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: ≥ 1 MΩ
Effect of source resistance: 1 μV/Ω
Cold junction compensation
Max. additional error: ± 0.5 K
Sensor break monitoring
Sensor current: ≤ 1 μA
Operating sense configurable (see page 2)

Resistance thermometer
Connection: 3-wire
Lead resistance: max. 30 Ω
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 Ω
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 μA

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

**Signals which can be monitored:**
- Process value (absolute)
- Difference between process value and adjusted limit value LC (relative)
- Sensor break or short circuit (Pt100)

**Table 1 Thermocouple ranges**

<table>
<thead>
<tr>
<th>Thermocouple</th>
<th>Range</th>
<th>Accuracy</th>
<th>Resolution (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L Fe-CuNi (DIN)</td>
<td>-100...900°C to -148...1652°F</td>
<td>≤ 2 K</td>
<td>0.1 K</td>
</tr>
<tr>
<td>J Fe-CuNi</td>
<td>-100...1200°C to -148...2192°F</td>
<td>≤ 2 K</td>
<td>0.1 K</td>
</tr>
<tr>
<td>K NiCr-Ni</td>
<td>-100...1350°C to -148...2482°F</td>
<td>≤ 2 K</td>
<td>0.2 K</td>
</tr>
<tr>
<td>N Nicrosil/Nisil</td>
<td>-100...1300°C to -148...2372°F</td>
<td>≤ 2 K</td>
<td>0.2 K</td>
</tr>
<tr>
<td>S PtRh-Pt 10%</td>
<td>0...1760°C to 32...3200°F</td>
<td>≤ 2 K</td>
<td>0.2 K</td>
</tr>
<tr>
<td>R PtRh-Pt 13%</td>
<td>0...1760°C to 32...3200°F</td>
<td>≤ 2 K</td>
<td>0.2 K</td>
</tr>
<tr>
<td>T Cu-CuNi</td>
<td>-200...400°C to -328...752°F</td>
<td>≤ 2 K</td>
<td>0.05 K</td>
</tr>
<tr>
<td>C W5%Re-W26%Re</td>
<td>0...2315°C to 32...4199°F</td>
<td>≤ 2 K</td>
<td>0.4 K</td>
</tr>
<tr>
<td>D W3%Re-W25%Re</td>
<td>0...2315°C to 32...4199°F</td>
<td>≤ 2 K</td>
<td>0.4 K</td>
</tr>
<tr>
<td>E NiCr-CuNi</td>
<td>-100...1000°C to -148...1832°F</td>
<td>≤ 2 K</td>
<td>0.1 K</td>
</tr>
<tr>
<td>B(1) PtRh-Pt 10%</td>
<td>(0400...1820°C) to 32(752)...3380°F</td>
<td>≤ 3 K</td>
<td>0.3 K</td>
</tr>
</tbody>
</table>

**Table 2 RTD’s**

<table>
<thead>
<tr>
<th>Type</th>
<th>Sensor current</th>
<th>Range</th>
<th>Accuracy</th>
<th>Resolution (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt100</td>
<td>0.2 mA</td>
<td>-200...850°C to -328...1562°F</td>
<td>≤ 1 K</td>
<td>0.1 K</td>
</tr>
<tr>
<td>Pt1000</td>
<td>0.2 mA</td>
<td>-200...200°C to -328...392°F</td>
<td>≤ 2 K</td>
<td>0.1 K</td>
</tr>
</tbody>
</table>

**Table 3 Current and voltage**

<table>
<thead>
<tr>
<th>Range</th>
<th>Input resistance</th>
<th>Accuracy</th>
<th>Resolution (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10 Volt</td>
<td>≥ 110 kΩ</td>
<td>≤ 0.1 %</td>
<td>0.6 mV</td>
</tr>
<tr>
<td>0-20 mA</td>
<td>49 Ω (voltage requirements 2.5 V)</td>
<td>≤ 0.1 %</td>
<td>1.5 μA</td>
</tr>
</tbody>
</table>

**Electrical connections:**

**Dimensions (mm):**

* Pay attention on the internal switch!
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:

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)
Shok: 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

OPERATION AND DISPLAY
Display
Process value: LED with 7 segments, 10,5 mm
Lower display: LED with 7 segments, 7,8 mm

3 yellow LEDs for the outputs
- green "OK"-LED
- Status LED's
- °C/°F
- Limit, parameters
- Error list
- Reset key
- Operation and navigation keys
- BluePort interface

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

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 mm²

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

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
**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.


**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

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**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>Description</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC adapter, for connecting BlueControl software to the BluePort®</td>
<td>9407-998-00001</td>
</tr>
<tr>
<td>Standard rail adapter</td>
<td>9407-998-00061</td>
</tr>
<tr>
<td>Operating manual</td>
<td>9499-040-63418</td>
</tr>
<tr>
<td>Operating manual</td>
<td>9499-040-63411</td>
</tr>
<tr>
<td>Operating manual</td>
<td>9499-040-63432</td>
</tr>
<tr>
<td>BlueControl Mini</td>
<td>9407-999-11001</td>
</tr>
<tr>
<td>BlueControl Basic</td>
<td>9407-999-11001</td>
</tr>
<tr>
<td>BlueControl Expert</td>
<td>9407-999-11011</td>
</tr>
</tbody>
</table>

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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 | 9499-040-63418
Operating manual | 9499-040-63411
Operating manual | 9499-040-63432
BlueControl Mini | 9407-999-11001
BlueControl Basic | 9407-999-11001
BlueControl Expert | 9407-999-11011

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**PMA**

Prozeß- und Maschinen- Automation GmbH
P.O. Box 31 02 29
D-34058 Kassel
Tel.: +49 - 561- 505 1307
Fax: +49 - 561- 505 1710
E-mail: mailbox@pma-online.de
Internet: http://www.pma-online.de

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Your local representative: