1 (RESET)

Connection of a potential-free contact suitable for switching „dry“ circuits.

Switched voltage: 2,5 V  
 Switched current: 50  $\mu\text{A}$

## OUTPUTS

### LC RELAY OUTPUT

#### Function

Interruption of heating or cooling power supply if the adjusted limit is reached.

Contacts: Potential-free changeover contact  
 Max. contact rating: 500 VA, 250 VAC, 2A at 48...62 Hz, resistive load  
 Min. contact rating: 5 V, 10 mA AC/DC  
 Operating life (electric): 600.000 duty cycles with max. rating

## RELAY OUTPUTS OUT1, OUT2

### Function

Additional alarms with max, min or max and min monitoring with adjustable hysteresis

### Signals which can be monitored:

- Process value (absolute)
- Difference between process value and adjusted limit value LC (relative)
- Sensor break or short circuit (Pt100)

Depending on selected input type, the input signal is monitored for break and short circuit.

Contacts: 2 NO contacts with common connection  
 Max. contact rating: 500 VA, 250 VAC, 2A at 48...62 Hz, resistive load  
 Min. contact rating: 6 V, 1 mA DC  
 Operating life (electric): 800.000 duty cycles with max. rating

Table 1 Thermocouple ranges

Thermocouple		Range		Accuracy	Resolution (∅)
L	Fe-CuNi (DIN)	-100...900°C	-148...1652°F	≤ 2 K	0,1 K
J	Fe-CuNi	-100...1200°C	-148...2192°F	≤ 2 K	0,1 K
K	NiCr-Ni	-100...1350°C	-148...2462°F	≤ 2 K	0,2 K
N	Nicrosil/Nisil	-100...1300°C	-148...2372°F	≤ 2 K	0,2 K
S	PtRh-Pt 10%	0...1760°C	32...3200°F	≤ 2 K	0,2 K
R	PtRh-Pt 13%	0...1760°C	32...3200°F	≤ 2 K	0,2 K
T	Cu-CuNi	-200...400°C	-328...752°F	≤ 2 K	0,05 K
C	W5%Re-W26%Re	0...2315°C	32...4199°F	≤ 2 K	0,4 K
D	W3%Re-W25%Re	0...2315°C	32...4199°F	≤ 2 K	0,4 K
E	NiCr-CuNi	-100...1000°C	-148...1832°F	≤ 2 K	0,1 K
B <sup>(1)</sup>	PtRh-Pt6%	0(400)...1820°C	32(752)...3308°F	≤ 3 K	0,3 K
Special		-25...75 mV		≤ 0,1 %	0,01 %

<sup>(1)</sup> values applied above 400°C

Table 2 RTD's

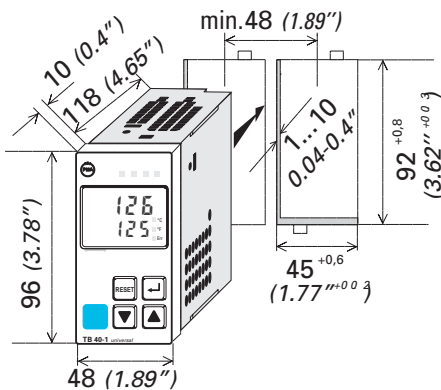
Type	Sensor current	Range		Accuracy	Resolution (∅)
Pt100	0,2 mA	-200...850°C	-328...1562°F	≤ 1 K	0,1 K
Pt1000		-200...200°C	-328...392°F	≤ 2 K	0,1 K
Resistance*		4500 Ω		≤ 0,1 %	0,01 %

\* The characteristic of a KTY 11-6 is preadjusted (-50...150°C)

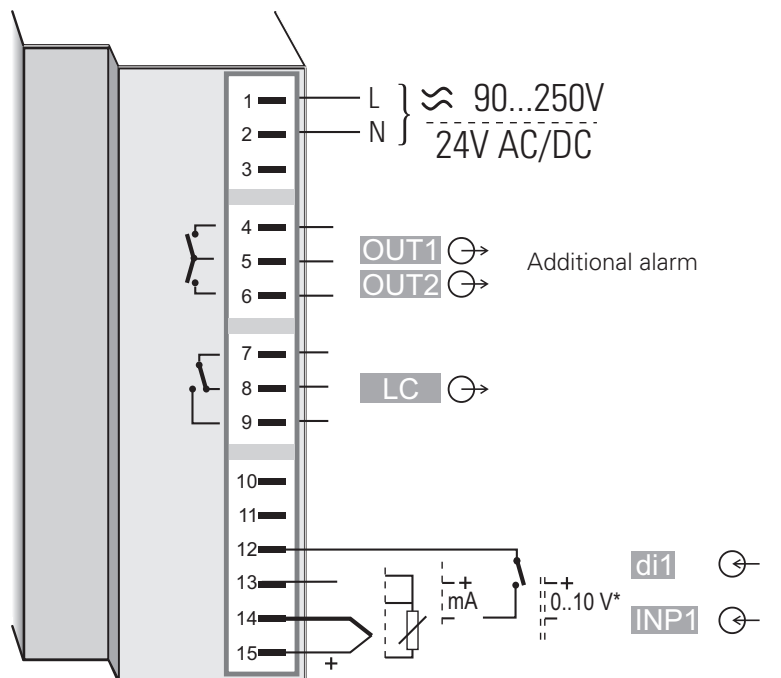
Table 3 Current and voltage

Range	Input resistance	Accuracy	Resolution (∅)
0-10 Volt	≈ 110 kΩ	≤ 0,1 %	0,6 mV
0-20 mA	49 Ω (voltage requirement ≤ 2,5 V)	≤ 0,1 %	1,5 μA

Dimensions (mm):



Electrical connections:



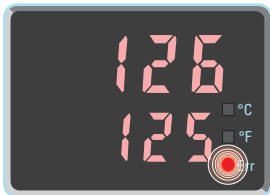
## MAINTENANCE MANAGER

Display of error signals, warnings, and latched limit messages in the error list. Signals are latched, and can be reset manually.

Possible signals in the error list:

Sensor break, short circuit, reversed polarity latched limit messages  
Re-calibration warning  
Internal fault (RAM, EEPROM, ...)

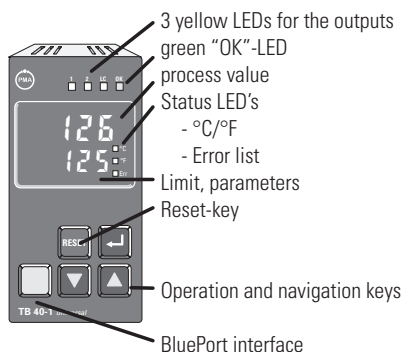
Flashing Error LED indicates active alarm in the error list:



## OPERATION AND DISPLAY

### Display

Process value: LED with 7 segments, 10,5 mm  
Lower display: LED with 7 segments, 7,8 mm



## POWER SUPPLY

Depending on version:

### AC SUPPLY

Voltage: 90...260 VAC  
Frequency: 48...62 Hz  
Power consumption approx. 7 VA

### UNIVERSAL SUPPLY 24 V UC

AC voltage: 20,4...26,4 VAC  
Frequency: 48...62 Hz  
DC voltage: 18...31 V DC  
Power consumption: approx: 7 VA (W)

### BEHAVIOUR WITH POWER FAILURE

Configuration, parameters, and adjusted limits:

Non-volatile storage in EEPROM

## BluePort® FRONT INTERFACE

Connection of PC via PC adapter (see „Accessories“). The BlueControl software is used to configure, set parameters, and operate the TB 40-1.

## ENVIRONMENTAL CONDITIONS

### Protection modes

Front panel: IP 65  
Housing: IP 20  
Terminals: IP 00

### Permissible temperatures

For specified accuracy: 0...60°C  
Warm-up time: < 15 minutes  
For operation: -20...65°C  
For storage: -40...70°C

### Humidity

75% yearly average, no condensation

### Shock and vibration

#### Vibration test Fc (DIN 68-2-6)

Frequency: 10...150 Hz  
Unit in operation: 1g or 0,075 mm  
Unit not in operation: 2g or 0,15 mm

#### Shock test Ea (DIN IEC 68-2-27)

Shock: 15g  
Duration: 11ms

### Electromagnetic compatibility

Complies with EN 61 326-1

- Complies with the immunity requirements for continuous, unattended operation
- Complies with the emission requirements class B for rural areas
- Surge disturbances may increase the measurement error

## GENERAL

### Housing

Material: Makrolon 9415, flame-retardant  
Flammability class: UL 94 V0, self-extinguishing

Plug-in module, inserted from the front

### Safety tests

Complies with EN 61010-1 (VDE 0411-1):  
Over voltage category II  
Contamination class 2  
Working voltage range 300 VAC  
Protection class II

## Certifications

Type test to DIN 3440 and Pressure Equipment Directive 97/23/EC

Can therefore be used in:

- Heat generating plants with outflow temperatures up to 120°C to DIN 4751
- Hot-water plants with outflow temperatures above 110°C to DIN 4752
- Thermal transfer plants with organic transfer media to DIN 4754
- Oil-heated plants to DIN 4755

UL certification (applied for)

## Electrical connections

Depending on version:

- Flat-pin connectors 1 x 6,3 mm or 2 x 2,8 mm to DIN 46 244
- Screw terminals for conductor cross-section from 0,5 to 2,5 mm<sup>2</sup>

## Mounting

Panel mounting with two fixing clamps at top/bottom or left/right  
Close mounting possible

Mounting position: not critical  
Weight: 0,27 kg (9.52 oz)

## Accessories supplied with unit

Operating instructions  
2 fixing clamps

## ACCESSORY EQUIPMENT

### BlueControl (Engineering Tool)

PC-based program for configuring, setting parameters, and operating (commissioning) the TB 40-1 temperature limiter. Moreover, all the settings are saved, and can be printed on demand.

Depending on version, a powerful data acquisition module is available, complete with trend graphics.

Software requirements:

Windows 95/98/NT/2000.

The built-in simulation serves to test the settings.

*Configurations that can only be implemented via the BlueControl software (not via the front-panel keys):*

- Customer-specific linearizations
- Adjustment of limits for operating hours and switching cycles
- Switch-over to 60 Hz mains frequency
- Disable operator actions and operating levels, plus password definition

#### Hardware requirements:

A PC adapter (see „Accessories“) is required for connecting the controller.

Updates and demo software can be downloaded from:  
[www.pma-online.de](http://www.pma-online.de)

## ORDERING INFORMATION

T B 4 0 - 1 - 0 0 0 - 0 0

Flat-pin connectors

Screw terminals

90..250V AC

24VAC / 18..30VDC

Standard configuration

Configuration to specification

no manual

manual german

manual english

manual french

Standard

UL certified

DIN 3440 + Pressure Equipment Directive 97/23/EC certified

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## ACCESSORIES

Description		Order no.
PC adapter, for connecting BlueControl software to the BluePort®		9407-998-00001
Standard rail adapter		9407-998-00061
Operating manual	german	9499-040-63418
Operating manual	english	9499-040-63411
Operating manual	french	9499-040-63432
BlueControl Mini	german/english/french	<a href="http://www.pma-online.de">www.pma-online.de</a>
BlueControl Basic	german/english/french	9407-999-11001
BlueControl Expert	german/english/french	9407-999-11011



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