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 mechanical violence 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 the controller

Protect the sensor cable against damage.
> Destruction of the sensor, failure of the measuring device

Never kink the sensor cable, do not bend the sensor cable in tight radii. The minimum bending radius is 14 mm (static). A dynamic movement is not allowed.
> Damage to the 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 of the operating temperature.
> Inaccurate or incorrect measurements

Notes on CE Marking

The following apply to the thermoMETER CT 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)
- Operating temperature:
  - Sensor: Depending on the sensor model between -20 °C ... 250 °C (-4 °F ... +482 °F) [1]
  - Controller: 0 ... 85 °C (+32 °F ... +185 °F)
- Storage temperature:
  - Sensor: Depending on the sensor model between -40 °C ... 250 °C (-40 °F ... +482 °F) [1]
  - Controller: -40 °C ... 85 °C (-40 °F ... +185 °F)
- Humidity: 10 - 95 %, non-condensing

Unpacking/Included in Delivery

- 1 thermoMETER CT sensor with sensor cable
- 1 Controller
- 1 Connection cable
- 1 Mounting nut
- 1 Assembly instruction
-

1) Specification, also see operating instructions

You can download a PDF of detailed operating instructions from our website:
http://www.micro-epsilon.de/download/manuals/man--thermoMETER-CT--en.pdf

Mechanical Installation

The thermoMETER CT sensors are equipped with a metrical M12x1-thread and can be installed either directly via the sensor thread or by means of the hex nut (included in scope of supply) to the mounting bracket available. Various mounting brackets which make the adjustment of the sensor easier can be ordered additionally as accessories, also see operating instructions.

The thermoMETER CTH and CTP sensors are delivered with massive housing and can be installed via the M18x1-thread.

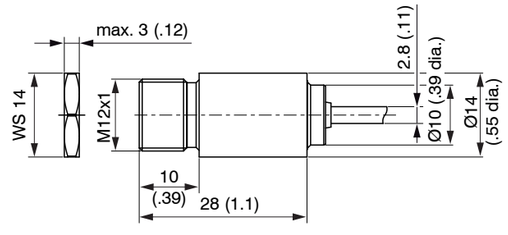

Fig. 1 Dimensional drawing of sensor

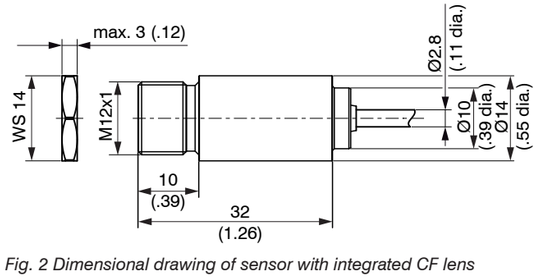

Fig. 2 Dimensional drawing of sensor with integrated CF lens

Dimensions in mm (inches), not to scale

With the CT-SF02 / CTH-SF02 / CTH-SF10 models, the sensor cable must not be moved during the measurement.
> False measurement results

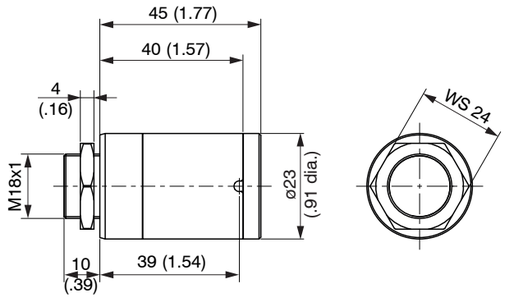

Fig. 3 Dimensional drawing of massive housing, CTH and CTP models

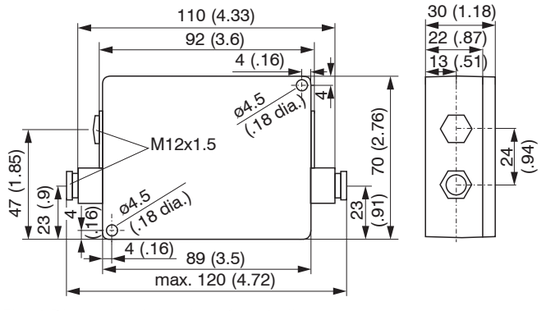

Fig. 4 Dimensional drawing of controller

Dimensions in mm (inches), not to scale

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X9771190-A032030HDR

Electrical Installation

Cable Connections

For the electrical installation of the thermoMETER CT, please open at first the cover of the controller (4 screws).

For the cable connection, you will find the screw terminals in the lower section of the controller.

Pin Assignment for CT-SF02, CT-SF15, CT-SF22, CTF-SF25, CTH-SF02, CTH-SF10, CTP-7 and CTP-3 Models

Pin	Designation
+8 ... 36 VDC	Power supply
GND	Ground (0 V) of power supply
GND	Ground (0 V) of internal in- and outputs
OUT-AMB	Analog output sensor temperature (mV)
OUT-TC	Analog output thermocouple (J or K)
OUT-mV/mA	Analog output object temperature (mV or mA)
F1-F3	Functional inputs
AL2	Alarm 2 (Open-collector output)
3V SW	3 VDC, switchable for laser sighting tool
GND	Ground (0 V), for laser sighting tool
BROWN	Temperature probe (sensor)
WHITE	Temperature probe (sensor)
GREEN	Detector signal (-)
YELLOW	Detector signal (+)

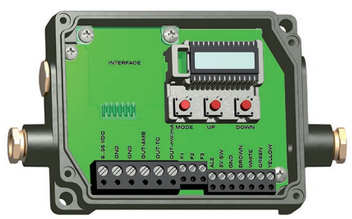


Fig. 5 Opened controller CT-SF02, CT-SF15, CT-SF22, CTP-7, CTF-SF15, CTF-SF25, CTH-SF02, CTH-SF10 with terminal connections

Pin Assignment for CTM-1, CTM-2, CTM-3 Models

Pin	Designation
+8 ... 36 VDC	Power supply
GND	Ground (0 V) of power supply
GND	Ground (0 V) of internal in- and outputs
AL2	Alarm 2 (Open collector output)
OUT-TC	Analog output thermocouple (J or K)
OUT-mV/mA	Analog output object temperature (mV or mA)
F1-F3	Functional inputs
GND	Ground (0 V)
3V SW	3 VDC, switchable for laser sighting tool
GND	Ground (0 V), for laser sighting tool
BROWN	Temperature probe sensor (NTC)
WHITE	Sensor ground
GREEN	Power supply (sensor)
YELLOW	Detector signal

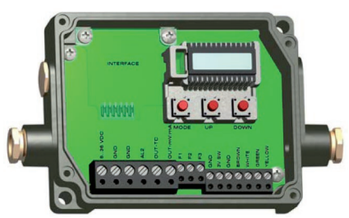


Fig. 6 Opened controller CTM-1, CTM-2, CTM-3 with terminal connections

Power Supply

Please use a power supply unit with an output voltage of 8 - 36 VDC/100 mA. The residual ripple should be max. 200 mV.

Please do never connect a supply voltage to the analog outputs.
> Destruction of the output

The thermoMETER CT is not a 2-wire sensor!

Ground Connection

At the bottom side of the main board PCB, you will find a plug connector (jumper). Depending on the position, the ground connections (GND power supply/ output) are connected with the ground of the controller housing, see Fig. 7, see Fig. 9. To avoid ground loops and related signal interferences, in industrial environments it might be necessary to interrupt this connection.

Remove the board in order to switch the jumper on the back of the board by loosening the two screws.

Please put the jumper in the corresponding position, see Fig. 8, see Fig. 10.

i If the thermocouple output is used, the ground connection GND - housing should generally be interrupted.

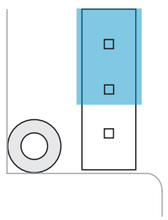


Fig. 7 Plug connector (jumper), GND to housing; CT-SF, CT-CF, CTF, CTH, CTP models

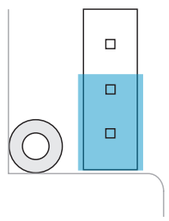


Fig. 8 Plug connector (jumper), GND - open; CT-SF, CT-CF, CTF, CTH, CTP models

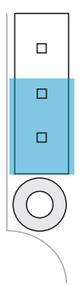


Fig. 9 Plug connector (jumper), GND to housing; CTM models

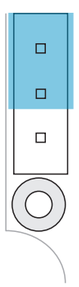


Fig. 10 Plug connector (jumper), GND - open; CTM models

Position for screw fixing of board

MICRO-EPSILON

Assembly Instructions
thermoMETER CT

Cable Assembling

Mounting

The cable gland M12x1.5 of the controller allows the use of cables with an outer diameter of 3 to 5 mm.

- Remove the insulation from the cable (40 mm power supply, 50 mm signal outputs, 60 mm functional inputs).
- Cut the shield down to approx. 5 mm and spread the strands out.
- Extract about 4 mm of the wire insulation and tin the wire ends.
- Place the pressing screw, the rubber washer and the metal washers of the cable gland one after the other onto the prepared cable end.
- Spread the strands and fix the cable shield between two of the metal washers.
- Insert the cable into the cable gland until the limit stop.
- Screw the cap tightly.

Every single wire may be connected to the appropriate screw clamps according to their colors.

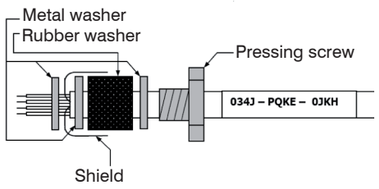


Fig. 11 Cable installation

i Use shielded cables only!
The sensor shield has to be grounded!

Shortening the Sensor Cable

With all CT models (except for CTM-3, CTP-7), the sensor cable can be shortened if necessary. With the models CTM-1, CTM-2 and CTF, the sensor cable can be shortened by max. 3 m. The CTM-3 models are only available with 3 m cable.

i Shortening the cable will cause an additional measuring error of about 0.1 K/ m.

Inputs and Outputs

Analog Outputs

The thermoMETER CT has either one or two analog output channels.

Please do never connect a supply voltage to the analog outputs.
The thermoMETER CT is not a 2-wire sensor!
> Destruction of the output

Output Channel 1

This output is used for output of the object temperature. Selection of the output signal is carried out via programming keys. The CompactConnect software enables to program the output channel 1 also as an alarm output.

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 according to the chosen output, different connection pins are used (OUT-mV/mA or OUT-TC).

Output Channel 2 (only CT-SF02, CT-SF15, CT-SF22, CTH, CTP-7 and CTP-3)

The connection pin OUT-AMB is used for output of the sensor temperature. The CompactConnect software allows the programming of output channel 2 as an alarm output. Further details, see operating instructions.

Digital Interfaces

Please refer to the operating instructions for the description of the optional, digital interfaces. The following interfaces are available: USB, RS232, RS485, Profibus DP, CAN-Bus, Modbus RTU or Ethernet.

Functional Inputs

The three functional inputs F1 - F3 can be programmed with the CompactConnect software, only.

Functional inputs	Description
F1 (digital)	Trigger (a 0 V - level on F1 resets the hold functions)
F2 (analog)	External emissivity adjustment [0 - 10 V: 0 V ▶ e = 0.1; 9 V ▶ e = 1; 10 V ▶ e = 1.1]
F3 (analog)	External compensation of ambient temperature/the range is scalable via CompactConnect software. [0 - 10 V: -40 - 900 °C/preset range: -20 -200 °C]
F1 - F3 (digital)	Emissivity (digital choice via table) A non-connected input represents: F1 = High F2, F3 = Low High-level: ≥ +3 V ... +36 V Low-level: ≤ +0.4 V ... -36 V

Alarms

The thermoMETER CT has following alarm features:

All alarms (alarm 1, alarm 2, output channel 1 and 2 if used as alarm output) have a fixed hysteresis of 2 K CTH: 1 K).

Output Channel 1 and 2 (Channel 2 on CT-SF / CTP-7 and CTP-3)

The respective output channel has to be switched into digital mode for activation. For this the CompactConnect software is required.

Visual Alarms

These alarms will cause a change of color of the LCD display and will also change the status of the optional relays interface. In addition, Alarm 2 can be used as open collector output at pin AL2 on the controller [24 V/ 50 mA].

The alarms are factory-set as follows:

Alarm 1	Norm. closed/Low-Alarm
Alarm 2	Norm. open/High-Alarm

Both of these alarms will have effect on color setting of the LCD display:

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

For extended setup like definition as low or high alarm (via change of normally open/closed), selection of the signal source [TObj, THead, TBox] a digital interface (e.g. USB, RS232) including the CompactConnect software is needed.

Ratio D = Distance from the front edge of the device to the measuring object / S = Spot Size

The size of the object to be measured and the optical resolution of the infrared thermometer determine the maximum distance between sensor and object. In order to prevent measuring errors, the object should fill out the field of view of the sensor lens completely. Consequently, the spot should at all times have at least the same size as the object or should be smaller than that.

Models	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D
CT-SF15 CTF-SF15	6.5	0	11.6	100	16.6	200	21.7	300	26.7	400	35	500	43.3	600	51.6	700	59.9	800	68.2	900	76.5	1000

Fig. 13 Example

Please refer to the operating instructions for further D/S ratios.

Operation

After powering up the supply voltage, the sensor starts an initializing routine for some seconds. During this time the display will show `INIT`. After this procedure, the object temperature is shown in the display. The display backlight color changes according to the alarm settings.

Sensor Setup

The programming keys O, ∧ and ∨ enable the user to set the sensor on-site. The current measuring value or the chosen feature is displayed. The current measuring value or the chosen feature is displayed. With O the operator obtains the chosen feature, with ∧ and ∨ the functional parameters can be selected – a change of parameters will have immediate effect. If no key is pressed for more than 10 seconds the display automatically shows the calculated object temperature (according to the signal processing).

Pressing the O button again recalls the last called function on the display.

The signal processing features peak hold and valley hold cannot be selected simultaneously.

Fig. 12 Display and programming keys

Restoring Factory Setting

To reset the thermoMETER CT to the factory settings, please first press the ∨ and then the O button and keep both pressed for 3 seconds.

The display will show `RESET` for confirmation.

Display	Mode (Example)	Adjustment range
142.3C	Object temperature (after signal processing) [142.3 °C]	Fixed
127CH	Sensor temperature [127 °C]	Fixed
25CB	Box temperature	Fixed
142CA	Current object temperature	Fixed

Display	Mode (Example)	Adjustment range
▯ MV5	Signal output channel 1 [0 - 5 V]	▯ 0 - 20 = 0 - 20 mA/ ▯ 4 - 20 = 4 - 20 mA/ ▯ MV5 = 0 - 5 V/ ▯ MV10 = 0 - 10 V/ ▯ TCJ = Thermocouple type J/ ▯ TCK = Thermocouple type K
E0.970	Emissivity [0.970]	0.100 ... 1.100
T1,000	Transmission [1.000]	0.100 ... 1.100
A 0.2	Signal output average [0.2 s]	A---- = inactive/ 0.1 ... 999.9
P----	Signal output peak hold [inactive]	P---- = inactive/0.1 ... 999.9 s/P ∞ ∞ ∞ ∞ = infinite
V----	Signal output peak hold [inactive]	V---- = inactive/ 0.1 … 999.9 s/ V oo oo oo oo = infinite
u 0.0	Lower limit temperature range [0 °C]	Depending on model/ inactive at TCJ and TCK output
n 500.0	Lower limit temperature range [500 °C]	
[0.00	Lower limit output signal [0 V]	According to the range of the selected output
] 5.00	Upper limit output signal [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/ returning to XHEAD (sensor temperature) by pressing ∧ and ∨ together

Display	Mode (Example)	Adjustment range
M 01	Multi-drop 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
S ON	Laser sighting (3 VDC-switches to the connection pin „3 VSW“)	ON/OFF; This menu item appears on the models CTM-1, CTM-2, CTM-3 on first position.

Error Messages

The display of the thermoMETER CT can show the following error messages:

CT-SF02, CT-SF15, CH-SF22, CTH and CTP-7 Models	
OVER	Object temperature too high
UNDER	Object temperature too low
^ ^ ^CH	Sensor temperature too high
vvvCH	Sensor temperature too low

CTM-1, CTM-2, CTM-3 Models	
1. Digit	
0x	No error
1x	Sensor temperature probe short circuit GND (bn)
2x	Box temperature too low
4x	Box temperature too high
6x	Box temperature probe interrupted
8x	Box temperature probe short circuit to GND
2. Digit	
x0	No errors
x2	Object temperature too high
x4	Sensor temperature too low
x8	Sensor temperature too high
xC	Sensor temperature probe interrupted (bn)

CompactConnect Software

Insert the CompactConnect installation CD into the appropriate drive of your PC or download the software from our website at: https://www.micro-epsilon.de/download/software/thermoMETER-CompactConnect/.

If the auto run option is activated, the installation wizard will start automatically. Otherwise, please start CDsetup.exe from the CD-ROM.

Please follow the instructions of the wizard until the installation is finished.

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

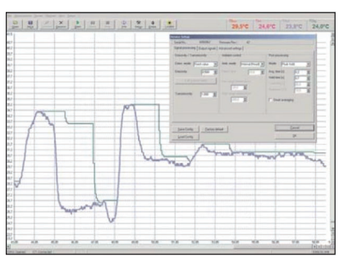
If you want to uninstall the CompactConnect software from your system, please use the `Uninstall` icon in the start menu.

You will find detailed software manual on the CompactConnect CD.

System Requirements

- Windows 7, 8 and 10
- At least 128 MByte RAM
- USB Interface
- CD-ROM drive
- Hard disc with at least 30 MByte free space

Main Features



- Graphic display and recording of temperature readings for subsequent analysis and documentation
- Complete set up of parameters and remote control of the sensor
- Sophisticated signal processing features
- Output scaling and parameter set up of functional inputs

i A detailed description of the commands you will find on the CompactConnect software CD in the directory: \Commands.