**Intended Use**

The thermoMETER CTL is designed for use in industrial and laboratory applications. It is used for non-contact temperature measurement.

The system must only be operated within the limits specified in the technical data, see operating instructions. Chap 2. The system must be used in such a way that no persons are endangered or machines are damaged in the event of malfunction or total failure of the system. Take additional precautions for safety and damage prevention in case of safety-related applications.

**Warnings**

Connect the power supply and the display/output device according to the safety regulations for electrical equipment.

- Risk of injury, damage to power supply or laser and/or the controller
- Avoid shocks and impacts to the sensor and the controller
- Damage to or destruction of the sensor and/or the controller
- Avoid rough mechanical force on the sensor
- Damage to or destruction of the sensor
- The supply voltage must not exceed the specified limits.
- Damage to or destruction of the sensor and/or controller
- Protect the sensor cable against damage.
- Destruction of the sensor, failure of the measuring device
- Never fold the sensor cable and do not bend it in tight radii. The minimum bending radius is 14 mm (static). Dynamic movement is not permitted.
- Never apply voltage to the analog outputs.
- Damage to or destruction of the sensor
- Avoid abrupt changes in ambient temperature.
- Inaccurate or incorrect measurements

**Notes on CE Marking**

- EU Directive 2011/65/EU, "RoHS" Category 9
- 1 thermoMETER CTL sensor and sensor cable
- Humidity: 10 ... 95 %, non-condensing
- Storage temperature: -40 °C ... +85 °C (-40 °F ... +185 °F)
- 1 Assembly instructions
- 1 thermoMETER CTL sensor and sensor cable
- Destroyed output:
  - Deviation in measurement, inaccurate measured result
  - Damage to or destruction of the sensor and/or the controller
  - Damage to or destruction of the sensor and/or controller
  - Fits the beam must be free of any obstructions.

**Power Supply**

Please use a power supply unit with an output voltage of 8 - 36 VDC that provides at least 190 mA current. Residual ripple should be no more than 200 mV.

**Mechanical Installation**

The CTL features a metric M48x1.5 thread and can be directly installed into existing mounting devices by using this thread or by using the hexagonal nut (default) and fixed mounting bracket (default).

- Avoid rough mechanical force on the sensor.
- Damage to or destruction of the sensor.

**Ground Connection**

A plug connector (jumper) is located on the bottom of the motherboard. Depending on the position, the ground terminals (GND supply voltage/output) are connected to the housing ground of the controller, see Fig. 6, see Fig. 8. To prevent ground loops and related signal interference, it may be necessary to separate this connection in an industrial environment.

- To do so, remove the board in order to switch the jumper on the back of the board by removing the 2 screw connections.
- Please push the jumper into the appropriate position, see Fig. 7, see Fig. 9.

When using the thermocouple output, separation of the ground connection GND - housing is recommended in principle.

**Electrical Installation**

Cable Connection

The default version is shipped with sensor cables (connection between sensor and controller).

- To connect the thermoMETER CTL, open the controller cover (4 screws).

The screw terminal connections for connecting the cables are located in the bottom of the controller.

**Pin Assignments for CTL/CTLF/CTLC/CTLG Models**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-</td>
<td>-36 VDC Power supply</td>
</tr>
<tr>
<td>GND</td>
<td>Internal input and output ground (0 V)</td>
</tr>
<tr>
<td>OUTAMB</td>
<td>Analog output for sensor temperature (mV)</td>
</tr>
<tr>
<td>OUTTC</td>
<td>Analog output for thermocouple U (K)</td>
</tr>
<tr>
<td>OUTmV/mA</td>
<td>Analog output for object temperature (mV or mA)</td>
</tr>
<tr>
<td>F1-F3</td>
<td>Function inputs</td>
</tr>
<tr>
<td>AL2</td>
<td>Alarm 2 (open collector output)</td>
</tr>
<tr>
<td>3V SW</td>
<td>PNP/power supply for laser (+)</td>
</tr>
<tr>
<td>GND</td>
<td>GRAY/power supply for laser (-)</td>
</tr>
<tr>
<td>BROWN</td>
<td>Temperature probe for sensor (NTC)</td>
</tr>
<tr>
<td>WHITE</td>
<td>Ground sensor</td>
</tr>
<tr>
<td>GREEN</td>
<td>Power supply sensor</td>
</tr>
<tr>
<td>YELLOW</td>
<td>Detector signal</td>
</tr>
</tbody>
</table>

**Laser Class**

The thermoMETER CTL sensor works with a double laser sight at a wavelength of 635 nm (visible/red).

The warning sign below is attached to the controller:

**CAUTION**

Do not look deliberately into the laser beam! Close your eyes, or immediately turn away if the laser beam hits the eye.

**Unpacking/Included in Delivery**

- 1 thermoMETER CTL sensor and sensor cable
- 1 Controller
- 1 Mounting nut and fixed mounting bracket
- 1 Assembly instructions

1) With temperatures < 0 °C, display function is not guaranteed any more.

**Proper Environment**

- Protection class:
  - Sensor: IP 65 (NEMA 4)
  - Controller: IP 65 (NEMA 4)
- Ambient temperature:
  - Sensor: -40 °C ... +85 °C (-40 °F ... +185 °F)
  - Controller: -40 °C ... +85 °C (-40 °F ... +185 °F)
- Humidity: 10 ... 95 %, non-condensing

**Grounding**

To prevent ground loops and related signal interference, it may be necessary to connect the GND terminals (GND supply voltage/output) are connected to the housing ground of the controller, see Fig. 6, see Fig. 8.

Depending on the position, the ground terminals (GND supply voltage/output) are connected to the housing ground of the controller, see Fig. 8.

A plug connector (jumper), connector

- To the housing.
- To the sensor.

The optical path of the beam must be free of any obstructions.

> Deviation in measurement, inaccurate measured result

Please enable the integrated double laser to precisely align the sensor with the object, see operating instructions.

You can download a PDF of the detailed operating instructions from our website:


**Electrical Installation**

Cable Connection

The default version is shipped with sensor cables (connection between sensor and controller).

To connect the thermoMETER CTL, open the controller cover (4 screws).

The screw terminal connections for connecting the cables are located in the bottom of the controller.

**Pin Assignments for CTLM Models**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-</td>
<td>-36 VDC Power supply</td>
</tr>
<tr>
<td>GND</td>
<td>Power supply ground (0 V)</td>
</tr>
<tr>
<td>GND</td>
<td>Internal input and output ground (0 V)</td>
</tr>
<tr>
<td>AL2</td>
<td>Alarm 2 (open collector output)</td>
</tr>
<tr>
<td>DOUTmV/mA</td>
<td>Analog output for object temperature (mV or mA)</td>
</tr>
<tr>
<td>F1-F3</td>
<td>Function inputs</td>
</tr>
<tr>
<td>GND</td>
<td>Ground (0 V)</td>
</tr>
<tr>
<td>3V SW</td>
<td>50/32 PNP/power supply for laser (+)</td>
</tr>
<tr>
<td>BROWN</td>
<td>Sensor ground</td>
</tr>
<tr>
<td>WHITE</td>
<td>Power supply sensor</td>
</tr>
<tr>
<td>YELLOW</td>
<td>Detector signal</td>
</tr>
</tbody>
</table>

**Power Supply**

Please use a power supply unit with an output voltage of 8 - 36 VDC that provides at least 190 mA current. Residual ripple should be no more than 200 mV.

**Assembly Instructions**

thermoMETER CTL

Do not stare into the laser beam! Close your eyes, or immediately turn away if the laser beam hits the eye.

**Fig. 1** Dimensional drawing of CTL sensor, dimensions in mm, not to scale

The optical path of the beam must be free of any obstructions.

**Fig. 2** Dimensional drawing of controller, dimensions in mm, not to scale

The mounting bracket is included in the scope of delivery.

**Fig. 3** Dimensional drawing of mounting bracket, dimensions in mm, not to scale

The sensor can be adjusted on 2 axes by using the adjustable mounting bracket; see also operating Instructions, Optional Accessories.
**Sensor Cable Installation**
The controller's M12x1.5 cable gland is suitable for cables with an outer diameter of 3 to 5 mm. Remove the cable insulation (40 mm power supply, 50 mm signal outputs, 60 mm function inputs). Shorten the shielding braid to approx. 5 mm and unravel the shielding. Remove approx. 4 mm of the individual core insulations and tin the core ends. Push the compression screw, washers and the cable screw connection's rubber seal one after another onto the prepared cable and according to the figure, see Fig. 10. Spread the shielding braids and affix the cable shield between two metal discs. Insert the cable into the cable gland until the stop. Tightly screw on the cap. Individual cores can now be attached to the appropriate screw terminal connections based on their colors.

**Propping screw Metal washer Push-out washer**

**Shield**

![Cable Installation Diagram](image)

**Fig. 10 Cable installation**

**Inputs and Outputs**

**Analog Outputs**
The thermoMETER CTL features 1 or 2 output channels. Never apply voltage to the analog outputs. The thermoMETER CTL is not a two-wire sensor! > Destruction of the output.

**Digital Interfaces**
The description of the optional digital interfaces is available in the operating instructions. The following interfaces are available: USB, RS232, RS485, ProfiBus, CAN BUS interface, Ethernet, Modbus RTU.

**Function Inputs**
The three function inputs F1 to F3 can only be programmed by using the CompactConnect software.

**Function inputs Description**

<table>
<thead>
<tr>
<th>F1 (digital)</th>
<th>Trigger [a 0 V level at F1 resets holding function]</th>
</tr>
</thead>
<tbody>
<tr>
<td>F2 (analog)</td>
<td>External emissivity [5 - 10 V]: ( y = x \times 0.9 \text{ V} )</td>
</tr>
<tr>
<td>F3 (analog)</td>
<td>External ambient temperature compensation/the range can be scaled by using the CompactCon- nect software.</td>
</tr>
</tbody>
</table>

**Output channels (1)**
The output is used to output the object temperature. The programming keys are used to select the output signal. Output channel 1 can also be pro- grammed as an alarm output by using the CompactConnect software.

**Output signal Range Connection pin on CT Board**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>0 - 5 V</th>
<th>O/F terminals/mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>0 - 20 mA</td>
<td>O/F terminals/mA</td>
</tr>
<tr>
<td>Current</td>
<td>4 - 20 mA</td>
<td>O/F terminals/mA</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>TC J</td>
<td>O/F TC</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>TC K</td>
<td>O/F TC</td>
</tr>
</tbody>
</table>

Please note that, depending on the used output, different connection pins (O/F terminals/mA or O/F TC) are used.

**Output channel 2 (only for CTL, CTLG models)**
The sensor temperature \([-20 ... 180 \, ^\circ \text{C} \text{ as 0 ... 5 V or 0 ... 10 V signal}\) is output to the OUT AMB connection pin. Channel output can also be programmed as an alarm output by using the software. Here the object temperature TDobj or controller temperature TDbus can also be used as an alarm source instead of the sensor temperature THead.

**Operation**
After the supply voltage is applied, the sensor starts an initialization routine and shows INIT on the display for a few seconds. Next, the object tempera- ture is displayed. The color of the display lightening changes depending on the alarm parameter settings.

**Configuring the Sensor**
The programming keys A and B allow the configuration of the sensor on the site. The display shows the current measurement or the selected func- tion. The key moves you to the desired function and changes the function parameters - a settings change is applied immediately. The key is pressed for more than 10 seconds, the display automatically switches to the front panel menu function settings.

When the A key is pressed, you automatical- ly reach the last function called. The "maximum search" and "minimum search" signal processing functions cannot be selected concurrently.

**Restoring Factory Setting**
To reset the thermoMETER CT1 to factory-set parameters, first press the A key and then the B key and hold both for 3 seconds.

**Error Messages**
The error messages below may appear on the thermoMETER CT display.

<table>
<thead>
<tr>
<th>Error Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No error</td>
<td>Sensor probe short-circuited after ground (br)</td>
</tr>
<tr>
<td>No error</td>
<td>Box temperature low</td>
</tr>
<tr>
<td>No error</td>
<td>Box temperature high</td>
</tr>
<tr>
<td>No error</td>
<td>Box temperature probe interrupted</td>
</tr>
<tr>
<td>No error</td>
<td>Box temperature probe short-circuited after ground</td>
</tr>
<tr>
<td>No error</td>
<td>Box temperature probe short-circuited after ground</td>
</tr>
</tbody>
</table>

**Rearrest 2**
After installation, the CompactConnect software is available on your desktop (as a program icon) and in the start menu.

For uninstall, please choose the uninstall program in the start menu.

Additional D/S ratios are available in the operating instructions.

**Rearrest 3**
A detailed description of the commands is available on the CompactConnect software CD in the folder: [Commands].

**Alarms**
The thermoMETER CTL features the following alarm functions:

- For all alarms (alarm 1, alarm 2, output channels 1 and 2 when used as alarm outputs), a 2 K hysteresis has been permanently set.

**Output channels (1 and 2 channel only for CTL, CTLG)**
To be activated, the corresponding output channel must be switched to digital mode. You can do so only by using the CompactConnect software.

**Visual alarms**
These alarms cause the color of the LCD display to change and are available by using the optional relay interface. Alarm 2 can additionally be used on pin AL2 on the controller as open collector output [24 V/50 mA].

The factory default settings of the alarms are:

- Alarm 1 Normal closed/low alarm
- Alarm 2 Normally open/high alarm
- Both alarms affect the color settings of the LCD display.

**Ratio D = Distance From Device Front Edge To Measured Object/S = Spot Size**
The size of the object to be measured and the optical resolution of the IR thermometer determine the maximum distance between sensor and object. To avoid measuring errors, the measured object should completely fill the field of vision of the sensor's optical system. This means, the spot must always be at least as large as or smaller than the measured object.

<table>
<thead>
<tr>
<th>D</th>
<th>0</th>
<th>50</th>
<th>100</th>
<th>150</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>400</th>
<th>500</th>
<th>600</th>
<th>700</th>
<th>800</th>
<th>900</th>
<th>1000</th>
<th>1200</th>
<th>1500</th>
<th>1800</th>
<th>2100</th>
<th>2400</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>0</td>
<td>150</td>
<td>300</td>
<td>450</td>
<td>600</td>
<td>750</td>
<td>900</td>
<td>1050</td>
<td>1200</td>
<td>1350</td>
<td>1500</td>
<td>1800</td>
<td>2100</td>
<td>2400</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>0</td>
<td>20</td>
<td>19.5</td>
<td>19</td>
<td>18.5</td>
<td>18</td>
<td>17.5</td>
<td>17</td>
<td>16.5</td>
<td>16</td>
<td>15</td>
<td>14</td>
<td>13</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>9</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>

**Combiconnect Software**
Place the CompactConnect installation CD into the corresponding drive on your PC or download the software from our website at: https://www.micro-epsilon.de/download/software/thermoMETER-CompactConnect/.

If Autorun has been enabled on your computer, the installation wizard starts automatically. Otherwise, please start CDsetup.exe on the CD-ROM.

Please follow the instructions in the wizard until the installation has been completed.

After installation, the CompactConnect software is available on your desktop (as a program icon) and in the start menu.

A detailed description of the software is available on the CompactConnect software CD.

**System Requirements**
- Windows XP, Windows Vista, Windows 7, 8 and 10
- At least 128 Mbyte RAM
- USB interface
- CD-ROM drive
- Hard drive with at least 30 Mbyte storage space

**Main Functions**

- Visual depiction and recording of measurement data for later analysis and documenta- tion
- Setting all sensor parameters and remote sensor monitoring
- Programming signal processing functions
- Scaling outputs and setting parameters for function inputs

**Fig. 12 Example for model CTL-SF/5**

**Display Mode (example) Settings range**

<table>
<thead>
<tr>
<th>M01</th>
<th>Multiplex address [1] (only with RS232 interface)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>01 ... 32</td>
</tr>
</tbody>
</table>

**Error Messages**

- Error message too low
- Error message too high
- Error message open/high alarm
- Error message closed/low alarm
- Error message short-circuited after ground
- Error message interrupted

**Display Mode (example) Settings range**

<table>
<thead>
<tr>
<th>M02</th>
<th>Multiplex address [2]</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>01 ... 32</td>
</tr>
</tbody>
</table>

**CompactConnect Software**
- Place the CompactConnect installation CD into the corresponding drive on your PC or download the software from our website at: https://www.micro-epsilon.de/download/software/thermoMETER-CompactConnect/.

- For uninstall, please choose the uninstall program in the start menu.

A detailed description of the software is available on the CompactConnect software CD.

**Display Mode (example) Settings range**

<table>
<thead>
<tr>
<th>M05</th>
<th>Signal output in output channel 1 [0 - 5 V]</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>0 ... + 20 mA/ - 20 mA</td>
</tr>
<tr>
<td>01</td>
<td>0 ... + 40 mA/ - 40 mA</td>
</tr>
<tr>
<td>02</td>
<td>0 ... 0.1 mA/ - 0.1 mA</td>
</tr>
<tr>
<td>03</td>
<td>0 ... 5 mA/ - 5 mA</td>
</tr>
<tr>
<td>04</td>
<td>0 ... + 10 mA/ - 10 mA</td>
</tr>
<tr>
<td>05</td>
<td>0 ... 0.001 mA/ - 0.001 mA</td>
</tr>
<tr>
<td>06</td>
<td>0 ... 0.01 mA/ - 0.01 mA</td>
</tr>
<tr>
<td>07</td>
<td>0 ... 0.1 mA/ - 0.1 mA</td>
</tr>
<tr>
<td>08</td>
<td>0 ... 5 mA/ - 5 mA</td>
</tr>
</tbody>
</table>

**Error Messages**

- Error message too low
- Error message too high
- Error message open/high alarm
- Error message closed/low alarm
- Error message short-circuited after ground
- Error message interrupted
- Error message probe short-circuited after ground (br)
- Box temperature too low
- Box temperature too high
- Box temperature probe interrupted
- Box temperature probe short-circuited after ground

**Alarm 1 Normal closed/low alarm
Alarm 2 Normally open/high alarm
Both alarms affect the color settings of the LCD display.**