Operating instructions
Infrared temperature sensor

efector6oo

TW70xx
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1 Miscellaneous

1.1 Information about this manual
The Operating Manual shall enable the user to properly install the infrared temperature sensor and the required accessories. Before starting installation, be sure to read and understand this entire manual, in particular the chapter on safety! The instructions contained in this manual, especially those concerning safety, as well as site-specific regulations governing accident prevention regulations must be complied with at all times!

1.2 Explanation of symbols
Important safety-related references in this manual are marked with a symbol.

⚠️ CAUTION
This symbol indicates important information which, if neglected, might result in damage to the instrument or malfunction or breakdown.

⚠️ PLEASE NOTE
This symbol points out guidelines which should be heeded for efficient and trouble-free operation.

► Action
This symbol instructs the operator to take action.

> Reaction, Result
This symbol indicates the result of the action taken.

1.3 Liability and Warranty
All information compiled in this manual is in accordance with applicable regulations. The statements made are based on state-of-the-art technology and reflect our extensive knowledge and many years of experience.

⚠️ Always carefully read this Operating Manual before beginning any work on or with the instrument, especially prior to installation and initial setup! The Manufacturer shall not be held liable for any damages or malfunctions arising from a disregard of the warnings and instructions contained herein.

1.4 Copyright
This Operating Manual should be treated as confidential. It is solely intended for use by persons involved with the instrument. This manual may not be made
available to a third party without prior Manufacturer’s consent. Please contact the Manufacturer if the need should arise.

2 Safety

This chapter outlines all important safety aspects to be considered for optimum employee protection and to ensure safe and reliable operations.

2.1 Intended use

The infrared temperature sensor is solely intended for use as described in this manual. Operational safety can only be ensured when the instrument is used for its intended purpose.

⚠️ The use of the infrared temperature sensor for any other purpose beyond what is specified in this manual is prohibited. Using the instrument in any other manner will be considered as improper. The Manufacturer/Authorised Agent shall not be held liable for any damages or loss resulting from such unintended or improper use; in this case the risk is solely borne by the user.

2.2 User’s responsibility

The infrared temperature sensor may only be used when it is in perfect working condition.

2.3 Safety requirements

The instrument operates at low voltage (10...34 V DC). The power supply unit must conform to directive EN 50178, SELV, PELV.

2.4 Electromagnetic Compatibility


European certification:
EN 61000-6-4
EN 61000-6-2
EN 61000-4-2/-3/-4/-6
EN 55011
When connecting a power supply unit, make sure that it also conforms to these standards.

Radio interference may arise if the infrared temperature sensor is interconnected with such peripheral devices which have not been properly interference-suppressed. This may necessitate additional interference suppression measures.

3 General Description

The infrared temperature sensor detects temperatures and monitors temperature ranges without contact.

The sensor detects the infrared energy radiated by a hot object and converts this to an electric switch signal.

The advantage of this technique is that there is no mechanical contact between the sensor and the hot object.

The instrument is suitable for the following applications:

- Moving or hard-to-reach objects
- Surface-treated or voltage-carrying objects
- Sticky materials such as dough or aggressive chemicals
- Applications requiring fast response times

The rugged stainless steel housing enables the instrument to be used in harsh industrial environments. The instruments are splash-proof according to IP65 (DIN 40050). The infrared temperature sensor features two switching relays which can be custom configured as NC or NO contacts.

4 Function

The infrared temperature sensor is equipped with two open collector outputs which can be used concurrently.

- The instrument’s display panel shows a value which is a percentage relating to the temperature range.
- It generates 2 output signals according to the configured function:

<table>
<thead>
<tr>
<th>OUT1</th>
<th>Switch signal for temperature threshold 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT2</td>
<td>Switch signal for temperature threshold 2</td>
</tr>
</tbody>
</table>
4.1 **Switching threshold**
OUTx changes switching status when the configured upper and lower thresholds (SP, RP) are exceeded.

First set the upper threshold [SP] as a percentaged value based on the temperature span. Then set the lower threshold [RP]. When you adjust the upper threshold [SP] the lower threshold [RP] will change accordingly. The span remains the same.

The lower threshold [RP] cannot be configured higher than the value of the upper threshold [SP]. When these parameter values are set to be equivalent, the lower threshold will be a ½ digit lower than the upper threshold.

4.2 **Upper threshold delay**
Once the sensor has detected a temperature which exceeds the switching threshold [SP] the time delay [DS] starts running. When this delay period has elapsed, the output OUTx activates switching. This status is sustained until the lower threshold [RP] is violated. If this occurs before the time delay has elapsed, the delay will reset. This function can be used, for example, to suppress spurious impulse signals at the output.

- Delay: [ωx] → [DS] = x s

4.3 **Lower threshold delay**
To make sure the output impulse is correctly identified, e.g. by a downstream control system, the output impulse can be lengthened.

- Delay: [ωx] → [d'r.] = x s

4.4 **Output signal**
The following switching functions can be selected:

- Normally open contact: [ωx] → [ωU]= no
- Normally closed contact: [ωx] → [ωU]= nc
1: Temperatur profile
2: Switch signal no
3: Switch signal no, with upper- and lower threshold delay
4: Switch signal nc
5: Switch signal nc, with upper- and lower threshold delay
4.6 Internal signal processing

![Diagram](image)

| Temperature ↓ | Switch point | no / nc | Lower- / upper threshold delay | Switching output ↓ |

**Emissivity of Materials:**

The infrared temperature sensor reacts to the thermal energy (infrared radiation) emitted by an object.

The ability to radiate heat depends on the type of material and its surface properties. Shiny metals or aluminium, for example, have a very low emissivity coefficient.

An infrared temperature sensor which has been calibrated by a black body will detect less infrared radiation when measuring a material with low emissivity. In such cases, you should select a lower switching temperature.

5 Electrical connection

### CAUTION

The infrared temperature sensor may only be installed by a skilled, qualified electrician. Do not connect the instrument while the voltage supply source is turned on. Please observe international safety regulations at all times.

- Switch to neutral and verify absence of voltage.
- Connect instrument according to the following schematic:
The infrared temperature sensor must be protected against high voltage and strong electromagnetic fields. Use a shielded cable, connecting it via connector casing to the device housing.

Use a flyback diode when switching inductive loads.

6 Shielding and Grounding

6.1 Potential Equalisation

The infrared temperature sensor housing is connected to the shielding via the cable connector! Differences in ground potentials might cause an equalising current to flow between devices through a cable shielded at both ends. In this case, be sure to install an additional potential equalisation line.

To avoid an equalising current, the infrared temperature sensor can be mounted electrically insulated. The shielding must be connected to the plant’s grounding.

If the infrared temperature sensor is installed without an insulator and without potential equalisation, the interference voltage may not exceed 48 V.
7 Operating controls and display

The IR temperature sensor TW70xx features a 2-digit display, 3 control keys and 2 LEDs. During Run Mode, the display indicates the measurement value as a percentage relating to the temperature span.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

1 und 2:
LED 1, LED 2 = indicates switching status of respective output

3: Control key up and down
Adjust configuration parameters

4: Control key enter
select parameter and confirm setting

5: Alphanumeric display, 2-digit
• indicates percentage of temperature value
• indicates parameters and configuration
8 Menu

8.1 Menu OUT1

1: key lock / release
8.2 Menu OUT2

1: key lock / release
8.3 Menu test function, factory reset

1: key lock / release
## 9 Menu Explanation

### 9.1 Configuration layer

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>o1</td>
<td>OUT1</td>
<td>Settings for Output 1</td>
</tr>
<tr>
<td>o2</td>
<td>OUT2</td>
<td>Settings for Output 2</td>
</tr>
<tr>
<td>( \mathcal{L} \mathcal{F} )</td>
<td>diagnostics (test) feature</td>
<td>Activates diagnostics feature for self-test</td>
</tr>
<tr>
<td>rS</td>
<td>Resetting to factory settings</td>
<td>The adjusted parameter are reset to factory settings</td>
</tr>
</tbody>
</table>

### 9.2 Parameter Layer

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>( SP )</td>
<td>Upper threshold</td>
<td>Value is % of defined temperature span</td>
</tr>
<tr>
<td>( rP )</td>
<td>Lower threshold</td>
<td>Value is % of defined temperature span Always (( \leq ) switching point)</td>
</tr>
<tr>
<td>oU</td>
<td>Output function</td>
<td>( \text{nO} ) normally opened ( \text{nC} ) normally losed</td>
</tr>
<tr>
<td>dS</td>
<td>Upper threshold delay</td>
<td>Value in s *</td>
</tr>
<tr>
<td>dr</td>
<td>Lower threshold delay</td>
<td>Value in s *</td>
</tr>
<tr>
<td>En</td>
<td>End</td>
<td>Exit menu</td>
</tr>
</tbody>
</table>

* Maximum 9.9 s in 0.1 s increments
## 10 Operating parameters

When you reset/adjust the operating parameters the instrument remains in run mode. It continues to operate, using the current parameter settings, until you have finished configuring by pressing [Enter].

### 10.1 Setting parameters

<table>
<thead>
<tr>
<th></th>
<th><strong>Configuration layer</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Setting parameters</strong></td>
</tr>
<tr>
<td></td>
<td>Press [Enter] to access the configuration layer.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th><strong>Select output or diagnostics feature</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td><strong>Select output or diagnostics feature</strong></td>
</tr>
<tr>
<td></td>
<td>Press control key [▲▼] until the display shows the desired output or diagnostics feature.</td>
</tr>
<tr>
<td></td>
<td>[Enter].</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th><strong>Adjust parameters</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td><strong>Adjust parameters</strong></td>
</tr>
<tr>
<td></td>
<td>Press control key [▲▼] until the display shows the desired parameter.</td>
</tr>
<tr>
<td></td>
<td>[Enter].</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th><strong>Show parameter value</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td><strong>Show parameter value</strong></td>
</tr>
<tr>
<td></td>
<td>Press [Enter] to view current parameter value.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th><strong>Change parameter value</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td><strong>Change parameter value</strong></td>
</tr>
<tr>
<td></td>
<td>Press and hold [Enter] key for 2 sec &gt; Current setting will flash as long as [Enter] key is held down.</td>
</tr>
<tr>
<td></td>
<td>Press control key [▲▼] to change parameter setting.</td>
</tr>
</tbody>
</table>

* The infrared temperature sensor will display the parameter value for 30 s. After that the display will once again indicate the measurement as a percentage.
**Confirm parameter value**

- Press [Enter].
- The display indicates the parameter. The new value has been saved and will take effect.

**Adjust additional parameters**

- Go back to Step 2.

**Return to configuration layer**

- Go to $E_n$ and use [Enter] key to reach the configuration layer.

**Exit operating parameters layer**

- At the configuration layer, use control key $[▲ ▼]$ to select $E_n$ to end the parameters layer. Then press [Enter].

---

The instrument features a keylock. Activate / deactivate as follows:

- Press $[▲ ▼]$ keys simultaneously and hold them down for 10 sec.
  - The display will flash once.

- If you press both $[▲ ▼]$ keys only briefly, you will exit the layer (ESC function).

### 10.2 Diagnostics feature

The infrared temperature sensor features an integrated diagnostics function which can be activated either using the control keys or by a static signal (10...34 V) on Pin 5.

Voltage must be applied for at least $t > 400$ ms. The diagnostics function simulates the detection of infrared radiation. The display shows $\omega L$.

To deactivate the diagnostics function, the static signal must be < 6 V for a period longer than 0.3 s. If the diagnostics function is activated using the control keys on the instrument, it will remain in this mode for 10 s.

The diagnostics function checks the instrument’s signal processing and tests the switching outputs.

- When the test function is not being used, connect the test input (Pin 5) to the negative pole of the supply voltage. Alternatively, use a 4-pin cable socket (Pin 5 not assigned).
11 Operation Mode

After connecting the supply voltage the infrared temperature sensor will be automatically initialized and will perform a self-diagnosis. After approx. 0.5 s the sensor is ready to operate and the instrument runs the signal processing.

11.1 View operating parameters

► Press [Enter] and select the desired output.
► Press [Enter] to go to the parameters layer.
► Press [▼/▲] until the display shows the desired parameter.
► Press [Enter].

> The display will indicate the parameter value for 30 s. After that it returns to Run Mode.

11.2 Ambient temperature

The maximum permissible ambient operating temperature for the infrared temperature sensor is 65 °C. If the instrument is used in ambient temperatures above 65 °C, it must be either cooled or shielded from excess radiant heat by means of a deflector plate.

11.3 Error indications

<table>
<thead>
<tr>
<th>Overload of output</th>
<th>Corresponding LED will flash at f = 2.0 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess temperature inside device</td>
<td>Display alternately shows ( \odot L ) and measurement reading at f = 0.5 Hz. The LEDs indicate the output switching status.</td>
</tr>
<tr>
<td>Faulty connection of supply voltage</td>
<td>Both LEDs flash at f = 2.0 Hz. Display shows measurement reading.</td>
</tr>
<tr>
<td>Supply voltage ≤7.8 V</td>
<td>Both LEDs, display and switching outputs are deactivated. (When voltage ≥8 V the device switches on and the switching outputs are activated)</td>
</tr>
<tr>
<td>Temperature below lower threshold</td>
<td>Display shows ( \odot L ).</td>
</tr>
<tr>
<td>Temperature above upper threshold</td>
<td>Display shows ( \odot L ).</td>
</tr>
</tbody>
</table>
12 Maintenance

12.1 Cleaning the lens
A false reading will be given when the lens is dirty. Therefore check the lens periodically and clean it, if necessary.

Dust can be removed by simply blowing it away or by using a soft brush. A special lens cleaning cloth is ideal, but any soft, clean, lint-free cloth will be suitable.

If the lens is quite dirty, use a very mild liquid detergent and rinse carefully with clear water while holding the device pointed down. Apply as little pressure as possible to avoid scratching the lens.

13 Shipping, Packaging and Disposal

13.1 Inspecting your shipment
Unpack and inspect the entire shipment immediately upon receipt to make sure it is complete and undamaged.

If the container/package shows visible signs of damage, please refuse the shipment. If this is not possible, accept the shipment on the condition that the freight carrier’s delivery record is noted with the extent of the damage in order to file a claim.

Should you discover a concealed loss or damage, report it to the shipper or freight carrier immediately. If the period for filing claims has expired, you will no longer be able to make any claims for compensation of damage or loss.

13.2 Packaging
The packages used are made of carefully selected, environmentally-compatible materials and are thus recyclable. We suggest you retain the packaging for possible future use; otherwise please ensure that they are disposed of in an ecologically sound manner.
14 Copyright

The device software contains portions of the avr-libc library.

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# 15 Default settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Factory default setting</th>
<th>Customized configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OUT1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>25 %</td>
<td></td>
</tr>
<tr>
<td>rP</td>
<td>23 %</td>
<td></td>
</tr>
<tr>
<td>dOU</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>dS</td>
<td>0 s</td>
<td></td>
</tr>
<tr>
<td>dr</td>
<td>0 s</td>
<td></td>
</tr>
<tr>
<td><strong>OUT2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>75 %</td>
<td></td>
</tr>
<tr>
<td>rP</td>
<td>73 %</td>
<td></td>
</tr>
<tr>
<td>dOU</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>dS</td>
<td>0 s</td>
<td></td>
</tr>
<tr>
<td>dr</td>
<td>0 s</td>
<td></td>
</tr>
</tbody>
</table>

More information at www.ifm.com