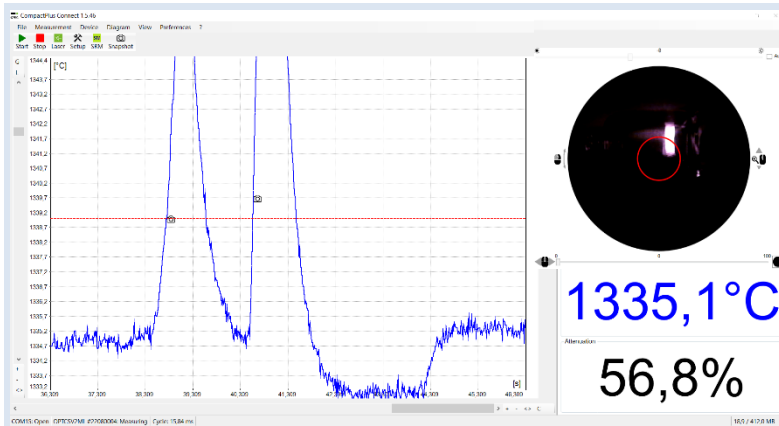


## Operator's manual



# optris® CompactPlus Connect

Software for Infrared-Thermometers



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### Table of contents

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## 4 Welcome!

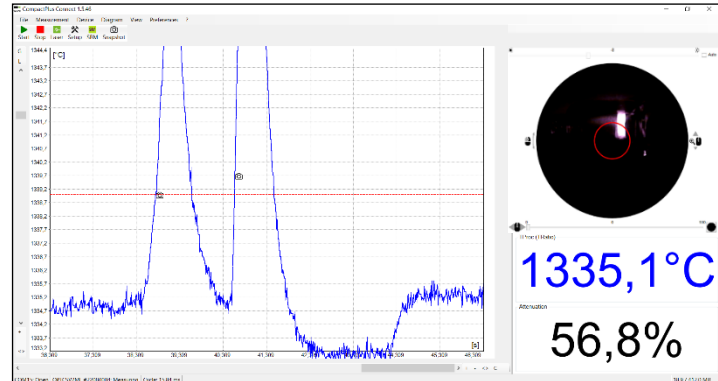
### Welcome!

Thank you for choosing an infrared thermometer and corresponding CompactPlus Connect software!

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

### Main features of CompactPlus Connect software:

- Temperature data analysis and documentation
- Automatic process control
- Customer specific software adjustments
- Complete parameterization of the device
- Temperature display and recording
- Videosignal (only for CSvision)



## 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 CompactPlus Connect 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.

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Internet: [www.optris.global](http://www.optris.global)

**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

Download the software from the Optris website. Please start **Setup.exe** and follow the instructions of the wizard until the installation is finished.

##### Minimum system requirements:

- Windows 10, 11
- USB interface
- Hard disc with at least 30 MByte free space
- At least 128 MByte RAM

The installation wizard will place a launch icon on the desktop and in the start menu:  
**[Start]\Programs\CompactPlus Connect.**



When using the Ethernet interface, the driver must be installed separately. This can be found in the download package in the Driver folder (Name: Ethernet).



##### Note

The software can be downloaded via the Optris website under the following link:  
<https://www.optris.global/downloads-software>

---

## IRmobile App

The pyrometers 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.

**Note**

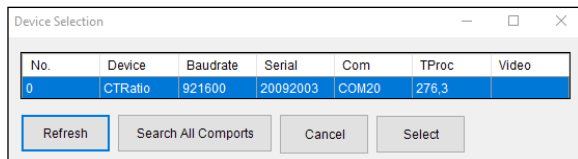
The IRmobile app works on most Android devices running 5.0 or higher with a micro USB or USB-C port supporting USB-OTG (On The Go).

---

## 1.2. Connection Sensor - Computer

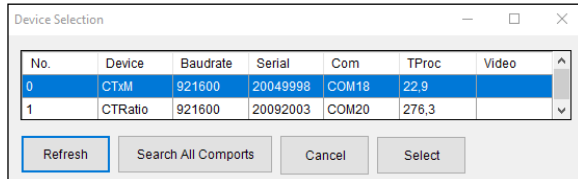
If you connect your sensor to your PC and start the software, the following message will appear (if option **Auto Start** is activated). ► **Menu Preferences/ [Options](#)**

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



**Example 1:** A sensor was found. Press **Select** to close the window.

**Refresh** starts a new search.



**Example 2:** Two sensors 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.

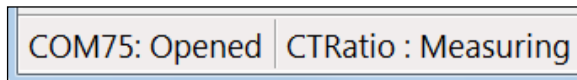
After the selection of a sensor you will get to the previous screen again. Here you will find now information about the used virtual COM port (VCP), the serial number and the baud rate.

To finish please press **OK**. The window will be closed.



If **Auto start device** is activated ► **Menu Preferences/ 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

CTRatio: Measuring

successful communication with the connected sensor

### 1.3. RS485/ RS422

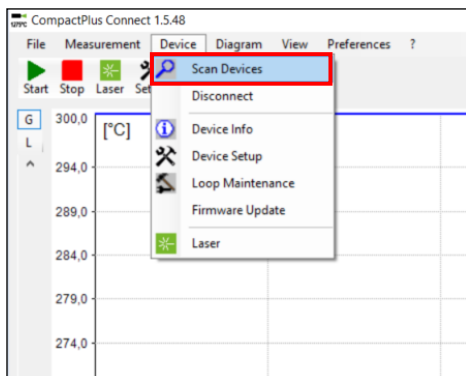
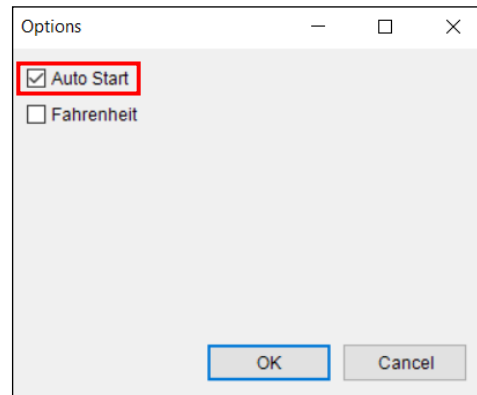
If a RS485 interface is used please activate the RS422 mode. Therefore you have to call this function with the programming keys on the sensor at first (menu item: multidrop address). You will need also the RS485 module and the RS485-USB adapter [**ACCTRS485USBK**].

## 1.4. Easy Start-Up

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

If this option is deactivated, you must select the corresponding device in **[Menu: Device\ Scan Devices]** and press the **Select** button.

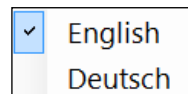
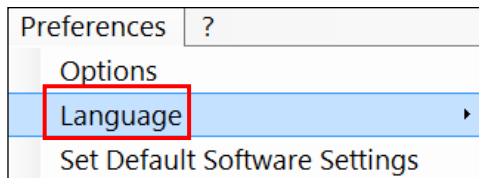
The button **Disconnect** in **[Menu: Device]** breaks the connection to the sensor and closes the COM port.



## 1.5. Basic Settings

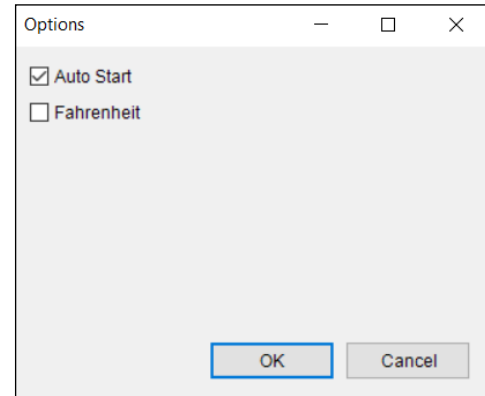
### 1.5.1. Language

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:



#### **Auto Start**

If activated, after each program start the measurement will be started automatically (if connected sensors have been found before).

#### **Auto Apply**

If activated the changing of the settings will be directly effected

#### **Fahrenheit**

If activated, the temperature is displayed in Fahrenheit.

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:

<b>Digital Display</b>	Selection which signals should be displayed as digital display
<b>Diagram</b>	Selection which signals should be displayed as graph
<b>Pen Width</b>	Pen width of the temperature graphs [1...5]
<b>Color</b>	Color of the temperature graph and digital displays
<b>Y-axis</b>	Display of the graph on the primary or secondary Y-axis
<b>Fast burst</b>	Deactivation of all raws

	Digital Display	Diagram	AutoRange	Fast Burst	Pen Width	Color	Y Axis
TProc	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	Blue	Primary Axis
TRatio	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	Red	Primary Axis
T1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	Orange	Primary Axis
T2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	Purple	Primary Axis
Attenuation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	Black	Secondary Axis
TDet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	Green	Primary Axis
TBox	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	Dark Red	Primary Axis
TActProc	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	Olive	Primary Axis
TActRatio	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	Violet	Primary Axis
TActT1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	Grey	Primary Axis
TActT2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	Teal	Primary Axis
ActAttenuation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	Pink	Secondary Axis
Eps T1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	Cyan	Primary Axis
Eps T2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	Dark Purple	Primary Axis
TRaw Proc	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	Teal	Primary Axis

OK Cancel

## 1.6. Digital Display

If the sensor is connected to your computer and you start the software, the process temperature  $T_{\text{Proc}}$  will be shown as digital display.

You can add additional displays **[Menu: Diagram\ Settings]**. Dependent on the sensor type the available signals may vary.

$T_{\text{Proc}}$  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
$T_{\text{Proc}}$	Process temperature	With signal processing, including averaging
$T_{\text{Ratio}}$	Ratio temperature	Without signal processing, including averaging
$T_1$	1-channel temperature	Without signal processing, including averaging
$T_2$	2-channel temperature	Without signal processing, including averaging
$T_{\text{ActRatio}}$	Actual temperature of ratio	Without signal processing, without averaging
$T_{\text{TAct1}}$	Actual temperature of channel 1	Without signal processing, without averaging
$T_{\text{TAct2}}$	Actual temperature of channel 2	Without signal processing, without averaging
<b>Attenuation</b>	Signal attenuation	Signal attenuation
$T_{\text{Det}} / T_{\text{Int}}$	Head temperature	Temperature value of detector
$T_{\text{Box}}$	Box temperature	Temperature of electronic box
$T_{\text{Avg}}$	Average temperatur	Without signal processing, including averaging

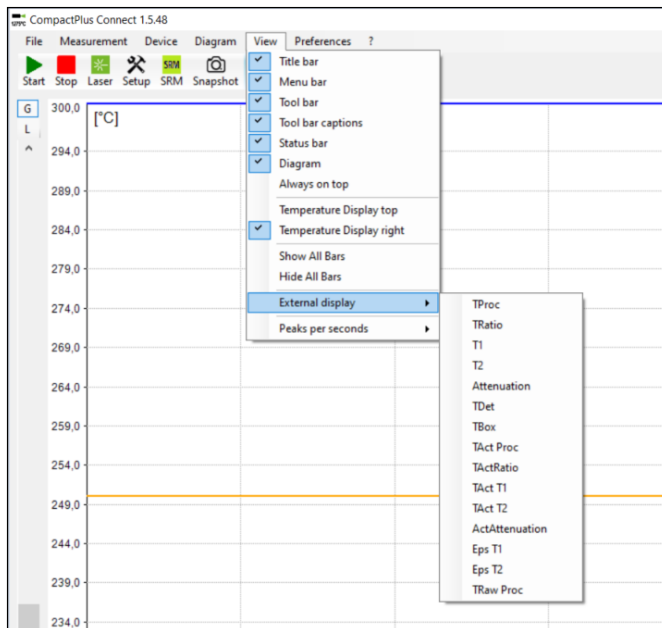


### Note

The available temperatures depend on the connected device type

## 1.7. Views

The CompactPlus Connect allows the creation of free definable screens and views:



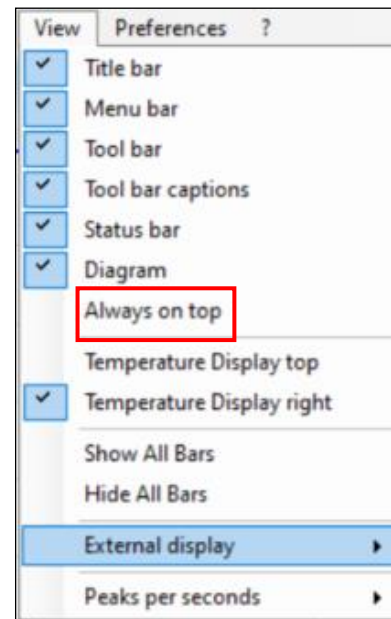
### Note

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



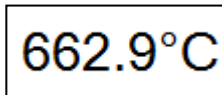
You can show the digital displays also separate by hiding of selected information (e.g. title bar, menu bar, etc.) in any size

► **Digital Displays** and, if desired, also always on top of your PC screen [**Menu: View\ Always on top**].



## 1.8. External Displays

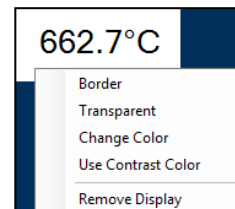
By double click on one of the digital displays **[Menu: View\ External Display]** you can start an external display for the respective signal. This display will appear initially in the same color than the respective display in the software. By drag and drop these external displays can be placed at any 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:




### Note

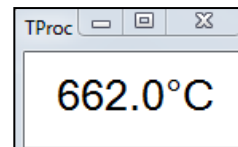
To distinguish between several displays the name of the software/ instance (for multiple software calls) as well as the signal name will be shown shortly.

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.

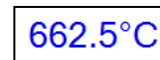


**Transparent**

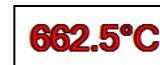
Transparent presenting – useful for a positioning of the display in front of pictures or wallpapers.

**Change color**

For changing the display color.

**Use contrast color**

Dependent on the used background the presenting of the display figures with contrast color (black edging) can be useful.

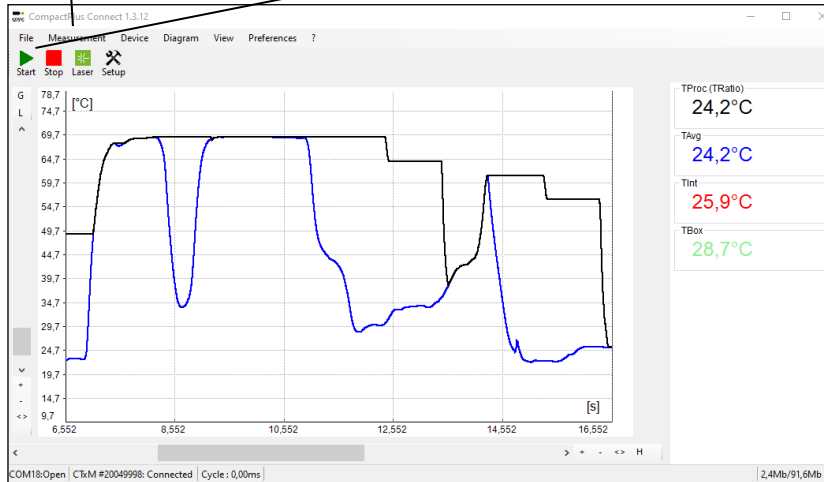
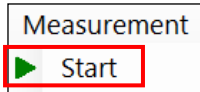
**Remove Display**

Closes the associated external display.

## 20 Basics

### 1.9. Start measurement

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

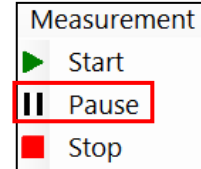


#### Control elements of the time axis:

- 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).

### 1.10. Scaling of the Temperature Axis

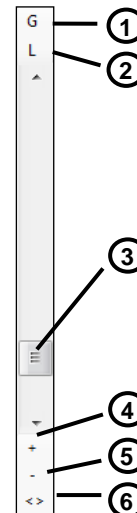
With **global scaling** the temperature range of the diagram will automatically be adapted to the respective peak values. The range will remain as set during the whole measurement.

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

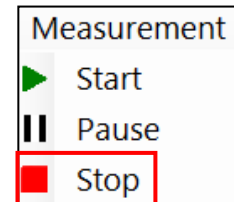


**Activation of the desired option:**  
**Control elements (temperature axis)**

### 1.11. Stop Measurement and Save Data

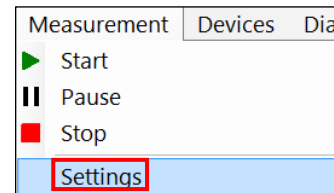
To stop the current measurement please press the **Stop** button  
[Menu: Measurement\ Stop].

The **Save** button [Menu: File\ Save as] opens an explorer window  
to select destination and file name [file type: \*.dat].



## 1.12. Measurement Configuration

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

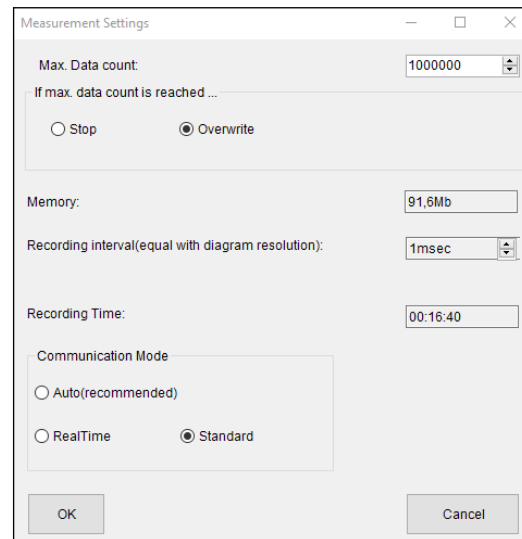


**Max. data count**      Limitation of the maximum number of data values – when achieved the measurement will be stopped.

**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**.

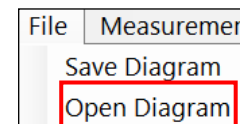
A change of the parameter **Recording interval** will have influence on the **Recording time** only.

---

**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).

### 1.13. 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 spreadsheet 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
1	[Connect DataFile][1.1]										
2	Date:	01.11.2019									
3	Time:	28:12,2									
4	Unit:	°C									
5	Resolution:	0,001									
6	Values:	10									
7	Time	TProc	TRatio	T1	T2	TActRatio	TAct1	TAct2	Attenuatio	THead	TBox
8	00:00,0	525	525	506,2	499	525	506,3	499,5	100	60,3	38,9
9	00:00,1	525	525	506,2	499	525	506,2	499	100	60,3	38,9
10	00:00,2	525	525	506,2	499	525	506,3	499,3	100	60,3	38,9
11	00:00,2	525	525	506,2	499	525	506,4	499,5	100	60,3	38,9
12	00:00,3	525	525	506,2	499	525	506,6	499,6	100	60,3	38,9
13	00:00,4	525	525	506,3	499,1	525	506,5	499,4	100	60,3	38,9
14	00:00,5	525	525	506,5	499,3	525	506,5	499,3	100	60,3	38,9
15	00:00,6	525	525	506,6	499,4	525	506,6	498,9	100	60,3	38,9
16	00:00,7	525	525	506,5	499,3	525	506,4	498,9	100	60,3	38,9

## 2. CTratio

### 2.1. Sensor Setup CTratio

The button **Setup** [Menu: **Device\ Device Setup**] opens a window for the setting of all sensor parameters. The dialog window is separated into 4 categories:

- Signal processing                      Setting of Emissivity/ Slope and Post processing
- Output                                    Setting of Output 1 and Output 2
- I/O Pins                                  Setting the In- and Outputs
- Display                                    Display main value and Backlight/ Alarm setting
- Advanced settings                    RS485 Multidrop address, Optical Set, Calibration

The screenshot shows the 'Configuration' window for the CTratio device. The window has a title bar with 'Serial Number: 20092003' and 'Firmware Rev.: 10014'. Below the title bar are four tabs: 'Signal Processing', 'Output', 'I/O Pins', and 'Advanced Settings'. The 'Signal Processing' tab is selected. It contains several sections: 'Ratio Mode' with 'Standard Ratio' selected, 'Standard' settings for Slope, Emissivity, Transmission 1, and Transmission 2, 'Process Temperature' set to 500.0, 'Calculate Slope/Emissivity' button, 'T Ratio (°C)' set to 275.0, 'T1 (°C)' set to 250.0, 'T2 (°C)' set to 250.0, 'Attenuation (%)' set to 100.0, 'Max Attenuation Reached Behavior' with 'Max Atten. (%)' set to 95.00 and 'Max Atten. Mode' set to 'Last valid value', and 'Post Processing' with 'Source' set to 'TRatio', 'Averaging' set to 'Normal', 'Averaging Time (s)' set to 0.020, 'Smart Averaging Hysteresis (K)' set to 5.0, 'Hold' mode set to 'Off', 'Time (s)' set to 10.000, 'Threshold (°C)' set to 1000.0, and 'Hysteresis (K)' set to 10.0. At the bottom are buttons for 'Load Config', 'Save Config', 'Factory default', and 'OK'.



**CTratio**

## 2.2. Sensor Setup CTRatio – Signal Processing

In this category you can adjust the parameters **Emissivity**, **Slope**, **Attenuation** and select the functions and define the parameters for **Post processing**. Furthermore, the desired ratio mode can be selected here. The Standard Ratio mode is activated as default setting.

The screenshot shows the 'Configuration' window for a CTRatio sensor. The 'Signal Processing' tab is selected and highlighted with a red box. The window displays various settings for the sensor, including Ratio Mode, Standard parameters, Post Processing, and Max Attenuation Reached Behavior.

**Configuration**  
Serial Number: 20092003      Firmware Rev.: 10014

**Signal Processing**    Output    I/O Pins    Display    Advanced Settings

**Ratio Mode**  
☒ Standard Ratio    ☐ Smart Ratio

**Standard**  
Slope: 1,000  
Emissivity/Transmission 1: 1,000  
Emissivity/Transmission 2: 1,000  
Calculate Slope/Emissivity  
Process Temperature: 500,0

TRatio [°C]: 275,0  
T1 [°C]: 250,0  
T2 [°C]: 250,0  
Attenuation [%]: 100,0

**Post Processing**  
Source: TRatio  
Averaging  
Averaging Time [s]: 0,020  
Averaging Mode: Normal  
Smart Averaging Hysteresis [K]: 5,0

**Hold**  
Mode: Off  
Time [s]: ☐ Infinite 10,000  
Threshold [°C]: 1000,0  
Hysteresis [K]: 10,0

**Max Attenuation Reached Behavior**  
Max Atten. [%]: 95,00  
Max Atten. Mode: Last valid value

Load Config    Save Config    Factory default    OK

### 2.2.1. Ratio Mode - Standard Ratio

#### Emissivity/ Slope/ Attenuation

The **Slope** is the quotient of the emissivity's of both of the overlapping wavelengths and therewith the deciding parameter for measurements in 2-color-mode.

The **Emissivity** ( $\epsilon$  – Epsilon) is a material constant factor to describe the ability of a body to emit infrared energy. The emissivity only affects measurements in the 1-color-mode.

The function **Calculate Slope/Emissivity** allows the determination of an unknown emissivity and slope at a known process temperature.

Ratio Mode  
☒ Standard Ratio
☐ Smart Ratio

Standard

Slope

1,000

Emissivity/  
Transmission 1

1,000

Emissivity/  
Transmission 2

1,000

Calculate Slope/ Emissivity

Process Temperature:

500,0

TRatio [°C]

275,0

T1 [°C]

250,0

T2 [°C]

250,0

Attenuation [%]

100,0

Attenuation

Max Attenuation [%]

95,00

Max Attenuation Mode

Last valid value

Min Attenuation [%]

0,00

Min Attenuation Mode

Last valid value

**Attenuation:** The temperature display is fixed if the attenuation exceeds the limit specified here. You can decide whether the **last valid value** should be kept or a **fixed value** entered. This can be selected for **maximum** and **minimum attenuation**.

### 2.2.2. Ratio Mode - Smart Ratio

While the standard mode requires a constant emissivity ratio/slope, the **Smart Ratio** measurement allows a data set of different slopes to be recorded and applied for temperature calculation. This is required, for example, if the degree of contamination of the protective window changes during the process and the ratio temperature is no longer correct. This cannot be described with a constant slope.

Ratio Mode  
☐ Standard Ratio
☒ Smart Ratio

Smart  

Teach-In
Off

TRatio [°C] 275,0  
T1 [°C] 250,0  
T2 [°C] 250,0  
Attenuation [%] 100,0

A requirement for the measurement is that the object temperature must be known.

**Note:** Before the first use a data record must be recorded

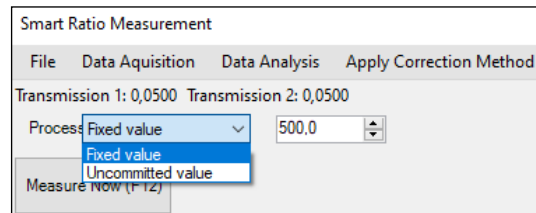
In the **Teach-in** function, the data records are recorded.

The Smart Ratio mode can be activated or deactivated with the **On/Off** buttons.

## Teach-In

The process temperature must be known for the teach-in function. This temperature can be set using two variants:

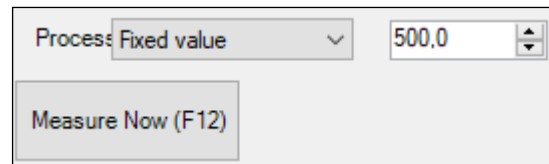
- **Variant 1: Via a fixed value**  
Here the known process temperature is entered manually.
- **Variant 2: Via Uncommitted value**  
The input is done via an analog signal, for example an external sensor.



## Procedure

Hold the dirty window in front of the sensor.

The **Measure Now button (F12)** can now be used to record measuring points. The current transmission and slope are entered into the table. Alternatively, the **F12** button can be pressed.

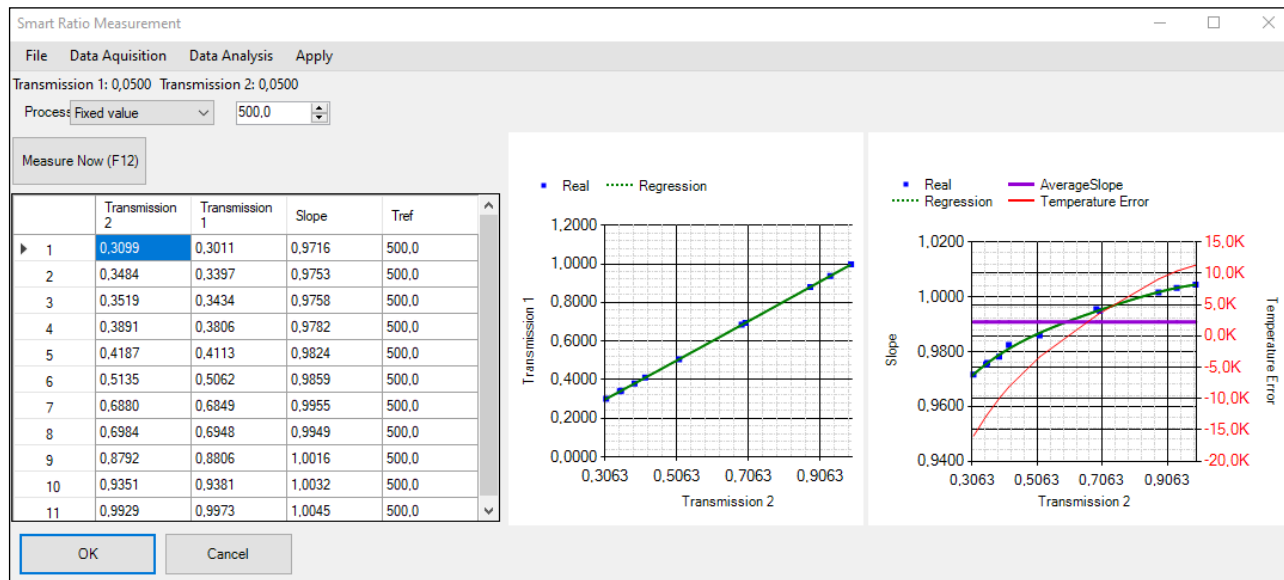


### Note



When recording different measuring points, the current process temperature must always be taken into account. At least two measuring points with different degrees of contamination. Recommendation: The more measuring points the better

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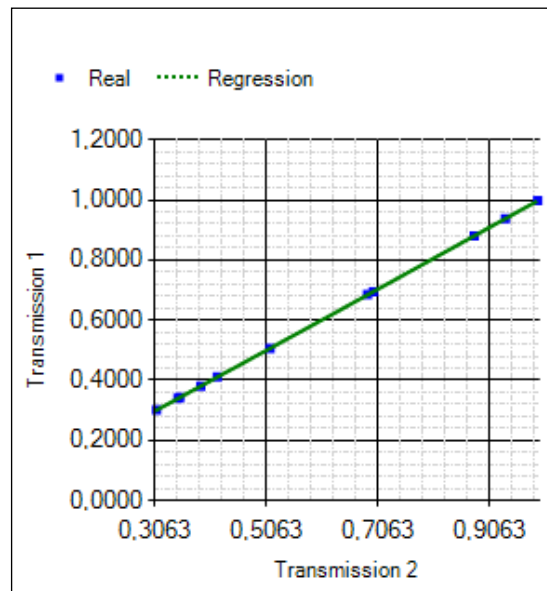
Smart Ratio example with 11 measuring points



The middle figure shows the transmission of diode 1 relative to the transmission of diode 2

The blue points are the recorded measuring points.

Green curve: Regression curve (polynomial) for calculating the values between the measuring points.



---

**Note**

The Smart Ratio method can only work if there is a monotonically increasing function progression. If this is not the case, the Smart Ratio method cannot be used. If this is not the case, repeat the measurement and check the measurement for measurement errors.

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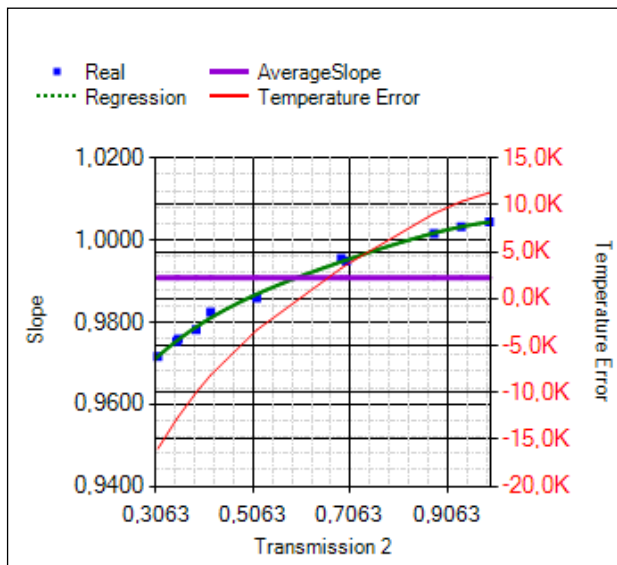
The right figure shows the transmission ratio (slope) relative to the transmission of diode 2.

The blue points are the recorded measuring points.

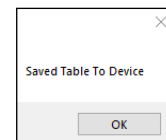
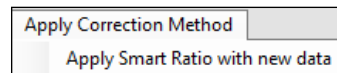
The violet horizontal line is the average slope calculated from the measured values.

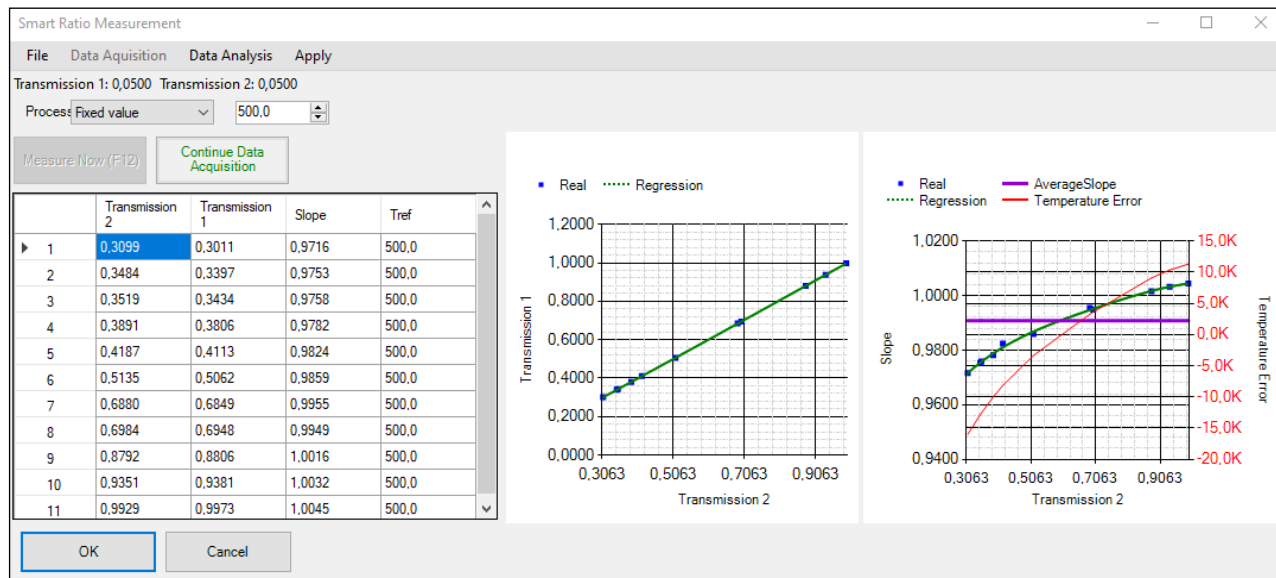
The red curve is an estimate of the quotient temperature error (in Kelvin) when using the average slope without the Smart Ratio method.

Green curve: Regression curve (polynomial) for calculating the values between the measurement points.



To write the created curves to the device, the **Apply Smart Ratio with new data** option must be selected in the menu under **Apply Correction Method**. The created regression curve is now written to the device. A message window appears indicating that the table is being saved to the device. The Smart Ratio mode is now automatically activated.





Smart ratio mode is now activated. Further data points can no longer be recorded in this mode. To add more data points, press the **Continue Data Acquisition** button (Smart Ratio mode is deactivated again).

After successful setting you can close the window with the **OK** button.

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Ratio Mode

☐ Standard Ratio ☒ Smart Ratio

Smart

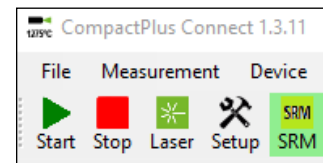
Teach-In ON

TRatio [°C] 275,0

T1 [°C] 250,0

T2 [°C] 250,0

Attenuation [%] 100,0



Activation of the Smart Ratio function is indicated by a green illuminated **On** button. In addition, there is an icon called **SRM**, which is framed in green when activated.

To deactivate the Smart Ratio function, you can either click on the icon or on the green on button.

Ratio Mode

☐ Standard Ratio ☒ Smart Ratio

Smart

Teach-In OFF

TRatio [°C] 275,0

T1 [°C] 250,0

T2 [°C] 250,0

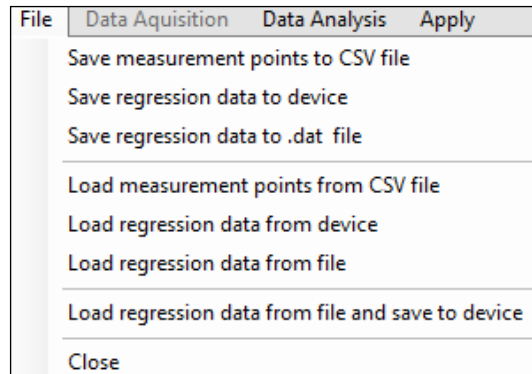
Attenuation [%] 100,0

## Further Settings

Further settings can be made in the menu under **File**.

**Save measurement points to CSV file:** The created data is stored on a hard disk.

**Save regression data to device:** The created data is stored on the device without activating or applying the Smart Ratio method.



**Save regression data to .dat file:** Here the data is stored on a hard disk for external data analysis.

**Load measurement points from CSV file:** If data sets already exist, the values can be read in and loaded into the table.

**Load regression data from device:** To view the currently used regression curve.

**Load regression data from file:** The regression data is loaded from an existing file.

**Load regression data from file and save to device:** Here the regression data is loaded from an existing file and saved directly to the device.

The following settings can be made in the menu under **Data Acquisition**.

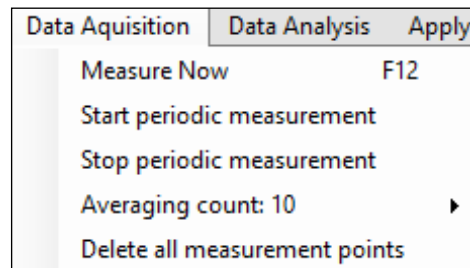
**Measure Now:** A single measuring point is created and written to the table.

**Start periodic measurement:** A predefined interval can be entered, in which the measuring points will be recorded automatically.

**Stop periodic measurement:** The recording of new measuring points is stopped.

**Averaging count:** Signal averaging during transmission measurement (response time is extended).

**Delete all measurement points:** All measuring points in the table are deleted (not from the device).

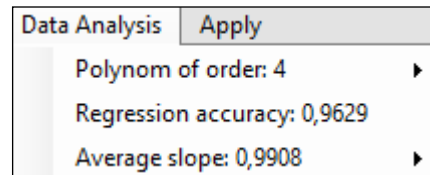


#### Note

To delete individual measuring points, you must mark them in the table and remove them with the delete key.

The following settings can be made in the menu under **Data Analysis**.

**Polynom of order:** The polynomial order is specified here. The factory setting is Auto and is determined automatically. Alternatively, it can be changed manually if required.

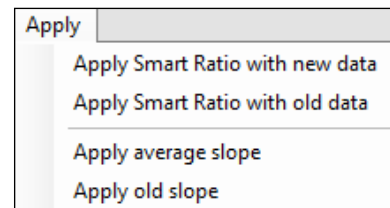


**Regression accuracy:** Characteristic value to evaluate the description of the measured values by the polynomial. Larger values are better. A value of 1 means perfect agreement. The regression accuracy is calculated automatically.

**Average slope:** The mean value of all slopes is calculated (violet straight line in the right diagram). The default setting is Auto. Alternatively it can be set manually. Allows to manually move the average slope (display optimization).

The following settings can be made in the menu under **Apply**.

**Apply Smart Ratio with new data:** The created regression curve is written to the device and the Smart Ratio mode is activated. A message window appears indicating that the table is being saved to the device.



**Apply Smart Ratio with old data:** Regression curve already stored in the device is retained and Smart Ratio mode is activated.

**Apply average slope:** Set average slope and activate standard ratio mode.

**Apply old slope:** Restore the slope value before opening the Smart Ratio configuration.

### 2.2.3. Post Processing

In the category **Post Processing** you can select the **Source** and make following settings:

- **Averaging** (Averaging time, average mode, smart threshold)
- **Hold** mode (Mode: Off, Peak Hold, Valley Hold, Advanced Peak Hold, Advanced Valley Hold)

You will find the description of the single functions on the next page.

#### Smart Averaging

If activated, a dynamic average adaptation at high signal edges is active. In addition you can enter the minimum temperature difference (**Smart Averaging Hysteresis**) to trigger this function.

Post Processing

Source

TRatio

Averaging

Averaging Time [s]

0,020

Averaging Mode

Normal

Smart Averaging Hysteresis [K]

5,0

Hold

Mode

Off

Off

Peak Hold

Valley Hold

Advanced Peak Hold

Advanced Valley Hold

Time [s]

☐ Infinite

Threshold [°C]

Hysteresis [K]

10,0



**Averaging**

In this mode an arithmetic algorithm will be performed to smoothen the signal. The **Averaging Time** is the time constant. This function can be combined with all other post processing functions. The minimum adjustable average time is 0,001 s.

**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 0,001 s.

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.

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**

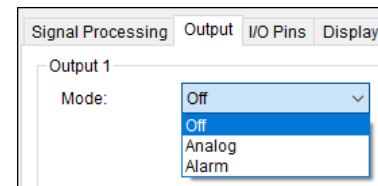
If **Off** is activated, no post processing will happen.

## 2.3. Sensor Setup CTratio – Output

### 2.3.1. Output 1 and 2

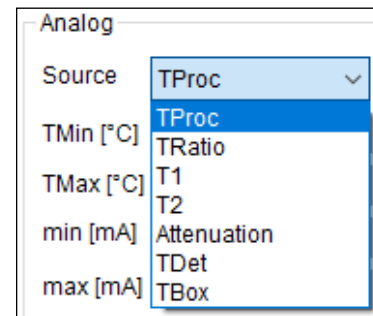
The device has two outputs (**OUT 1**, **OUT 2**) which can be configured as desired. The following options are available under **Mode**:

- Off
- Analog
- Alarm



When Analog is activated, the following signal sources can be selected in the Source field:

- |                      |                         |
|----------------------|-------------------------|
| ▪ <b>TProc</b>       | Process temperature     |
| ▪ <b>TRatio</b>      | Ratio temperature       |
| ▪ <b>T1</b>          | 1 channel temperature   |
| ▪ <b>T2</b>          | 2 channel temperature   |
| ▪ <b>Attenuation</b> | Signal attenuation in % |
| ▪ <b>TDet</b>        | Temperature of detector |
| ▪ <b>TBox</b>        | Box temperature         |



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The desired temperature measuring range of the sensor can now be set. The range limits can be changed by entering them in the corresponding fields. The source can be selected between  $T_{Proc}$ ,  $T_{Ratio}$ ,  $T1$ ,  $T2$ , **Attenuation**,  $T_{Det}$  or  $T_{Box}$ .

- **TMin**: lower temperature range limit
- **TMax**: upper temperature range limit
- **Min [mA]**: lower limit mA output
- **Max [mA]**: upper limit mA output

Signal Processing | **Output** | I/O Pins | Display | Advanced Settings

Output 1

Mode: Analog

Analog

Source	TProc	FailSafe Min Range [°C]	700,0
TMin [°C]	700,0	FailSafe Max Range [°C]	1400,0
TMax [°C]	1400,0	FailSafe min [mA]	0,0
min [mA]	4,0	FailSafe max [mA]	20,1
max [mA]	20,0	<input type="checkbox"/> FailSafe is Active min	
		<input checked="" type="checkbox"/> FailSafe is Active max	

Alternatively, outputs 1 and 2 can be used as alarm outputs. To do this, select the Alarm setting.

As source you can choose between **T<sub>Proc</sub>**, **T<sub>Ratio</sub>**, **T1**, **T2**, **Attenuation**, **T<sub>Det</sub>** or **T<sub>Box</sub>**.

Under **Threshold** the threshold value for triggering the alarm is defined.

**Hysteresis:** Setting the minimum hysteresis

**Alarm Off [mA/mV]:** Value if no alarm

**Alarm On [mA/mV]:** Value on alarm

Selecting **Open/Closed** under **Mode** defines the output as High or Low alarm.

#### Output 2

Mode:

Alarm

#### Alarm

Source

TProc

Threshold [°C]

900,0

Hysteresis [°C]

10,0

Alarm Off [mA]

4,0

Alarm On [mA]

20,0

Mode

Open

Difference Mode

Inactive

**Difference Mode:** When activated, no absolute value is used for the alarm threshold, but the difference between process temperature and ambient temperature (T<sub>Proc</sub>-T<sub>Um</sub>g).

### 2.3.2. Failsafe

The pyrometer has a failsafe function that can be used in analog mode.

The range can be configured as desired. The settings for fail-safe operation allow a defined level to be output at the analog output depending on specified temperature limits.

Thus, a possible cable defect can be detected quickly.

FailSafe Min Range [°C]	700,0
FailSafe Max Range [°C]	1400,0
FailSafe min [mA]	0,0
FailSafe max [mA]	20,1
<input type="checkbox"/> FailSafe is Active min <input checked="" type="checkbox"/> FailSafe is Active max	

### 2.4. Sensor Setup CTratio – I/O pins

The CTratio has three I/O pins which can be programmed as in- or outputs using the software. The following options are available:

<u>Function</u>	<u>I/O pin acts as</u>	<u>Description</u>
Alarm	output (digital)	Open collector output/ definition as HIGH- or LOW alarm via norm. open/ norm. close options in software dialog.
Valid Low	input (digital)	The output follows the process temperature as long as there is a Low level at the I/O pin. After discontinuation of the Low level the last value will be held.
Valid High	input (digital)	The output follows the process temperature as long as there is a High level at the I/O pin. After discontinuation of the High level the last value will be held.
Hold Low-High	input (digital)	The last value will be held if there is a signal with a rising edge on the I/O pin.

Hold High-Low	input (digital)	The last value will be held if there is a signal with a falling edge on the I/O pin
Hold Reset Low	input (digital)	Reset of a hold function on a Low level at the I/O pin
Hold Reset High	input (digital)	Reset of a hold function on a High level at the I/O pin
Slope external	input (analog)	External adjustment of the slope value using an analog voltage (0-10 V)
Emissivity external	input (analog)	External adjustment of the emissivity value using an analog voltage (0-10 V)
Uncommitted Value	input (analog)	Display of a freely scalable value
Laser on Low	input (digital)	Switch on laser (Low signal)
Laser on High	input (digital)	Switch on laser (High signal)

**Low-/High-level: via software**

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If you select the function **Alarm** the following signal sources can be selected:

- **TProcess** Process temperature
- **TRatio** Ratio temperature
- **T1** 1 channel temperature
- **T2** 2 channel temperature
- **Attenuation** Signal attenuation in %
- **TDet** Detector temperature
- **TBox** Box temperature

The definition as Low or High alarm can be done by switching between **Normally: open** and **Normally: closed**.

If you select the function **Slope external** or **Emissivity external** the I/O pin is set as analog input. The scaling can be done using the parameter fields **P1/P2** and **Slope P1/P2 / Epsilon P1/P2**.

I/O Pin 1

Mode Alarm

Parameter

Source TProc

Threshold [°C] 800,0

Hysteresis [°C] 10,0

Normally Open

Difference Mode Inactive

I/O

**OUTPUT**

I/O Pin 2

Mode Slope external

Parameter

P1 [V] 0.0

P2 [V] 10.0

Slope P1 0.9

Slope P2 1.1

I/O

**INPUT**



If you select the function **Hold Reset Low** or **Hold Reset High** the I/O-Pin is set as digital input. An activated hold function (MAX, MIN, advanced MAX, advanced MIN) will be reset if a low or high level is at the I/O pin.

I/O Pin 3

Mode

Hold Reset Low

Parameter

Threshold [V]0,0

Hysteresis [V]0,0

I/O

INPUT

## 2.5. Sensor Setup CTratio – Display

In this tab you can make settings for the display and the backlight (=visual alarms). Furthermore, the temperature unit can be selected here.

### 2.5.1. Visual Alarms

Independent of the selected signal for the analog output, a signal from the following list can be selected under General/ Main display source, which is shown in the digital display of the electronics:

<b>TProc</b>	Process temperature
<b>TRatio</b>	Ratio temperature
<b>T1</b>	Temperature value 1-color-mode
<b>T2</b>	Temperature value 2-color-mode
<b>Attenuation</b>	Signal attenuation in %
<b>TDet</b>	Temperature of the detector
<b>TBox</b>	Temperature of the electronics

For the visual alarm areas up to eight alarm limits can be assigned to a signal. The selected signal can be selected under **Source** independent of the value shown in the display and independent of the analog output.

Signal Processing Output I/O Pins **Display** Advanced Settings




General

Main Display Source: TProc

Temperature Unit: Celsius

Visual Alarms

Source Attenuation

From	To			
400,0 [%]	405,0 [%]	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
410,0 [%]	415,0 [%]	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
420,0 [%]	425,0 [%]	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
430,0 [%]	435,0 [%]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
440,0 [%]	445,0 [%]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
450,0 [%]	455,0 [%]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
460,0 [%]	465,0 [%]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
470,0 [%]	475,0 [%]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### 2.5.2. Temperature unit

The temperature unit can be changed between °C and °F under **Preferences/ Options**.

## 2.6. Sensor Setup CTratio – Advanced Settings

In the category **Advanced Settings** the following parameter can be adjusted:

- RS485 - Multidrop address
- Optical Set
- Calibration

The screenshot shows the 'Advanced Settings' window for CTratio. The 'Advanced Settings' tab is selected and highlighted with a red box. The window contains three main sections: RS485, Optical Set, and Calibration.

**RS485**

Multidrop Address: 1

**Optical Set**

Number: 1

**Calibration**

Mode: Manual

**Ratio**

Offset [K]: 0,0

Gain: 1,00000

**T1**

Offset [K]: 100,0

Gain: 1,00000

**T2**

Offset [K]: 100,0

Gain: 1,00000

### 2.6.1. RS485 Multidrop Address

In combination with a RS485 interface you can build a network of several CTratio 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](#)

#### RS485

Multidrop Address:

### 2.6.2. Optical Set

If replacement fibers are used, the correct number must be entered for exact allocation. Each fiber has a unique number.

#### Optical Set

Number

### 2.6.3. Calibration

In the Advanced Settings tab, three different modes can be selected to perform a calibration of the device:

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

These amplification factors can be entered for the Ratio, T1 and T2 temperature.

#### 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

Calibration

Mode

Manual

Ratio

Offset [K]

0,0

Gain

1,00000

T1

Offset [K]

100,0

Gain

1,00000

T2

Offset [K]

100,0

Gain

1,00000

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).

## 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** and the **set temperature**. An offset calculation takes place and is displayed.

Calibration

Mode

1 Point

Ratio

Offset [K]

0,0

Gain

0,99415

T1

Offset [K]

0,0

Gain

0,00001

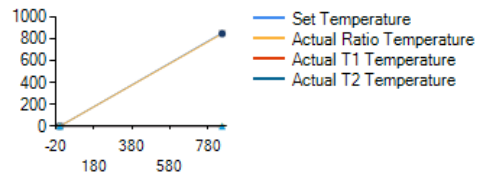
T2

Offset [K]

0,0

Gain

0,00001



P1

Set Temperature [°C]

855,0

Actual Ratio Temperature [°C]

850,0

Actual T1 Temperature [°C]

0,0

Actual T2 Temperature [°C]

0,0

## 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** and the **set temperature** for two different points. An offset and gain is then calculated.

Calibration

Mode

2 Point

Ratio

Offset [K]

2,8

Gain

0,99083

T1

Offset [K]

0,0

Gain

0,00001

T2

Offset [K]

0,0

Gain

0,00001

Set Temperature [°C]	Actual Ratio Temperature [°C]	Actual T1 Temperature [°C]	Actual T2 Temperature [°C]
855,0	850,0	0,0	0,0
1400,0	1390,0	0,0	0,0

P1

Set Temperature [°C]

855,0

Actual Ratio Temperature [°C]

850,0

Actual T1 Temperature [°C]

0,0

Actual T2 Temperature [°C]

0,0

P2

Set Temperature [°C]

1400,0

Actual Ratio Temperature [°C]

1390,0

Actual T1 Temperature [°C]

0,0

Actual T2 Temperature [°C]

0,0

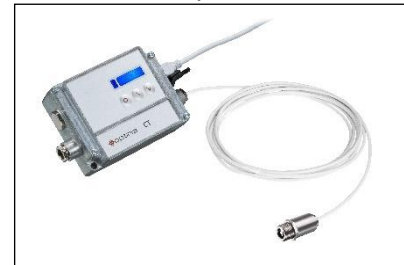
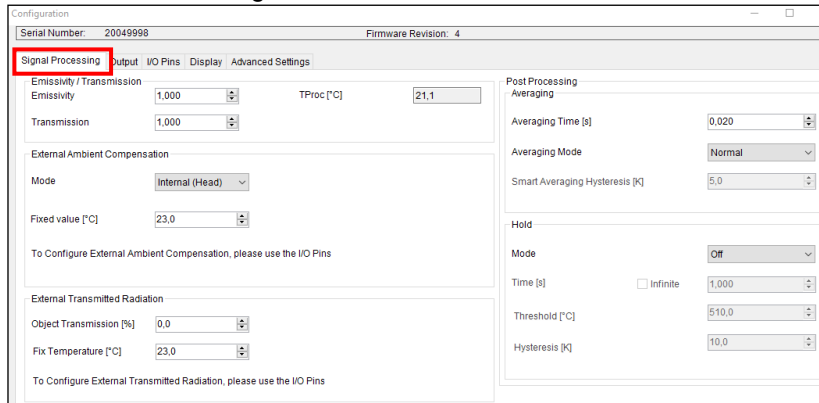


### 3. CT

### 3.1. Sensor Setup CT – 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 5 categories:

- |                     |   |
|---------------------|---|
| ▪ Signal processing | Setting of Emissivity/ Transmission and Post processing |
| ▪ Output            | Setting of Output 1 and Output 2                        |
| ▪ I/O Pins          | Setting the In- and Outputs                             |
| ▪ Display           | Display main value and Backlight/ Alarm setting         |
| ▪ Advanced settings | Calibration, USB connection, RS485 Multidrop address    |



CT

### 3.1.1. Emissivity and Transmissivity

Under **Emissivity/Transmission** in the **Signal Processing** tab, you can set the two parameters:

**Emissivity:** The **Emissivity** ( $\epsilon$  – Epsilon) is a material constant factor to describe the ability of a body to emit infrared energy. The emissivity only affects measurements in the 1-color-mode.

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

Signal Processing	Output	I/O Pins	Display	Advanced Settings
Emissivity / Transmission				
Emissivity	1,000		TProc [°C]	21,0
Transmission	1,000			

### 3.1.2. 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).
- **Fixed value:** A fixed value can be entered in the edit box **Fixed value** (if the ambient radiation is constant).

#### External Ambient Compensation

Mode

Internal (Head) ▼

Fixed value [°C]

23,0

To Configure External Ambient Compensation, please use the I/O Pins



#### Note

Especially if there is a big difference between the ambient temperature at the process and head temperature the use of Ambient control with **Fixed value** or via the I/O pins (mode: **External Ambient Compensation**) is recommended.

### 3.1.3. Post Processing

Under **Post Processing** you can set the **averaging** and **hold mode**.

**Averaging:** In this mode an arithmetic algorithm will be performed to smoothen the signal. The **Averaging Time** is the time constant. This function can be combined with all other post processing functions.

The minimum adjustable average time is for the CT 4M model 1ms (0,001s). On this model values below 0,1 s can be increased/ decreased only by values of the power series of 2 (0,002, 0,004, 0,008, 0,016, 0,032, ...).

Under the **Averaging Mode** you can choose between **Normal** and **Adaptive**. With Adaptive, a dynamic adjustment of the averaging process is performed for steep signal edges (**Smart Averaging**).

Post Processing

**Averaging**

Averaging Time [s] 0,020

Averaging Mode Normal

Smart Averaging Hysteresis [K] 5,0

**Hold**

Mode Off

Time [s] ☐ Infinite

Threshold [°C] 10,0

Hysteresis [K] 10,0

The following post-processing functions are available:

#### Off

If **Off** is activated, no post processing will happen ( $T_{Proc} = T_{Avg}$ ).

#### 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 1 ms (0,001 s).

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.

### Peak picking function

For a detection of fast hotspots (detection time 90  $\mu$ s) the averaging time must be set to 0.0 s.

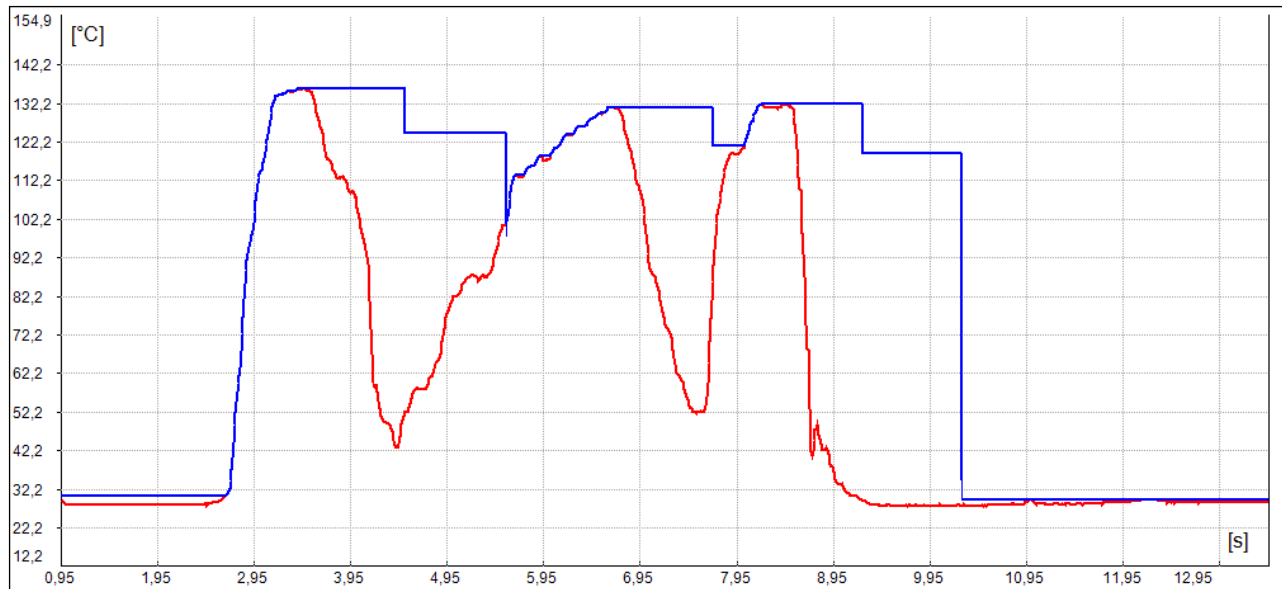


#### Note

You can display the process temperature  $T_{\text{Proc}}$  (with post processing) and also the current average temperature  $T_{\text{Avg}}$  (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.

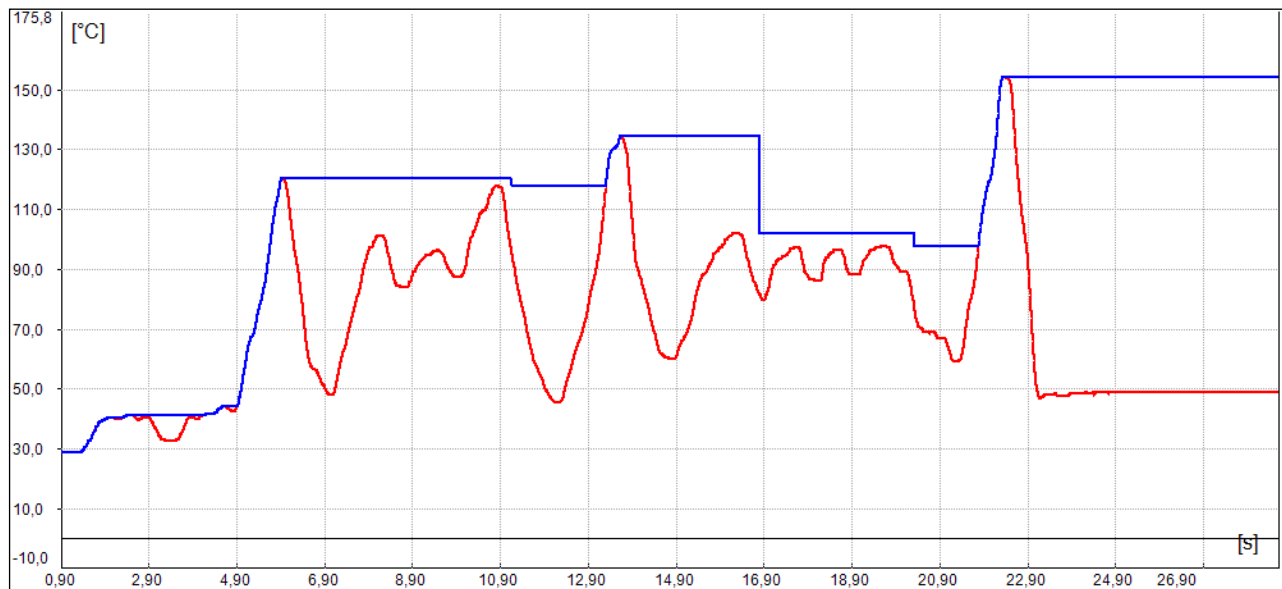
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## Signal Graphs



—  $T_{\text{Proc}}$  with Peak Hold (Hold time = 1s)

—  $T_{\text{Avg}}$  without post processing



- $T_{Proc}$  with Advanced peak hold (Threshold = 80 °C/ Hysteresis = 20 °C)
- $T_{Avg}$  without post processing



### 3.2. Sensor Setup CT – Output

In the **Output** tab, you can set the **Output 1** and **2** and the **Digital Output AL2**. If the optional **Relay** interface is used, it can also be configured here.

Signal Processing	Output	I/O Pins	Display	Advanced Settings	Calibration
<div> <div> <div>Output 1</div> <div> Mode: Analog mA </div> <div>Analog</div> <div> Source: TProc </div> <div> TMin [°C]: 100,0 </div> <div> TMax [°C]: 200,0 </div> <div> Min [mA]: 4,0 </div> <div> Max [mA]: 20,0 </div> <div> FailSafe Min Range [°C]: 100,0 </div> <div> FailSafe Max Range [°C]: 200,0 </div> <div> FailSafe min [mA]: 0,0 </div> <div> FailSafe max [mA]: 20,1 </div> <div> <input checked="" type="checkbox"/> FailSafe is Active min </div> <div> <input checked="" type="checkbox"/> FailSafe is Active max </div> </div> </div> <div> <div>Output 2</div> <div> Mode: Analog mA </div> <div>Analog</div> <div> Source: TInt </div> <div> TMin [°C]: 0,0 </div> <div> TMax [°C]: 70,0 </div> <div> Min [mA]: 4,0 </div> <div> Max [mA]: 20,0 </div> <div> FailSafe Min Range [°C]: 300,0 </div> <div> FailSafe Max Range [°C]: 400,0 </div> <div> FailSafe min [mA]: 0,0 </div> <div> FailSafe max [mA]: 20,1 </div> <div> <input checked="" type="checkbox"/> FailSafe is Active min </div> <div> <input checked="" type="checkbox"/> FailSafe is Active max </div> </div>					

Digital Output AL2

Source: TProc

Threshold [°C]: 10,0

Hysteresis [°C]: 0,0

Normally: Open

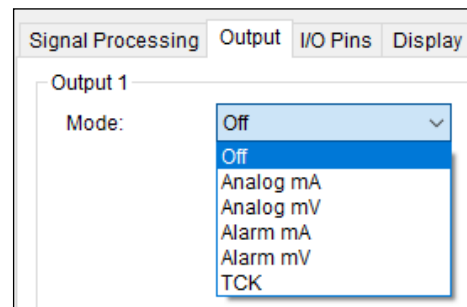
Difference Mode: Inactive

☐ Relays

### 3.2.1. Output 1 and 2

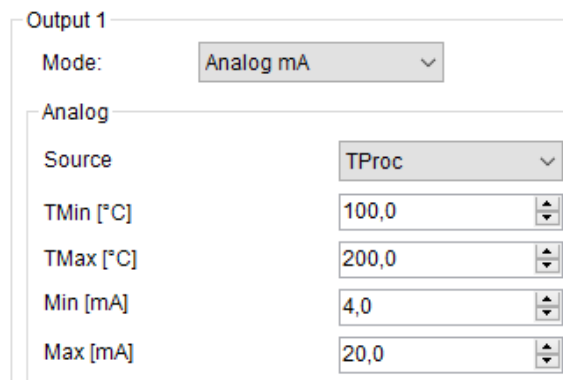
The device has two outputs (OUT-1, OUT-2) which can be configured as desired. The following options are available for selection:

- Off
- Analog mA
- Analog mV
- Alarm mA
- Alarm mV
- TCK



When using the analog mA or mV output, either  $T_{Proc}$ ,  $T_{Int}$  or  $T_{Box}$  can be selected as source. The desired temperature measurement range of the sensor can now be set. The range limits can be changed by entering the values in the corresponding fields.

- **TMin:** lower temperature range limit
- **TMax:** upper temperature range limit
- **Min [mA/mV]:** lower limit mA/mV output
- **Max [mA/mV]:** upper limit mA/mV output



Alternatively, outputs 1 and 2 can be used as alarm outputs. To do this, select the **Alarm mA** or **Alarm mV** setting.

As source you can choose between **T<sub>Proc</sub>**, **T<sub>Int</sub>** Or **T<sub>Box</sub>**.

Under **Threshold** the threshold value for triggering the alarm is defined.

**Hysteresis:** Setting the minimum hysteresis

**Alarm Off [mA/mV]:** Value if no alarm

**Alarm On [mA/mV]:** Value if alarm

Selecting **Open/Closed** under **Mode** defines the output as High or Low alarm.

Output 1

Mode: Alarm mA ▾

Alarm

Source	TProc ▾
Threshold [°C]	510,0 ▴ ▾
Hysteresis [°C]	10,0 ▴ ▾
Alarm Off [mA]	0,0 ▴ ▾
Alarm On [mA]	0,0 ▴ ▾
Mode	Open ▾
Difference Mode	Inactive ▾

**Difference mode:** When activated, no absolute value is used for the alarm threshold, but the difference between process temperature and ambient temperature (T<sub>Proc</sub>-T<sub>Amb</sub>).

### 3.2.2. Failsafe

The pyrometer has a failsafe function that can be used in analog mode. As source  $T_{Proc}$ ,  $T_{Int}$  or  $T_{Box}$  can be selected.

The range can be configured as desired. The settings for fail-safe operation allow the output of a defined level at the analog output depending on defined temperature limits.

Thus a possible cable defect can be detected quickly.

Output 1

Mode: Analog mA

Analog

Source	TProc
TMin [°C]	100,0
TMax [°C]	200,0
Min [mA]	4,0
Max [mA]	20,0
FailSafe Min Range [°C]	100,0
FailSafe Max Range [°C]	200,0
FailSafe min [mA]	0,0
FailSafe max [mA]	20,1

☒ FailSafe is Active min

☒ FailSafe is Active max

### 3.2.3. Digital Output AL2

The electronic box has an AL2 pin that can be configured as an open-collector output (24 V/ 50 mA) under **Digital Output AL2**.

As source  $T_{Proc}$ ,  $T_{Int}$  or  $T_{Box}$  can be selected.

Under **Threshold** the threshold value for triggering the alarm is defined.

Digital Output AL2	
Source:	TProc ▾
Threshold [°C]	10,0 ▴ ▾
Hysteresis [°C]	0,0 ▴ ▾
Mode:	Open ▾
Difference Mode:	Inactive ▾

**Hysteresis:** Setting the minimum hysteresis

Selecting **Open/Closed** under **Mode** defines the output as High or Low alarm.

**Difference mode:** When activated, no absolute value is used for the alarm threshold, but the difference between process temperature and ambient temperature ( $T_{Proc}-T_{Amb}$ ).

### 3.2.4. Relays

When using the optional relay interface,  $T_{Proc}$ ,  $T_{Int}$  or  $T_{Box}$  can be selected as source.

Under **Threshold** the threshold value for triggering the alarm is defined.

Selecting **Open/Closed** under **Mode** defines the output as High or Low alarm.

**Difference mode:** When activated, no absolute value is used for the alarm threshold, but the difference between process temperature and ambient temperature ( $T_{Proc}-T_{Amb}$ ).

Relays	
<b>Relay 1</b>	
Source:	TProc ▾
Threshold [°C]	100 ▴ ▾
Hysteresis [°C]	5,0 ▴ ▾
Mode:	Open ▾
Difference Mode:	Inactive ▾
<b>Relay 2</b>	
Source:	TInt ▾
Threshold [°C]	70 ▴ ▾
Hysteresis [°C]	0,0 ▴ ▾
Difference Mode:	Inactive ▾
Mode:	Open ▾

### 3.3. I/O Pins

The CT 4M has three I/O pins, which can be programmed as output or input using the software. The following functions are possible:

<u>Function</u>	<u>I/O Pin is on</u>	<u>Description</u>
Alarm	Output (digital)	Open collector output/ definition as High- or Low alarm via normally open/ normally close options in software dialog.
Valid Low	Input (digital)	The output follows the object temperature as long as there is a Low level at the I/O pin. After discontinuation of the Low level the last value will be held.
Valid High	Input (digital)	The output follows the object temperature as long as there is a High level at the I/O pin. After discontinuation of the High level the last value will be held.
Hold Low-High	Input (digital)	The last value will be held if there is a signal with a rising edge on the I/O pin.
Hold High-Low	Input (digital)	The last value will be held if there is a signal with a falling edge on the I/O pin.
Hold Reset Low	Input (digital)	Reset of Peak or valley hold (High-Low signal)
Hold Reset High	Input (digital)	Reset of Peak or valley hold (Low-High signal)
External Emissivity	Input (analog)	The emissivity value can be adjusted via a 0-10 V signal on the I/O pin (scaling possible via software).
Uncommitted value	Input (analog)	Display of uncommitted value
Laser on Low	Input (digital)	Turning on the laser (Low signal)
Laser off High	Input (digital)	Turning on the laser (High signal)
External Ambient compensation	Input (analog)	The ambient temperature will be determined by a voltage on the I/O-pin [0–10 V; range scalable].
External Transmitted compensation	Input (analog)	The transmitted ambient temperature will be determined by a voltage on the I/O-pin [0–10 V; range scalable].

**Low/High level: Via Software**

When selecting the Alarm function, the following signal sources can be selected:

- **TProc**            Process temperature
- **TInt**            Temperature of detector
- **TBox**            General internal temperature inside the housing

Under **Threshold** the threshold value for triggering the alarm is defined.

**Hysteresis:** Setting the minimum hysteresis

Selecting **Open/Closed** under **Mode** defines the output as High or Low alarm.

**Difference mode:** When activated, no absolute value is used for the alarm threshold, but the difference between process temperature and ambient temperature (TProc-TAmb).

I/O Pin 1

Mode

Alarm

Parameter

Source

TProc

Threshold [°C]

510,0

Hysteresis [°C]

10,0

Normally

Open

Difference Mode

Inactive

I/O

OUTPUT



If the function **External Emissivity** is selected, the I/O pin is programmed as analog input. The input can be scaled in the fields **P1 [V]**, **P2 [V]**, **Epsilon P1** and **Epsilon P2**.

When the **Hold Reset Low** or **Hold Reset High** function is selected, the I/O pin is programmed as digital input. When a Low or High level is applied, an activated Hold function (MAX, MIN, extended MAX, extended MIN) is reset.

I/O Pin 2

Mode

External Emissivity

Parameter

P1 [V]

0,0

P2 [V]

10,0

Epsilon P1

0,0

Epsilon P2

1,1

I/O

INPUT

I/O Pin 3

Mode

Hold Reset High

Parameter

Threshold [V]

0,0

Hysteresis [V]

0,0

I/O

INPUT

### 3.4. Display

In this tab you can make settings for the display and the backlight (= visual alarms). Furthermore, the temperature unit can be selected here.

#### 3.4.1. Visual Alarms

Independent of the selected signal for the analog output, a signal from the following list can be selected under **General/ Main display Source**, which is shown in the digital display of the electronics:

<b>TProc</b>	Process temperature
<b>TInt</b>	Temperature of detector
<b>TBox</b>	General internal temperature inside the housing

For the visual alarm areas up to eight alarm limits can be assigned to a signal. The selected signal can be selected under **Source** independent of the value shown in the display and independent of the analog output.

Signal Processing
Output
I/O Pins
Display
Advanced Settings




General

Main Display Source: TProc

Temperature Unit: Celsius

Visual alarm ranges

Source: TProc

From	To			
0,0 °C	5,0 °C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10,0 °C	15,0 °C	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
20,0 °C	25,0 °C	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
30,0 °C	35,0 °C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40,0 °C	45,0 °C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50,0 °C	55,0 °C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60,0 °C	65,0 °C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
70,0 °C	75,0 °C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

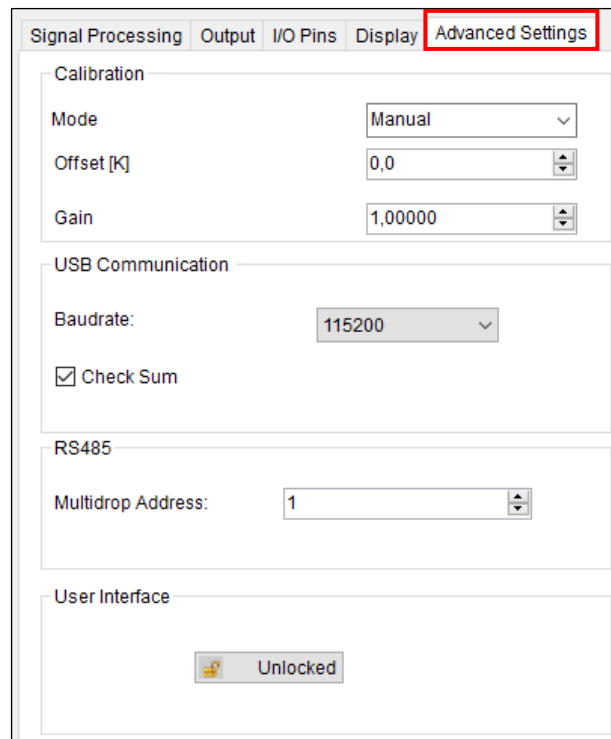
### 3.4.2. Temperature unit

The temperature unit can be changed between °C and °F under **Preferences/ Options**.

### 3.5. Sensor Setup CT – Advanced Settings

The following parameters can be set in the Advanced Settings tab:

- Calibration
- USB Communication
- RS485 Multidrop address
- Locking and unlocking of the programming keys



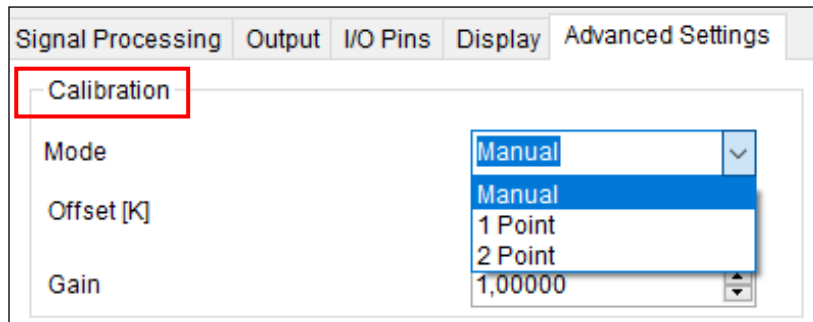
The screenshot shows the 'Advanced Settings' tab of the 'Sensor Setup CT' software. The tab is highlighted with a red border. The settings are organized into four sections:

- Calibration**
  - Mode: Manual (dropdown menu)
  - Offset [K]: 0,0 (spin box)
  - Gain: 1,00000 (spin box)
- USB Communication**
  - Baudrate: 115200 (dropdown menu)
  - ☒ Check Sum
- RS485**
  - Multidrop Address: 1 (spin box)
- User Interface**
  - Unlocked (button with a lock icon)

### 3.5.1. Sensor Setup CT – Calibration

In the **Advanced Settings** tab, three different modes can be selected to perform a calibration of the device:

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



### 3.5.2. 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).


Calibration



Mode	Manual
Offset [K]	0,0
Gain	1,00000



### 3.5.3. 1 Point Calibration

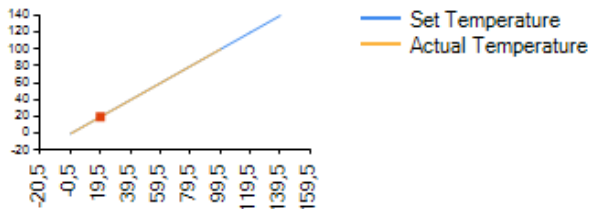
In this mode, a 1-point calibration can be made for the device. To do this, select under Mode **1 Point** (Calibration) and enter the **Actual Temperature** and the **Set Temperature**. An offset calculation takes place and is displayed.

Calibration


Mode 1 Point 



Offset [K] 0,0  



Gain 1,00000  





Calibration



Mode 1 Point 

Offset [K] 1,3  

Gain 1,00000  

P1

Set Temperature [°C] 19,5  

Actual Temperature [°C] 18,2  

### 3.5.4. 2 Point Calibration

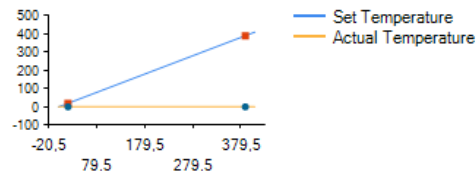
In this mode, a 2 point calibration can be made. To do this, select under Mode **2 Point** (Calibration) and enter the **Actual Temperature** and the **Set Temperature** for two different points. An offset and gain is then calculated.

Calibration

Mode 2 Point ▼

Offset [K]  ▲▼

Gain  ▲▼



Calibration

Mode  ▼

Offset [K]  ▲▼

Gain  ▲▼

P1

Set Temperature [°C]  ▲▼

Actual Temperature [°C]  ▲▼

P2

Set Temperature [°C]  ▲▼

Actual Temperature [°C]  ▲▼



### 3.5.5. USB Communication

Under USB communication the baud rate of the sensor can be selected. You can choose between 115200 and 921600. With activation of the check sum

USB Communication

Baudrate:

115200

☒ Check Sum

### 3.5.6. RS485-Multidrop address

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](#)

RS485

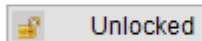
Multidrop Address:

1

### 3.5.7. Locking the 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.

#### User Interface

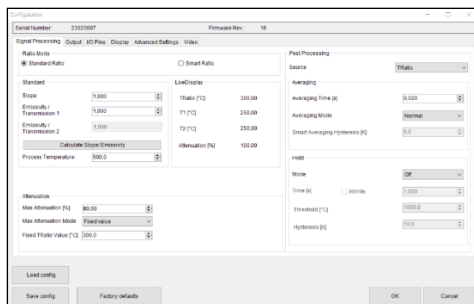


## 4. CSvision

### 4.1. Setup CSvision

The button **Setup** [Menu: **Device\ Device Setup**] opens a window for the setting of all sensor parameters. The dialog window is separated into 5 categories:

- Signal processing                      Setting of Ratio Mode, Emissivity/ Slope, Max Attenuation and Post processing
- Output                                    Setting of Output 1 and Output 2
- I/O Pins                                  Setting the In- and Outputs
- Display                                    Display main value and Backlight/ Alarm setting
- Advanced settings                    RS485/Modbus settings, Calibration
- Video                                      Setting of video signals



**CSvision**

## 4.2. Sensor Setup CSvision – Signal processing

In this category you can adjust the parameters **Emissivity**, **Slope**, **Attenuation** and select the functions and define the parameters for **Post processing**. Furthermore, the desired ratio mode can be selected here. The Standard Ratio mode is activated as default setting.

The screenshot shows the 'Configuration' window for the CSvision sensor, specifically the 'Signal Processing' tab. The window has a title bar with standard minimize, maximize, and close buttons. Below the title bar, there are fields for 'Serial Number: 23020007' and 'Firmware Rev.: 16'. The 'Signal Processing' tab is highlighted with a red box. The main content area is divided into several sections:

- Ratio Mode:** Two radio buttons are present: 'Standard Ratio' (selected) and 'Smart Ratio'.
- Standard:** A section containing input fields for 'Slope' (1,000), 'Emissivity / Transmission 1' (1,000), and 'Emissivity / Transmission 2' (1,000). Below these is a 'Calculate Slope/ Emissivity' button and a 'Process Temperature' field (500,0).
- LiveDisplay:** A section showing 'TRatio [°C]' (300,00), 'T1 [°C]' (250,00), 'T2 [°C]' (250,00), and 'Attenuation [%]' (100,00).
- Attenuation:** A section with 'Max Attenuation [%]' (80,00), 'Max Attenuation Mode' (Fixed value), and 'Fixed TRatio Value [°C]' (300,0).
- Post Processing:** A section with 'Source' (TRatio), 'Averaging' parameters (Averaging Time [s] at 0,020, Averaging Mode at Normal, Smart Averaging Hysteresis [K] at 5,0), and 'Hold' parameters (Mode at Off, Time [s] at 1,000, Threshold [°C] at 1000,0, Hysteresis [K] at 10,0).

At the bottom of the window, there are three buttons: 'Load config', 'Save config', and 'Factory defaults'. On the right side, there are 'OK' and 'Cancel' buttons.

### 4.2.1. Ratio Mode - Standard Ratio

#### Emissivity/ Slope/ Attenuation

The **Slope** is the quotient of the emissivity's of both of the overlapping wavelengths and therewith the deciding parameter for measurements in 2-color-mode.

The **Emissivity** ( $\epsilon$  – Epsilon) is a material constant factor to describe the ability of a body to emit infrared energy. The emissivity only affects measurements in the 1-color-mode.

The function **Calculate Slope/Emissivity** allows the determination of an unknown emissivity and slope at a known process temperature.

Ratio Mode  
☒ Standard Ratio
☐ Smart Ratio

Standard

Slope

1,000

Emissivity / Transmission 1

1,000

Emissivity / Transmission 2

1,000

Calculate Slope/ Emissivity

Process Temperature:

500,0

LiveDisplay

TRatio [°C]

300,00

T1 [°C]

250,00

T2 [°C]

250,00

Attenuation [%]

100,00

Attenuation

Max Attenuation [%]

80,00

Max Attenuation Mode

Fixed value

Fixed TRatio Value [°C]

300,0

**Attenuation:** The temperature display is fixed if the attenuation exceeds the limit specified here. You can decide whether the **last valid value** should be kept or a **fixed value** entered.

#### 4.2.2. Ratio Mode - Smart Ratio

While the standard mode requires a constant emissivity ratio/slope, the **Smart Ratio** measurement allows a data set of different slopes to be recorded and applied for temperature calculation. This is required, for example, if the degree of contamination of the protective window changes during the process and the ratio temperature is no longer correct. This cannot be described with a constant slope.

Signal Processing Output I/O Pins Display Advanced Settings Video

Ratio Mode

☐ Standard Ratio ☒ Smart Ratio

Smart

Teach-In Off

LiveDisplay

TRatio [°C]	300,00
T1 [°C]	250,00
T2 [°C]	250,00
Attenuation [%]	100,00

A requirement for the measurement is that the object temperature must be known.

**Note:** Before the first use a data record must be recorded

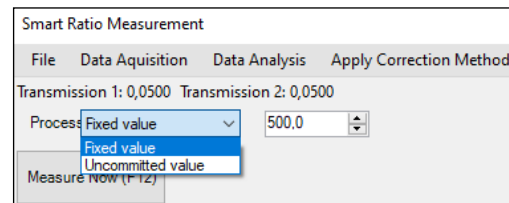
In the **Teach-in** function, the data records are recorded.

The Smart Ratio mode can be activated or deactivated with the **On/Off** buttons.

## Teach-In

The process temperature must be known for the teach-in function. This temperature can be set using two variants:

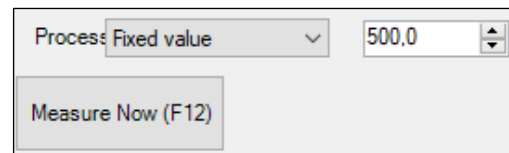
- **Variant 1: Via a fixed value**  
Here the known process temperature is entered manually.
- **Variant 2: Via Uncommitted value**  
The input is done via an analog signal, for example an external sensor.



## Procedure

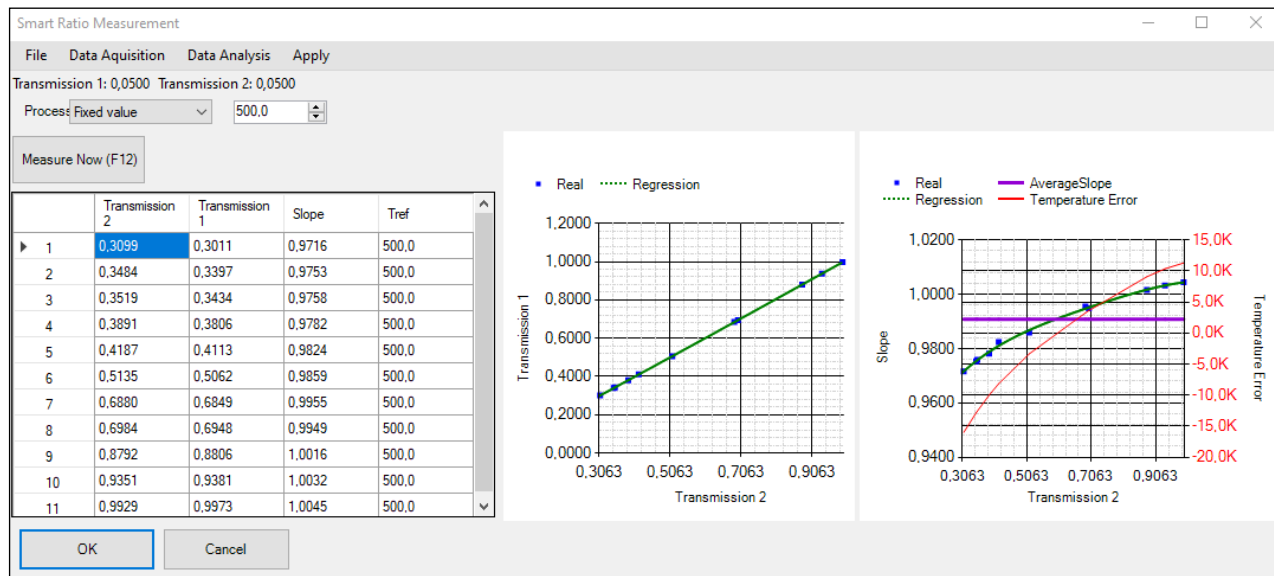
Hold the dirty window in front of the sensor.

The **Measure Now button (F12)** can now be used to record measuring points. The current transmission and slope are entered into the table. Alternatively, the **F12** button can be pressed.



### Note

When recording different measuring points, the current process temperature must always be taken into account. At least two measuring points with different degrees of contamination. Recommendation: The more measuring points the better



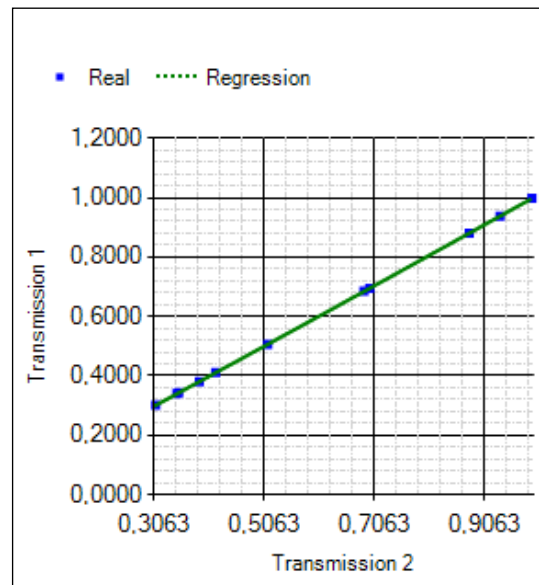
Smart Ratio Measurement: example with 11 measuring points



The middle figure in the **Smart Ratio Measurement** shows the transmission of diode 1 relative to the transmission of diode 2.

The blue points are the recorded measuring points.

Green curve: Regression curve (polynomial) for calculating the values between the measuring points.

**Note**

The Smart Ratio method can only work if there is a monotonically increasing function progression. If this is not the case, the Smart Ratio method cannot be used. If this is not the case, repeat the measurement and check the measurement for measurement errors.

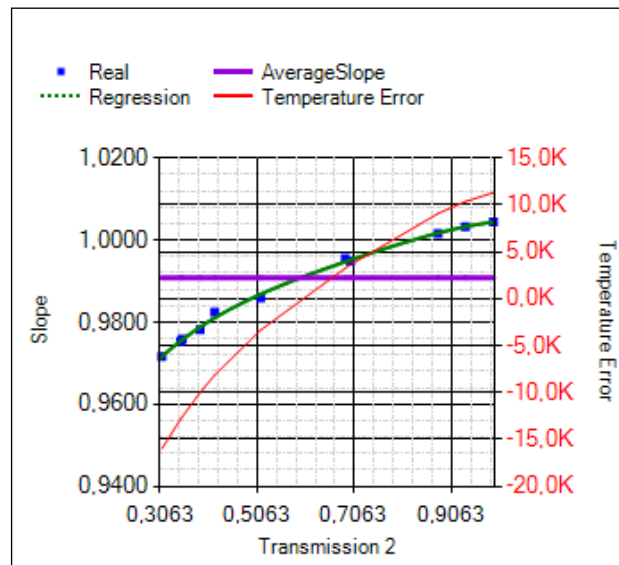
The right figure in the **Smart Ratio Measurement** shows the transmission ratio (slope) relative to the transmission of diode 2.

The blue points are the recorded measuring points.

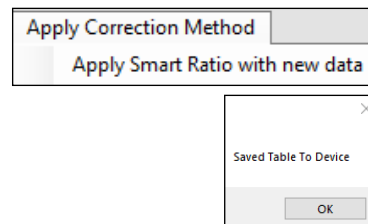
The violet horizontal line is the average slope calculated from the measured values.

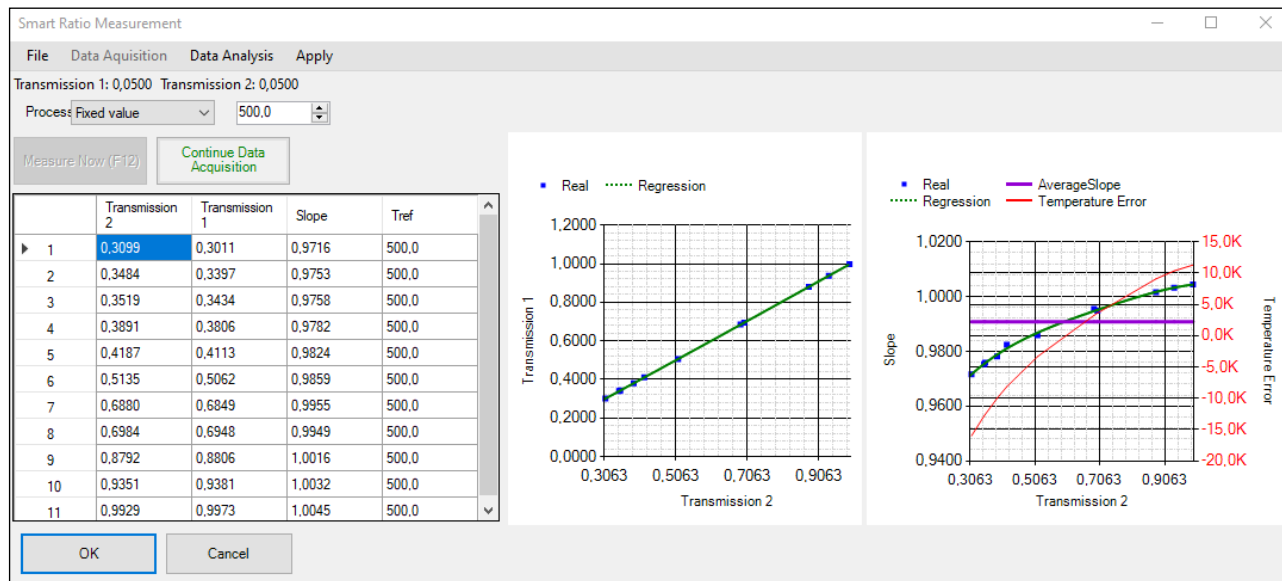
The red curve is an estimate of the quotient temperature error (in Kelvin) when using the average slope without the Smart Ratio method.

Green curve: Regression curve (polynomial) for calculating the values between the measurement points.



To write the created curves to the device, the **Apply Smart Ratio with new data** option must be selected in the menu under **Apply Correction Method**. The created regression curve is now written to the device. A message window appears indicating that the table is being saved to the device. The Smart Ratio mode is now automatically activated.





Smart ratio mode is now activated. Further data points can no longer be recorded in this mode. To add more data points, press the **Continue Data Acquisition** button (Smart Ratio mode is deactivated again).

After successful setting you can close the window with the **OK** button.

Ratio Mode

☐ Standard Ratio ☒ Smart Ratio

Smart

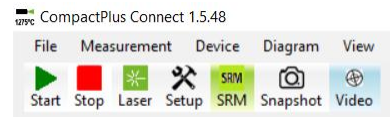
Teach-In **ON**

TRatio [°C] 275,0

T1 [°C] 250,0

T2 [°C] 250,0

Attenuation [%] 100,0



Activation of the Smart Ratio function is indicated by a green illuminated **ON** button. In addition, there is an icon called **SRM**, which is framed in green when activated.

To deactivate the Smart Ratio function, you can either click on the icon or on the green on button.

Ratio Mode

☐ Standard Ratio ☒ Smart Ratio

Smart

Teach-In **OFF**

TRatio [°C] 275,0

T1 [°C] 250,0

T2 [°C] 250,0

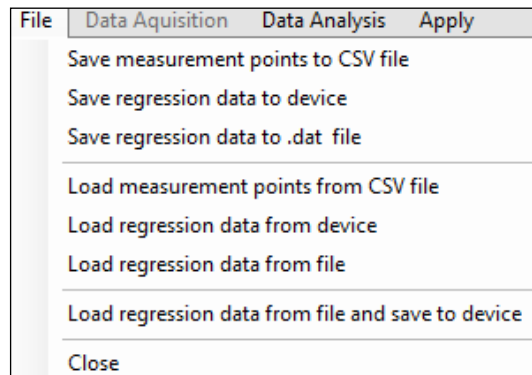
Attenuation [%] 100,0

## Further Settings

Further settings can be made in the menu under **File**.

**Save measurement points to CSV file:** The created data is stored on a hard disk.

**Save regression data to device:** The created data is stored on the device without activating or applying the Smart Ratio method.



**Save regression data to .dat file:** Here the data is stored on a hard disk for external data analysis.

**Load measurement points from CSV file:** If data sets already exist, the values can be read in and loaded into the table.

**Load regression data from device:** To view the currently used regression curve.

**Load regression data from file:** The regression data is loaded from an existing file.

**Load regression data from file and save to device:** Here the regression data is loaded from an existing file and saved directly to the device.

The following settings can be made in the menu under **Data Acquisition**.

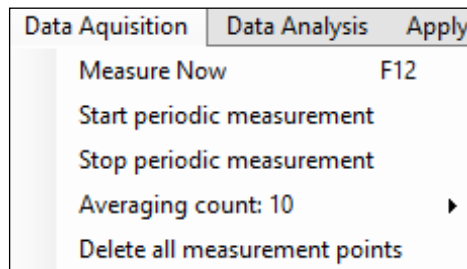
**Measure Now:** A single measuring point is created and written to the table.

**Start periodic measurement:** A predefined interval can be entered, in which the measuring points will be recorded automatically.

**Stop periodic measurement:** The recording of new measuring points is stopped.

**Averaging count:** Signal averaging during transmission measurement (response time is extended).

**Delete all measurement points:** All measuring points in the table are deleted (not from the device).

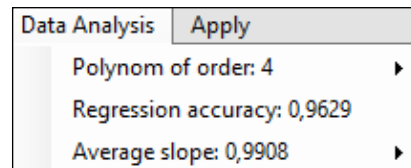


#### Note

To delete individual measuring points, you must mark them in the table and remove them with the delete key.

The following settings can be made in the menu under **Data Analysis**.

**Polynomial of order:** The polynomial order is specified here. The factory setting is Auto and is determined automatically. Alternatively, it can be changed manually if required.



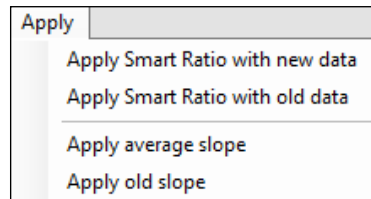
**Regression accuracy:** Characteristic value to evaluate the description of the measured values by the polynomial. Larger values are better. A value of 1 means perfect agreement. The regression accuracy is calculated automatically.

**Average slope:** The mean value of all slopes is calculated (violet straight line in the right diagram). The default setting is Auto. Alternatively it can be set manually. Allows to manually move the average slope (display optimization).

The following settings can be made in the menu under

**Apply**.

**Apply Smart Ratio with new data:** The created regression curve is written to the device and the Smart Ratio mode is activated. A message window appears indicating that the table is being saved to the device.



**Apply Smart Ratio with old data:** Regression curve already stored in the device is retained and Smart Ratio mode is activated.

**Apply average slope:** Set average slope and activate standard ratio mode.

**Apply old slope:** Restore the slope value before opening the Smart Ratio configuration.

#### 4.2.3. Post Processing

In the category **Post Processing** you can select the **Source** and make following settings:

- **Averaging** (Averaging time, average mode, smart threshold)
- **Hold** mode (Mode: Off, Peak Hold, Valley Hold, Advanced Peak Hold, Advanced Valley Hold)

You will find the description of the single functions on the next page.

### Smart Averaging

If activated, a dynamic average adaptation at high signal edges is active. In addition you can enter the minimum temperature difference (**Smart Averaging Hysteresis**) to trigger this function.

The screenshot shows the 'Post Processing' configuration window. It is divided into two main sections: 'Averaging' and 'Hold'.

**Post Processing**

**Source**: TRatio

**Averaging**

- Averaging Time [s]**: 0,020
- Averaging Mode**: Normal
- Smart Averaging Threshold [°C]**: 5,0

**Hold**

- Mode**: Off (The dropdown menu is open, showing options: Off, Peak Hold, Valley Hold, Advanced Peak Hold, Advanced Valley Hold)
- Time [s]**: ☐ Infinite
- Threshold [°C]**: 10,0
- Hysteresis [K]**: 10,0



**Averaging**

In this mode an arithmetic algorithm will be performed to smoothen the signal. The **Averaging Time** is the time constant. This function can be combined with all other post processing functions. The minimum adjustable average time is 0,001 s.

**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 0,001 s.

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.

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**

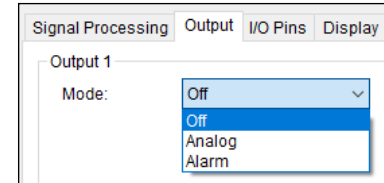
If **Off** is activated, no post processing will happen.

### 4.3. Sensor Setup CSvision – Output

#### 4.3.1. Output 1 and 2

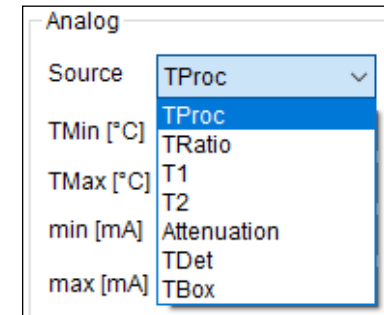
The device has two outputs (**OUT 1**, **OUT 2**) which can be configured as desired. The following options are available under **Mode**:

- Off
- Analog
- Alarm



Bei Aktivierung von **Analog** stehen im Feld **Quelle** folgende Signalquellen zur Wahl:

- |                      |                         |
|----------------------|-------------------------|
| ▪ <b>TProc</b>       | Process temperature     |
| ▪ <b>TRatio</b>      | Ratio temperature       |
| ▪ <b>T1</b>          | 1 channel temperature   |
| ▪ <b>T2</b>          | 2 channel temperature   |
| ▪ <b>Attenuation</b> | Signal attenuation in % |
| ▪ <b>TDet</b>        | Temperature of detector |
| ▪ <b>TBox</b>        | Sensor temperature      |



The desired temperature measuring range of the sensor can now be set. The range limits can be changed by entering them in the corresponding fields. The source can be selected between **T<sub>Proc</sub>**, **T<sub>Ratio</sub>**, **T1**, **T2**, **Attenuation**, **T<sub>Det</sub>** or **T<sub>Box</sub>**.

- **TMin**: lower temperature range limit
- **TMax**: upper temperature range limit
- **Min [mA]**: lower limit mA output
- **Max [mA]**: upper limit mA output

The screenshot displays the 'Output' configuration window in the CSvision software. The window has tabs for 'Signal Processing', 'Output', 'I/O Pins', 'Display', 'Advanced Settings', and 'Video'. The 'Output' tab is active, showing settings for 'Output 1' and 'Output 2'.

**Output 1 Settings:**

- Mode:** Analog
- Source:** TRatio
- TMin [°C]:** 300,0
- TMax [°C]:** 1300,0
- Min [mA]:** 0,0
- Max [mA]:** 20,0
- FailSafe Min Range [°C]:** 300,0
- FailSafe Max Range [°C]:** 1400,0
- FailSafe min [mA]:** 3,5
- FailSafe max [mA]:** 21,0
- ☐ FailSafe is Active min
- ☐ FailSafe is Active max

**Output 2 Settings:**

- Mode:** Analog
- Source:** (empty)
- MinAtn [%]:** (empty)
- MaxAtn [%]:** (empty)
- Min [mA]:** (empty)
- Max [mA]:** (empty)
- FailSafe Mi:** (empty)
- FailSafe M:** (empty)
- FailSafe mi:** (empty)
- FailSafe m:** (empty)
- ☐ FailSafe
- ☐ FailSafe

Alternatively, outputs 1 and 2 can be used as alarm outputs. To do this, select the Alarm setting.

As source you can choose between **T<sub>Proc</sub>**, **T<sub>Ratio</sub>**, **T1**, **T2**, **Attenuation**, **T<sub>Det</sub>** or **T<sub>Box</sub>**.

Under **Threshold** the threshold value for triggering the alarm is defined.

**Hysteresis**: Setting the minimum hysteresis

**Alarm Off [mA]**: Value if no alarm

**Alarm On [mA]**: Value on alarm

Selecting **Open/Closed** under **Mode** defines the output as High or Low alarm.

Output 2

Mode: Alarm

Alarm

Source: TProc

Threshold [°C]: 900,0

Hysteresis [°C]: 10,0

Alarm Off [mA]: 4,0

Alarm On [mA]: 20,0

Mode: Open

Difference Mode: Inactive

#### 4.3.2. Failsafe

The pyrometer has a failsafe function that can be used in analog mode.

The range can be configured as desired. The settings for fail-safe operation allow a defined level to be output at the analog output depending on specified temperature limits.

Thus, a possible cable defect can be detected quickly.

FailSafe Min Range [°C]	700,0
FailSafe Max Range [°C]	1400,0
FailSafe min [mA]	0,0
FailSafe max [mA]	20,1
<input type="checkbox"/> FailSafe is Active min <input checked="" type="checkbox"/> FailSafe is Active max	

#### 4.4. Sensor Setup CSvision – I/O-Pin

The CSvision has one I/O pin which can be programmed as in- or output using the software. The following options are available:

<u>Function</u>	<u>I/O pin acts as</u>	<u>Description</u>
Alarm	output (digital)	Open collector output/ definition as HIGH- or LOW alarm via norm. open/ norm. close options in software dialog.
Valid Low	input (digital)	The output follows the process temperature as long as there is a Low level at the I/O pin. After discontinuation of the Low level the last value will be held.
Valid High	input (digital)	The output follows the process temperature as long as there is a High level at the I/O pin. After discontinuation of the High level the last value will be held.

Hold Low-High	input (digital)	The last value will be held if there is a signal with a rising edge on the I/O pin.
Hold High-Low	input (digital)	The last value will be held if there is a signal with a falling edge on the I/O pin
Hold Reset Low	input (digital)	Reset of a hold function on a Low level at the I/O pin
Hold Reset High	input (digital)	Reset of a hold function on a High level at the I/O pin
Slope external	input (analog)	External adjustment of the slope value using an analog voltage (0-10V)
Emissivity external	input (analog)	External adjustment of the emissivity value using an analog voltage (0-10V)
Uncommitted Value	input (analog)	Display of a freely scalable value
Laser on Low	input (digital)	Switch on laser (Low signal)
Laser on High	input (digital)	Switch on laser (High signal)

**Low-/High-level: via software**

If you select the function **Alarm** the following signal sources can be selected:

- **TProcess**      Process temperature
- **TRatio**        Ratio temperature
- **T1**             1 channel temperature
- **T2**             2 channel temperature
- **Attenuation**    Signal attenuation in %
- **TDet**          Detector temperature
- **TBox**          Sensor temperature

The definition as Low or High alarm can be done by switching between **Normally: open** and **Normally: closed**.

If you select the function **Slope external** or **Emissivity external** the I/O pin is set as analog input. The scaling can be done using the parameter fields **P1/P2** and **Slope P1/P2 / Epsilon P1/P2**.

I/O Pin 1

Mode Alarm

Parameter

Source TProc

Threshold [°C] 800,0

Hysteresis [°C] 10,0

Normally Open

Difference Mode Inactive

I/O

**OUTPUT**

I/O Pin 1

Mode Slope external

Parameter

P1 [V] 0,0

P2 [V] 10,0

Slope P1 0,9

Slope P2 1,1

I/O

**Input**



If you select the function **Hold Reset Low** or **Hold Reset High** the I/O-Pin is set as digital input. An activated hold function (MAX, MIN, advanced MAX, advanced MIN) will be reset if a low or high level is at the I/O pin.

The screenshot shows the 'I/O Pin 1' configuration window. It has a 'Mode' dropdown menu set to 'Hold Reset Low'. Below it is a 'Parameter' section with two input fields: 'Threshold [V]' and 'Hysteresis [V]', both set to '0,0'. At the bottom, there is an 'I/O' section with a label 'Input'.

I/O Pin 1	
Mode	Hold Reset Low
Parameter	
Threshold [V]	0,0
Hysteresis [V]	0,0
I/O	
Input	

## 4.5. Sensor Setup CSvision – Display

In this tab you can make settings for the **backlight LED** (=visual alarms).

### 4.5.1. Visual Alarms




Independent of the selected signal for the analog output, a signal from the following list can be selected under General/ Main display source, which is shown in the digital display of the electronics:

<b>TProc</b>	Process temperature
<b>TRatio</b>	Ratio temperature
<b>T1</b>	Temperature value 1-color-mode
<b>T2</b>	Temperature value 2-color-mode
<b>Attenuation</b>	Signal attenuation in %
<b>TDet</b>	Temperature of the detector
<b>TBox</b>	Temperature of the electronics

For the visual alarm areas up to eight alarm limits can be assigned to a signal. The selected signal can be selected under **Source** independent of the value shown in the display and independent of the analog output.

Visual Alarms

SourceAttenuation

From	To			
400,0 [%]	405,0 [%]	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
410,0 [%]	415,0 [%]	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
420,0 [%]	425,0 [%]	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
430,0 [%]	435,0 [%]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
440,0 [%]	445,0 [%]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
450,0 [%]	455,0 [%]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
460,0 [%]	465,0 [%]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
470,0 [%]	475,0 [%]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### 4.5.2. Temperature unit

The temperature unit can be changed between °C and °F under **Preferences/ Options**.

#### 4.6. Sensor Setup CSvision – Advanced Settings

In the category **Advanced Settings** the following parameter can be adjusted:

- **Interface**

- RS485 – Terminal Resistor, Baudrate, Base Address
- RS422 – Terminal Resistor, Baudrate
- Modbus – Terminal Resistor, Baudrate, Bus address/Node ID

- **Field Calibration**

- Manual
- 1 Point
- 2 Point

The screenshot shows the 'Advanced Settings' window of the CSvision software. The 'Advanced Settings' tab is selected and highlighted with a red box. The window is divided into two main sections: 'Interface' and 'Field calibration'.

**Interface Section:**

- Mode:** RS485 (dropdown menu)
- RS485 Section:**
  - Terminal R:** No (dropdown menu)
  - Baudrate:** 115200 (dropdown menu)
  - Baseaddress:** 1 (spin box)

**Field calibration Section:**

- Mode:** Manual (dropdown menu)
- Ratio:** 0,0 (spin box)
- Gain:** 1,00000 (spin box)
- T1 Section:**
  - Offset [K]:** 0,0 (spin box)
  - Gain:** 1,00000 (spin box)
- T2 Section:**
  - Offset [K]:** 0,0 (spin box)
  - Gain:** 1,00000 (spin box)

#### 4.6.1. RS485 Base Address

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

► [RS485/ RS422](#)

The Terminal resistor has to be set to **Yes** at the last unit in your network.



The screenshot displays a configuration window for an RS485 interface. It features a title bar 'Interface' and a 'Mode' dropdown menu set to 'RS485'. Below this is a section titled 'RS485' containing three settings: 'Terminal R' set to 'No', 'Baudrate' set to '115200', and 'Baseaddress' set to '1' with a small up/down arrow icon next to the input field.

Interface	
Mode	RS485 ▼
RS485	
Terminal R	No ▼
Baudrate	115200 ▼
Baseaddress	1 ▲▼

#### 4.6.2. Field Calibration

In the **Advanced Settings** tab, three different modes can be selected to perform a calibration of the device:

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

These amplification factors can be entered for the Ratio, T1 and T2 temperature.

##### 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
- 

The screenshot shows a 'Field calibration' window with a 'Mode' dropdown set to 'Manual'. Below this are three sections for 'Ratio', 'T1', and 'T2'. Each section contains 'Offset [K]' and 'Gain' input fields with up/down arrows. The 'Ratio' section has an Offset of 0,2 and a Gain of 1,00000. The 'T1' and 'T2' sections both have an Offset of 0,0 and a Gain of 1,00000.

Parameter	Offset [K]	Gain
Ratio	0,2	1,00000
T1	0,0	1,00000
T2	0,0	1,00000

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).

## 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** and the **set temperature**. An offset calculation takes place and is displayed.

Field calibration

Mode

1 Point

Ratio

Offset [K]

0,0

Gain

1,00000

T1

Offset [K]

0,0

Gain

1,00000

T2

Offset [K]

0,0

Gain

1,00000

-100

0

100

200

0

20

40

60

80

100

120

Set Temperature

Actual Ratio Temperature

Actual T1 Temperature

Actual T2 Temperature

P1

Set Temperature [°C]

300,0

Actual Ratio Temperature [°C]

300,0

Actual T1 Temperature [°C]

300,0

Actual T2 Temperature [°C]

300,0

Use Current Values

Calculate

## 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** and the **set temperature** for two different points. An offset and gain is then calculated.

Field calibration

Mode 2 Point

Ratio

Offset [K] 0,0

Gain 1,00000

T1

Offset [K] 0,0

Gain 1,00000

T2

Offset [K] 0,0

Gain 1,00000

P1

Set Temperature [°C] 300,0

Actual Ratio Temperature [°C] 300,0

Actual T1 Temperature [°C] 300,0

Actual T2 Temperature [°C] 300,0

Use Current Values

P2

Set Temperature [°C] 300,0

Actual Ratio Temperature [°C] 300,0

Actual T1 Temperature [°C] 300,0

Actual T2 Temperature [°C] 300,0

Use Current Values

Calculate

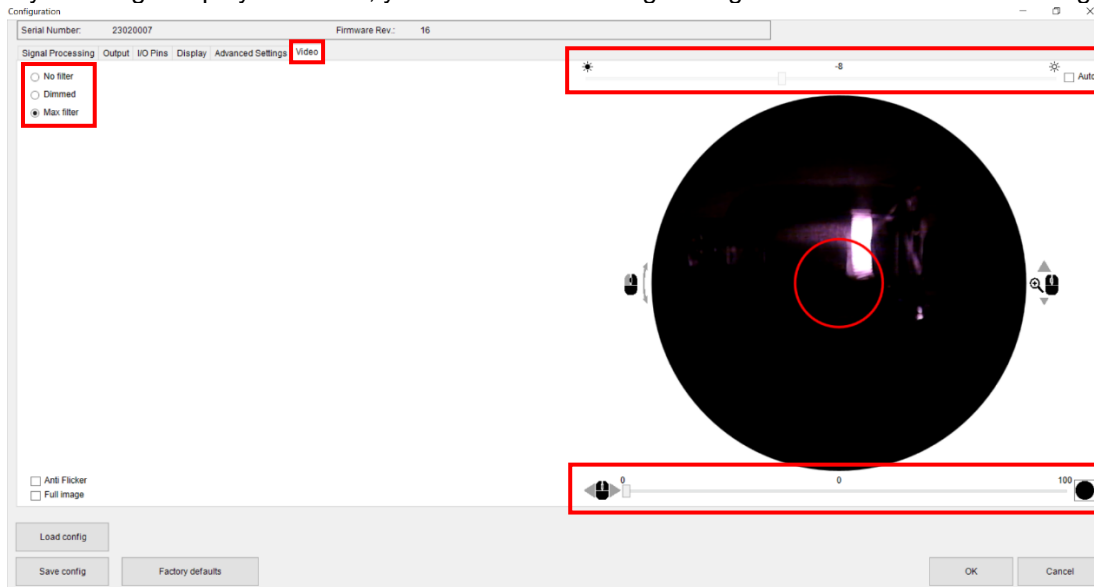


### 4.6.3. Videosignal

The CSvision has an integrated visual camera with a built-in two-step brightness reduction filter. For very overexposed objects, the filter can be switched in two steps. It also has digital exposure of the signal and can be adjusted in the brightness bar.

Additionally, the image can be zoomed in or out with the mouse wheel. If your pyrometer is not perpendicular to your target, the image can be rotated by drag and drop with the left mouse button.

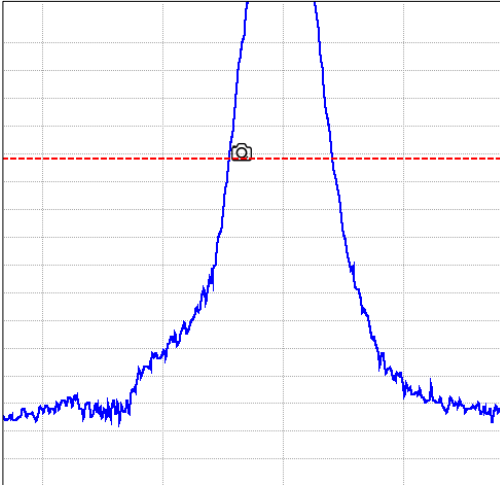
If your image display is blurred, you can focus the image using the focus bar below the image.



#### 4.6.4. Automatic Snapshots

You can have temperature-triggered snapshots of the video signal created automatically. To do this, go to **Measurement/ Automatic snapshots** and set the check mark under **Enable snapshot trigger**. Now you can make the settings for triggered snapshots. In addition, you can have the trigger threshold shown in the diagram.

If a trigger event has happened and a triggered photo has been taken, an icon of a camera is shown in the temperature-time diagram.

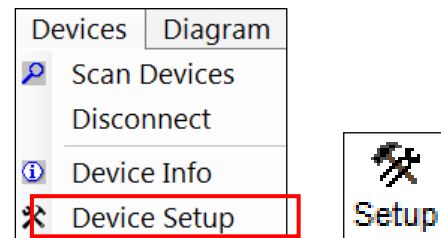
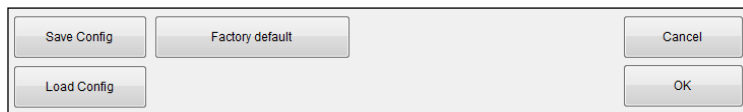


Further settings can be made under **Preferences/ Video snapshot Setup**. The description of the snapshot with information on the date, time, serial number of the sensor and other measuring point information can be made, and the file storage location for the snapshots can be changed.

## 5. Special Feature

### 5.1. 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

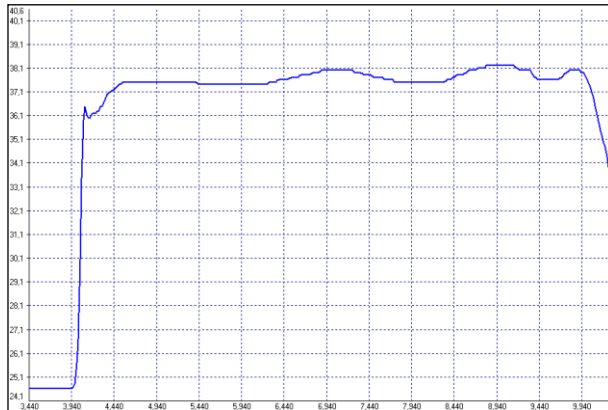
This button enables the user to reset the unit to the factory default values. It also can be reset by pressing at first the **Down** button and then the **Mode** button (keep both pressed for approx. 3 seconds).

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

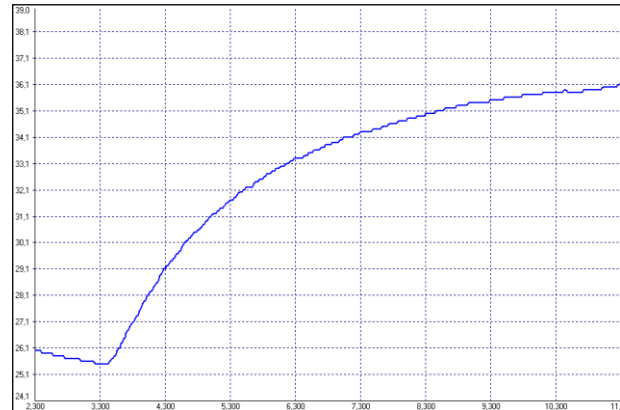
## 5.2. Smart Averaging

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.



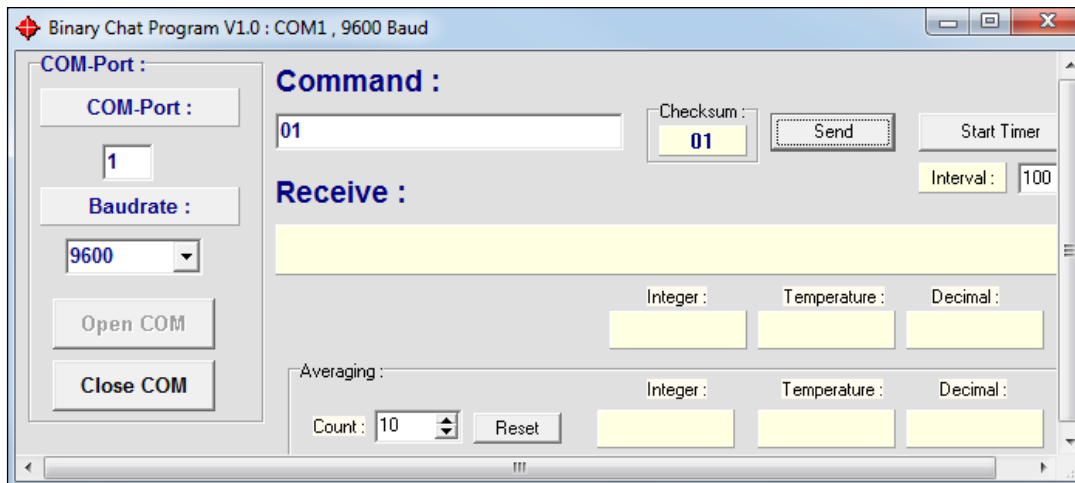
Signal graph with Smart Averaging function



Signal graph without Smart Averaging function

### 5.3. Binary Chat Program

In the download package 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 **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 CompactPlus Connect 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 CompactPlus Connect 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.

The screenshot shows the 'Binary Chat Program V1.0 : COM75 , 115200 Baud' window. On the left, the 'COM-Port' is set to '75' and the 'Baudrate' is '115200'. The 'Command' field contains '01' and the 'Checksum' is '01'. The 'Send' button is visible. The 'Receive' section shows a yellow box with the text '1D~4E'. Below this, three fields display the results: 'Integer : 8033', 'Temperature : 703,3', and 'Decimal : 8,033'. At the bottom, the 'Averaging' section shows 'Count : 10' and 'Reset' button, with results: 'Integer : 4314', 'Temperature : 331,4', and 'Decimal : 4,314'.

**Example 1: CTratio/ Polling of the process temperature**

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

## 1 Basic Functions

DECIMAL	HEX	Command	Data	Answer	Result	Unit
1	0x01	READ Temp. - Process	none	byte1 byte2	$= (\text{byte1} * 256 + \text{byte2} - 1000) / 10$	°C
2	0x02	READ Temp. - Det	none	byte1 byte2	$= (\text{byte1} * 256 + \text{byte2} - 1000) / 10$	°C
3	0x03	READ Temp. - Box	none	byte1 byte2	$= (\text{byte1} * 256 + \text{byte2} - 1000) / 10$	°C
10	0x0A	READ Temp. - Ratio	none	byte1 byte2	$= (\text{byte1} * 256 + \text{byte2} - 1000) / 10$	°C
11	0x0B	READ Temp. – T2	none	byte1 byte2	$= (\text{byte1} * 256 + \text{byte2} - 1000) / 10$	°C
12	0x0C	READ Temp. – T1	none	byte1 byte2	$= (\text{byte1} * 256 + \text{byte2} - 1000) / 10$	°C
13	0x0D	READ Temp. - Attenuation	none	byte1 byte2	$= (\text{byte1} * 256 + \text{byte2} - 1000) / 10$	%

### 5.3.1. Additional Features

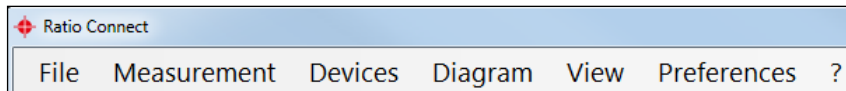
Under **Averaging** you can calculate the average value out of a defined number of values **Count**.

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

#### Save Diagram

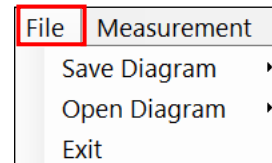
To save temperature files

#### Open Diagram

To open saved temperature files (\*.dat)

#### Exit

To exit the program





## 6.2. Menu: Measurement

### Start

To start the measurement

### Pause

To freeze the continuous diagram actualization

### Stop

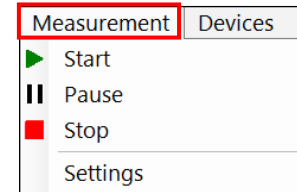
To stop the measurement

### Settings

Opens the window: **Measurement Settings**

### Configure Burst String

In the burst mode the sensor works in a unidirectional communication mode – the sensor is sending data continuously.



### 6.3. Menu: Device

**Scan Devices**

Scans for connected sensors (if Auto scan is deactivated)

**Disconnect**

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...**

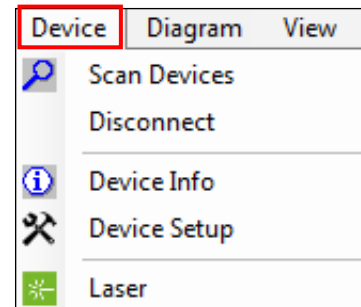
Opens the window: Device setup

**Loop Maintenance**

Verification of the analog output channels

**Laser**

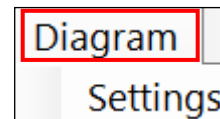
To switch On and Off the Laser



## 6.4. Menu: Diagram

### Settings

Opens the window: **Diagram settings** to select digital displays, temperature graphs, pen width and color of graphs



 A screenshot of the 'Settings' window for the CT 4M device. The window has a title bar with 'Settings' and standard window controls. Below the title bar is a tabbed interface with tabs for 'Digital Display', 'Diagram', 'AutoRange', 'Pen Width', 'Color', and 'Y Axis'. The 'Diagram' tab is selected. It contains a list of digital displays with checkboxes for 'Digital Display' and 'Diagram', a 'Pen Width' dropdown set to '2', a 'Color' color swatch, and a 'Y Axis' dropdown menu. The displays listed are TProc, TAvG, TAdt, Tint, TBox, Eps, Trans, mV IO1, mV IO2, and mV IO3. At the bottom are 'OK' and 'Cancel' buttons.
 

Item	Digital Display	Diagram	Pen Width	Color	Y Axis
TProc	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Black Swatch]	[Primary Axis]
TAvG	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Green Swatch]	[Primary Axis]
TAdt	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Blue Swatch]	[Primary Axis]
Tint	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Red Swatch]	[Primary Axis]
TBox	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Light Green Swatch]	[Primary Axis]
Eps	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Gray Swatch]	[Primary Axis]
Trans	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Pink Swatch]	[Primary Axis]
mV IO1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Magenta Swatch]	[Primary Axis]
mV IO2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Orange Swatch]	[Primary Axis]
mV IO3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Olive Swatch]	[Primary Axis]

CT 4M

 A screenshot of the 'GraphOptionsForm' window for the CTratio device. The window has a title bar with 'GraphOptionsForm' and standard window controls. Below the title bar is a tabbed interface with tabs for 'Digital Display', 'Diagram', 'Pen Width', 'Color', and 'Y Axis'. The 'Diagram' tab is selected. It contains a list of digital displays with checkboxes for 'Digital Display' and 'Diagram', a 'Pen Width' dropdown set to '2', a 'Color' color swatch, and a 'Y Axis' dropdown menu. The displays listed are TProc, TRatio, T1, T2, TAdtRatio, TAdt1, TAdt2, Attenuation, THead, and TBox. At the bottom are 'OK' and 'Cancel' buttons.
 

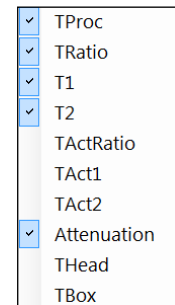
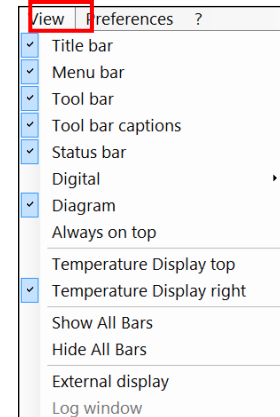
Item	Digital Display	Diagram	Pen Width	Color	Y Axis
TProc	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Gray Swatch]	[Primary Y Axis]
TRatio	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Teal Swatch]	[Primary Y Axis]
T1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Purple Swatch]	[Primary Y Axis]
T2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	[Olive Swatch]	[Primary Y Axis]
TAdtRatio	<input type="checkbox"/>	<input type="checkbox"/>	2	[Gray Swatch]	[Primary Y Axis]
TAdt1	<input type="checkbox"/>	<input type="checkbox"/>	2	[Dark Blue Swatch]	[Primary Y Axis]
TAdt2	<input type="checkbox"/>	<input type="checkbox"/>	2	[Dark Red Swatch]	[Primary Y Axis]
Attenuation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	[Green Swatch]	[Secondary Y Axis]
THead	<input type="checkbox"/>	<input type="checkbox"/>	2	[Black Swatch]	[Primary Y Axis]
TBox	<input type="checkbox"/>	<input type="checkbox"/>	2	[Blue Swatch]	[Primary Y Axis]

CTratio

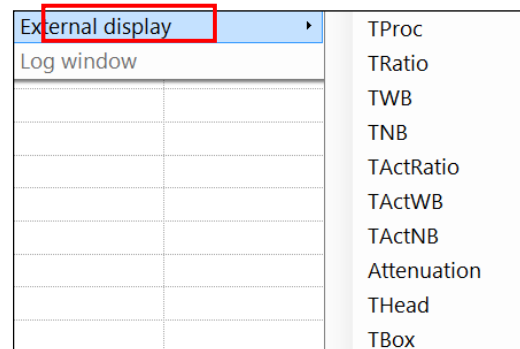
## 6.5. Menu: View

<b>Title bar</b>	To show or hide the title bar of the software window
<b>Menu bar</b>	To show or hide the menu bar of the software window
<b>Tool bar</b>	To show or hide the tool bar
<b>Tool bar captions</b>	To show or hide the captions of the tool bar
<b>Status bar</b>	To show or hide the status bar

<b>Digital</b>	Selection of all available values which can be shown as a digital display
<b>Diagram</b>	To show or hide the temperature diagram



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



## 6.6. Menu: Preferences

### Options

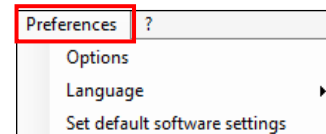
Opens the window: **Options** to make basic settings and define options for data saving

### Language

To select the desired language

### Set default software settings

The software will be reset to the factory default settings (The sensor settings are not affected by this)



## 6.7. Menu: Help

### Help...

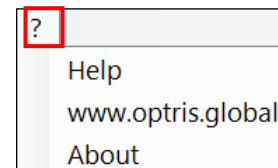
To open the help file

[www.optris.global](http://www.optris.global)

Opens the Optris homepage in your web browser

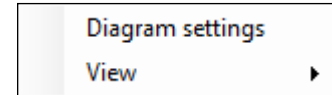
### About...

To show the software version installed on your computer



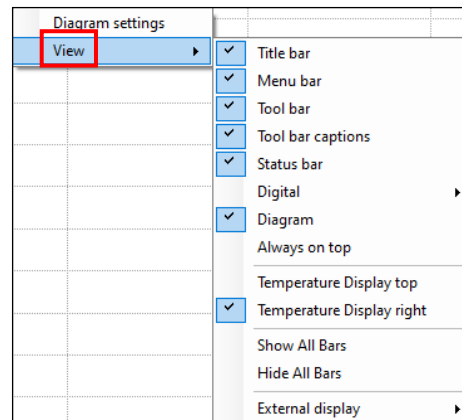
## 6.8. Context Menu (right mouse button)

<b>Settings</b>	Opens the window: <b>Diagram settings</b> to select digital displays, temperature graphs, pen width and color of graphs
<b>View</b>	Linking to the sub menu <b>View</b>



## 6.9. Context Menu [Sub menu: View]

<b>Title bar</b>	Shows or hides the title bar
<b>Menu bar</b>	Shows or hides the menu bar
<b>Tool bar</b>	Shows or hides the tool bar
<b>Tool bar captions</b>	Shows or hides the tool bar captions
<b>Status bar</b>	Shows or hides the status bar
<b>Diagram</b>	Shows or hides the diagram
<b>Temperature Display top</b>	Places the digital displays on top of the diagram
<b>Temperature Display right</b>	Places the digital displays right of the diagram
<b>Show all bars</b>	Shows all bars at once
<b>Hide all bars</b>	Hides all bars at once
<b>External display</b>	Linking to the sub menu <b>External display</b>
<b>Log window</b>	Display of logged software events





## 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.

