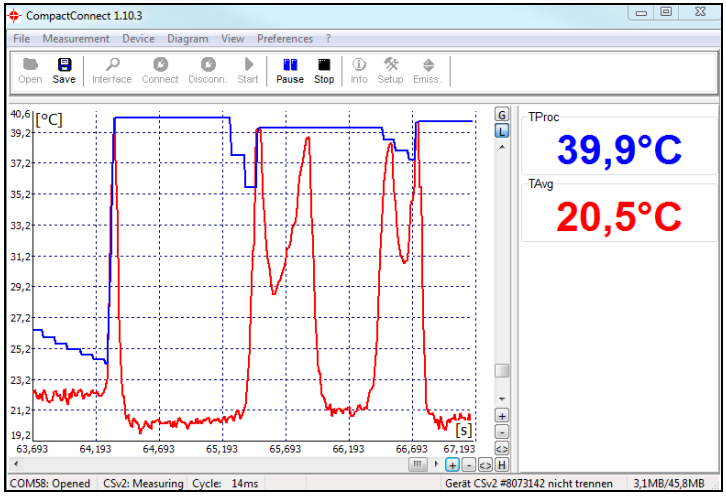
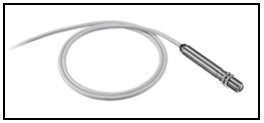
CompactConnect

Software for Infrared Thermometer





Operator‘s Manual

Table of contents

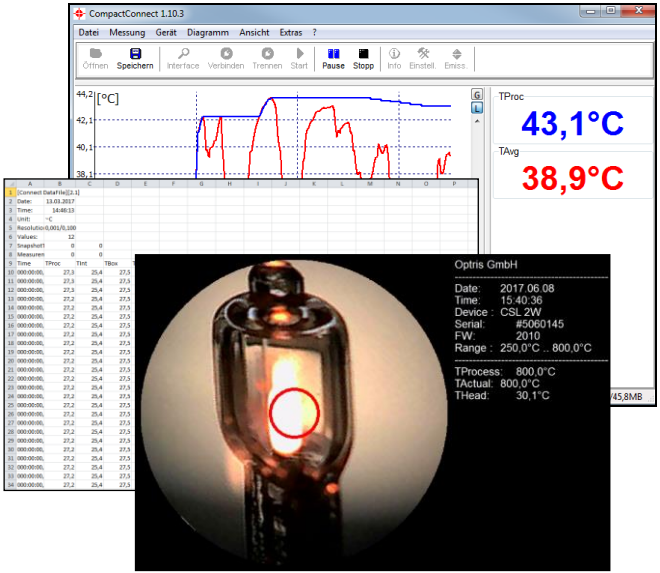
Welcome!

Thank you for choosing an infrared thermometer and corresponding CompactConnect software!

The sensor calculates the surface temperature based on the emitted infrared energy of objects [► **Basics of Infrared Thermometry**].

Main features of CompactConnect software:

- Temperature data analysis and documentation
- Automatic process control
- Customer specific software adjustments
- Complete parameterization of the device
- Temperature display and recording
- Creating snapshots (only video models)



Legal disclaimer

All products are warranted against defective materials and workmanship for a period of two (2) years from the delivery date of the original purchase, provided such products have been under normal storage, use and service, and in accordance with the instruction. This warranty expires in case of inappropriate use of all delivered components.
All products not manufactured by us included in systems delivered by us to the original purchaser carry the warranty, if any, of the particular supplier only and we have no responsibility whatsoever for such products.
The manufacturer is not liable for any use of the software CompactConnect including data recording. The manufacturer does not carry liability for error-free operation of the software in any hardware and operating system.
The warranty is not expressed for possible quality changes, errors when presenting the software, occurring defects during operation or insufficiencies in certain applications. The user is liable for any defects or data processing insufficiencies when in using the software.
The manufacturer has no other liability inside the scope of supply other than mentioned above. The manufacturer shall not be liable for any business loss or claim for compensation, loss of the computer software, possible loss of data, additional costs for replacement software, claims of third parties or other occurring costs or failures and deficits.
The software is protected by copyright and is not allowed to be changed or sold to third parties.

Note
Read the manual carefully before you start the device. The manufacturer reserves the right to change the herein described specifications in case of technical advance of the product.

1. Basics

1.1. Software installation

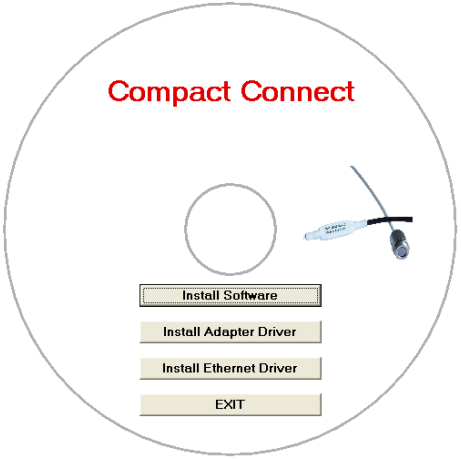
Insert the installation CD into the according drive on your computer. If the autorun option is activated the installation wizard will start automatically. Otherwise please start **CDsetup.exe** from the CD-ROM.

Minimum system requirements:

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

After pressing the button **Install Compact Connect** the software will be installed on your PC. The installation wizard will place a launch icon on the desktop and in the start menu: **[Start]\Programs\CompactConnect**.

Now please press the button **Install Adapter driver** – all necessary device drivers will be installed. After connecting new sensors or new USB adapter cables to your PC the system will allocate them to the correct driver automatically.
If the **Found New Hardware Wizard** appears you can select **"Connect to Windows Update" or "Install the software automatically"**.



The button **Install Ethernet Driver** will only be needed if the Ethernet interface is used (CT/ CTlaser). **EXIT** will close the installation wizard.

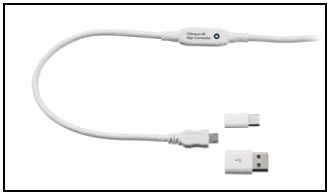
Tablet function

In addition to the installed software icon, an additional icon is created, which is intended for the use of a tablet (windows). The screen and menu are customized and displayed according to their functions.

IRmobile App

The CS/CSmicro/CSlaser (v3) and the CT/CTlaser pyrometer have a direct connection to an Android smartphone or tablet. All you have to do is download the IRmobile app for free in the Google Play Store. This can also be done via the QR code. For the connection to the smartphone the respective App Connector is needed (for CS/CSmirco/CSlaser [**Part-No.: ACCSMIAC**], for CT/CTlaser [**Part-No.: ACCTIAC**]).

GET IT ON Google Play



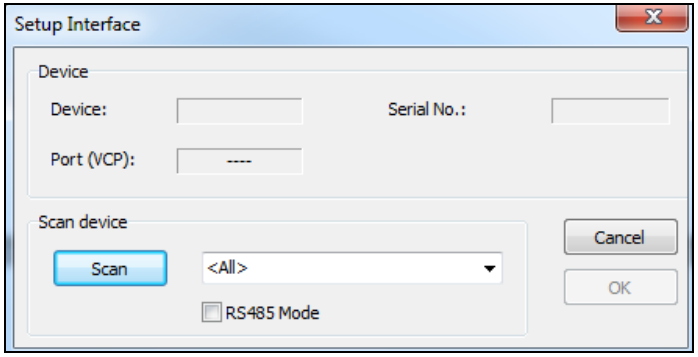
App Connector

Note
The IRmobile app works on most Android devices running 5.0 or higher with a micro USB port supporting USB-OTG (On The Go).

1.2. Connection Sensor - Computer

If you connect your sensor to your PC and start the software, the following message will appear (if option **Auto scan device** is activated). ► **Basic Settings/ Options:**

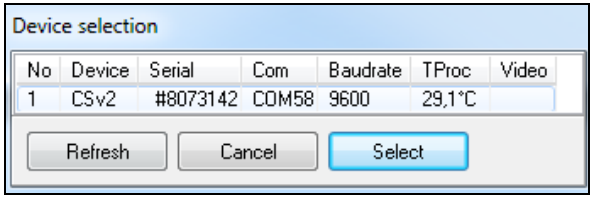
If the Auto Scan Device option is deactivated, please open at first **[Menu: Preferences\ Interface].**



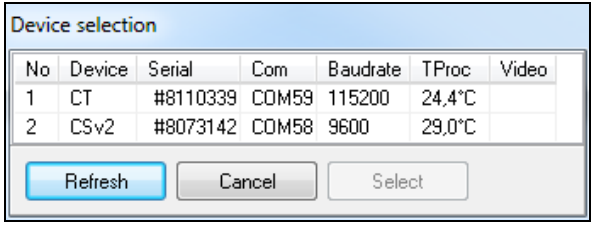
You can predefine the search for connected sensors as follows:

- All
- CS/ CSM/ CX/ CSL
- CT (incl. CTlaser, CT XL)

Then please press the **Scan** button. All sensors found will be shown in a selection screen:



Example 1: A sensor (CS) was found. Press **Select** to close the window.
Refresh starts a new search.

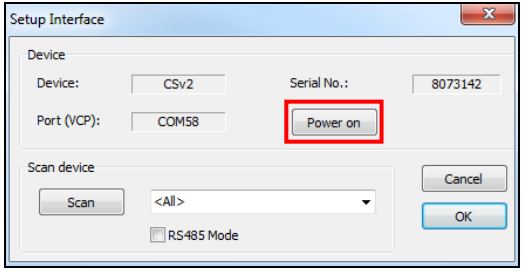


Example 2: Two sensors (CT and CS) were found. Please activate with the cursor the desired unit and after that press the **Select** button to close the window.
Refresh starts a new search.

After the selection of a sensor you will get to the previous screen again. Here you will find now information about the used virtual COM port (VCP), the serial number and the baud rate.

Only CS/ CSmicro

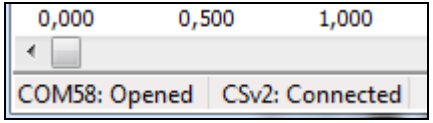
If CS/ CSmicro sensors are selected you will find in addition the button **Power On** in this screen.
With this function you can operate your sensor as analog device (mV or mA output). The USB interface of your computer will act only as power supply in this case.
After you have pressed **Power On** the sensor will be powered via USB, but operates in the analog mode (mV output via OUT pin).



Note
To use this feature the **window must stay open** – if you press **OK** the window will close and the sensor will go back to the communication mode!

To finish please press **OK**. The window will be closed.
If **Auto start device** is activated ► **Basic Settings/ Options** the measurement starts and the temperature values will be shown in the diagram.

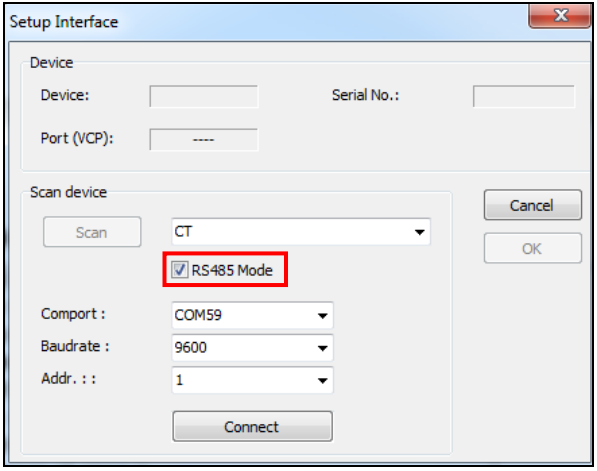
After the sensor selection the status line (below the time axis) shows the following information:



COMxx: Opened	active COM port
CT/CS/CSmicro: Connected	successful communication with the connected sensor

1.3. RS485/ RS422 [CT/ CTlaser]

If a RS485 interface is used please activate the **RS485 Mode [Menu: Preferences\ Interface]**. After selection of **COM port, Baud rate** and **Sensor address** (both of these values must be identical with the settings on the unit) please press **Connect**. In RS485 mode up to 32 sensors can be connected in one network. The CompactConnect can only display one sensor at once.

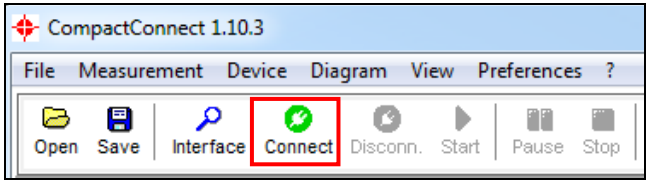


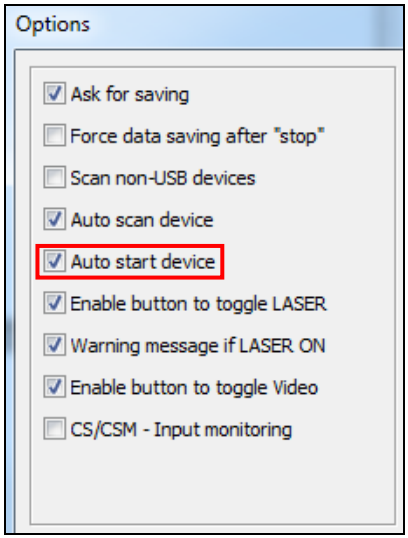
For a faster data transfer we recommend the **RS422 mode**. You will need also the RS485 module and the RS485-USB adapter **[ACCTRS485USBK]**. To activate the RS422 mode you have to call this function with the programming keys on the sensor at first (menu item: multidrop address). Now you can connect the sensor as described under ► **Connection Sensor – Computer**. The RS485 Mode must be deactivated in this case.

1.4. Easy Start-Up

If you restart the software and the last used sensor is connected to the computer and the **Auto scan device** option is activated ► **Basic Settings/ Options** the connection will be made automatically (without sensor selection window).

If this option is deactivated, please press the **Connect** button in the tool bar or **[Menu: Device\ Scan Device]**.
The button **Disconn.** or **[Menu: Device\ Disconnect Device]** breaks the connection to the sensor and closes the COM port.

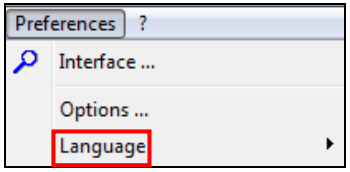




1.5. Basic Settings

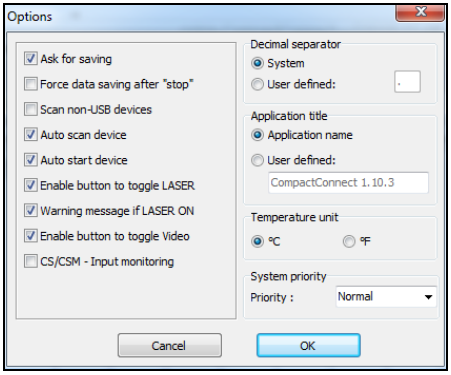
1.5.1. Language

You can choose the desired **language** in the menu **[Menu: Preferences\ Language]**.



1.5.2. Options

The menu item **[Menu: Preferences\ Options]** allows the following settings:

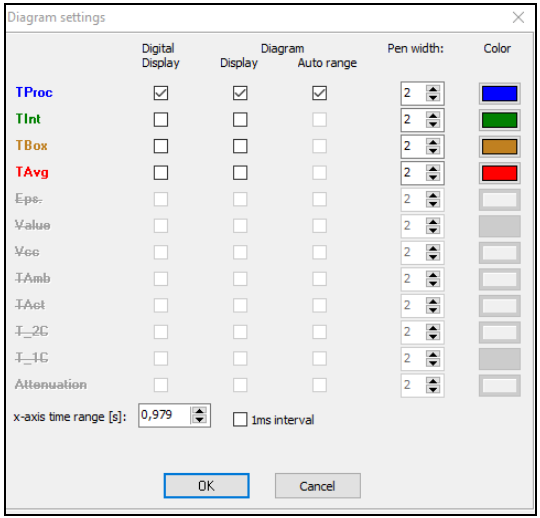


Scan non-USB devices	Activate this option, if you use sensors with other interfaces (non-USB) e.g. CT with RS232 or Ethernet interface.
Auto scan device	If activated, after each program start the software is looking for connected devices.
Auto start device	If activated, after each program start the measurement will be started automatically (if connected sensors have been found before).
Enable button to toggle LASER	**[CTlaser, CSlaser only]** If activated, an additional button to switch on and off the laser will be shown in the tool bar and in the menu **[Menu: Device]**.
Enable button to toggle Video	**[CTvideo, CSvideo only]** If activated, additional buttons for Video and Snapshot will be shown in the tool bar.
CS rev. 2 – Input monitoring	**[CS/ CSmicro v2/v3 only]** Must be activated for display of additional values (mV in, Vcc, Eps, T_{Amb}).
Application title	Selection between the program name of the manufacturer or a user defined name. The title will be shown in the top line of the program window.
Temperature unit	Selection between °C and °F **[CS, CSmicro only]**. For all sensors of the CT series this selection has to be made under: **[Menu: Device\ Device Setup]**. **► Temperature unit**

The further options are described under **► Stop Measurement and Save Data**.

1.5.3. Diagram settings

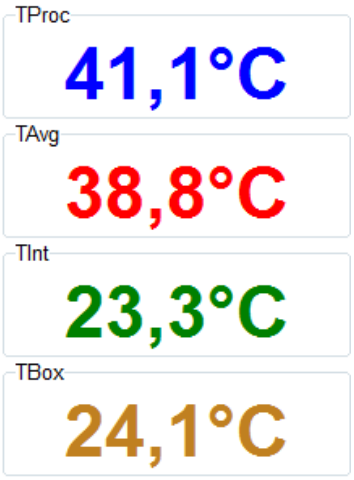
The menu item Settings **[Menu: Diagram\ Settings]** enables the selection of the following diagram options:



Digital Display	Selection which signals should be displayed as digital display
Diagram Display	Selection which signals should be displayed as graph
Diagram Auto range	Selection, for which signal graphs an auto scaling should be active
Pen Width	Pen width of the temperature graphs **[1...5]**
Color	Color of the temperature graph and digital displays
x-axis time range	Time frame on the x-axis, which should be displayed at the beginning of a measurement
1 ms Interval	Data transmission in 1 ms (only for CT/CTlaser/CTvideo 1M, 2M, 3M models visible/available and only applicable for T_{Proc} and T_{Avg})

1.6. Digital Display

If the sensor is connected to your computer and you start the software, the process temperature **T_{Proc}** will be shown as digital display (top right). You can add additional displays **[Menu: View\ Digital]**. Dependent on the sensor type the available signals may vary.
T_{Proc} includes the current post processing functions (average, peak hold, etc.).



The once selected displays will also appear after a restart of the software. The **size** can be changed if you put the cursor on the line beneath the display and pull it down. The buttons of the tool bar will also be moved (depending on the display size).

The colors of the different displays are equal to the colors selected under **[Menu: Diagram\ Settings]** for the corresponding temperature graphs. **►Basic Settings**

Overview of Digital Display

Notation		Description
T_{Proc}	Process temperature	With signal processing, including averaging
T_{Int}	Internal temperature	Temperature from detector
T_{Box}	Box temperature	General internal temperature inside the housing
T_{Act}	Actual temperature	Without signal processing, without averaging
Eps.	Epsilon	Emissivity value
Vcc	Supply voltage	Supply voltage
T_{Amb}	Ambient temperature	Value for external ambient temperature compensation
T_{Avg}	Average temperature	Without signal processing, including averaging

1.6.1. Double Sensoring/ Input Monitoring

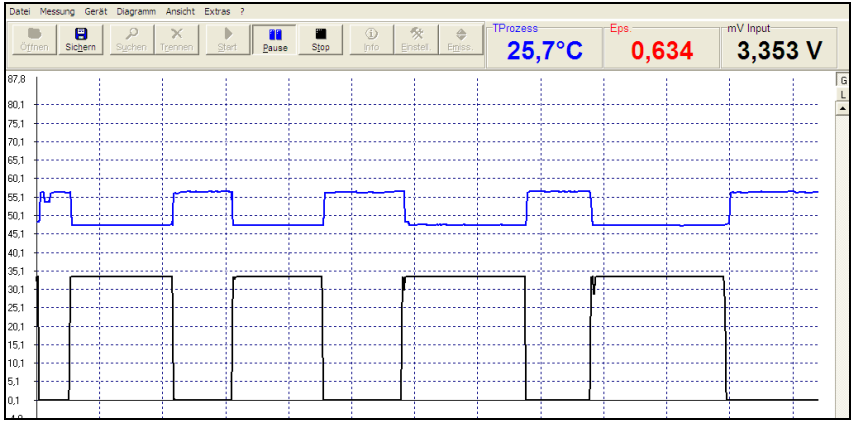
On the CS and CSmicro mV (Rev. 2/3) the following additional values can be visualized in the diagram and shown as digital display:

mV in Voltage at pin IN/ OUT if used as functional input (display of an free scalable **uncommitted value**))

Vcc Supply voltage

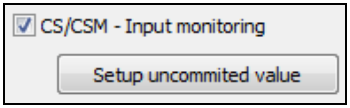
Eps Emissivity value

TAmb Value for external ambient temperature compensation

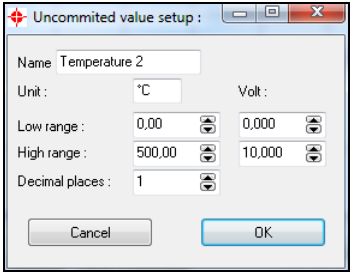


Example: External emissivity setting via an analog voltage at the pin IN/ OUT. The graph allows an analysis of the process temperature change in dependence on the set emissivity.

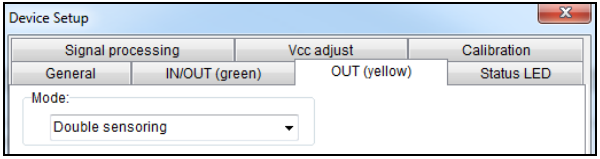
For a display of the input monitoring please activate ***CS/CSM – Input monitoring***
[Menu: Preferences\ Options]



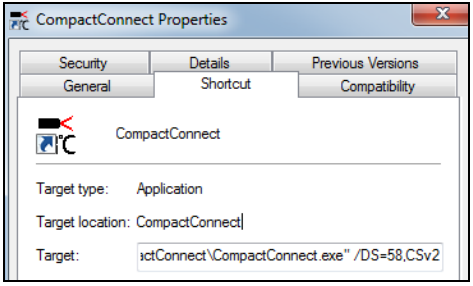
After this please push the button **Setup uncommitted value**. You can enter the desired name and unit for the uncommitted value and make the range scaling:



Now you can open the device settings **[Menu: Device\ Device Setup]** and select **double sensoring** on the tab **OUT**.

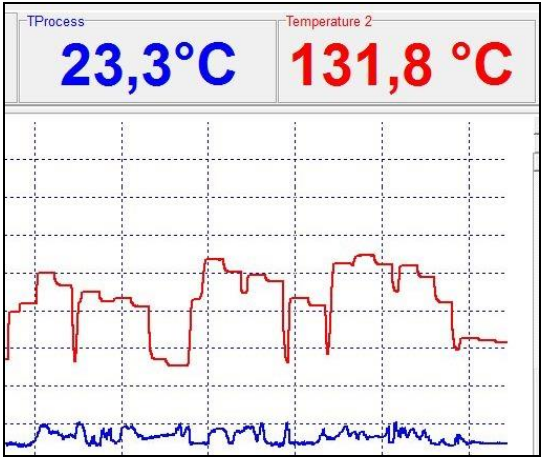


After closing and restart the software with the command line parameter **/DS=xx,yy** [1] the program will start directly in the diagram mode. The sensor is operating in the burst mode now.
A return to the sensor configuration is only possible by starting the CompactConnect without parameter.



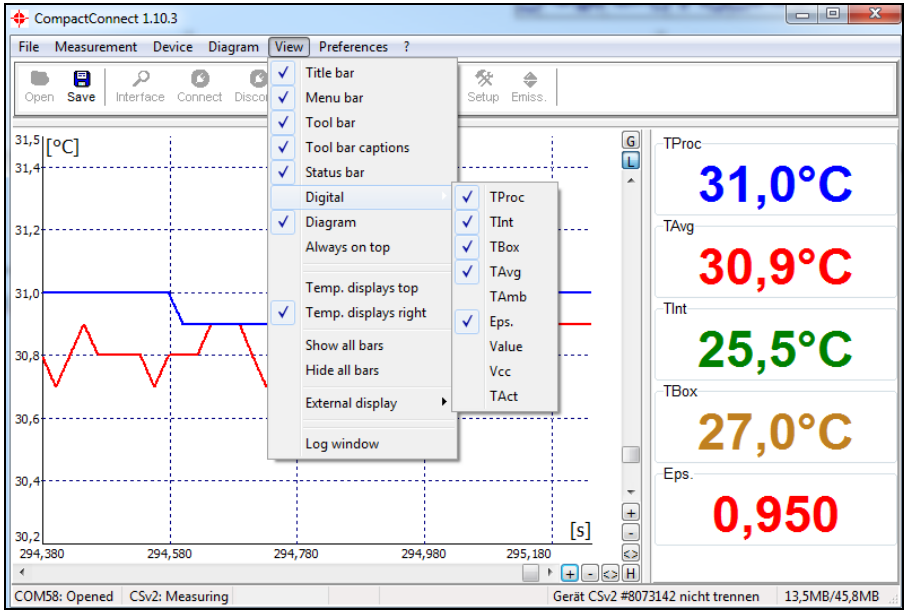
[1] /DS=xx,yy: xx = COM-Port number yy = device type (CS= CSv2 / CSM LT= CSMBV / CSM 3M= CSMBV3M)

Example: Double sensoring with a second IR sensor (value "Temperature 2") whose output is connected directly to the IN/ OUT-Pin of the CS/ CSmicro.



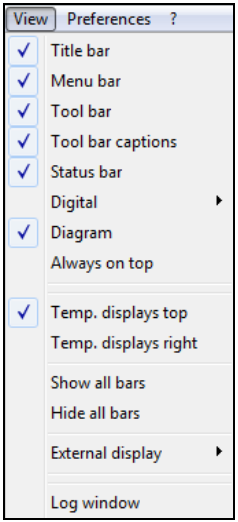
1.7. Views

The CompactConnect allows the creation of free definable screens and views:



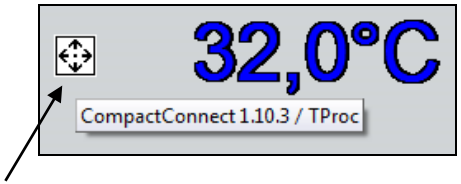
Note
The digital displays can be arranged optional on top or right side **[Menu: View\ Temp. displays top** or **Temp. displays right]**.

You can show the digital displays also separate by hiding of selected information (e.g. title bar, menu bar, etc.) in any size ► **Digital Displays** and, if desired, also always on top of your PC screen **[Menu: View\ Always on top]**.



1.8. External Displays

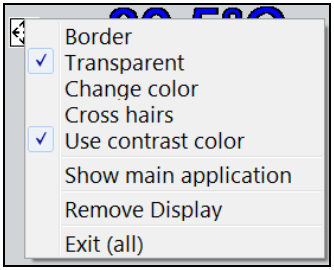
By double click on one of the digital displays **[Menu: View\ External Display]** you can start an external display for the respective signal. This display will appear initially in the same color than the respective display in the software. By drag and drop these external displays can be placed at any desired location on the PC screen (the position of the according software display will not change). For an easy positioning a mark will appear on the left of the display if crossed with the cursor:



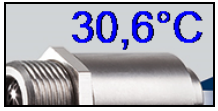
Mark of positioning of the display

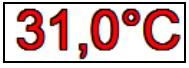
Note
To distinguish between several displays the name of the software/ instance (for multiple software calls) as well as the signal name will be shown shortly.

There are different options available for the design of the external displays which can be called with the right mouse button:

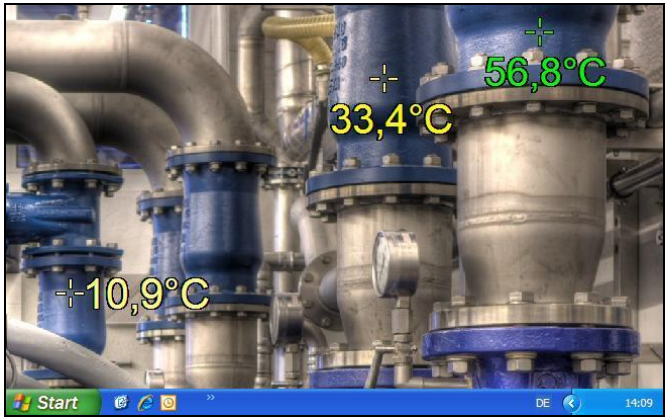


Border	Presenting the display with a border – in this mode the size of the display can be changed.
Transparent	Transparent presenting – useful for a positioning of the display in front of pictures or wallpapers.
Change color	For changing the display color.
Cross hairs	To show cross hairs which can be positioned independent on the external display.
Use contrast color	Dependent on the used background the presenting of the display figures with contrast color (black edging) can be useful.
Show main application	Calls the window of the main application (out of the invisible mode e.g.).
Remove Display	Closes the associated external display.
Exit (all)	Closes all external displays as well as the main application.



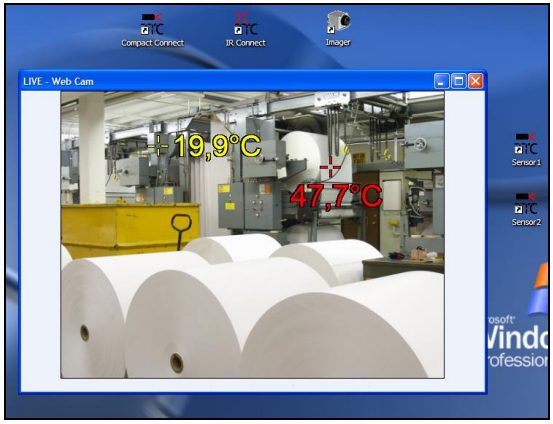


Application examples for external displays



Temperature displays in front of a static machine view

The picture of an industrial plant or of a process is used as wallpaper on the computer. The single instances of the CompactConnect are running in the invisible mode. The external displays are positioned that they are showing the real measurement targets on the plant. After a reboot of the computer the CompactConnect is started automatically via the autostart feature and the external displays are appearing on the previously defined positions.



Temperature displays in front of a live picture

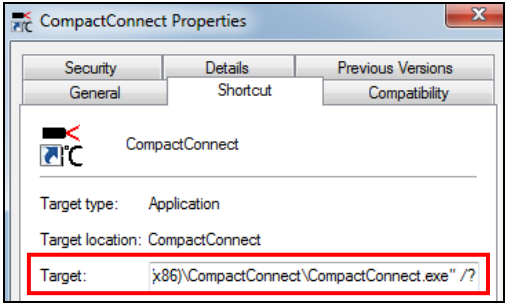
A camera is showing the live picture of an industrial plant or a machine. As in the previous example the external displays are pointing to the real measurement targets on site showing the current temperatures inside the live picture.

1.9. Multiple Software Calls

Command Line Parameters

The software can be started with different command line parameters.

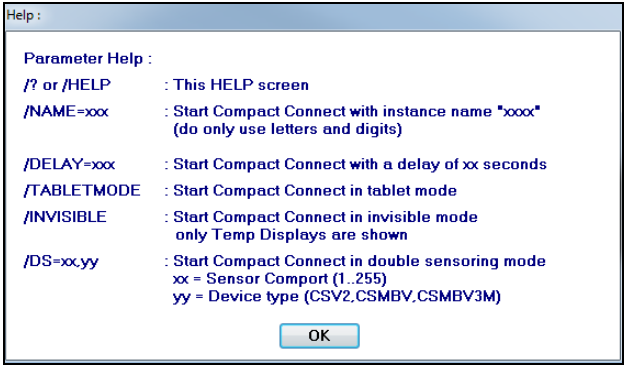
You will get an overview if you enter **[blank space] /?** behind the program call in the shortcut (properties).
If you start the application now the following window will appear:



The parameter **/NAME** allows a multiple start of separate software instances for displaying different instruments simultaneously.

The parameter **/DELAY** should be used, if several instances of the software are started at the same time. It prevents possible conflicts which can be caused by simultaneous access to the virtual COM ports.

Also a combination of both parameters is possible (see next page).



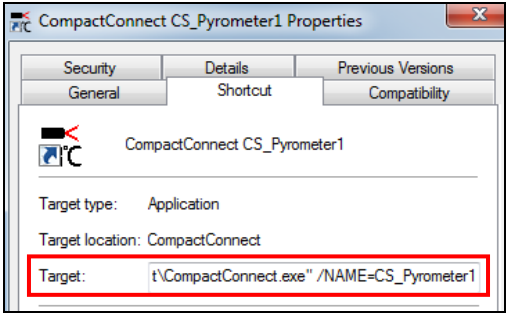
Please make at first a copy of the existing shortcut on your desktop and give it a name. Under properties you have to add now at the end of the line:

"C:\Programme\Compact Connect\CompactConnect.exe" a blank space and after:

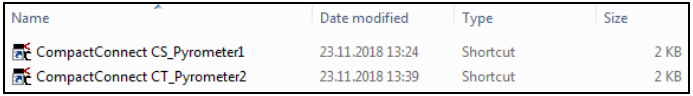
/Name=example

Example can be the desired sensor or measurement location name (z.B. /NAME=CS_Pyrometer1).

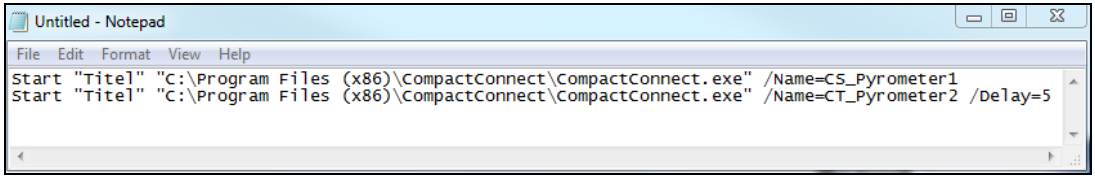
Note: No spaces are allowed in the name.



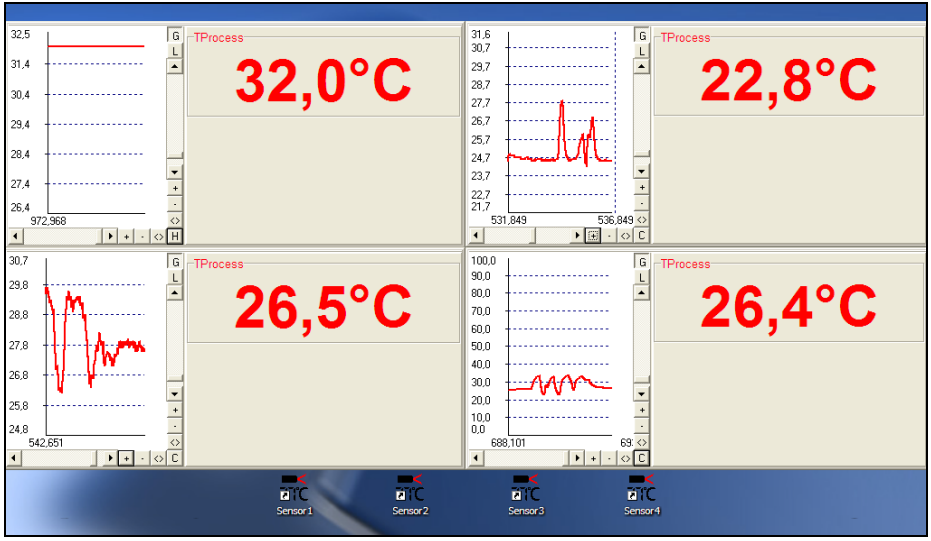
To start those different instances automatically shortcuts can be copied into the **autostart** folder or called with the help of a **batch file** (*.bat):



Autostart folder with two instances of the CompactConnect



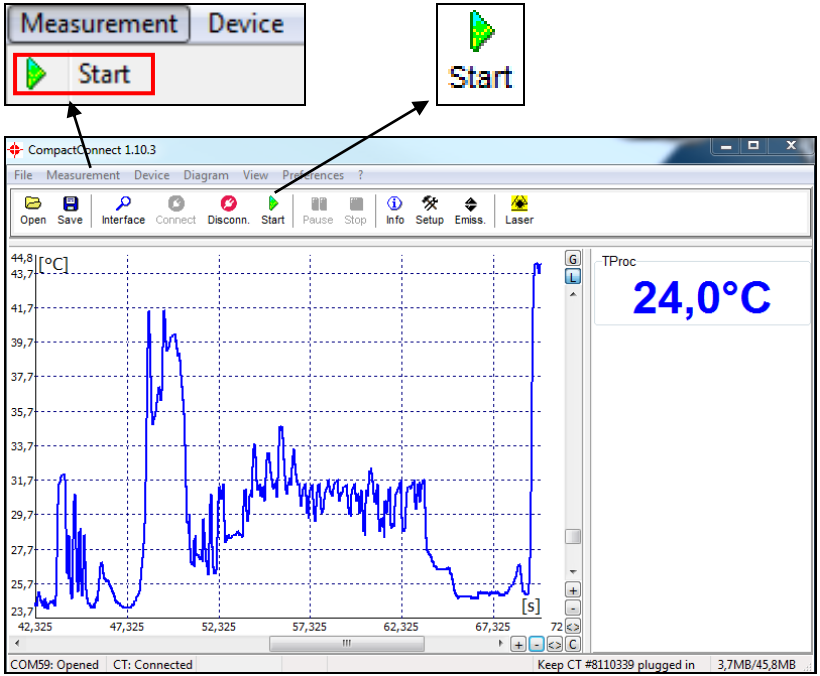
Batch file for an automatized call of two instances of the CompactConnect



Four displays with diagrams are showing the temperature of four via USB connected sensors

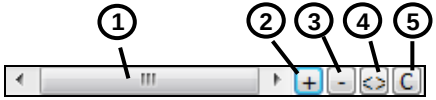
1.10. Start measurement

To start a measurement, please press the **Start** button in the tool bar **[Menu: Measurement\ Start]**.

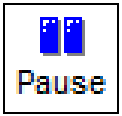


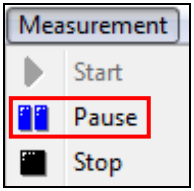
Control elements of the time axis:

1	Scroll bar
2	Zoom in (increase)
3	Zoom out (decrease)
4	Whole range
5	H: Hold/ C: Continue



Any activation of a control element of the time axis or of the **Pause** button will stop the further actualization of the measurement graph. The measurement itself continues in the background. To return to the current measurement graph please press the **Pause** button again **[Menu: Measurement\ Pause]** or **C**.

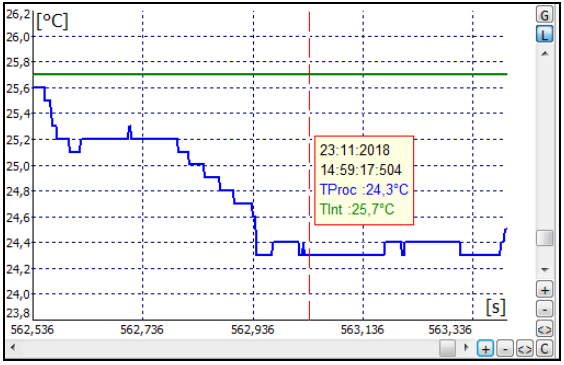




During the stopped status any parts of the diagram can be selected with the **Time scroll bar**. With the zoom in-button **+** these parts can be stretched (enlarged) and with the zoom out-button **–** clinched (minimized).

Time information

During the **Pause** mode the real date and time can be displayed for a certain position by clicking into the diagram. In addition the according temperature values of that position are shown.



1.11. Scaling of the Temperature Axis

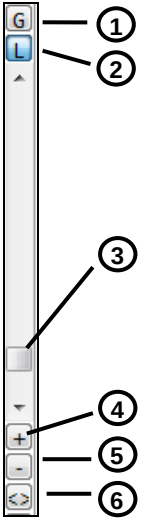
With **global scaling** the temperature range of the diagram will automatically be adapted to the respective peak values. The range will remain as set during the whole measurement.

With **local scaling** the temperature range of the diagram will be adapted dynamically to the respective peak values. After the respective peak has left the diagram in the further process of the measurement, the range will be readapted. This option enables an optimum display of the temperature graph.

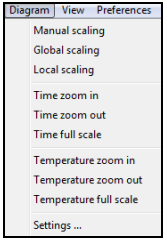
A **manual scaling** can be done at any time using the control elements of the temperature axis.

Control elements of the temperature axis:

1	Global auto scaling
2	Local auto scaling
3	Scroll bar
4	Zoom in (increase)
5	Zoom out (decrease)
6	Whole range

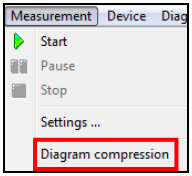


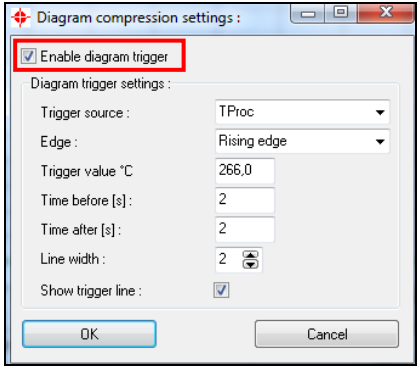
Activation of the desired option:
Control elements (temperature axis) or [Menu: Diagram].

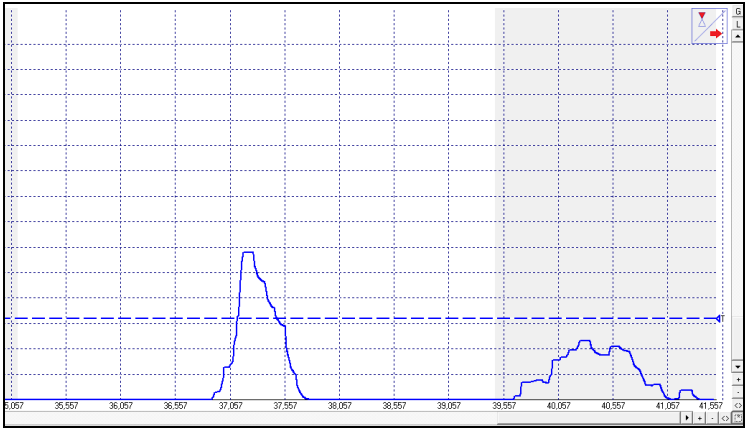


1.12. Diagram Compression

With this function you can activate an automatic on-hold of the diagram update and recording via a temperature threshold **[Menu: Measurement\ Diagram compression]**. In the example below the diagram will only be updated if the process temperature exceeds the threshold value of 266 °C. The made settings also allow a recording of 2 s before and 2 s after the temperature event.





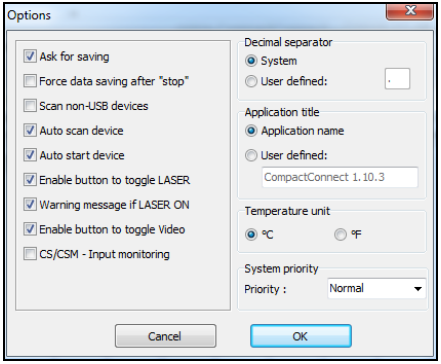


During the on-hold a blinking trigger symbol is shown in the right top corner of the diagram. The allocation of the events to certain process phases is possible without any problem as the real time of the computer will be recorded automatically.
Especially on discontinued processes the amount of data can be reduced with this feature.

1.13. Stop Measurement and Save Data

To stop the current measurement please press the **Stop** button **[Menu: Measurement\ Stop]**.
The **Save** button **[Menu: File\ Save as]** opens an explorer window to select destination and file name
[file type: *.dat].

The menu **[Menu: Preferences\ Options]** enables the following settings for data protection:



Ask for saving [1)]
If activated, each **Stop** and new **Start** will be followed by the query: **There is unsaved Data. Save now?**

Force data saving after "stop" [1)]
If activated, after each **Stop** an explorer window for saving the data will be opened automatically.

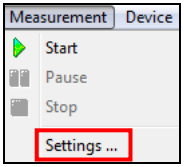
Decimal separator
System uses the computer system based separator for saving the data. If you want to use a **user defined** you can enter the desired separator in the according field.

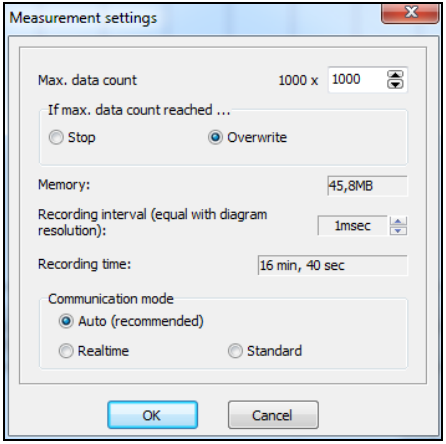
[1)] **If none of both options is activated, a new measurement will be started after termination of one measurement and pressing of the Start button again. In this case the former data are deleted!**

The further options are described under **► Options**.

1.14. Measurement Configuration

With the menu item **[Menu: Measurement\ Settings]** you can define the following parameter for the measurement:





Max. data count — Limitation of the maximum number of data values – when achieved the measurement will be stopped.

Stop/ Overwrite — If the maximum number of data values is achieved,
at **Stop** the current measurement will be terminated automatically/
at **Overwrite** the measurement will continue and the first values will be overwritten (principle of ring memory)

Memory — Memory, calculated from the max. data count value

Recording interval — Time between single data **[1ms...10s]**

Recording time — Maximum time of measurement, calculated from **Max data count** and **Recording interval**

Note

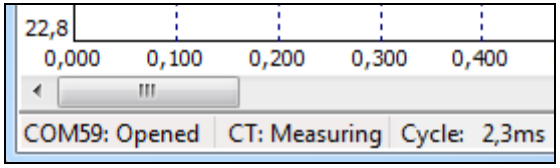
A change of the parameter **Max data count** will have influence on the **Memory** and **Recording time**.

A change of the parameter **Recording interval** will have influence on the **Recording time** only.

Communication mode

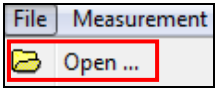
At **Auto** setting (recommended) the connected sensor works in **Realtime mode** (=Burst mode: Sensor is sending data continuously) if the recording interval is <200 ms. If the recording interval is >200 ms the sensor works in the **Standard mode** (= Polling mode: Temperature values will be polled by the software).

The current real cycle time will be shown in the status line:



1.15. Opening of Files

To open a saved file please press the button **Open** **[Menu: File\ Open].**
You can select the desired file in an explorer window which will be opened **[file type: *.dat]**.



Note
The temperature files can also be opened and edited with any text editor or with Microsoft Excel.

If you open a file with a spreadshett program you will find beside the relative time (starting with 000:00:00 – column A) also the absolute time for each measurement value (column N).
On video devices and if the function “Automatic Snapshots” is activated you will find further information to the recorded snapshots in the columns O and P:

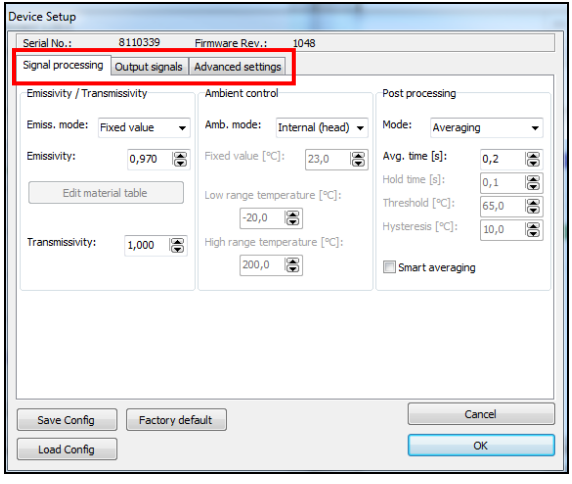
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	[Connect DataFile][2.0]															
2	Date:	10.01.2014														
3	Time:	13:49:45														
4	Unit:	°C														
5	Resolution:	0,001/0,100														
6	Values:	11														
7	Time	TObj	TInt	TBox	TAct	T2C	T1C	ATTENUA	Epsilon	mVin	Vcc	TAmb	Compress	Time absc	ImageIdx	ImageVal
020	000:00:06,012	268,5	26,6	0	268,5	0	0	0	0	0	0	0		13:49:55:063	2014-01-10 - 13-49-54.jpg	268,5
571	000:00:07,563	271,8	26,6	0	271,8	0	0	0	0	0	0	0		13:49:56:614	2014-01-10 - 13-49-56.jpg	271,8
2739	000:00:12,731	267,7	26,7	0	267,7	0	0	0	0	0	0	0		13:50:13:306	2014-01-10 - 13-50-13.jpg	267,7

2. CT / CTlaser / CTvideo

2.1. Sensor Setup CT/ CTlaser/ CTvideo – Signal Processing

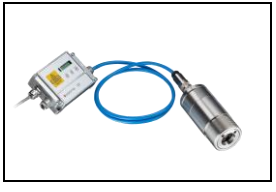
The button **Setup** **[Menu: Device\ Device Setup]** opens a window for the setting of all sensor parameters. The dialog window is separated into 3 categories:

- **Signal processing** — Emissivity, Transmissivity, T_{Amb} compensation, Post processing
- **Output signals** — Output channels and Alarm settings
- **Advanced settings** — Head parameter, Device adjustment, Multidrop address, Lock of programming keys, Temperature unit



CT

CTlaser



CTvideo

2.1.1. Emissivity and Transmissivity

In the selection field **Mode** in section **Signal processing/ Emissivity, Transmissivity** you can choose between three options to set the emissivity:

Fixed value: The value can be set in the input field **Emissivity**

External (Pin F2): The value is determined by a voltage on the functional input F2. **[0–10 V: 0 V ► ε=0,1 | 9 V ► ε=1,0 | 10 V ► ε=1,1]**

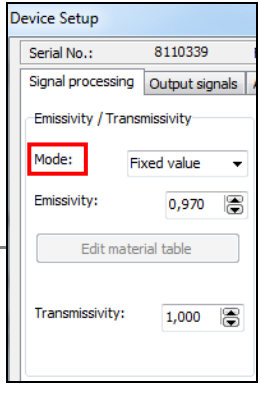


Table: Input of up to eight different emissivity values and corresponding alarm values A and B in a **Material Table**. A combination of low and high values on the functional inputs F1 to F3 selects the different table values.

A non connected input represents: F1=High | F2, F3=Low.
[High level: ≥ +3 V…+36 V | Low level: ≤ +0,4 V…–36 V]

In the input field **Transmissivity** you have to enter the transmissivity of optional optical components like an additional lens (CF-optics ACCTCF e.g.) or a protective window (ACCTPW e.g.).

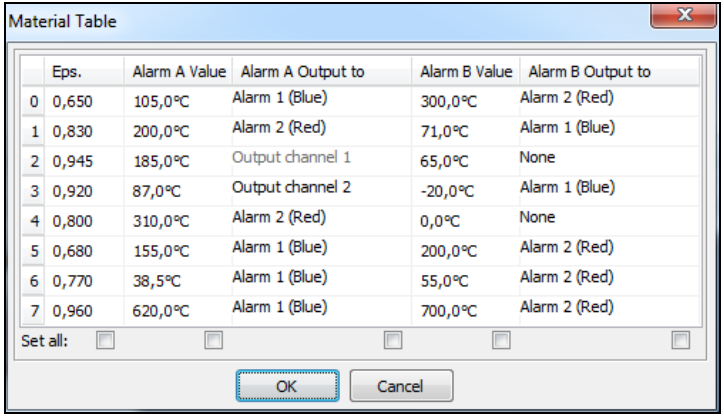
2.1.2. Material Table

After selection of **Table** in the field **Mode** you can press the button **Edit material table**.
You can now preset the emissivity values for up to 8 different materials. Thereto you have to set the cursor in the respective field of the table.

Two alarms (A and B) can be allocated for each material/ emissivity value. For the output of the alarm the following selection is possible:

- Alarm 1 (blue)
- Alarm 2 (red)

- Output channel 1
- Output channel 2
- <none>



Output channel 1 and 2 can only be selected if they are defined as digital (section **Output signals**) before.

Other properties like normally open/ close and source (the source of output channel 1 [T_{Proc}] cannot be changed) have to be defined in section **Output signals** too.

The selection of **Set all** (below the colums) will cause a take over of an entered value for all fields of the according column.

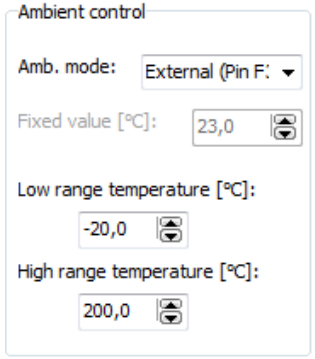
2.1.3. Ambient Temperature Compensation

In dependence on the emissivity value of the object a certain amount of ambient radiation will be reflected from the object surface. To compensate this impact, the software provides the feature **Ambient control**:

- **Internal (Head):** The ambient temperature will be taken from the head-internal Pt1000 probe (factory default setting).
- **External (Pin F3):** The ambient temperature will be determined by a voltage on the functional input-pin F3 **[0 – 10 V ► -40 – 900 °C; range scalable]**. With an external probe or with

a second CT a real-time ambient temperature compensation can be realized.

- **Fixed value:** A fixed value can be entered in the edit box **Fixed value** (if the ambient radiation is constant).

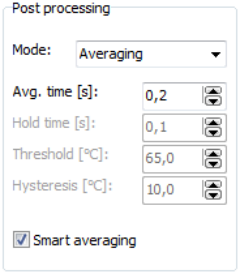


Note
Especially if there is a big difference between the ambient temperature at the process and head temperature the use of Ambient control with **External (PinF3)** or **Fixed value** is recommended.

2.1.4. Post Processing

In section **Signal processing/ Post processing** you can select the following functions:

- Averaging
- Peak hold
- Valley hold
- Adv. peak hold
- Adv. valley hold
- Off



Averaging

In this mode an arithmetic algorithm will be performed to smoothen the signal. The **Avg. time** is the time constant. This function can be combined with all other post processing functions. The minimum adjustable average time is 0,1s; on the models 1M, 2M and 3M 1ms (0,001s). On these models values below 0,1s can be increased/ decreased only by values of the power series of 2 (0,002, 0,004, 0,008, 0,016, 0,032, ...).

Peak hold

In this mode the sensor is waiting for descending signals. If the signal descends the algorithm maintains the previous signal peak for the specified **Hold time**.
The minimum adjustable hold time is 0,1s; on the models 1M, 2M and 3M 1ms (0,001s).
After the hold time the signal will drop down to the second highest value or will descend by 1/8 of the difference between the previous peak and the minimum value during the hold time. This value will be held again for the

	specified time. After this the signal will drop down with slow time constant and will follow the current process temperature. ► **Signal Graphs** Therefore, if periodic events will be measured (bottles on a conveyor e.g.) this peak hold function avoids a drop down of the signal to the conveyor temperature in-between 2 events.
Valley hold	In this mode the sensor waits for ascending signals. If the signal ascends the algorithm maintains the previous signal valley for the specified **Hold time**. The definition of the algorithm is according to the peak hold algorithm (inverted).
Advanced Peak hold	In this mode the sensor waits for local peak values. Peak values which are lower than their predecessors will only be taken over if the temperature has fallen below the **Threshold** value beforehand. If **Hysteresis** is activated a peak in addition must decrease by the value of the hysteresis before the algorithm takes it as a new peak value.
Advanced Valley hold	This mode is the inverted function of Advanced Peak hold. The sensor waits for local minima. Minimum values which are higher than their predecessors will only be taken over if the temperature has exceeded the **Threshold** value beforehand. If **Hysteresis** is activated a minima in addition must increase by the value of the hysteresis before the algorithm takes it as a new minimum value.
Smart Averaging	If activated, a dynamic average adaptation at high signal edges is active.
Off	If **Off** is activated, no post processing will happen ($T_{Proc} = T_{Avg}$).

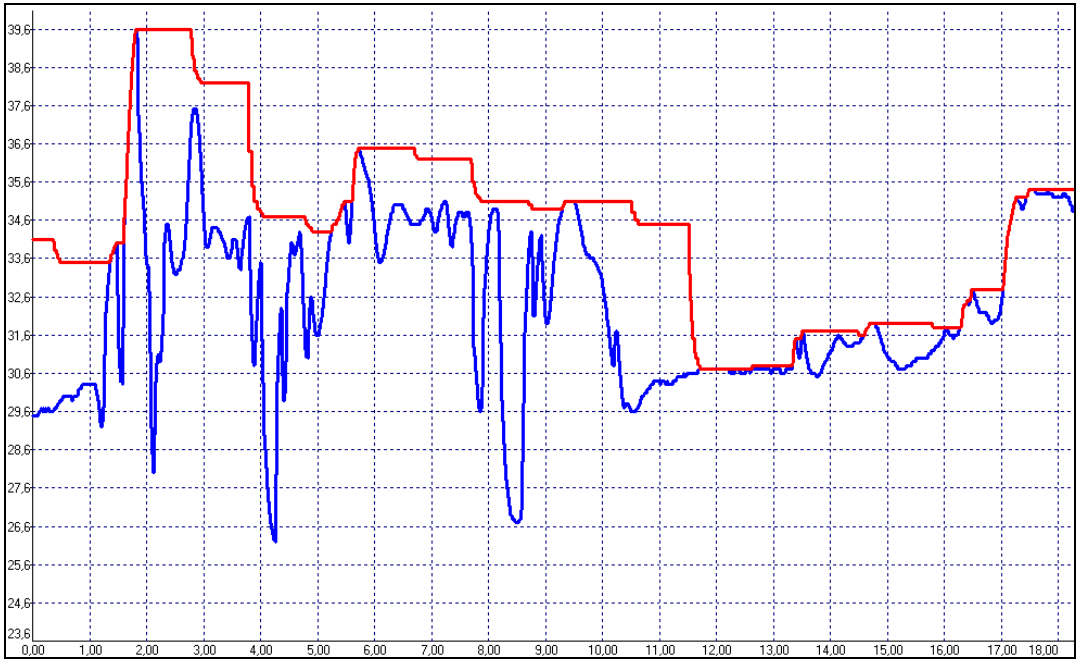
Peak picking function [1M/ 2M/ 3M only]

In order to detect fast events which are shorter than 1 ms you have to set the **Avg. time** to 0,0 s and activate the **Peak hold** function. In this mode the sampling rate is 250 µs.

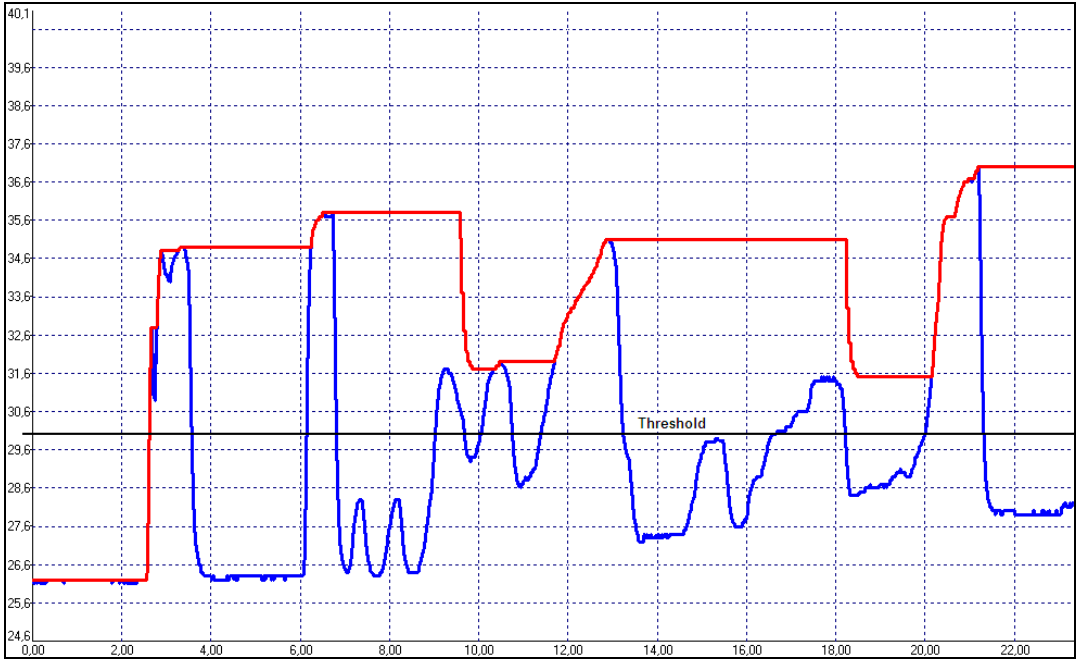
Note

You can display the process temperature $\mathbf{T_{Proc}}$ (with post processing) and also the current average temperature $\mathbf{T_{Avg}}$ (without any post processing) in the diagram. In this way the result and functionality of the selected post processing features can easily be traced and controlled.

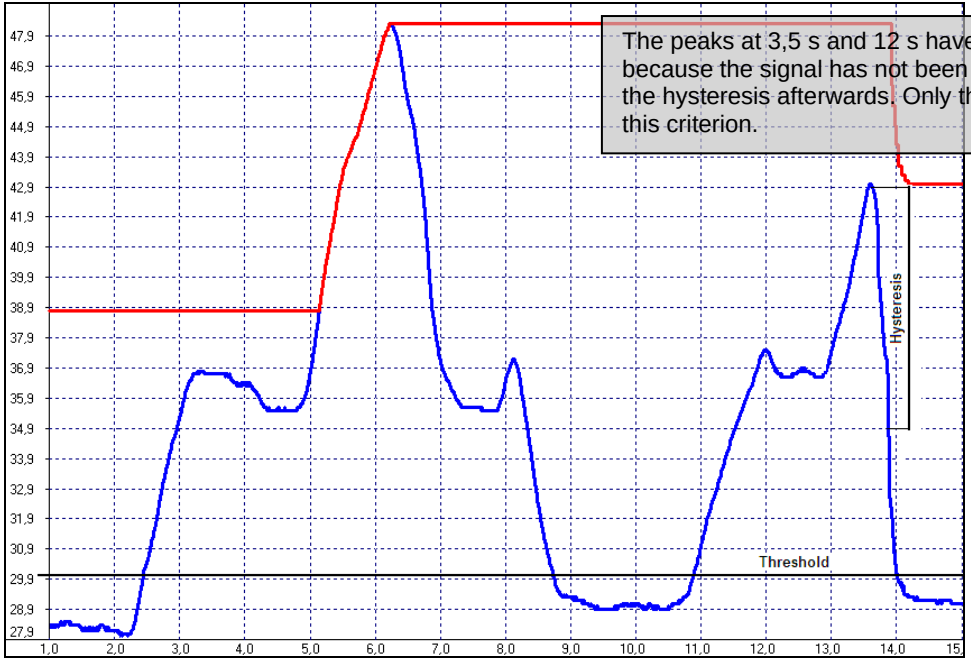
Signal Graphs



— T_{Proc} with Peak Hold (Hold time = 1s)
— T_{Avg} without post processing



— T_{Proc} with Advanced peak hold (Threshold = 30 °C/ Hysteresis = 1 °C)
— T_{Avg} without post processing

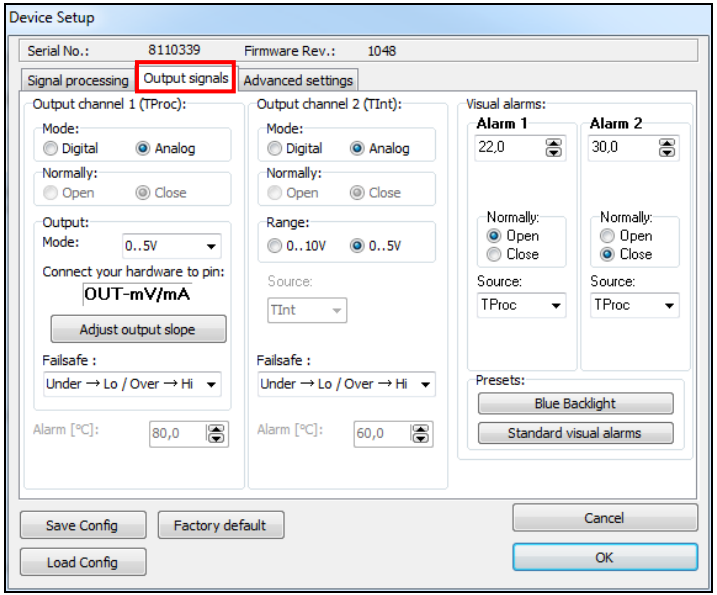


The peaks at 3,5 s and 12 s have not been taken over, because the signal has not been decreased by the value of the hysteresis afterwards. Only the peak at 13,5 s is fulfilling this criterion.

— T_{Proc} with Advanced peak hold (Threshold = 30 °C/ Hysteresis = 8 °C)
— T_{Avg} without post processing

2.2. Sensor Setup CT/ CTlaser/ CTvideo – Output Signals

You can set up the **Output channels 1** and **2** and the **Visual alarms** in section **Output signals**.



Overview Alarm outputs

- **Output channel 1 and 2** if Mode is set to digital
- **Visual alarms**

  = color alarms in the LCD display

  = alarms of the optional relays interface

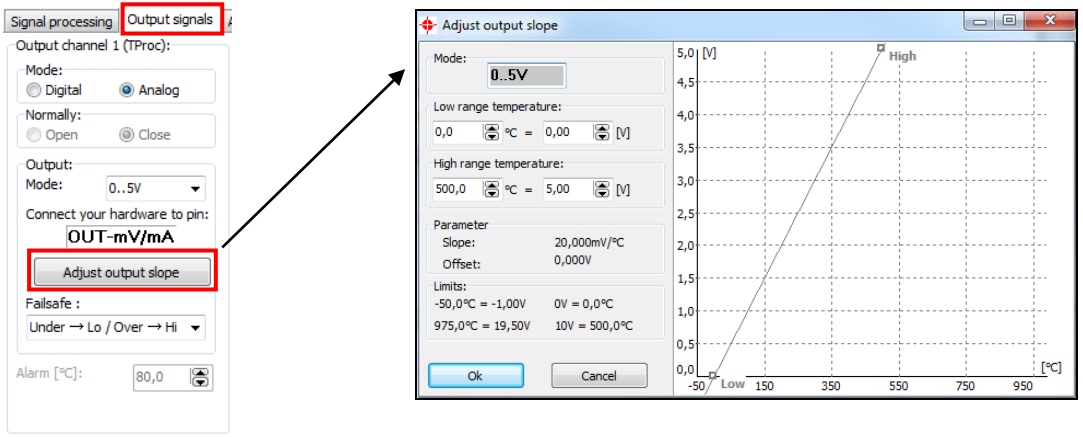
  = AL2 output (open collector/ only Alarm 2)

2.2.1. Output Channel 1

The output channel 1 is used for output of the process temperature $\mathbf{T_{Proc}}$.
If **analog** is activated the following analog output signals are available in the selection field **Output: Mode**:

- 0-5 V
- 0-10 V
- 0/4-20 mA
- Thermocouple (TCJ or TCK)

After you have selected the desired output you can adjust the temperature range of the sensor by pressing the button **Adjust output slope**. The range limits can either be entered directly in the input fields or by shifting the output function graph (by catching the points **LOW** or **HIGH** with the cursor).



Alternatively the output channel 1 can also be used as an alarm output. Thereto you have to choose the mode **digital**. The selection **Normally open/ closed** defines the output as High or Low alarm.

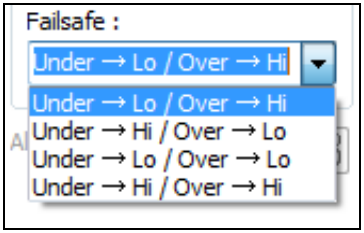
Please enter the alarm value (threshold) in the input field **Alarm**.

The selected output signal (0-5 V/ 0-10V/ 0-20 mA/ 4-20 mA) is also valid if the channel is used as alarm output. Dependent on the alarm status either the lower or the upper range limit value will be given out.

Failsafe

The CT/CTlaser/CTvideo has a failsafe function for the analog output channels 1 (T_{Proc}) and 2 (T_{Int}). Four different modes can be selected:

- Under → Lo / Over → Hi
- Under → Hi / Over → Lo
- Under → Lo / Over → Lo
- Under → Hi / Over → Hi



Example of analog output (4-20 mA) with mode *Under → Lo / Over → Hi*: If the temperature value is under the defined temperature range, a low signal (e.g. 3,7 mA) is given out and if the temperature value is over the defined temperature range, a high signal (e.g. 21 mA) is given out. So a possible cable defect can be detected quickly.

2.2.2. Output Channel 2 [LT/ G5/ P7 only]

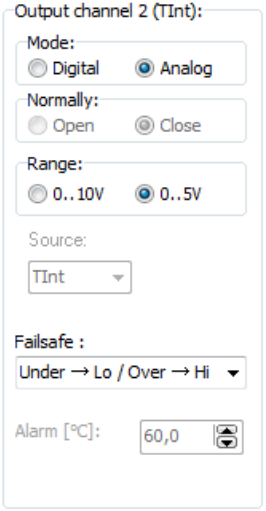
This channel is normally used as output for the head temperature $\mathbf{T_{Int}}$ (Analog mode preset). The output signal is 0-5 V or 0-10 V [according -20...180 °C or -20...250 °C on CThot models].

Alternatively the output channel 2 can also be used as an alarm output. For this you have to choose the mode **digital**. The selection **Normally open/ closed** defines the output as High or Low alarm.

In the selection field **Source** the alarm signal source can be selected between $\mathbf{T_{Proc}}$, $\mathbf{T_{Int}}$ and $\mathbf{T_{Box}}$.

Please enter the alarm value (threshold) in the input field **Alarm**.

The output can be selected between 0-5 V and 0-10V.
Dependent on the alarm status either the lower or the upper range limit value will be given out.



2.2.3. Visual Alarms

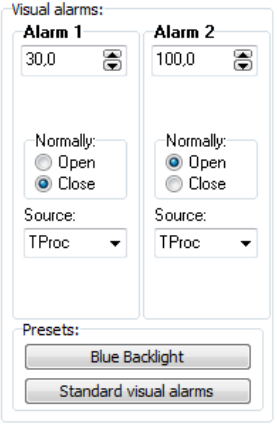
The **Alarms 1 and 2** (Visual Alarms) will cause a change of the backlight color of the LCD display of the electronic box and in addition they are available via the optional relay interface. In addition the Alarm 2 can be used as open collector output on pin **AL2** at the CT electronics (24 V/ 50 mA).

Also here the selection **Normally open/ closed** defines the alarm as High or Low alarm.
In the selection field **Source** the alarm signal source can be selected between $\mathbf{T_{Proc}}$, $\mathbf{T_{Int}}$ and $\mathbf{T_{Box}}$.
Both alarms will cause the following color change of the LCD display:

- blue: Alarm 1 aktive
- red: Alarm 2 aktive
- green: no Alarm aktive

The standard mode for the visualization of the alarms can be reset with the button **Standard visual alarms**.

The button **Blue Backlight** is a presetting to achieve a permanent blue backlight on the LCD display.



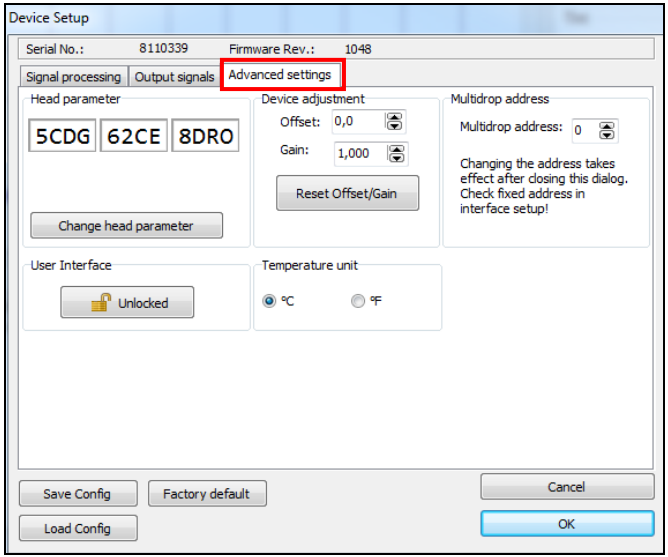
Note
All alarms (Alarm 1, Alarm 2, Output channel 1 and 2 if used as alarm output) have a fixed hysteresis of 2 K (CThot: 1 K).

On the models 1M, 2M and 3M the hysteresis at Alarm 2 can be adjusted in addition.

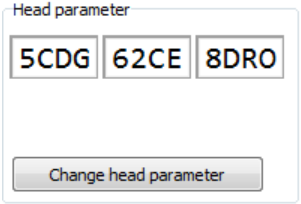
2.3. Sensor Setup CT/ CTlaser – Advanced Settings

In section **Advanced settings** the following settings can be made:

- Head parameter
- Device adjustment
- Multidrop address
- Lock/ Unlock of programming keys
- Temperature unit



2.3.1. Head Parameter



With exception of the CTfast (LT15F/ LT25F) an exchange of sensing heads and electronics on all models of the CT- and CTlaser-series is possible.
The 3x4-digit code (resp. 5x4-digit code) contains the calibration data of the head. For a correct temperature measurement it is necessary, that the sensing head code (labeled on each head or head cable) is matching the entered code in the corresponding electronic box.

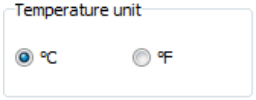
From the factory side this has been done already – a change of the setting by pressing the button **Change head parameter** is only necessary, if the head will be exchanged.

2.3.2. Lock Programming Keys

With this function you can lock the programming keys on the CT electronics to avoid a non authorized change of parameters on the unit. Pressing the button will set the unit into the **Locked** or **Unlocked** mode. In the locked mode all parameter and settings can be displayed on the unit by pressing the **Mode** button – a change of parameters with the **Up** or **Down** button is not possible.

2.3.3. Temperature unit

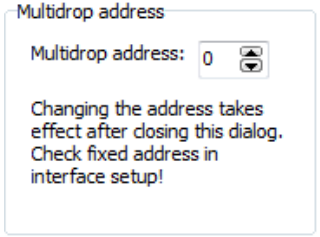
Selection between °C and °F as temperature unit.



2.3.4. RS485-Multidropadresse

In combination with a RS485 interface you can build a network of several CT sensors (max. 32 sensors).
For the digital communication each sensor must have its own address which you can enter in the input field Multidrop address.

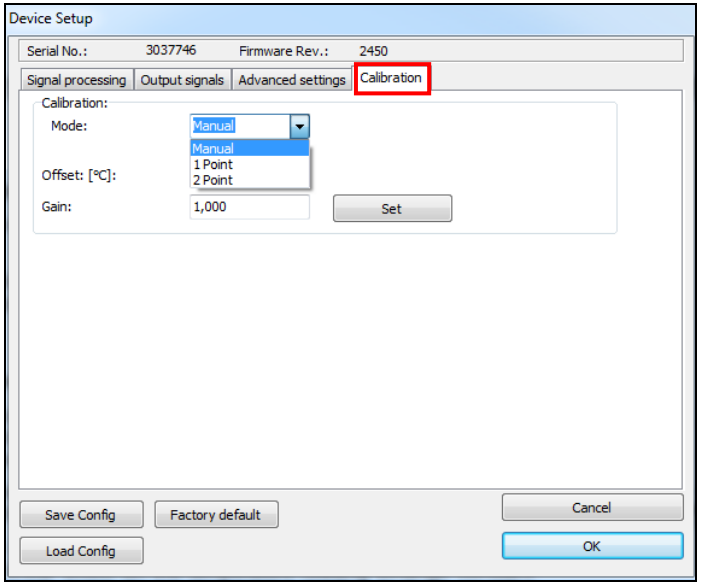
► RS485/ RS422



2.4. Sensor Setup CT/ CTlaser – Calibration

In the tab Calibration, three different modes can be selected to calibrate the device:

- Manual
- 1 Point (Calibration)
- 2 Point (Calibration)



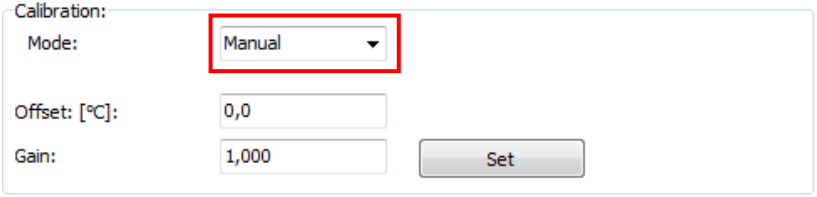
2.4.1. Manual Calibration

For certain applications or under certain circumstances a temperature offset or a change of the gain for the temperature curve may be useful.

The **factory default settings** for Offset and Gain are:

- Offset: 0,0 K
- Gain: 1,000

A changed **Offset** causes a parallel shifting of the temperature curve and therewith it has a linear effect on the temperature reading (change constant independent on process temperature). A change of the **Gain** will have a non-linear effect on the temperature reading (change depends on process temperature).

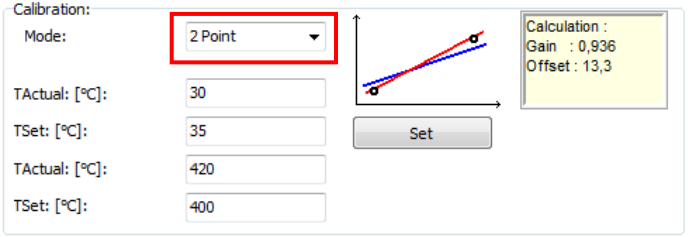


2.4.2. 1 Point Calibration

In this mode, a 1-point calibration can be made for the device. To do this, select under Mode **1 Point** (Calibration) and enter the actual temperature (**TActual**) and the set temperature (**TSet**). An offset calculation takes place and is displayed. With **Set** the input is made.

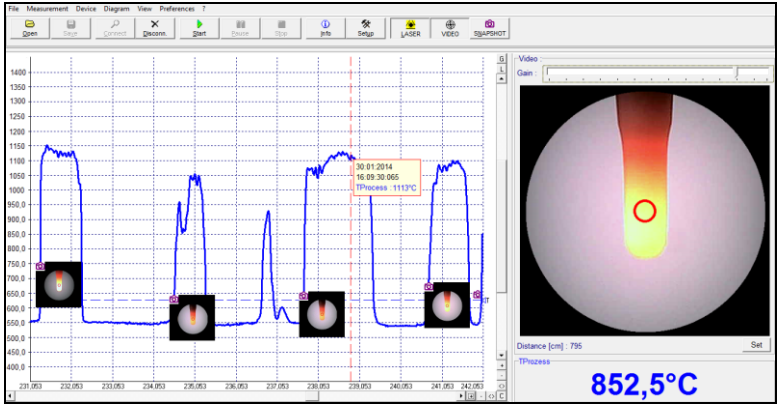
2.4.3. 2 Point Calibration

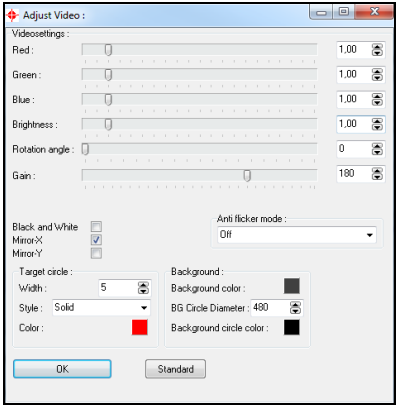
In this mode, a 2 point calibration can be made. To do this, select under Mode **2 Point** (Calibration) and enter the actual temperature (**TActual**) and the set temperature (**TSet**) for two different points. An offset and gain is then calculated. With **Set** the input is made.



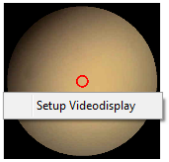
2.5. Video Settings

If a CTvideo or CSvideo is connected you will see the live video picture automatically in the right part of the software window. With the button **Video** **[Menu: View\ enable Video]** you can switch on and off the video display.





The location and size of the measurement spot is shown in the video picture. This enables an exactly positioning of the sensor to the target.
With the right mouse button you can open **Setup Videodisplay** (if the cursor is placed on the video display).



The following settings can be made here:

Red/ Green/ Blue:	Gain setting for the different color channels
Brightness:	Setup of brightness
Rotation angle [1]:	Stepless rotation of the video picture for a correct display of the measurement object independent on the installation position of the sensor
Gain [2]:	Setup of gain – in combination with brightness adaptation to different luminosities of objects
Black and White:	Switch to b/w video display
Mirror-X:	Picture mirroring in x axis
Mirror-Y:	Picture mirroring in y axis
Anti flicker mode:	Filter for a suppression of 50Hz or 60Hz flickering
Target circle:	Setup of line Width, Style (Solid, Dotted line) and Color of the spot marking
Background:	Setup of the colors for background, circle background and circle diameter – with this parameter you can adjust the magnification of the video display.

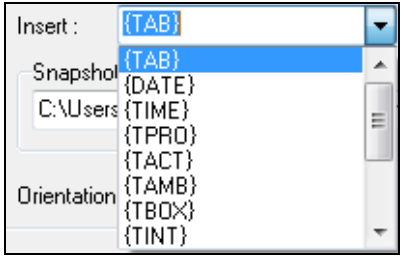
[1] The display rotation can also be done outside this dialog: with the left mouse button you can grab the picture and rotate it by moving the mouse to the left or to the right side.
[2] The slider for gain is in addition also available right on top of the video picture.

Underneath the video picture you will find a field for input of the measurement distance. Please enter here by pushing the **Set** button the distance sensor – object after you did the focusing of the optics:

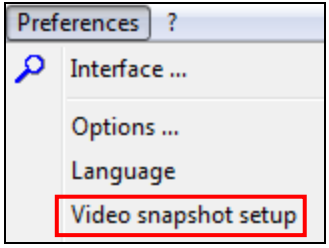
The settings are stored for the connected sensor and kept also after software termination.
With the **Standard** button the factory default setting can be easily restored.

2.5.1. Video Snapshots

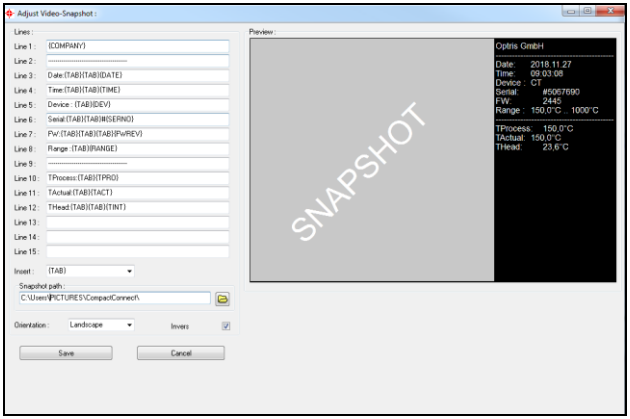
With the software you can make manually or automatically triggered snapshots.
Beside the picture you can display additional information which is stored inside the snapshot file:



TAB	Tabulator
DATE	Current date
TIME	Current time
TPRO	T_{Proc} (Process temperature)
TACT	T_{Avg} (current average temperature without signal processing)
TBOX	T_{Box} (temperature of the electronic box (CTvideo))
TINT	T_{Int} (internal sensor temperature)
SERNO	Serial number
RANGE	Measurement range
FWREV	Revision of the sensor firmware
DEV	Sensor type
COMPANY	Manufacturer (information taken from the corporate.ini file)

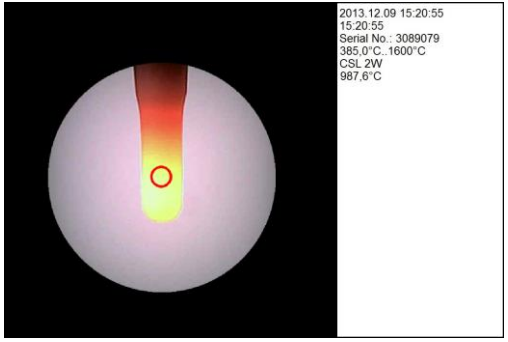


You can open the snapshot configuration under **[Menu: Preferences\ Video snapshot setup]**.
Each line (1-15) can contain a combination of free text and data fields. To insert a field please click into the according line and select the field under **Insert**.
With **invers** white letters on black background can be displayed.



You can define the location for saving a snapshot under **Snapshot path**.

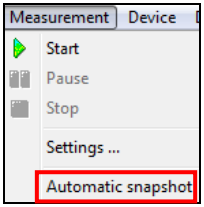
If you press the button **Snapshot** **[Menu: View\ Video snapshot]** a picture will be stored.



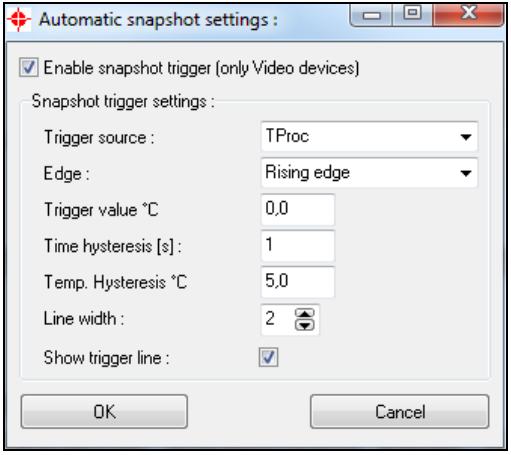
Example for a snapshot

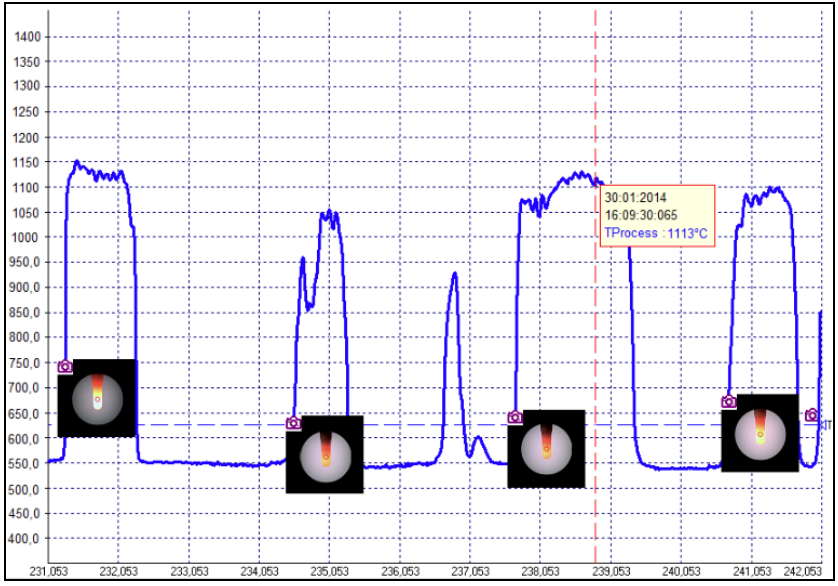
2.5.2. Automatic Snapshots

You can make automatic snapshots which are either time triggered (fixed interval) or temperature triggered (Threshold). Please open **[Menu: Measurement\ Automatic snapshot]**. After activation you can select under **Trigger source** different temperature signals (T_{Proc}, T_{Int}, T_{Box}, T_{Avg}) or **Time** for a time triggered recording.



Edge	Snapshot triggering on rising or falling signal edge
Time hysteresis	Minimum gap between two snapshots
Temp. Hysteresis	Snapshot will be triggered only if the signal drops by the value of the hysteresis under the threshold (rising edge) or over the threshold (falling edge)
Line width	Line width of the trigger line if shown in the diagram (**Show trigger line** activated)





Temperature-Time-Diagram with automatic snapshots – a mouse click on the camera icon opens a thumbnail of the according picture; double click opens the snapshot in full screen.

If you save the diagram as *.dat file all related pictures will be saved automatically in a folder which is located in the same directory and which has the same name as the dat-file.

3. Sensor Setup CSlaser/ CSvideo/ CX

3.1. Sensor Setup CSlaser/ CSvideo/ CX

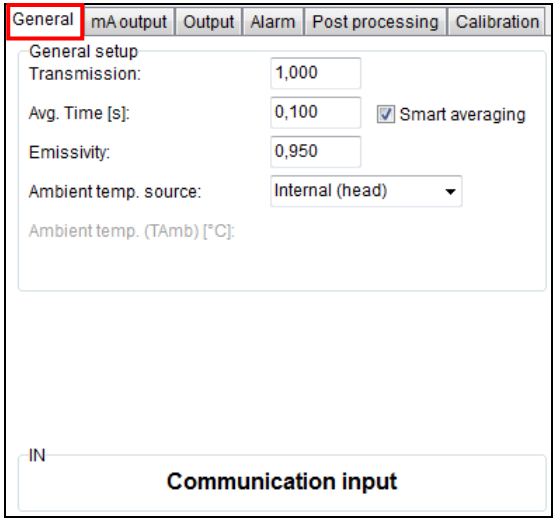
The button **Setup** **[Menu: Device\ Device Setup]** opens a dialog window for set up the parameters of the sensor.

CSlaser

CSvideo

CX

3.1.1. General [CX]



Transmission: Transmissivity setting

Avg. Time (s): Average time setting

Smart averaging: Function for dynamic average adaptation at high signal edges

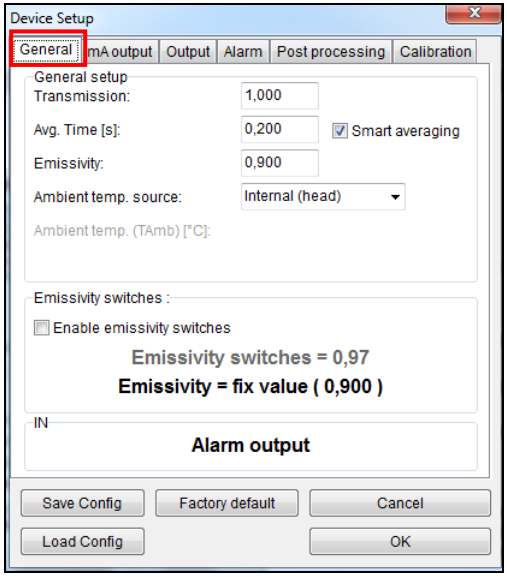
Emissivity Source: Fixed value

Emissivity: Emissivity setting (Fixed value)

Ambient temp. source 1): Selection between **Internal (head),** or **Fixed value**

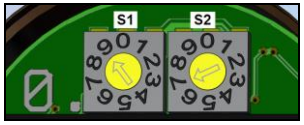
Ambient temperature: Value input for mode **Fixed value**

3.1.2. General [CSlaser/ CSvideo]

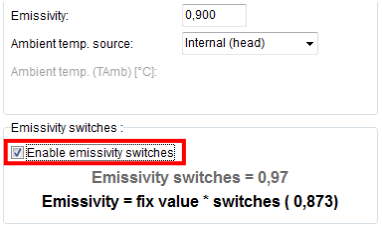


Transmission:	Transmissivity setting
Avg. Time (s):	Average time setting
Smart averaging:	Function for dynamic average adaptation at high signal edges
Emissivity:	Emissivity setting (Fixed value)
Ambient temp. source 1):	Selection between **Internal (head)** or **Fixed value**
Ambient temperature:	Value input for mode **Fixed value**
Emissivity switches:	Activation or Deactivation of the emissivity switches on the sensor (CSlaser only).

If the switches are activated the consequent emissivity is the result of the multiplication of the emissivity set on the sensor and the emissivity set in the software.



After opening of the sensor backplane both of the emissivity switches are accessible.

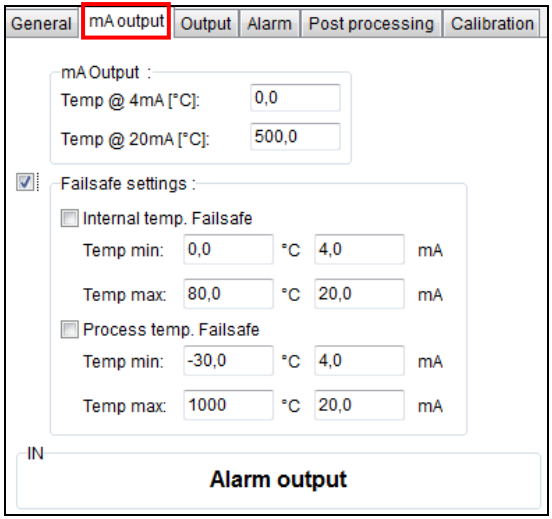


[1)] For the compensation of the ambient temperature the internal head temperature is used if Internal (head) is selected. In dependence on the emissivity value of the object a certain amount of ambient radiation will be reflected from the object surface. Therefore for certain applications it may be useful taking the ambient temperature on the object site for compensation (if significant different from head ambient temperature e.g.).

The following settings can be made:

Fixed value: You can enter a value which represents the ambient radiation in the field **Ambient temp.**

3.1.3. Analog Output (mA)



mA output

Temp @ 4 mA:	Lower limit temperature range
Temp @ 20 mA:	Upper limit temperature range
Failsafe settings1):	Definition of failsafe modes

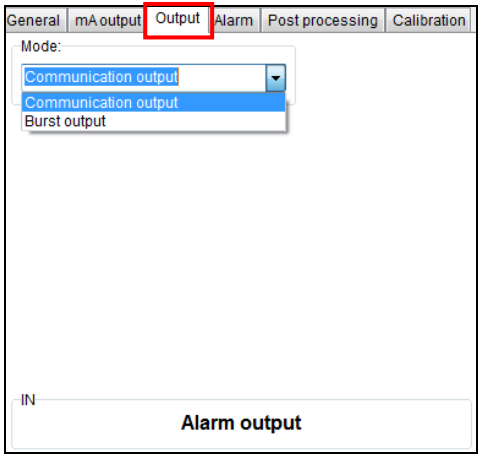
Note

If the sensor will be connected to the supply voltage, the unit is checking for the first 300 ms if a USB adapter is connected.
In this case the bidirectional communication mode will be activated automatically.

1) The settings for failsafe mode enable a defined level on the analog output in dependence on preset temperature limits for process temperature and/ or sensing head temperature (**Temp min** and **Temp max**).

3.1.4. Digital Output

In the selection field **Mode** you can select between **communication output** (bidirectional digital communication for interaction with the software) and **burst output**.

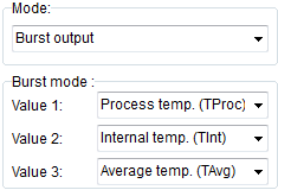


Burst output

Value 1…3: Selection between:

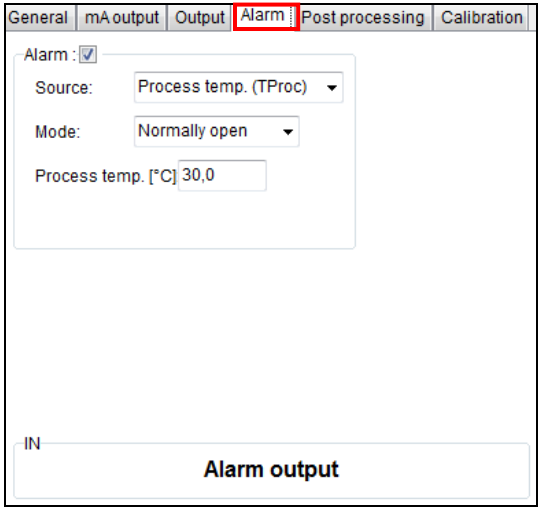
< none >
Process temp. (T_{Proc})
Internal temp. (T_{Int})
Emissivity (Eps.)
Transmissivity
Ambient temperature (T_{Amb})
Average temp. (T_{Avg})
Electronic temp.

In the burst mode the sensor works in a unidirectional communication mode – the sensor is sending data continuously. The burst string can be configured by selection of value 1 to 3.
[► Command List on software CD]



3.1.5. Open Collector Alarm Output

This function activates an additional alarm output (open collector output) at the **RxD pin (green).**

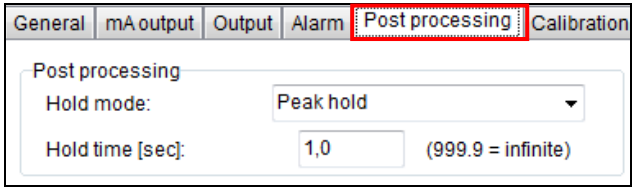


Alarm [open collector]

Source:	Selection between: ▪ Process temp. (T_{Proc}) ▪ Internal temperature (T_{Int})
Mode:	normally off/ on
Temp.:	alarm value

The RxD pin acts as alarm output.
[► Sensor manual: Electrical Installation]

3.1.6. Post Processing – Peak/ Valley Hold



Hold mode: Selection between:

- Off
- Peak hold
- Valley hold
- Advanced peak hold
- Advanced valley hold
- Peak hold Trigger off
- Valley hold Trigger off

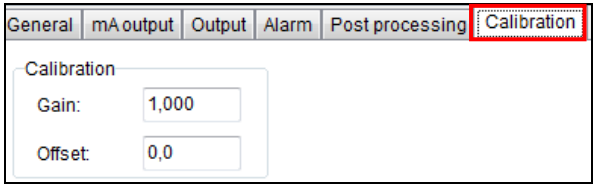
Hold time (sec.): Hold time adjustment (999,9 = infinite)

In the **Peak hold** mode the sensor is waiting for descending signals. If the signal descends the algorithm maintains the previous signal peak for the specified **Hold time**.

In the **Valley hold** mode the sensor waits for ascending signals. If the signal ascends the algorithm maintains the previous signal valley for the specified **Hold time**.

You will find a detailed description of these functions under **Post Processing**.

3.1.7. Calibration



Gain: Adjustment of Gain

Offset: Adjustment of a temperature offset

For certain applications or under certain circumstances a temperature offset or a change of the gain for the temperature curve may be useful.
The factory default settings for Gain and Offset are:

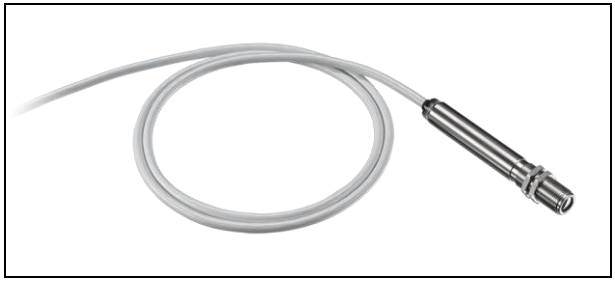
- Gain: 1,000
- Offset: 0,0 K

A changed **Offset** causes a parallel shifting of the temperature curve and therewith it has a linear effect on the temperature reading (change constant independend on process temperature). A change of the Gain will have a non-linear effect on the temperature reading (change depends on process temperature).

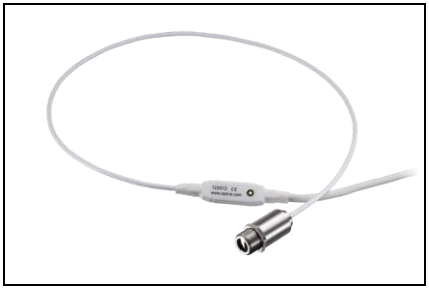
4. CS / CSmicro

4.1. Sensor Setup CS/ CSmicro

The button **Setup** **[Menu: Device\ Device Setup]** opens a dialog window for set up the parameters of the sensor.

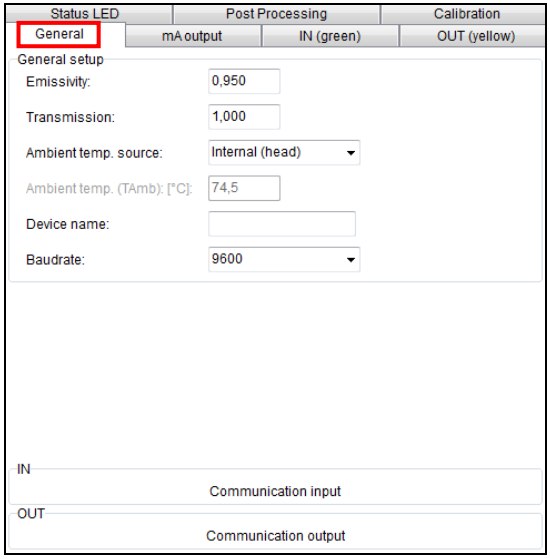


CS



CSmicro

4.2. General



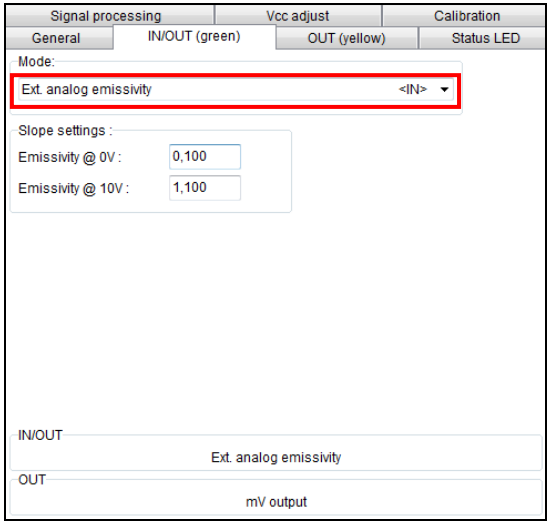
Emissivity	Emissivity setting (Fixed value)
Transmission:	Transmissivity setting
Ambient temp. source [2]:	Selection between **Internal (head)** or **Fixed value**
Ambient temperature (TAmb) [°C] [2]:	Value input for mode **Fixed value**
Device name:	Name of device (only CSmicro)
Baudrate	Setting of Baudrate (only CSmicro)

In the lower range of the unit adjustment window the current use of the **IN/ OUT** (green) and **OUT** (yellow) pins will be shown.

4.3. IN/ OUT (green)

4.3.1. IN/ OUT (green) – ext. Emissivity/ Ambient temp. [CS/ CSmicro LT only]

The **IN/ OUT** pin can be programmed as an input as well as an output.



Mode: Selection between:

- Ext. analog emissivity [IN] [1)]
- Ext. analog ambient [IN] [1)]
- Valid control high active (high level >0,8 V [IN]
- Valid control low active (low level <0,8 V) [IN]
- Ext. hold _/‾ rising edge (edge level 0,8 V) [IN]
- Ext. hold ‾_ falling edge (edge level 0,8 V) [IN]
- Communication input [IN]
- Alarm output (open collector) [OUT]
- Temp. code indication (open collector) [OUT]
- Not used [2)]

ext. analog emissivity [IN]] [3)]

Slope settings:

Emissivity @ 0V:	lower range limit emissivity
Emissivity @ 10V:	upper range limit emissivity

ext. analog ambient [IN]] [3) 4)]

Slope settings:

Temp. @ 0V:	lower range limit ambient temp.
Temp. @ 10V:	upper range limit ambient temp.

[1)] only available on CS/ CSmicro LT
[2) 3) 4)] for explanation see next page

[2] If the mV output is used exclusively the **IN/ OUT** pin should be set to **inactive** to avoid interferences. If **mV output** is selected in the tab **OUT (yellow)** the IN/ OUT pin is set automatically to inactive for this reason.

[3] If the function **ext. analog emissivity** or **ext. analog ambient** is selected the **IN/ OUT** pin acts as analog input. Via a voltage (0-10 V) on the **IN/ OUT** pin the emissivity or ambient temperature (see footnote 2) can be adjusted remotely. The range limits can be adjusted using the slope settings.

[4] For the compensation of the ambient temperature the internal head temperature is used if **Internal (Head)** is selected. In dependence on the emissivity value of the object a certain amount of ambient radiation will be reflected from the object surface. Therefore for certain applications it may be useful taking the ambient temperature on the object site for compensation (if significant different from head ambient temperature e.g.).

The following settings can be made:

- **ext. analog ambient temperature (tab: IN/ OUT):**

  Using the IN/ OUT pin you can control the ambient temperature value with an external voltage of 0-10 V.

- **Fixed value (tab: General):**

  You can enter a value which represents the ambient radiation in the field **Ambient temperature**.

4.3.2. IN/ OUT (green) – ext. Trigger

To trigger the measurement signal the following functions are available:

Valid control – high active
The output follows the process temperature as long as there is a High level (>0,8 V) at the **IN/ OUT** pin. After discontinuation of the High level the last value will be held.

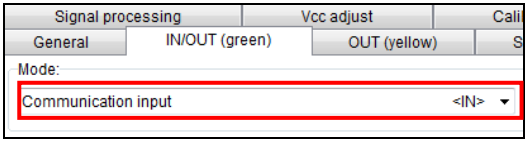
Valid control – low active
The output follows the process temperature as long as there is a Low level (<0,8 V) at the **IN/ OUT** pin. After discontinuation of the Low level the last value will be held.

ext. Hold _/‾ rising edge
The last value will be held if there is a signal with a rising edge (level 0,8 V) at the **IN/ OUT** pin.

ext. Hold ‾_ falling edge
The last value will be held if there is a signal with a falling edge (level 0,8 V) at the **IN/ OUT** pin

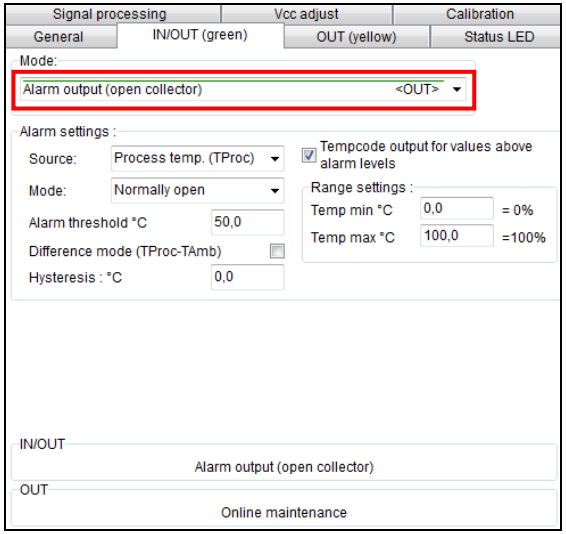
4.3.3. IN/ OUT (green) – Communication input

The input for the digital communication can be activated and used independent on the communication output. (to change sensor parameters via binary commands e.g.). The maximum UART voltage should not exceed 3,3 V.
[► Sensor manual: Digital Commands]



4.3.4. IN/ OUT (green) – Alarm Output (open collector)

With this function an additional alarm output (open collector output) at the **IN/ OUT** pin will be activated.
[► Sensor manual: Electrical installation]



Source: Selection between:
- Process temp. (TProc)
- Average temp. (TAvg)
- Internal temp. (TInt)
- Box temp. (TBox)

Mode: normally open/ closed

Alarm threshold: Temperature for alarm activation

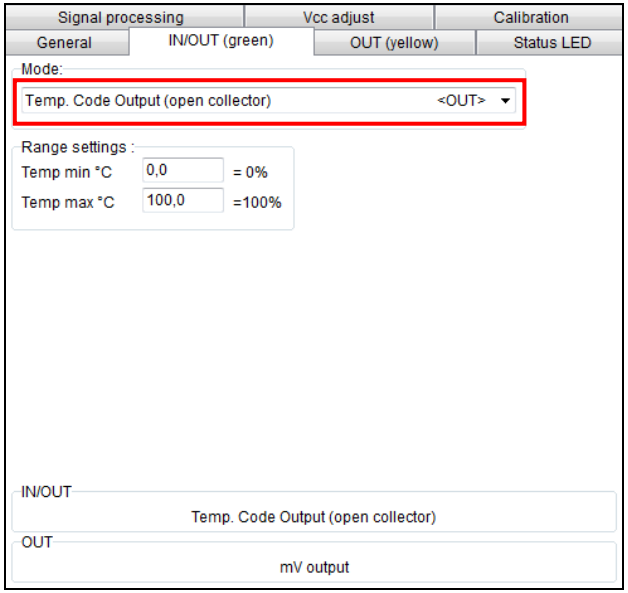
Difference mode: If activated, the difference between process temp. and ambient temp. will be used for the alarm threshold.

Temp. code output: If activated, in case of an active alarm the current temperature will be given out as temp. code via the open collector output.

Range settings: Definition of the range limits for the temp. code output (0 and 100% value)

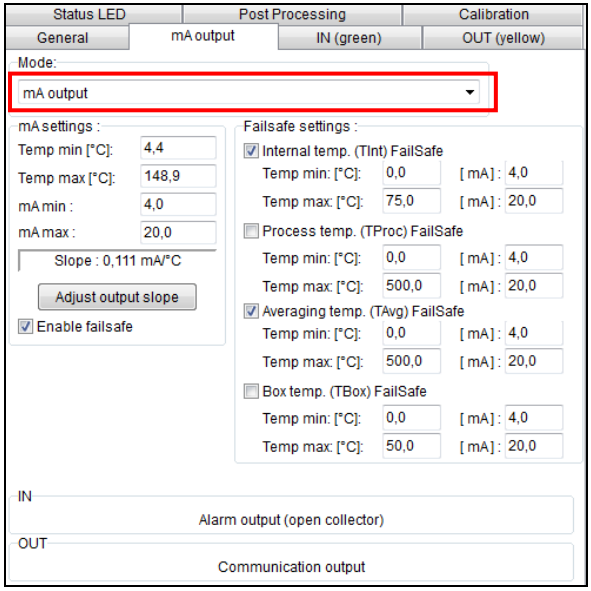
4.3.5. IN/ OUT (green) – Temp. Code Output (open collector)

With this function an output of the **temperature code** (open collector output) at the **IN/ OUT** pin will be activated.



Range settings: Definition of the range limits for the temp. code output (0 and 100 % value)

4.4. Analog Output (mA)/ Alarm Output [CSMA]



Mode: Selection between:

- mA output [analog]
- mA alarm output [two-level alarm]

mA output

Temp min: Lower limit temperature range

Temp max: Upper limit temperature range

mA min: Lower output range

mA max: Upper output range

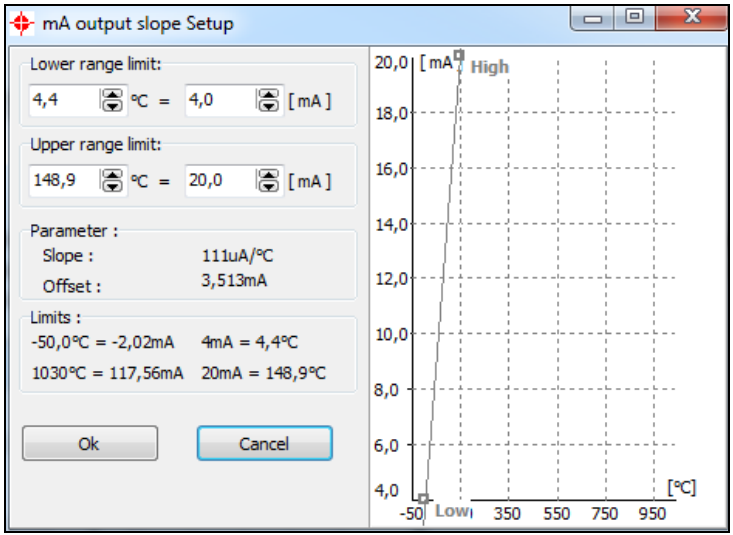
Failsafe settings[1]: Definition of failsafe modes

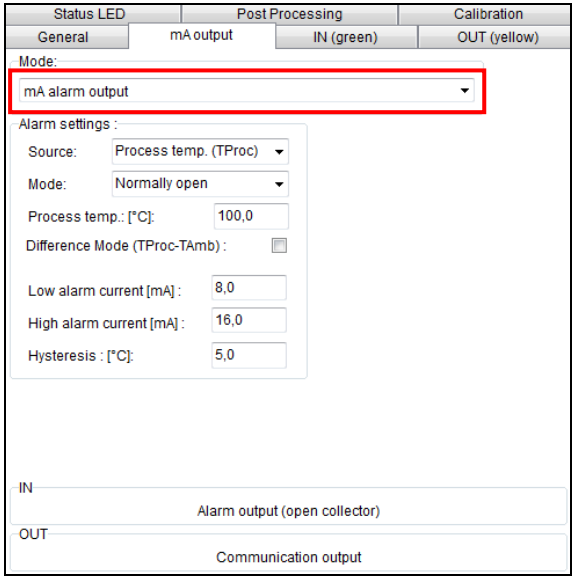
Note

If the sensor will be connected to the supply voltage, the unit is checking for the first 300 ms if a USB adapter is connected.
In this case the bidirectional communication mode will be activated automatically.

[1] The settings for failsafe mode enable a defined level on the analog output in dependence on preset temperature limits for process temperature and/ or sensing head temperature (**Temp min** and **Temp max**).

You can adjust the temperature range of the sensor by pressing the button **Adjust output slope**. The range limits can either be entered directly in the input fields or by shifting the output function graph (by catching the points **LOW** or **HIGH** with the cursor).



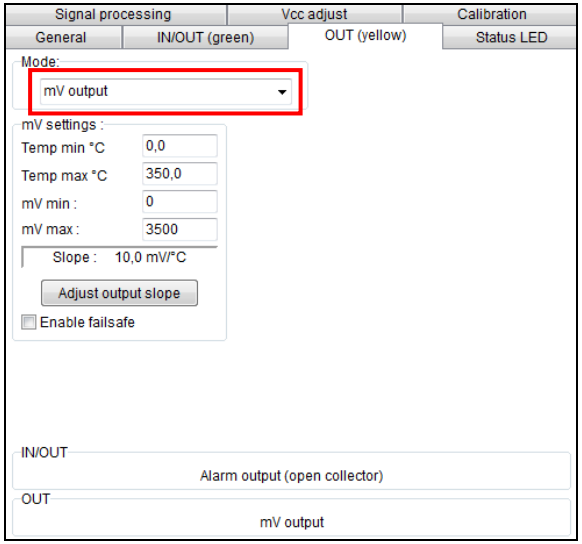


mA alarm output

Source:	<u>Selection between:</u> ▪ Process temp. (T_{Proc}) ▪ Average temp. (T_{Avg}) ▪ Internal temp. (T_{Int}) ▪ Box temp. (T_{Box})
Mode:	normally open/ closed
Alarm threshold:	Temperature for alarm activation
Difference mode:	If activated, the difference between process temp. and ambient temp. will be used for the alarm threshold.
Low alarm current:	lower alarm output value
High alarm current:	higher alarm output value

4.5. OUT (yellow)

4.5.1. OUT (yellow) – Analog Output (mV)/ Alarm Output [CS/ CSmicro LT]



Mode: Selection between:

- mV output [analog]
- Alarm output [two-level alarm]
- 3-state output [three-level alarm]
- Communication output [bidirectional digital]
- Burst output [unidirectional digital]
- double sensoring
- TC K output [CS only]
- 0...1 V output

mV output

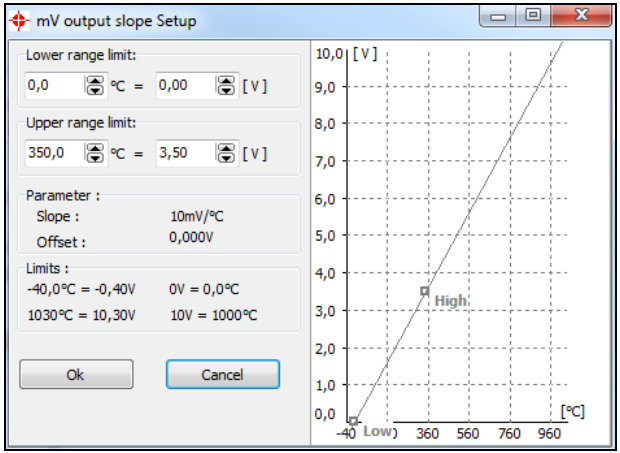
Temp min:	Lower limit temperature range
Temp max:	Upper limit temperature range
mV min:	Lower output range
mV max:	Upper output range
Failsafe settings[1]:	Definition of failsafe modes

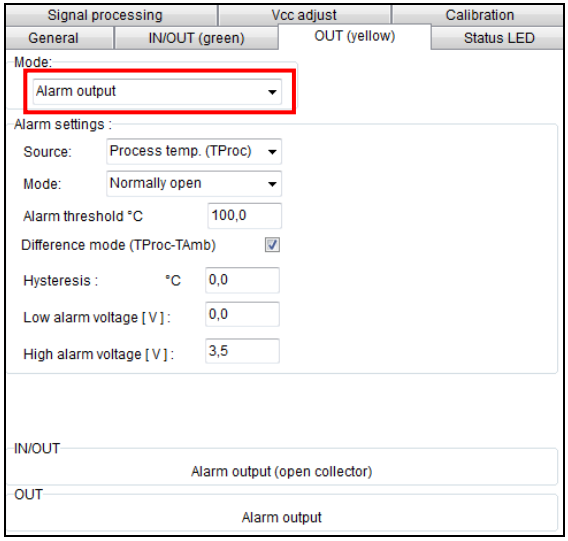
[1] The settings for failsafe mode enable a defined level on the analog output in dependence on preset temperature limits for target temperature and/ or sensing head temperature (**Temp min** and **Temp max**).

Note
If the sensor will be connected to the supply voltage, the unit is checking for the first 300 ms if a USB adapter is connected. In this case the bidirectional communication mode will be activated automatically.

If the **mV output** is selected the **IN/ OUT** pin will switch automatically to **inactive** (default setting).

You can adjust the temperature range of the sensor by pressing the button **Adjust output slope**. The range limits can either be entered directly in the input fields or by shifting the output function graph (by catching the points **LOW** or **HIGH** with the cursor).

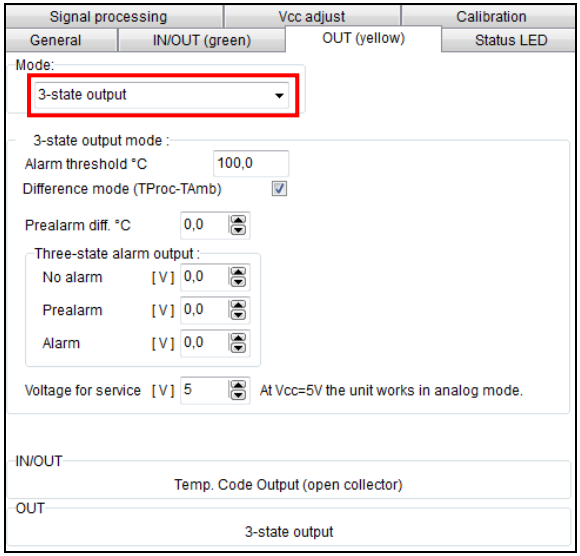




Alarm output

Source:	<u>Selection between:</u> ▪ Process temp. (T_{Proc}) ▪ Average Temp. (T_{Avg}) ▪ Internal temp. (T_{Int}) ▪ Box temp. (T_{Box})
Mode:	normally open/ closed
Alarm threshold:	Temperature for alarm activation
Difference mode (T_{Proc}-T_{Amb}):	If activated, the difference between process temp. and ambient temp. will be used for the alarm threshold.
Hysteresis	Adjustment of the minimum temperature
Low alarm voltage:	lower alarm output value
High alarm voltage:	higher alarm output value

4.5.2. OUT (yellow) – 3-state Output [CS/ CSmicro LT]

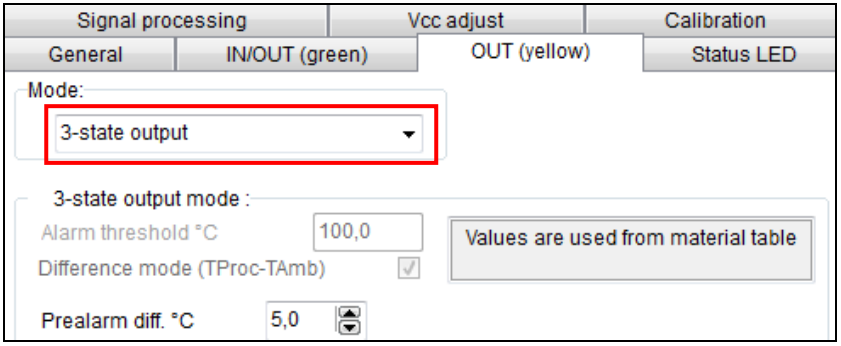


3-state output

Alarm threshold:	Temperature for alarm activation
Difference mode:	If activated, the difference between process temp. and ambient temp. will be used for the alarm threshold.
Prealarm diff.:	Temperature difference related to the alarm threshold value; the prealarm will be activated at alarm threshold – prealarm diff.
No alarm:	Voltage level setting for status: no alarm
Prealarm:	Voltage level setting for status: Pre-alarm
Alarm:	Voltage level setting for status: Alarm
Voltage for service:	Setting of a supply voltage level (Vcc) at which the unit works as analog device (mV output)

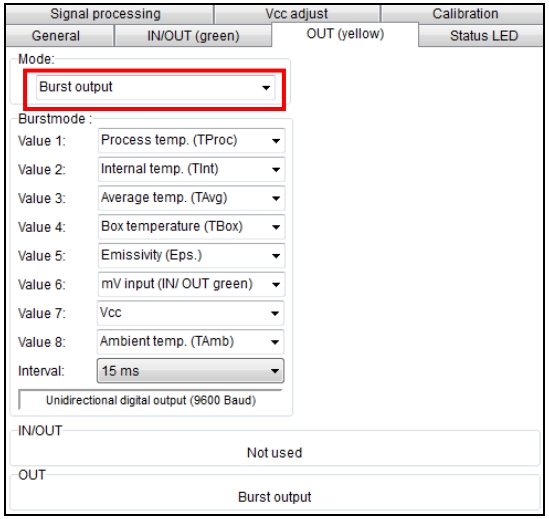
The sensor is equipped with a 3-state alarm output which is useful for temperature monitoring applications. This output provides beside the main alarm a so called pre-alarm. This pre-alarm will be activated if the process temperature exceeds a defined critical value which is below the actual alarm level (pre-alarm diff.).

In order to increase the system safety furthermore the output voltage level for alarm should be 0 V – in this case also a defect sensor would activate the alarm.
The sensor can be switched into the standard analog mode (mV output) by varying the supply voltage (voltage for service).
If the function **Vcc adjust** is used simultaneously the alarm values from Vcc adjust tabel are used for the 3-state output:



4.5.3. OUT (yellow) – Digital Outputs

In the selection field **Mode** you can switch the output to digital communication. You can select between **communication output** (bidirectional digital communication for interaction with the software) and **burst output**.



Burst output

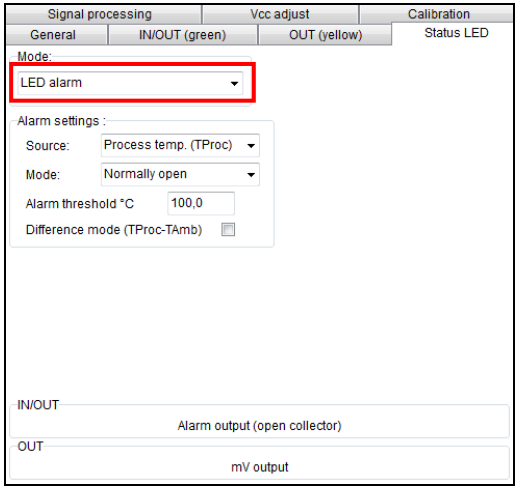
Value 1…8:	Selection between:
	<none>
	Process temp. (T_{Proc})
	Internal temp. (T_{Int})
	Emissivity (Eps.)
	Transmissivity
	Ambient temp. (T_{Amb})
	Average Temp. (T_{Avg})
	Box temp. (T_{Box})
	mV Input (IN/OUT green)
	Vcc
Interval:	Setup of the interval [15 ms...1 s]

In the burst mode the sensor works in a unidirectional communication mode – the sensor is sending data continuously. The burst string can be configured by selection of value 1 to 8.
[► Command List on software CD]

4.6. Status LED

4.6.1. Status LED – LED Alarm/ Automatic Aiming Support

The green LED at the end of the sensor housing (CS) or inside the electronics (CSmicro) can be used for different functions:



Mode: Selection between:

- Off
- LED Alarm
- Automatic aiming support
- Self diagnostic
- Temp. code indication

LED Alarm

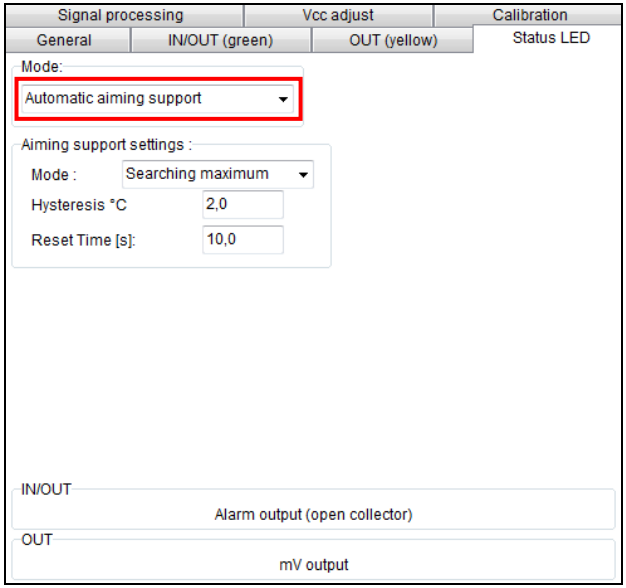
Source: Selection between:

- Process temp. (T_{Proc})
- Average temp. (T_{Avg})
- Internal temp. (T_{Int})
- Box temp. (T_{Box})

Mode: normally open/ closed

Alarm threshold: Temperature for alarm activation

Difference mode: If activated, the difference between process temp. and ambient temp. will be used for the alarm threshold.

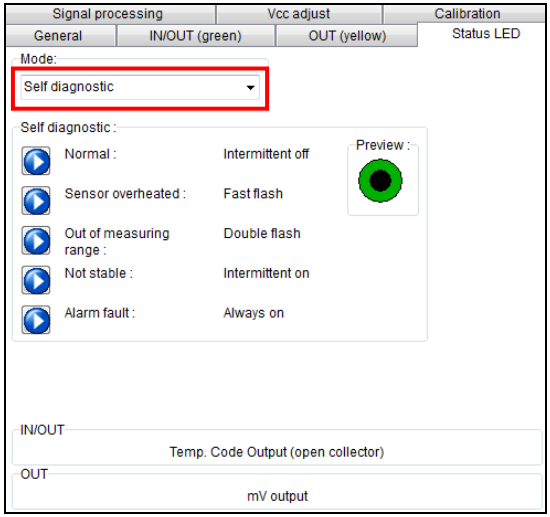


Automatic Aiming Support

Mode:	Selection between: ▪ Searching maximum ▪ Searching minimum
Hysteresis:	Adjustment of the minimum temperature difference for activation of the function
Reset time:	After the set time the search function will be reset.

The function **Automatic Aiming Support** helps to adjust the unit to an object which has a temperature different to the background. The sensor is looking for the highest process temperature (mode: searching maximum); means the threshold value for activating the LED will be automatically tuned. This works also if the sensor is aimed at a new object (with probably colder temperature). After expiration of a certain reset time (standard: 10s) the sensor will adjust the threshold level for activation of the LED new.

4.6.2. Status LED – Self Diagnostic



If activated, the LED will show one out of five possible states of the sensor:

Status	**LED mode**	
Normal	intermittent off	- - - -
Sensor overheated	fast flash	- - - - - - - - - - - -
Out of measuring range	double flash	-- -- -- -- -- -- --
Not stable	intermittent on	▬▬ ▬▬ ▬▬ ▬▬
Alarm fault	always on	▬▬▬▬▬▬▬▬▬▬

The preview of the different LED modes can be activated by clicking on the respective sign:

Sensor overheated: The internal temperature probes have detected an invalid high internal temperature of the sensor.

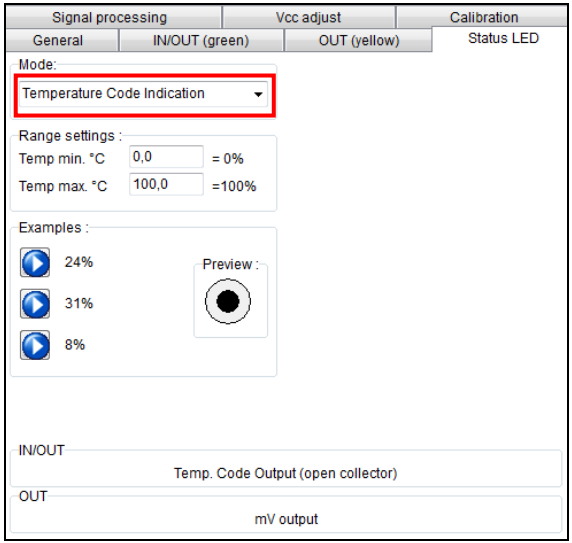
Out of measuring range: The process temperature is out of measuring range.

Not stable: The internal temperature probes have detected an unequally internal temperature of the sensor.

Alarm fault: Current through the switching transistor of the open-collector output is too high.

4.6.3. Status LED – Temperature Code Indication

With this function the current measured process temperature will be indicated as percentage value by long and short flashing of the LED.
At a range setting of **0-100 °C → 0-100 %** the LED flashing indicates the temperature in °C.

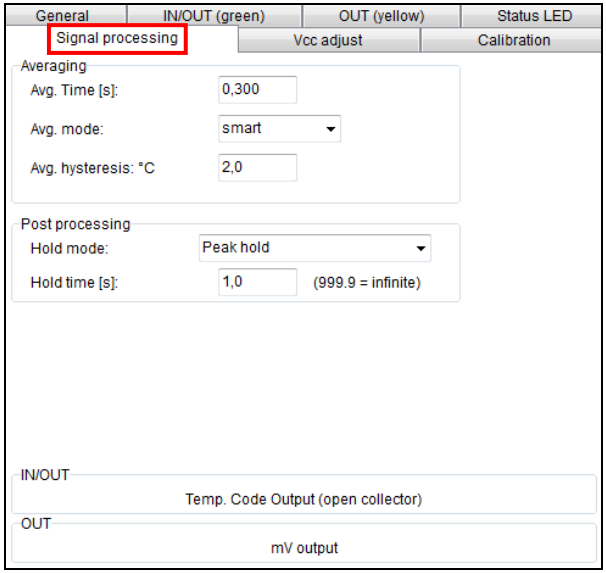


Long flashing → first digit:	**x**x
Short flashing → second digit:	x**x**
10-times long flashing → first digit=0:	**0**x
10-times short flashing → second digit=0:	x**0**

Example:

87 °C	8-times long flashing indicates	**8**7
and afterwards	7-times short flashing indicates	8**7**
31 °C	3-times long flashing indicates	**3**1
and afterwards	1-times short flashing indicates	3**1**
8 °C	10-times long flashing indicates	**0**8
and afterwards	8-times short flashing indicates	0**8**
20 °C	2-times long flashing indicates	**2**0
and afterwards	10-times short flashing indicates	2**0**

4.7. Signal Processing



Hold mode: Selection between:

- Off
- Peak hold
- Valley hold
- Advanced peak hold
- Advanced valley hold

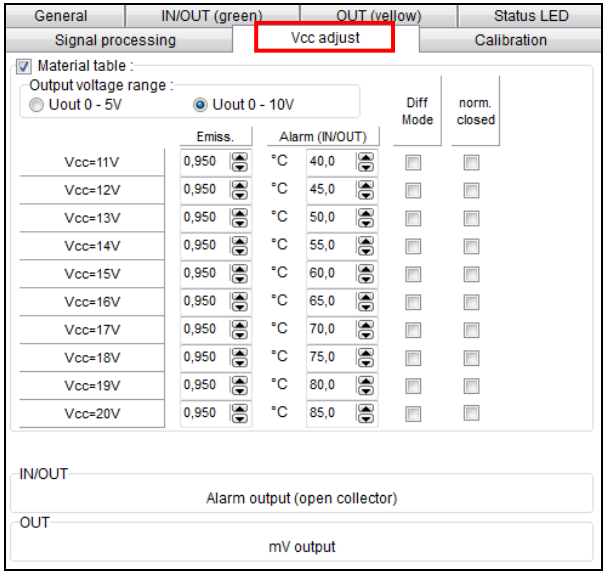
Hold time: Hold time adjustment (999,9 = infinite)

In the **Peak hold** mode the sensor is waiting for descending signals. If the signal descends the algorithm maintains the previous signal peak for the specified **Hold time**.

In the **Valley hold** mode the sensor waits for ascending signals. If the signal ascends the algorithm maintains the previous signal valley for the specified **Hold time**.

You will find a detailed description of these functions under **► Post Processing**.

4.8. Vcc Adjust [CS/ CSmicro LT]



If this function is activated you can switch between 10 different emissivity settings combined with alarm threshold values by variation of the supply voltage (Vcc).

Output voltage range: Selection between 0-5 V or 0-10 V voltage output

0-5 V output → 6-15 V adjustment range

0-10 V output → 11-20 V adjustment range

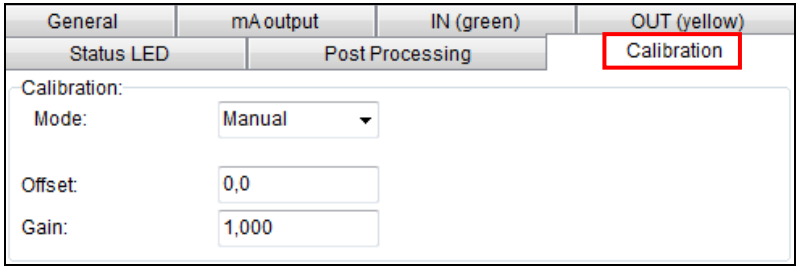
Difference mode: If activated, the difference between process temp. and ambient temp. will be used for the alarm threshold.

The set alarm values [Alarm (IN/ OUT)] will only affect the open collector output. Therefore, if the Vcc adjust mode is used, the IN/ OUT pin should be set to **alarm output (open collector).**

4.9. Calibration

In the tab Calibration, three different modes can be selected to calibrate the device:

- Manual
- 1 Point (Calibration)
- 2 Point (Calibration)



4.9.1. Manual Calibration

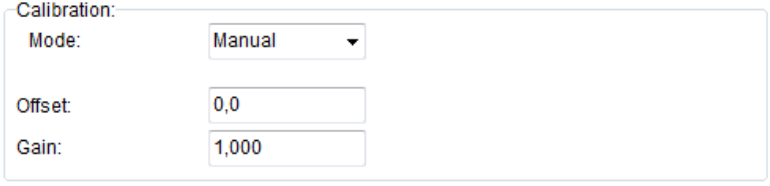
For certain applications or under certain circumstances a temperature offset or a change of the gain for the temperature curve may be useful.

The **factory default settings** for Gain and Offset are:

- Gain: 1,000
- Offset: 0,0 K

Gain: Adjustment of Gain
Offset: Adjustment of a temperature offset

A changed **Offset** causes a parallel shifting of the temperature curve and therewith it has a linear effect on the temperature reading (change constant independent on process temperature). A change of the Gain will have a non-linear effect on the temperature reading (change depends on process temperature).

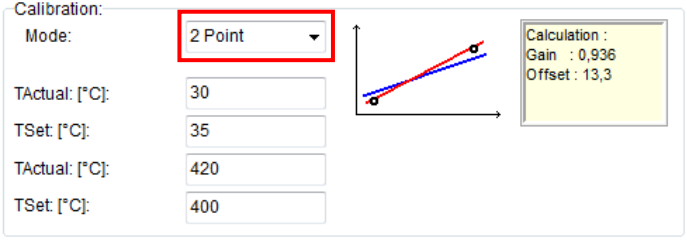


4.9.2. 1 Point Calibration

In this mode, a 1-point calibration can be made for the device. To do this, select under Mode **1 Point** (Calibration) and enter the actual temperature (**TActual**) and the set temperature (**TSet**). An offset calculation takes place and is displayed.

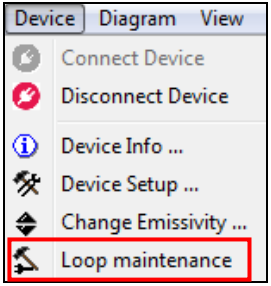
4.9.3. 2 Point Calibration

In this mode, a 2 point calibration can be made. To do this, select under Mode **2 Point** (Calibration) and enter the actual temperature (**TActual**) and the set temperature (**TSet**) for two different points. An offset and gain is then calculated.



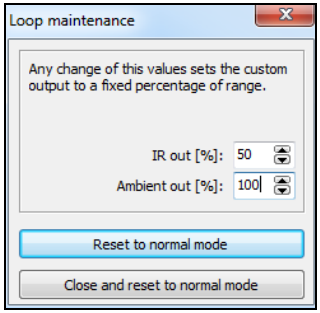
5. Special Feature

5.1. Loop Maintenance

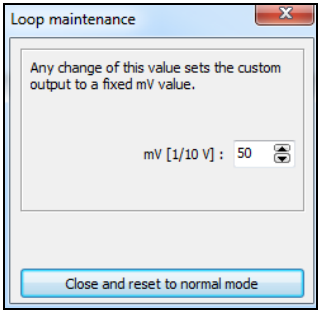


This function enables a verification of the analog output (on CT models in addition output channel 2).
An input will set the sensor output to the according percentage of the output range or to a fixed mV value or mA value.
An input in field **Ambient out** [CT models only] will set the **output channel 2** to the according percentage value of the adjusted output range.

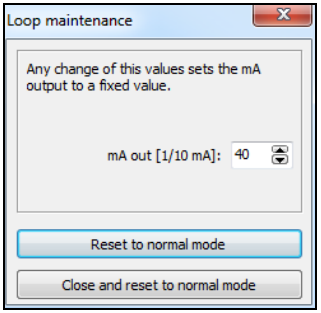
The button **Reset to normal mode** will deactivate the loop maintenance – the sensor outputs will follow the current process or ambient temperature again.



CT [Beispiel: 50% des Bereichs (IR)/ 100% des Bereichs (Umg.-Temp.)]



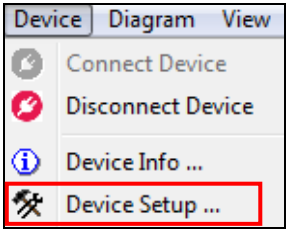
CS [Beispiel: 5 V]



CSmicro [CSMA][Beispiel: 20 mA]

5.2. Saving the Sensor Configuration

In each window which you enter with the button **Setup** **[Menu: Device\ Device Setup]** you will find at the bottom edge the following buttons for saving of the sensor configuration:



Save Config — With this button you can save the current configuration of the connected sensor in a file (ending: *.cfg). An explorer window will be opened and enables definition of filename and destination.

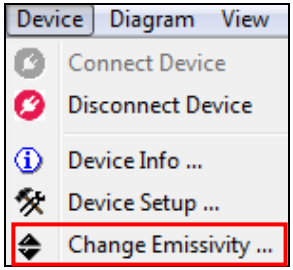
Load Config — A previous saved configuration can be opened and stored into the connected sensor.

Factory default — This button enables the user to reset the unit to the factory default values (CS/ CSmicro/ CX only). Sensors of the CT/ CTlaser series can be reset by pressing at first the **Down** button and then the **Mode** button (keep both pressed for approx. 3 seconds).

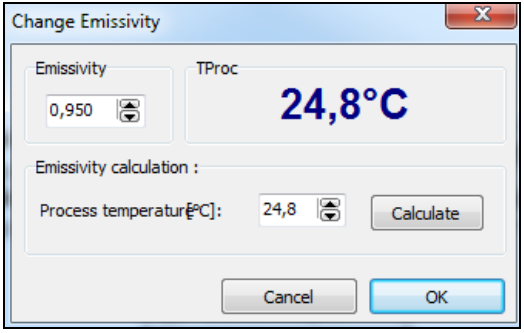
After pressing **OK** all changes and settings will apply.

5.3. Emissivity Calculation

The button **Emiss.** **[Menu: Device\ Change Emissivity]** opens a window in which you can enter the current emissivity value of your object. The function **Emissivity calculation** determines an unknown emissivity based on a known process temperature.



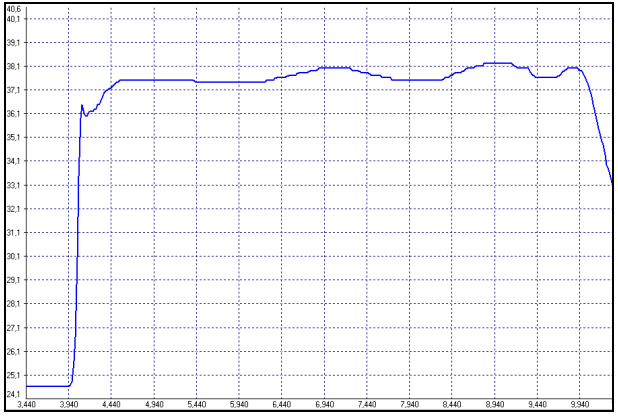
Please enter the process temperature which you have determined before with another sensor (thermocouple e.g.) in the field **Process temperature**.
After you have pressed the **Calculate** button the calculated emissivity will be shown in the field **Emissivity** and taken over into the connected sensor.



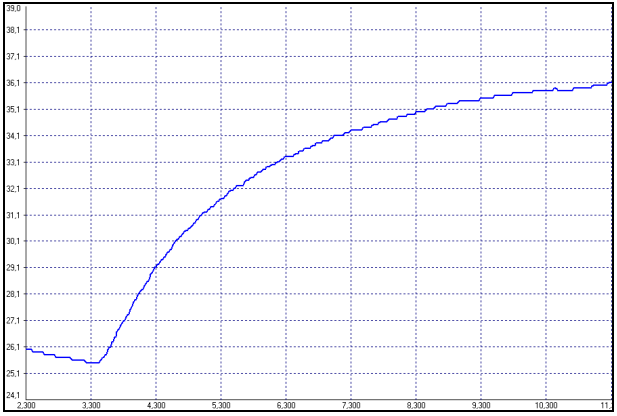
Note
To determine the emissivity the process temperature should be different from the ambient temperature.

5.4. Smart Averaging

The average function is generally used to smoothen the output signal. With the adjustable parameter time this function can be optimal adjusted to the respective application. One disadvantage of the average function is that fast temperature peaks which are caused by dynamic events are subjected to the same averaging time. Therefore those peaks can only be seen with a delay on the signal output.
The function **Smart Averaging** eliminates this disadvantage by passing those fast events without averaging directly through to the signal output.



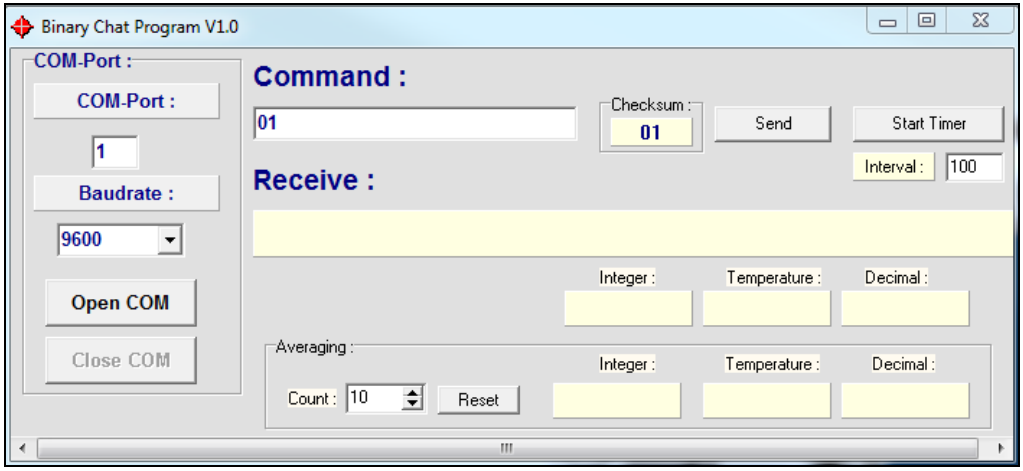
Signal graph with Smart Averaging function



Signal graph without Smart Averaging function

5.5. Binary Chat Program

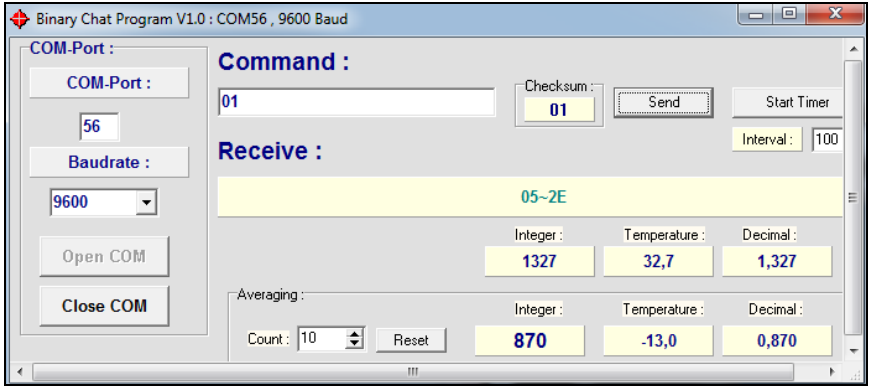
On the program CD you will find an additional program for a simple check of the digital communication of the connected sensor. Please copy the application (BinaryChat.exe) out of the folder on the CD **\Binary Chat Program** on your desktop or into any desired folder on your hard disc drive of your PC. After starting the program the following window will appear:



Please select at first the COM port of the connected sensor (you will find this information in the status line of your CompactConnect or in the device manager of your PC).
Please enter the **Baudrate** your sensor is working with.
Now you can open the COM port by pressing the button **Open COM**.

Note
Before you open the COM port please close the CompactConnect software as this application may access the same sensor/ COM port.
Please make sure that the sensor is set to **bidirectional digital communication**.

Now you can enter a binary command as hexadecimal value out of the according command list of the connected sensor. After pressing **Send** the answer will be shown in the line **Receive** (also as HEX value). Below the receive line you will find the **Integer** decimal value of the answer as well as the calculated **Temperature** or the **Decimal** value which is calculated by dividing the answer by 1000. This calculation is used for the emissivity value e.g.

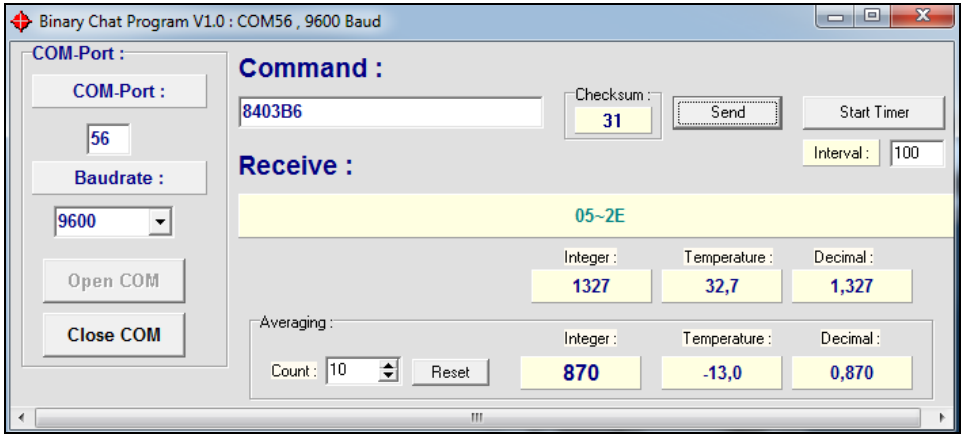


Example 1: CSmicro [CSMA] LT/ Polling of the process temperature

Example 1 shows the polling of the process temperature from a CSmicro. This is done according to the command list (CD: \Commands):

1 Basic Functions

LT mA	LT mV	xM mA	xM mV	DEZ	HEX	Commands	Data	Answer	Result	Unit
✓	✓	✓	✓	1	0x01	READ Temp - Process	none	byte1 byte2	= (byte1*256 + byte2 - 1000) / 10	°C



Example 2: CSmicro [CSMA] LT/ Set of emissivity value

In example 2 the sending of the command and the calculating of the emissivity out of the answer is done also according to the command list. The emissivity value can be read at **Decimal**:

1.1 IR- Settings

LT mA	LT mV	xM mA	xM mV	DEZ	HEX	Commands	Data	Answer	Result	Unit
✓	✓	✓	✓	4	0x04	READ Epsilon	none	byte1 byte2	= (byte1*256 + byte2) / 1000	
✓	✓	✓	✓	132	0x84	SET Epsilon	byte1 byte2	byte1 byte2	= (byte1*256 + byte2) / 1000	

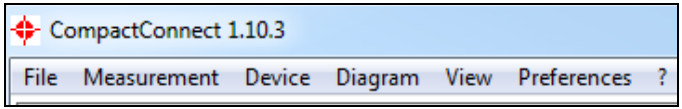
5.5.1. Additional Features

Under **Averaging** you can calculate the average value out of a defined number of values **Count**.

If you press the button **Start Timer** you can activate a repeated polling of values (useful for process temperature e.g.). The polling **Interval** can be set (in ms).
Please use only times >50 ms, as otherwise you may receive wrong data.

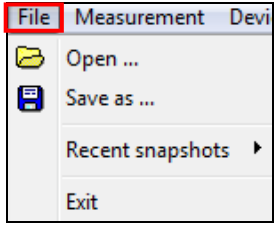
6. Menu Overview

Using the menu you can adjust all software settings. Each feature will be explained in detail in the following chapters of this manual:



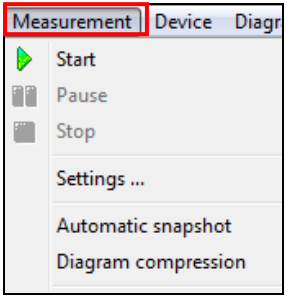
6.1. Menu: File

Open...	To open saved temperature files (*.dat)
Save as…	To save temperature files
Recent snapshots	Opens a list with the last 10 snapshots **open folder:** opens the defined folder for snapshots
Exit	To exit the program



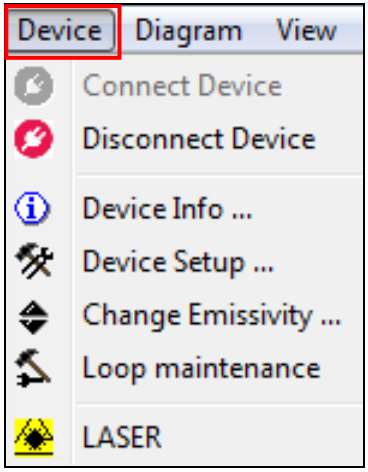
6.2. Menu: Measurement

Start	To start the measurement
Pause	To freeze the continuous diagram actualization
Stop	To stop the measurement
Settings...	Opens the window: **Measurement configuration**
Automatic snapshot	Opens the configuration window for automatic snapshots
Diagram compression	Opens the configuration window for diagram compression

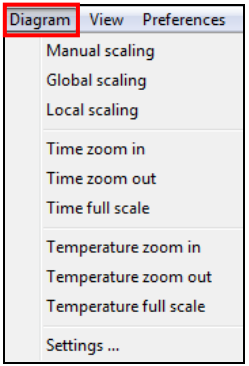


6.3. Menu: Device

Connect Device	Scans for connected sensors (if Auto scan is deactivated)
Disconnect Device	The connection will be determined and the COM port will be closed.
Device Info...	Shows information about the connected unit (firmware revision etc.).
Device Setup...	Opens the window: Device setup
Change Emissivity...	Adjustment/ Calculation of the Emissivity
Loop Maintenance	Verification of the analog output channels.
LASER	To switch On and Off the Laser (not at CS/ CSmicro/ CX)/ Activation via ► **Options**



6.4. Menu: Diagram



Manual Scaling	Manual scaling of the temperature axis
Global auto scaling	The temperature range of the diagram will be adapted automatically to the respective peak values. The range will stay in this setting during the whole measurement.
Local auto scaling	The temperature range of the diagram will be adapted dynamically to the respective peak values. After the respective peak has left the diagram the range will be readapted.
Time zoom in	A selected part of the diagram will be stretched.
Time zoom out	A selected part of the diagram will be clinched.
Time full scale	Shows the whole time range of the measurement.
Temperature zoom in	To scale up a part of the temperature axis.
Temperature z. out	To scale down a part of the temperature axis.
Temperature full sc.	Shows the whole temperature range
Settings...	Opens the window: **Diagram settings** to select digital displays, temperature graphs, pen width and color of graphs

6.5. Menu: View

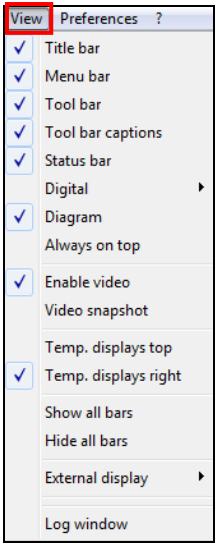
Title bar To show or hide the title bar of the software window

Menu bar To show or hide the menu bar of the software window

Tool bar To show or hide the tool bar

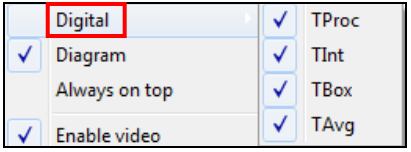
Tool bar captions To show or hide the captions of the tool bar

Status bar To show or hide the status bar

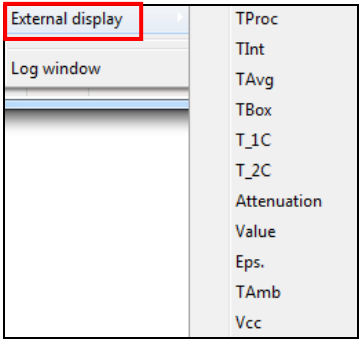


Digital Selection of all available values which can be shown as a digital display

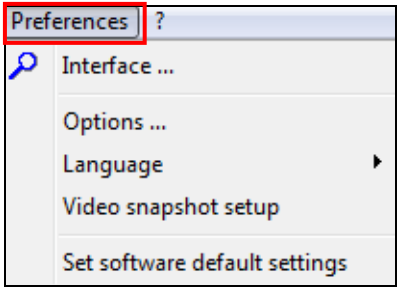
Diagram To show or hide the temperature diagram



Always on top	If activated, the software screen will always visible on top (independent on other active applications)
Enable Video	To switch on and off the video display
Video snapshot	To make a snapshot
Temp. displays top	The digital display group will be located on the top right corner of the software screen
Temp. display right	The digital display group will be located on the right side of the software window
Show all bars	All bars will be shown (title-, menu-, tool- and status-bar)
Hide all bars	All bars will be hidden (title-, menu-, tool- and status-bar)
External Display	To open an **external display**
Log window	Display of logged software events

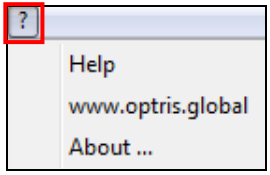


6.6. Menu: Preferences



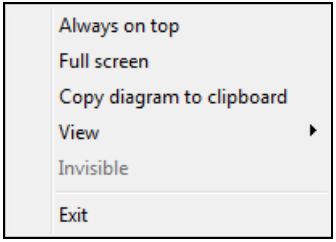
Interface...	Settings for device scan, COM port information etc.
Options...	Opens the window: **Options** to make basic settings and define options for data saving
Language	To select the desired language
Video snapshot setup	Opens the configuration window for video snapshots
Set software default settings	The software will be reset to the factory default settings (The sensor settings are not affected by this)

6.7. Menu: Help



	To open the help file
About...	To show the software version installed on your computer

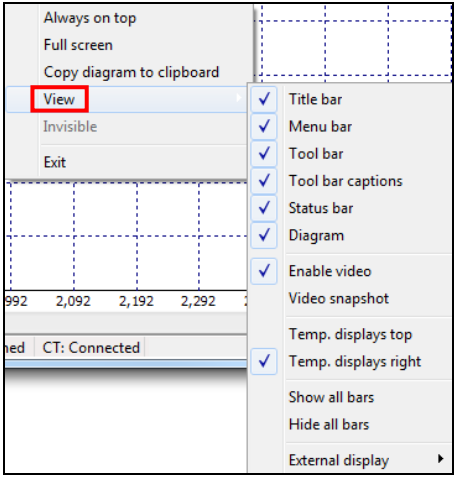
6.8. Context Menu (right mouse button)



Always on top	Shows the application permanently on top of the screen, independent of other active windows
Full screen	Shows the application as full screen
Copy diagram to clipboard	The diagram will be copied into the clipboard
View	Linking to the sub menu **View**
Invisible	Closes the application window (the software is running in the background as process) – only the external displays are further visible
Exit	To exit the program

6.9. Context Menu [Sub menu: View]

Title bar	Shows or hides the title bar
Menu bar	Shows or hides the menu bar
Tool bar	Shows or hides the tool bar
Tool bar captions	Shows or hides the tool bar captions
Status bar	Shows or hides the status bar
Diagram	Shows or hides the diagram
Enable Video	To switch on and off the video display
Video Snapshot	To make a snapshot
Temp. displays top	Places the digital displays on top of the diagram
Temp. displays right	Places the digital displays right of the diagram
Show all bars	Shows all bars at once
Hide all bars	Hides all bars at once
External display	Linking to the sub menu **External display**



6.10. Context-Menu [Sub menu: External Display]

In this menu you can call separate digital displays for the different signals. These displays will also be shown if the application runs in the invisible mode. The displays are always on top of the PC screen.