MANUAL

Smart Temperature Monitoring Relays
CM-TCN
Important notice, purpose and basic description

These manual supplements our product catalog and provides the general functionality as well as application suggestions for our smart temperature monitoring relays. For additional technical data please refer to our catalogue or contact us.

You can either read the entire manual or selectively gather information about individual devices and their possible applications.

The table of contents and the index section enable quick and easy access to the desired information.

Target group

This description is intended for use by trained specialists in electrical installation and control and automation engineering, who are familiar with the applicable national standards.

Safety requirements

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Symbols

This technical document contains markers to point the reader to important information, potential risks and precautionary information the following symbols are used:

- Indicates a potentially dangerous situation that can cause damage to the connected devices or the environment.
- Indicates important information and conditions.
- Indicates a potentially dangerous situation that can cause human injuries.

Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFC</td>
<td>Near Field Communication</td>
</tr>
<tr>
<td>EPiC</td>
<td>Electrification Products intuitive Configurator</td>
</tr>
<tr>
<td>CM-TCN</td>
<td>Temperature monitoring relay</td>
</tr>
</tbody>
</table>

Related Documents

<table>
<thead>
<tr>
<th>Document ID</th>
<th>Title</th>
</tr>
</thead>
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<td>2CDC112286C2010</td>
<td>CM-TCN catalog</td>
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1. **Device overview**

The CM-TCN smart temperature monitoring relay aims to meet different customer needs with just one device. The LCD screen provides status updates with a single glance. Near Field Communication (NFC) enables to adjust settings with one touch of a smartphone, making installation faster and more intuitive. The device comes with a wide measuring range from -200...+850 °C and is compatible with multiple sensor types, as well as predefined settings for common motor or transformer supervision applications and storage space for user-defined settings.

With the ABB EPiC app wireless configuration and status checks are easily possible. By using the app parameter settings can be edited quickly, stored in the app or copied to other CM-TCN devices, even in an unpowered state. Moreover, parameters can be uploaded into a cloud or shared within seconds e.g. via E-mail.

The temperature monitoring relays are typically used in the following applications:

- Motor and system protection
- Temperature monitoring in control cabinets
- Monitoring of electronic motors
- Monitoring of transformers
- Ambient temperature monitoring
- Temperature limits for process variables
- Monitoring of bearing temperatures
- Monitoring of cooling liquids
- Packaging industry
- Air Conditioning Systems
- Ventilation systems
- Heat pumps
- Hot water supplies

1.1. **LCD display and symbol-based menu structure**

Variants with LCD display are available. The display:

- Allows the intuitive and fast configuration with the help of a symbol-based menu structure. Profiles are available for various applications. Each parameter can also be modified individually and stored as a user profile for later reuse.

- Shows permanently the device status and all currently measured temperatures. Detailed diagnosis information helps to identify problems quickly.

- Provides access to various service counters helping to reduce maintenance cost

Symbols are used instead of text throughout the whole menu structure.
1.2. **Near Field Communication (NFC)**

Every device of the smart monitoring relay family is equipped with an NFC antenna. This enables the parametrization of the devices with the ABB EPiC Mobile smartphone app via NFC.

To read or write data the smartphone needs to touch the surface of the CM-TCN. The connection is only active when the data transmission takes place. Contrary to e.g. Bluetooth there is no constant communication to the device.

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**NFC** is an international transmission standard based on radio-frequency identification technology for the contact-less exchange of data. This technology is already integrated in most electronic devices like tablets and smartphones and part of everyday life, e.g. for contactless payment.

The CM-TCN can be configured powered or without power supplied. This simplifies pre-configuration of devices for customers and helps optimize workflows.

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**ABB EPiC smartphone app**

EPiC means “Electrification Products intuitive Configurator” and is the mobile application that allows to configure and check the status of the ABB low voltage products. The app is available for free and can be downloaded for Android and iOS. Registration with a user account is mandatory.
1.3. Device description

- **Push-in and screw terminals**
- **3 measuring inputs**: PT100, PT1000, PTC, NTC
- **Back-lit LCD**: Symbol-based menu structure
- **Push-rotate button**: Intuitive operation with just one button
- **Marker label**
- **Connection terminals**: Wide terminal spacing allows connection of wires: $2 \times 1.5 \text{ mm}^2 (2 \times 16 \text{ AWG})$ with wire and ferrules or $2 \times 2.5 \text{ mm}^2 (2 \times 14 \text{ AWG})$ without ferrules

LED status indication:
- Red: Failure
- Yellow: NFC ready for pairing
- Green: Control supply voltage applied; no failure

Width 45 mm
2. **Installation**

2.1. **Mounting and de-mounting**

Snap-on mounting onto a 35 mm standard mounting rail, without using any tool.

2.2. **Block diagram**

The following block diagram shows the set-up of the CM-TCN: supply voltage range, connection of sensor types, control input, function of output relays and the galvanic insulation.

In UL applications a fuse protection for the supply circuit is required.
2.3. Sealable transparent cover

To protect the relay against unauthorized access and usage, a transparent sealable cover can be used. The cover is available as an accessory. Before mounting the sealable cover, the standard marker label must be removed from the device and the mounting clip which is delivered together with the sealable cover must be snapped onto the device. After mounting the relay can be protected by a seal.
3. Commissioning

The smart temperature relays are configurable in two ways:
- The first option is via the LCD and the push-rotate button on the front of the device.
- The second option is to use the EPiC smartphone app.

In the next sections the configuration via LCD and push-rotate button is explained.

3.1. Main screen

On the main screen the most important information is provided to oversee the status of the device. The main screen is divided in four sections, each containing a different set of information.

Section one displays the measured temperature in each measuring circuit (channel). Each channel is displayed by the symbol for channel with a number corresponding to the number of the measuring circuit e.g. channel 1 equals measuring circuit 1T1/1T2/1T3.

In section two the relay status is displayed. Through the symbol the actual status of the relay can be determined immediately: a white relay means the relay is deenergized and a filled-out symbol equals energized. The relays are numbered according to the numbers on the terminal e.g. relay 1 equals terminal assignment 11/12/14.

Section three provides information regarding configurations which deviate from the default e.g. cyclic switching function running or simulation mode selected. In this case the symbol for e.g. cyclic switching function is shown here. This section is also used in case of a relay trip to display the trip information per channel.

In case more than one trip is active, the information switches in a rhythm of 5 seconds between relays. The relay whose status is displayed will be framed. To view the trip reason for a specific relay the user can enter section two and rotate between the relays to display the needed value or to reset a trip in case manual
reset is selected. With a rotate action section 2 will be entered. A frame will be displayed around the first relay and the trip reason for this relay will be displayed in the bottom line.

The device offers two reset options: automatic and manual reset. To reset a relay manually when manual reset is enabled the push-rotate button needs to be pressed when the frame is around the relay which should be reset.

The reset screen will open:

![Reset Screen]

By clicking on ✅ a reset is conducted. To abort the reset and go back to the start screen ❌ needs to be selected.

Default setting for all relays is automatic reset. In this case the reset menu will not be displayed. If manual reset is configured for a relay, the reset menu will become available automatically. The relay detects if the reset condition is reached. In case it is not reached the reset menu will not be available.

Example: In the picture displayed above, channel 1 shows a measured temperature of 180.6 °C. Navigating the frame to relay 1 shows that it has tripped because the configured threshold for overtemperature monitoring at 175 °C at channel 3 has been reached.

Section 4 is used for devices with Modbus only. Here a symbol signalizes the working Modbus communication.

### 3.2. Menu navigation

The operation of the device as well as the configuration is done via a push-rotate button which allows a precise menu navigation and accurate setting of any value.

The encoder can be operated either with a screwdriver or with the delivered knob which fits into the screwdriver fitting.
As soon as the relay is powered, the LCD lights up and the start screen shows the currently measured values. The menu is entered with a push on the push-rotate button. Through the rotation to the left or to the right the menu can be navigated. To enter a submenu the respective symbol must be selected. The values of the parameters can be selected through push-rotate actions. The set value becomes active immediately after confirmation. To exit a menu the back symbol can be used or pushing the push-rotate encoder for 2 s.

The display goes back to the main screen if no user interaction is detected within 30 s. The current setting remains unchanged.

4. Configuration and setup

This section provides information how to configure the CM-TCM temperature relay with the help of profiles. There are two different profile categories – Factory and user profiles. The following sections will explain each option and how to select and modify them.

The following parameters can be set:

<table>
<thead>
<tr>
<th>Menu</th>
<th>Parameter</th>
<th>Symbol</th>
<th>Explanation</th>
<th>Data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profiles</td>
<td>Factory profiles</td>
<td>![symbol]</td>
<td>One of seven profiles can be selected for immediate use or for optimized configuration</td>
<td>[yes, no]</td>
</tr>
<tr>
<td></td>
<td>User profiles</td>
<td>![symbol]</td>
<td>The user can save individual parameter sets in one of four user profiles</td>
<td>[yes, no]</td>
</tr>
</tbody>
</table>

Conducting a factory reset will delete the saved user profile configurations.

4.1. Factory profiles

Factory profiles are parameter sets which offer default values for each parameter, covering the most common applications like e.g. motor or transformer monitoring and protection. These profiles allow a quick setup of the CM-TCN.
Factory profiles are read-only and cannot be overwritten. Default is factory profile 1. The following factory profiles are available:

<table>
<thead>
<tr>
<th>Factory 1</th>
<th>Factory 2</th>
<th>Factory 3</th>
<th>Factory 4</th>
<th>Factory 5</th>
<th>Factory 6</th>
<th>Factory 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel 1</td>
<td>PT100</td>
<td>PT100</td>
<td>PT100</td>
<td>PTC</td>
<td>PT100</td>
<td>PT100</td>
</tr>
<tr>
<td>Channel 2</td>
<td>PT100</td>
<td>PT100</td>
<td>PT100</td>
<td>PTC</td>
<td>PT100</td>
<td>PT100</td>
</tr>
<tr>
<td>Channel 3</td>
<td>PT100</td>
<td>none</td>
<td>PT100</td>
<td>none</td>
<td>PT100</td>
<td>PT100</td>
</tr>
</tbody>
</table>

### Settings

<table>
<thead>
<tr>
<th>Factory 1</th>
<th>Factory 2</th>
<th>Factory 3</th>
<th>Factory 4</th>
<th>Factory 5</th>
<th>Factory 6</th>
<th>Factory 7</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Settings</th>
<th>Relay assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel 1</td>
<td>PT100</td>
</tr>
<tr>
<td>Channel 2</td>
<td>PT100</td>
</tr>
<tr>
<td>Channel 3</td>
<td>PT100</td>
</tr>
</tbody>
</table>

### Relay 1

#### Working principle
- NC

#### Signal
- 1,2,3
- Threshold:
  - Ch>130°C
  - Ch>90°C

#### Hysteresis
- 10 K

#### Delay
- 0 s

#### Sensor error
- -

#### Cyclic Switching
- Period:
  - 1 week
  - On-time:
    - 15 min

### Relay 2

#### Working principle
- NC

#### Signal
- 4,5,6
- Threshold:
  - Ch>150°C
  - Ch>110°C

#### Hysteresis
- 5 K

#### Delay
- 0 s

#### Sensor error
- -

#### Cyclic Switching
- -

### Relay 3

#### Working principle
- NC

#### Signal
- -
- Threshold:
  - Ch>155°C

#### Hysteresis
- 5 K

#### Delay
- 0 s

#### Sensor error
- 1,2,3

#### Cyclic Switching
- -
4.1.1. Factory 1 - Motor protection with PT100 sensors

This profile allows motor supervision with two escalation steps. The first threshold is configured as a pre-warming at 130 °C for all measuring circuits. When the threshold is reached, relay 1 will trip. The second threshold controls the switch off at a temperature of 150 °C. Relay 2 will trip if the threshold value is measured by any of the three measuring circuits. In case of sensor errors in any of the three sensor circuits (short circuit, open wire) relay 3 is triggered immediately.

The relays energize when the measured temperature is below the threshold and the set hysteresis value. The hysteresis is set to 10 K for the pre-warning and 5 K for the switch off threshold.

The relays operate in closed circuit principle. Automatic reset is active for all output relays.

The operating logic and the settings are displayed in the block diagram:
4.1.2. **Factory 2: Motor bearing supervision with PT100**

Profile 2 focuses on motor bearing instead of motor winding supervision. For each of the bearings (left and right) a PT100 sensor is configured. Like the motor winding supervision, the profile offers a pre-warning at 90 °C tripping relay 1 and a switch off threshold at 110°C tripping relay 2.

The hysteresis for both thresholds is set to 5 K. Relay 3 trips in case of sensor errors. The relays operate in closed circuit principle. Automatic reset is active for all output relays.

The operating logic and the settings are displayed in the block diagram:
4.1.3. **Factory 3: Motor supervision with PT100 – 2**

Profile 3 follows the same logic as profile 1. The temperature thresholds are configured for higher temperatures. Threshold number 1 trips at 150 °C and threshold number 2 is reached at 170 °C.

The relays operate in closed circuit principle. Automatic reset is active for all output relays.

The operating logic and the settings are displayed in the block diagram:
4.1.4. Factory 4: Motor winding supervision with PTC

This profile allows motor supervision with two escalation steps. The threshold correlates to the used PTC sensors. If the first threshold is reached, relay 1 will trip and for the second threshold relay 2. In this profile channel 1 correlates to signal 1 and channel 2 to signal 2.

Relay 3 trips in case of sensor error for both measuring circuits.

The relays operate in closed circuit principle. Automatic reset is active for all output relays.

The maximum permitted cold state resistance in series is 750 Ohm.

In the signal menu the settings for threshold and hysteresis are disabled for the corresponding signals if PTC is set as sensor.

For conformity with IEC 60947-8 the equipment needs to be switched-off in case of sensor error. This is to be taken into consideration during the wiring or in the device configuration.

The operating logic and the settings are displayed in the block diagram:
### Factory 5: Transformer supervision with PT100

This profile allows transformer supervision with three escalation steps. Threshold 1 is set to 130 °C and starts ventilation for cooling. If the threshold is reached relay 1 trips. A cyclic switching function is assigned to relay 1 to periodically switch the relay once per week for 15 minutes to keep the fan from clogging.

Threshold 2 is a pre-warning at 140 °C and trips relay 2. Additionally to the threshold configuration the sensor error signals are assigned to relay 2 as well.

Threshold 3 is for the switch off at 155 °C.

Relays 1 and 3 operate in open-circuit-principle, relay 2 in closed-circuit-principle. Automatic reset is active for all relays.

The operating logic and the settings are displayed in the block diagram:
4.1.6. **Factory 6: Transformer supervision with PTC**

Profile 6 follows the same logic as profile 5 with PTC sensors. In this setting each measuring input correlates to one output relay: channel 1 to Relay 1, channel 2 to relay 2 and channel 3 to relay 3. The temperature thresholds depend on the selected sensors.

Cyclic switching function 1 is assigned to relay 2.

Relay 2 trips in case of sensor error for all measuring circuits.

Relay 1 and 3 operate in normally-open working principle, relay 2 in normally-closed. Automatic reset is active for all output relays.

The operating logic and the settings are displayed in the block diagram for detailed information:
4.1.7. **Factory 7: Individual temperature supervision with PT100**

In this profile each channel corresponds to one of the relays: channel 1 to relay 1, channel 2 to relay 2 and channel 3 to relay 3.

The sensor error is assigned for each channel to the corresponding relay. All thresholds are set to measure overtemperature at 40 °C. The relays work in the open-circuit-principle. Automatic reset is active for all relays.

The operating logic and the settings are displayed in the block diagram for detailed information:
4.2. **User profiles and individual parameterization**

All parameters within the CM-TCN can be adjusted according to the users’ needs. The individual parametrization consists of three steps: sensor configuration, signal definition and relay assignment.

- **Step 1:** First, configure the connected sensor type for each measuring circuit (channel 1 – 3). It is possible to configure each input individually e.g. channel 1 as PT100, channel 2 as PT1000 and channel 3 as PTC input.

- **Step 2:** Define the signals which compare the measured temperature from one of the three channels with the configured threshold. The following operators are available: <, >

Additionally, temperature differences between two measuring circuits can be monitored and set as threshold. The absolute difference is measured. The configured sensors must be the same for both channels. This function is only possible with PT100, PT1000 and NTC sensor configuration.

- **Step 3:** Allocate the signals to a relay output. This means that as soon as signal becomes true the assigned relay output is activated. It is possible to allocated multiple signals to the same relay output. In this case the relay output becomes active as soon as at least one signal is true (or operation).

It is most convenient to select a profile with settings similar to the needed ones and modify just the parameters which differ from the required configuration.

4.2.1. **Step 1: Sensor configuration**

In this menu the general settings for the measuring circuits can be made. The user needs to select which sensor type is connected to which input.

The picture below shows the screen for the setting menu:

By clicking on the symbol, the sub menu is entered. In the sub menu the channel for which the sensor should be set can be selected:
Currently channel 1 is selected and the configured sensor is PT100. By pushing the symbol for channel 1 the sub menu is entered. Pushing again will enable the user to change the sensor type by rotation. To confirm the selection another push action is needed, the sub-menu is left automatically after confirmation.

The following parameters can be set:

<table>
<thead>
<tr>
<th>Menu</th>
<th>Parameter</th>
<th>Symbol</th>
<th>Explanation</th>
<th>Data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings</td>
<td>Measuring circuit 1</td>
<td>![Symbol]</td>
<td>Selection of the sensor type for measuring circuit 1 – 1T1, 1T2, 1T3</td>
<td>[PT100], [PT1000], [PTC], [NTC], [Bi-metal switch]</td>
</tr>
<tr>
<td></td>
<td>Measuring circuit 2</td>
<td>![Symbol]</td>
<td>Selection of the sensor type for measuring circuit 2– 2T1, 2T2, 2T3</td>
<td>[PT100], [PT1000], [PTC], [NTC], [Bi-metal switch]</td>
</tr>
<tr>
<td></td>
<td>Measuring circuit 3</td>
<td>![Symbol]</td>
<td>Selection of the sensor type for measuring circuit 3 – 3T1, 3T2, 3T3</td>
<td>[PT100], [PT1000], [PTC], [NTC], [Bi-metal switch]</td>
</tr>
</tbody>
</table>

4.2.2. **Step 2: Signal definition**

In this menu up to nine different signals and three cyclic switching functions can be configured. A signal setting consists of the threshold configuration, the hysteresis and ON- and OFF-delay settings related to the threshold.

With a cyclic switching function regular switching of equipment according to a defined time schedule can be realized e.g. weekly switching of a fan for 15 minutes to reduce risk of clogging due to non-movement. Next to these two signals there are further options like fault supervision signals. More information can be found in chapter relay assignment.

For configuration select signal S1-S9 or cyclic switching function CF1-CF3 by rotating through the menu and push the selected one.

**Signals – Signal 1:**

![Diagram]
After selecting a signal, the first screen displays the threshold configuration. By clicking on the symbol, the sub-menu for threshold configuration is entered and the values can be adjusted.

Signal 1 – Threshold:

By rotating the push-rotate button left or right other sub menus can be selected: hysteresis, ON-delay and OFF delay configuration. Pressing the back symbol in the sub menu leads back to the higher level.

The following values can be set for signals one to nine:

<table>
<thead>
<tr>
<th>Menu</th>
<th>Parameter</th>
<th>Symbol</th>
<th>Explanation</th>
<th>Data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signals 1-9</td>
<td>Signal source</td>
<td>🗃️</td>
<td>These parameters make the threshold configuration e.g. channel 1 (symbol channel) &gt; 300°C</td>
<td>[Ch1], [Ch2], Ch3, [DiffCh1Ch2], [DiffCh1Ch3], [DiffCh2Ch3]</td>
</tr>
<tr>
<td></td>
<td>Over- or under</td>
<td>⬇️</td>
<td>Temperature value</td>
<td>[-200...+850 °C]</td>
</tr>
<tr>
<td></td>
<td>temperature</td>
<td></td>
<td></td>
<td>[-328...+1530 °F]</td>
</tr>
<tr>
<td></td>
<td>Hysteresis</td>
<td>⌘️</td>
<td>Configuration of hysteresis related to threshold</td>
<td>[1...99.9 °C]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[33.8...211.82 °F]</td>
</tr>
<tr>
<td></td>
<td>ON-delay</td>
<td>⏯️</td>
<td>Configuration of the ON-delay: delayed switching of the relay after the threshold is reached</td>
<td>[0 – 6553.5 s]</td>
</tr>
<tr>
<td></td>
<td>OFF delay</td>
<td>⏯️</td>
<td>Configuration of the OFF-delay: delayed switching of the relay after the hysteresis value is reached</td>
<td>[0 – 6553.5 s]</td>
</tr>
</tbody>
</table>

The setting options for the signals depend on the sensor selection in the device settings. In case PTC or bi-metal is configured for the selected channel, the options to define threshold and hysteresis, will automatically be removed from the signal.
Threshold

Entering the threshold menu allows setting of the signal source, over- or under-temperature monitoring and the temperature value. Signal source refers to the sensor circuit from which the measured temperature values is taken as reference to the configured threshold. The CM-TCN provides three independent sensor circuits: 1T1/1T2/1T3, 2T1/2T2/2T3 and 3T1/3T2/3T3

Signals 1 – Threshold:

The currently selected parameter is underlined, signaling it can be changed by rotating. After adjusting the new value, another push action confirms the new selection or exits the configuration.

Threshold – Channel selection:

Clicking on \( \leftarrow \) leads back to the next higher menu stage. Alternatively, the button can be pressed for 2 seconds.

Hysteresis

In this sub-menu the hysteresis related to the configured threshold can be set. The term hysteresis refers to the release of an energized relay after its threshold value has been reached again.

Example: The relay picks up if the temperature rises above 100 °C, i.e. over-temperature detected, output relay is energized (open-circuit principle), but it does not de-energize immediately if the temperature decreases to the threshold value of 100 °C again but only after the threshold minus hysteresis value has been reached e.g. 95 °C.

The hysteresis is given as an absolute value added or subtracted to the threshold value depending if the configuration is under- or overtemperature monitoring. The release hysteresis prevents the relay from continuously switching on and off in case of temperature variations around the threshold value.
Hysteresis menu:

ON and OFF Delay

With the ON and OFF delay settings a time delayed switching of the output relay can be realized. The ON-delay allows a delayed switching of the relay according to the configured time when the threshold value is reached. The OFF-delay keeps the relay from switching back for the set amount of time after the measured value has reached the threshold + hysteresis value.

ON-delay menu:

Cyclic switching function

The cyclic switching function follows a periodical rhythm. The user can define the cycle time and the on-time. The cycle time is the period after which the ON-time is scheduled e.g. one week. The ON-time is the time for which the relay switches positions e.g. 20 minutes. This function can be used to keep e.g. fans from clogging.

Cyclic-switching-function menu:

In the example settings the cycle time is set to seven days and the ON-time to one hour, which means that the relay is tripped every week for one hour.
### 4.2.3. Step 3: Relay assignment and configuration

In this step the signals defined in the previous step can be allocated to an output relay. It is possible to allocate one or more signals to an output relay. Additionally, sensor error signals can be assigned. These signals are available per default and cannot be changed by the user.

Beside the signal allocation the working principle and the reset option are configured in this step as well. When entering the menu, first select the relay to configure. The number in the top right corner refers to one of the three relays. Relay 1 corresponds to terminals 11-12-14, relay 2 to 21-22-24 and relay 3 to 31-32-34.

Relay menu with relay 1 selected:

By clicking on the relay, the sub-menu of the selected relay is entered. The following parameters can be set for each relay:

<table>
<thead>
<tr>
<th>Menu</th>
<th>Parameter</th>
<th>Symbol</th>
<th>Explanation</th>
<th>Data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relay 1-3</td>
<td>Signals</td>
<td>🔄</td>
<td>The signals defined in the previous menu can be assigned to one of the three relays.</td>
<td>[1, 2, 3, 4, 5, 6, 7, 8, 9]</td>
</tr>
<tr>
<td>Cyclic switching function</td>
<td></td>
<td>🔄</td>
<td>One of the three cyclic switching functions defined in the previous menu can be assigned one of the three relays.</td>
<td>[1, 2, 3]</td>
</tr>
<tr>
<td>Sensor Error</td>
<td></td>
<td>🔄</td>
<td>A sensor error signal can be assigned to one of the relays. For every measuring circuit one sensor error signal is available. Channel 1 corresponds to Sensor Error 1.</td>
<td>[1, 2, 3]</td>
</tr>
<tr>
<td>Working principle</td>
<td></td>
<td>🔄</td>
<td>The relay working principle can be adjusted independently for each of the three relays.</td>
<td>[NO, NC]</td>
</tr>
<tr>
<td>Reset</td>
<td></td>
<td>🔄</td>
<td>For each relay an automatic or manual reset can be set.</td>
<td>[Auto, Manual]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Default: Auto</td>
<td></td>
</tr>
</tbody>
</table>
**Signal assignment**

In this step the configured signals can be assigned to the previously selected relay. Using the push-rotate button allows to select the available signal categories one by one: Threshold, cyclic switching function and sensor error. Additionally, the working principle and the reset option can be defined.

The following picture displays the assignment menu for threshold settings. The numbers represent the signals one to nine configured before. By rotating the push-rotate button each of the numbers can be selected. To assign a signal the button needs to be pressed. The selection is shown by a black background behind the chosen number.

**Relay 1 – threshold signal:**

![Signal assignment menu](image)

In the picture signal 1 is currently assigned to relay 1. The cursor on signal 2 signals the user the position on the display. For the signal on which the cursor is currently positioned, the configuration is shown in the bottom line of the screen. In the picture for signal 2 the threshold configuration is CH2 > 175.0 °C

**Relay working principle**

For each of the relays the working principle can be adjusted to open circuit principle (NO) or closed-circuit principle (NC). The default setting is closed-circuit principle (NC) for profile 1. Closed-circuit principle means that in case of no event the relay coil is energized immediately. If an error occurs the relay de-energizes.

**Relay 1 – working principle:**

![Relay working principle](image)
Reset / trip acknowledge

The CM-TCN devices offer two reset options: manual or automatic reset. The default setting for all relays is automatic reset.

When the configuration is automatic reset, the relay will switch back to its default position as soon as the measured temperature is below or above (depending if over- or under temperature monitoring is set) threshold value plus hysteresis value and no other switching condition is active.

With the manual reset the relay will remain in the switched position even if the good state is reached again. The user needs to manually activate the reset either via the display or remotely via terminals S1-C.

Relay 1 – Reset:

Cyclic switching function

The assignment of the cyclic switching functions follows the same principle as the assignment of the threshold signals.

Sensor error signals

The assignment of the sensor errors follows the same principle as the assignment of the signals.

Relay 1 – Sensor error:

Contrary to the previous signals the sensor errors are default signals. They are set in case of a sensor fault. The measurement circuits detect short circuit or wire break at their inputs. These sensor errors can be assigned to any relay. No additional configuration is required.
4.2.4. **Save configuration into user profiles**

User defined profiles offer the opportunity to save a user-specific configuration on the device for later reuse. In total there are four user defined storage spaces. To save a new setting the saving icon in the main menu needs to be selected:

Four user-defined profiles will show up, displayed by the person icon. The number in the top right corner represents the number of the user profile. Any profile can be selected to save the data.

After the selection the device will ask for confirmation of the selection:

Selecting the cross will abort the saving process. Confirmation via tick will save the configuration to the selected user profile and can be selected in the profile menu.
5. Security

The CM-TCN offers different security options to protect the information and settings from unauthorized access and changes. The parameter lock and the password protection can be set in the security menu accessible via the main menu. Additionally, the device offers the opportunity to disable NFC.

<table>
<thead>
<tr>
<th>Menu</th>
<th>Parameter</th>
<th>Symbol</th>
<th>Explanation</th>
<th>Data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td>Parameter lock</td>
<td>![Lock Icon]</td>
<td>This mode prevents change of any parameters at the display menu. It can be enabled/disabled at any time.</td>
<td>[enable, disable]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Default: disable</td>
<td>Default: disable</td>
</tr>
<tr>
<td>Password protection</td>
<td>A four-digit password can be set for the device</td>
<td>![Password Icon]</td>
<td>[enable, disable]</td>
<td>Default: Disabled</td>
</tr>
<tr>
<td>NFC</td>
<td>NFC can be set to enabled or disabled</td>
<td>![NFC Icon]</td>
<td>[enable, disable]</td>
<td>Default: enabled</td>
</tr>
</tbody>
</table>

5.1. Parameter lock

The parameter lock is an additional function to protect the device from accidental changes. Contrary to the password protection every user who has access to the device can enable or disable the parameter lock.

The parameter lock can be activated in the security menu. From the moment the parameter lock is activated no further settings can be made. All menus can still be accessed in a read-only mode. When trying to change settings while the parameter lock is enabled the symbol for parameter lock will be shown on the display to remind the user that the mode is still enabled:
5.2. Password protection

A user-selected four-digit password can be set for the device. To enable the password, select the symbol for password enabled in the security menu. The user will be asked to provide an individual four-digit password. After the password selection, the password protection becomes active.

Security – password protection enabled:

As soon as the password is active no parameters can be changed.

A request to enter the password is made every time the user wants to access the menu. Instead of entering the password and thus enabling full parameter setting functionality the user can select the read-only mode. The read-only mode works like the parameter lock and gives the operator full read access to the menus to e.g. check data and values but does not allow parameters to be changed.

Security – read only mode:

Security – enter password:

The device will show the symbol for password protection in case the user tries to enter the parameter configuration while in read-only mode:
5.3. **Near Field Communication**

For the CM-TCN device, NFC communication can be disabled either via the display menu on the device itself or through the app.

When NFC is disabled, no further communication with the EPiC Mobile app is possible. To enable the communication again, NFC needs to be enabled directly at the device.

**NFC pairing**

If the device is powered the button needs to be pressed for three seconds to enable NFC while on the main screen. This enables NFC-pairing for 15 seconds, during which time a connection must be established. During the 15 seconds time frame the LED is blinking orange.

When the first communication was successful NFC stays enabled for another 5 minutes.

This ensures that NFC communication can only be established by an authorized person, which has access to the device and pushes the button.

If the device is unpowered NFC communication is always enabled unless selected otherwise.

**Security – NFC disabled:**
6. Error handling, maintenance and service

6.1. Additional functions

In additional functions device-related settings like temperature unit can be found. Additionally, the menu offers the user the possibility to store up to three individual texts in the device.

<table>
<thead>
<tr>
<th>Menu</th>
<th>Parameter</th>
<th>Symbol</th>
<th>Explanation</th>
<th>Data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common settings</td>
<td>Display ON-time</td>
<td>🕋</td>
<td>Time during which the display backlight is on.</td>
<td>[OFF, 10 s, 30 s, 1 min, 2 min, 5 min, 10 min, 30 min, 1 h, ON] Default: 3 s</td>
</tr>
<tr>
<td>Device:</td>
<td>Temperature unit</td>
<td>🟥</td>
<td>Selection of the temperature unit in which temperature values will be displayed and processed</td>
<td>[Celsius °C, Fahrenheit °F] Default: °C</td>
</tr>
<tr>
<td>App:</td>
<td>Power-on delay</td>
<td>⏰</td>
<td>Delay after relay start-up. During this phase the relay does not evaluate the measured values.</td>
<td>[3.0-999.9 s] Default: 3 s</td>
</tr>
<tr>
<td></td>
<td>User defined text 1-3</td>
<td>🖋️</td>
<td>A user defined text consisting of x digits can be stored</td>
<td>[A-Z, 1-9, :, ;, &lt;, =, &gt;, ?,*]</td>
</tr>
</tbody>
</table>

6.1.1. Display ON-time

The display ON-time means the time the display back light will stay on after no action is registered. The backlight can be continuously on or off or be set to a specific time.

The default display ON-time is 30 seconds.

Common settings – display ON-time:
6.1.2. Temperature unit

The temperature unit can be individually set to either Celsius °C or Fahrenheit °F. By changing the temperature unit all parameters in the device are automatically adapted to the new unit, no further adjustments from the user-side are needed.

Common settings – Temperature unit:

6.1.3. Power-on delay

The device has a configurable power-on delay. During the power-on phase the measured values are not evaluated by the relay and therefore do not lead to a premature trip.

The default start-up time is 2 seconds.

Common settings – Power-on delay:
6.1.4. **User-defined text**

The device offers the option to save up to three user-defined texts with up to 8 signs. They can be used for device specific information like location, use etc. ASCII signs only.

Common settings – user-defined text:

<table>
<thead>
<tr>
<th>P</th>
<th>G</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSTER--</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. **Condition monitoring**

In the condition monitoring menu the user finds additional information events, average measured temperatures, operating counter and the simulation mode.

The following values can be set for each parameter:

<table>
<thead>
<tr>
<th>Menu</th>
<th>Parameter</th>
<th>Symbol</th>
<th>Explanation</th>
<th>Data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis</td>
<td>Event history</td>
<td>![event-history]</td>
<td>The events contain all information related to a relay trip. Up to 10 events are stored.</td>
<td>[No settings possible] Can be reset by the user</td>
</tr>
<tr>
<td></td>
<td>Operating hour counter</td>
<td>![hour-counter]</td>
<td>The operating hour counter stores lifetime information about the relay.</td>
<td>[No settings possible] Cannot be reset by the user</td>
</tr>
<tr>
<td></td>
<td>Maintenance counter</td>
<td>![maintenance-counter]</td>
<td>The maintenance counter counts the trips per relay.</td>
<td>[No settings possible] Can be reset by the user</td>
</tr>
<tr>
<td>Statistics</td>
<td></td>
<td>![statistics]</td>
<td>In statistics the user finds the minimum, maximum and average measured temperature values per measuring circuit.</td>
<td>[No settings possible] Can be reset by the user</td>
</tr>
<tr>
<td>Password reset counter</td>
<td></td>
<td>![password-reset]</td>
<td>Numbers of password resets is counted.</td>
<td>[No settings possible] Cannot be reset by the user</td>
</tr>
<tr>
<td>Simulation mode</td>
<td></td>
<td>![simulation-mode]</td>
<td>Simulation mode for simulation of temperature values and relay trips.</td>
<td>Channel 1-3: [-200...+850 °C] Relay 1-3: [NO, NC]</td>
</tr>
</tbody>
</table>
### 7.1.1. Event history

In the event history all events are listed. These include all relay trips, error conditions and cyclic switching function events. The information displayed for each event includes the tripped relay, information related to the cause of the event (threshold reached, cyclic switching function, error condition) and the time when the event happened measured in time since power on.

One event is displayed at a time. To see all events the user can scroll though the event history. It is possible to delete the whole event history. Pressing the button will lead to the delete and back option. A maximum of ten events can be stored in the event history. In case the buffer is full, the oldest event will be deleted in favor of a new one. The event history will be stored even after a new power cycle. The date code will be deleted from events from a previous power cycle to inform the user.

Example 1 - overtemperature:

![Example 1 - overtemperature](image)

Example 2 – sensor error:

![Example 2 – sensor error](image)
7.1.2. Operating hour counter

The operation hour counter provides information about the total on-time of the relay, the on-time since the last power on and total energized time of each relay. To see all information the user can scroll through the list. Pushing the push-rotate button will lead back to the condition monitoring menu.

Condition monitoring – operating hour counter:

The values cannot be reset.

7.1.3. Maintenance counter

In this menu the total switching cycles per relay are counted. The relay trip counter can be reset. To reset the user needs to press the push-rotate button and select .

The device will ask for confirmation:

With the confirmation all values are reset.

Condition monitoring – maintenance counter:
7.1.4. **Statistics**

The statistics menu provides information about the lowest measured temperature, the highest measured temperature and the average measured temperature for each measuring circuit. The values can be reset.

Condition monitoring – statistics:

7.1.5. **Password reset counter**

The password reset counter counts how often the password has been reset by the user and displays the time when the password was reset. The time given as a value related to the time since power on.

Condition monitoring – password reset counter:

7.1.6. **Simulation mode**

The simulation mode can be used for commissioning or testing. There are two options in the simulation mode: Simulation of temperature values to test the relay configuration or trip of the relays.

The symbol for simulation mode is displayed in the bottom pane of the display. The user can navigate through the simulation mode by rotating. To change a value or a relay position, the according symbol needs to be clicked. For the channels the temperature can be simulated by clicking and rotating. The changes are effective immediately. The user can use this mode to test the settings and check the relay behavior in case of temperature changes. The relays can also be reached via rotation. Clicking on a relay changes the state immediately.

Condition monitoring – simulation mode:
The simulation mode will stay active for 15 minutes if no user interaction is detected. The symbol for simulation mode will be displayed on the bottom of the display.

7.1.7. **QR-code**

Scanning the QR-code with a smartphone will lead to the web page for ABB low voltage electronic relays and controls. On the page more information and details about the temperature monitoring portfolio as well as other related products can be found.

7.1.8. **Factory reset**

A factory reset sets the device back to the delivery condition. All personal settings and user profiles will be deleted. Maintenance counter which cannot be deleted by the user will be kept even after a factory reset. To make a factory reset the user needs to click on the symbol.

Condition monitoring – factory reset

A confirmation pane will be displayed to ask again for confirmation. Confirmation will lead to a factory reset.

Condition monitoring – confirmation factory reset

It is advised to conduct a factory reset before disposing of the device at the end-of-life.
7.1.9. Device information

Under device information the name of the device, the order code, the serial number and the firmware version are stored.

Device information:
ABB STOTZ-KONTAKT GmbH
Eppelheimer Strasse 82
69123 Heidelberg
Germany

You can find the address of your local sales organization on the ABB homepage.

Additional information

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