

## 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 or destruction of the sensor 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.

> Damage to sensor cable, failure of the measuring device

Avoid exposure of sensor (both optics and housing) to cleaning agents that contain solvents.

> Damage to or destruction of the sensor

Avoid abrupt changes in ambient temperature.

> Inaccurate or incorrect measurements

## 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:



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

## Notes on CE Marking

The following apply to the thermoMETER CTL measuring system:

- EU Directive 2014/30/EU
- EU Directive 2011/65/EU, "RoHS" Category 9

The sensor satisfies the requirements if the guidelines in the operating instructions are maintained in installation and operation.

## Proper Environment

- Protection class:
  - Sensor: IP 65 (NEMA 4)
  - Controller: IP 65 (NEMA 4)
- Ambient temperature:
  - Sensor: -20 °C ... +85 °C (-4 °F ... +185 °F) (+50 °C (+122 °F) when laser is on)
  - Controller: 0 ... +85 °C (+32 °F ... +185 °F) <sup>1</sup>
- Storage temperature:
  - Sensor: -40 °C ... +85 °C (-40 °F ... +185 °F)
  - Controller: -40 °C ... +85 °C (-40 °F ... +185 °F)
- Humidity: 10 ... 95 %, non-condensing

## 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.

## Pin Assignments for CTLM Models

Pin	Explanation
+8 ... 36 VDC	Power supply
GND	Power supply ground (0 V)
GND	Internal input and output ground (0 V)
AL2	Alarm 2 (open collector output)
OUT-TC	Analog output for thermocouple (J or K)
OUT-mV/mA	Analog output for object temperature (mV or mA)
F1-F3	Function inputs
GND	Ground (0 V)
3V SW	PINK/power supply for laser (+)
GND	PINK/power supply for laser (-)
BROWN	Temperature probe for sensor (NTC)
WHITE	Sensor ground
GREEN	Power supply sensor
YELLOW	Detector signal

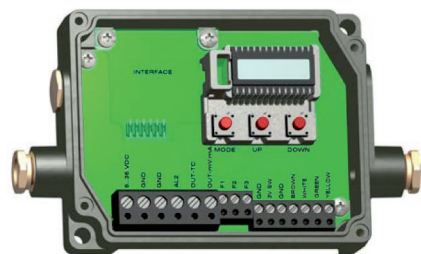


Fig. 5 Open CTLM controller with terminal connections

## Power Supply

Please use a power supply unit with an output voltage of 8 - 36 VDC that provides at least 160 mA current. Residual ripple should be no more than 200 mV.

Never apply voltage to the analog outputs.

> Destruction of the output

thermoMETER CTL is not a two-wire sensor!

## 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.

> Destruction of the system

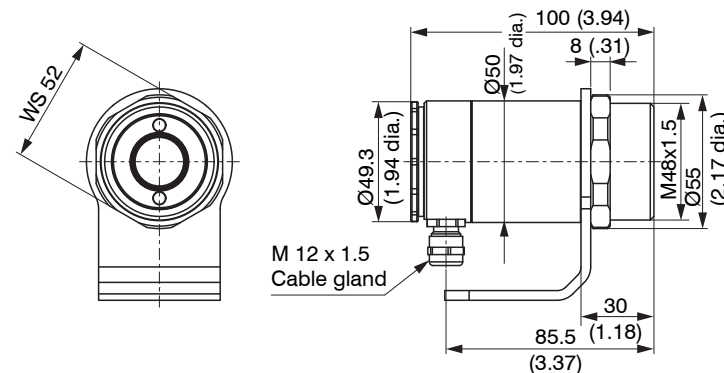


Fig. 1 Dimensional drawing of CTL sensor, dimensions in mm, not to scale

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

> 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:

<http://www.micro-epsilon.de/download/manuals/man--thermoMETER-CTL--en.pdf>

## 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.

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

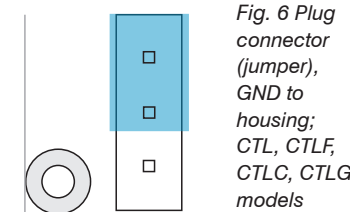


Fig. 6 Plug connector (jumper), GND to housing; CTL, CTLF, CTLC, CTLG models

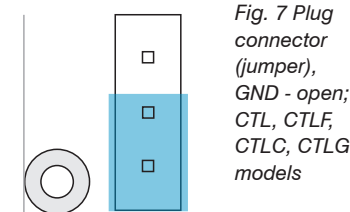


Fig. 7 Plug connector (jumper), GND - open; CTL, CTLF, CTLC, CTLG models

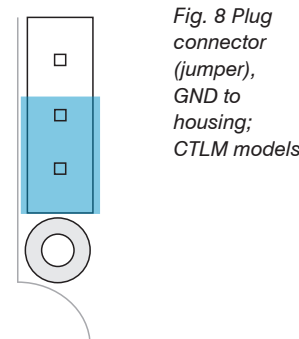


Fig. 8 Plug connector (jumper), GND to housing; CTLM models

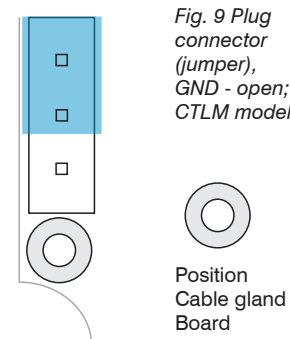


Fig. 9 Plug connector (jumper), GND - open; CTLM models

Position Cable gland Board

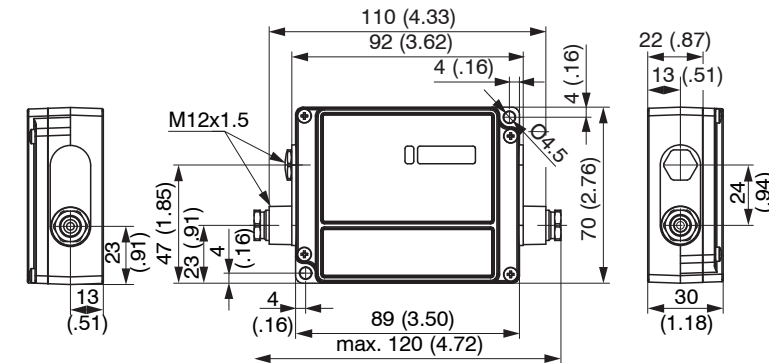


Fig. 2 Dimensional drawing of controller, dimensions in mm, not to scale

The mounting bracket is included in the scope of delivery.

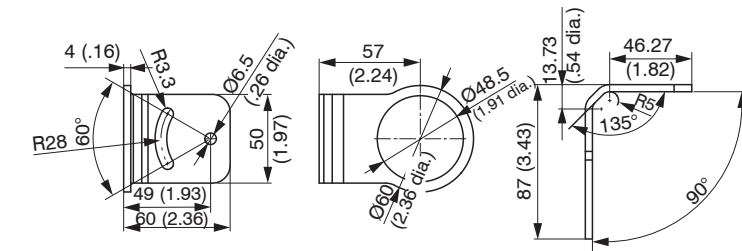


Fig. 3 Dimensional drawing of mounting bracket, dimensions in mm, not to scale

The sensor can be adjusted on 2 axes by using the adjustable mounting bracket; see also operating instructions, Optional Accessories.

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Assembly Instructions  
thermoMETER CTL

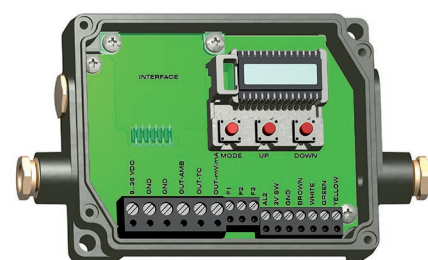


Fig. 4 Open CTL/CTLF/CTLC/CTLG controller with terminal connections



## 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 wires.
- 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 end 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.

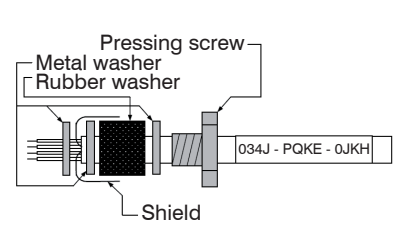


Fig. 10 Cable installation

**i** Only use shielded cables! The sensor must be grounded!

## 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 temperature is displayed. The color of the display lighting changes depending on the alarm settings.

### Configuring the Sensor

The programming keys **O**, **^** and **v** allow the configuration of the sensor on site. The display shows the current measurement or the selected function. The **O** key moves you to the desired function, **^** and **v** change the function parameters - a settings change is applied immediately. If no key is pressed for more than 10 seconds, the display automatically switches to showing the calculated object temperature (according to the selected signal processing).



When the **O** key is pressed, you automatically reach the last function called.

The "maximum search" and "minimum search" signal processing functions cannot be selected concurrently.

Fig. 11 Display and programming keys

### Restoring Factory Setting

- To reset the thermoMETER CTL to factory-set parameters, first press the **v** key and then the **O** key and hold both for 3 seconds.

For confirmation, RESET appears on the display.

Display	Mode (example)	Settings range
S ON	Laser sighting [On]	ON/OFF
142.3C	Object temperature (after signal processing) [142.3 °C]	Cannot be changed
127CH	Sensor temperature [127 °C]	Cannot be changed
25CB	Box temperature [25 °C]	Cannot be changed

## 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

#### Output channel 1

This output is used to output the object temperature. The programming keys are used to select the output signal. Output channel 1 can also be programmed as an alarm output by using the CompactConnect software.

Output signal	Range	Connection pin on CT board
Voltage	0 ... 5 V	OUT-mV/mA
Voltage	0 - 10 V	OUT-mV/mA
Current	0 - 20 mA	OUT-mV/mA
Current	4 - 20 mA	OUT-mV/mA
Thermocouple	TC J	OUT-TC
Thermocouple	TC K	OUT-TC

**i** Please note that, depending on the output used, different connection pins (OUT-mV/mA or OUT-TC) are used.

#### Output channel 2 (only for CTL, CTLG models)

The sensor temperature [-20 ... 180 °C as 0 ... 5 V or 0 ... 10 V signal] is output to the OUT AMB connection pin. Output channel 2 can also be programmed as an alarm output by using the software. Here the object temperature T<sub>Object</sub> or controller temperature T<sub>Box</sub> can also be used as an alarm source instead of the sensor temperature T<sub>Head</sub>.

Display	Mode (example)	Settings range
142CA	Current object temperature	Cannot be changed
<input type="checkbox"/> MV5	Signal output in output channel 1 [0 - 5 V]	<input type="checkbox"/> 0 - 20 = 0 - 20 mA/ <input type="checkbox"/> 4 - 20 = 4 - 20 mA/ <input type="checkbox"/> MV5 = 0 - 5 V/ <input type="checkbox"/> MV10 = 0 - 10 V/ <input type="checkbox"/> TCJ = thermocouple output type J/ <input type="checkbox"/> TCK = thermocouple output type K
E0.970	Emissivity [0.970]	0.100 ... 1.100
T1.000	Transmission [1.000]	0.100 ... 1.100
A 0.2	Mean signal output [0.2 s]	A---- = inactive/ 0.1 ... 999.9 s
P----	Maximum signal output [inactive]	P---- = inactive/ 0.1 ... 999.9 s/P oo oo oo oo = infinite
V----	Minimum signal output [inactive]	V---- = inactive/ 0.1 ... 999.9 s/V oo oo oo oo = infinite
u 0.0	Temperature range lower limit [0 °C]	Depending on model/inactive for TCJ and TCK output
n 500.0	Temperature range lower limit [500 °C]	
[ 0.00	Output signal lower limit [0 V]	According to the range of the selected output
] 5.00	Output signal upper limit [5 V]	
U °C	Temperature unit [°C]	°C/°F
/ 30.0	Lower alarm limit [30 °C]	Depending on model
// 100.0	Upper alarm limit [100 °C]	Depending on model
XHEAD	Ambient temperature compensation [sensor temperature]	XHEAD = sensor temperature/ -40.0 - 900.0 °C (for LT) as fixed value for compensation/pressing <b>^</b> and <b>v</b> at the same time switches back to XHEAD (sensor temperature)

## 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
F1 (digital)	Trigger (a 0 V level at F1 resets holding functions)
F2 (analog)	External emissivity [0 - 10 V: 0 V ▶ ε = 0.1; 9 V ▶ ε = 1; 10 V ▶ ε = 1.1]
F3 (analog)	External ambient temperature compensation/the range can be scaled by using the CompactConnect software. [0 - 10 V: -40 - 900 °C/preset range: -20 - 200 °C]
F1 - F3 (digital)	Emissivity (digital selection using table) An unconnected input is interpreted as follows: F1 = high level F2, F3 = low level High level: ≥ +3 V - +36 V Low level: ≤ +0.4 V - -36 V

### 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.

D	0	150	300	450	600	750	900	1050	1200	1350	1500	1800	2100	2400
S	20	19.5	19	18.5	18	17.5	17	16.5	16	20.5	25	34	43	52

Fig. 12 Example for model CTL-SF75

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

Display	Mode (example)	Settings range
M 01	Multidrop address [1] (only with RS485 interface)	01 ... 32
B 9.6	Baud rate in kBaud [9.6]	9.6/19.2/38.4/57.6/115.2 kBaud

### Error Messages

The error messages below may appear on the thermoMETER CTL display:

CTL, CTLF, CTLC-4, CTLC-2, CTLC-6, CTLG models	
OVER	Object temperature too high
UNDER	Object temperature too low
^^^CH	Sensor temperature too high
vvvCH	Sensor temperature too low

CTLM-1, CTLM-2, CTLM-3, CTLM-5 models	
<b>1st digit</b>	
0x	No error
1x	Sensor probe short-circuited after ground (bn)
2x	Box temperature too low
4x	Box temperature too high
6x	Box temperature probe interrupted
8x	Box temperature probe short-circuited after ground

<b>2nd digit</b>	
x0	No error
x2	Object temperature too high
x4	Sensor temperature too low
x8	Sensor temperature too high
xC	Sensor temperature probe interrupted (bn)

## 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 2 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 definitions of the alarms are:

Alarm 1	Normally closed/low alarm
Alarm 2	Normally open/high alarm

Both alarms affect the color settings of the LCD display:

BLUE	Alarm 1 active
RED	Alarm 2 active
GREEN	No alarm active

For advanced settings, such as defining them as low or high alarm (by changing normally open/closed) or selecting the signal source [T<sub>Object</sub>, T<sub>Head</sub>, T<sub>Box</sub>], a digital interface (e.g., USB, RS232) and the CompactConnect software are required.

## 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/>.

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.

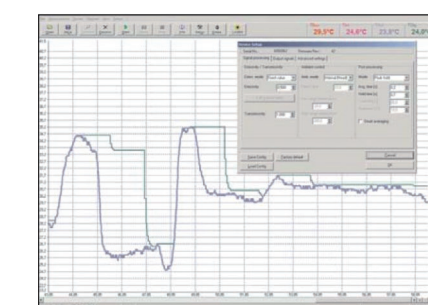
If you want to uninstall the software, please use Uninstall in the start menu.

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 temperature measurements for later analysis and documentation
- Setting all sensor parameters and remote sensor monitoring
- Programming signal processing functions
- Scaling outputs and setting parameters for function inputs

**i** A detailed description of the commands is available on the CompactConnect software CD in the folder: \Commands.