Pyrometers

CAPELLA C3 Series

Radiation pyrometers C309 / C316 / C318
2-color pyrometers C311 / C322

User Manual

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1 General

1.1 Information to this Manual

This manual is valid for the products listed on the front page, using original parts from Sensortherm.
This manual enables the safe and efficient use with the device. The manual is part of the instrument and has to be kept in a location where users always have access to.
Read this manual carefully before operating the product. All security notes and operation procedures in the manuals must be followed to ensure safety.
Additionally the local accident prevention regulations and common safety regulations of the instruments' operational area are valid.
The descriptions may differ from the current delivery status, since the pyrometer is continuously developed. Illustrations in this manual are for basic understanding and can differ from the actual construction.

1.2 CE Conformity and Standards

The product conforms to the following standards:

CE conformity:	DIN EN 61326-1 (electromagnetic compatibility)
Laser safety:	IEC 60825-1, laser class 2
RoHS:	2011/65/EU

1.3 Limitation of Liability

All information and notes in this manual are made under consideration of valid standards and rules, state of technology and our expert knowledge for many years.
The producer assume no liability for damages due to:

- Non-observance of this manual
- Usage out of intended use
- Assignment of unskilled personnel
- Mechanical damages
- Unauthorized modifications
- Technical modifications
- Usage of spare parts not approved

The responsibilities of the delivery contract are valid as well as our general terms and conditions and terms of delivery and the valid statutory rule at date of the conclusion of contract.

1.4 Terms of Warranty

A warranty period is 24 months from date of shipment form the Sensortherm facility. The seller will repair or replace the device at its own discretion. Further claims of the buyer against the seller or its agents are excluded, especially claims for damages that are not incurred in the delivery itself. This shall not apply in cases of intent, gross negligence, or the absence of assured properties. Damage or misuse of the product will be determined and void the warranty coverage. Repairs paid by the customer will include a 180 days warranty from date of shipment. Transportation costs are to be paid by the customer. Any claims for damage caused by misuse, neglect or tampering with the sensor are excluded.

1.5 Copyright

This manual is protected by copyrights and are intended solely for internal purposes.

It is not permitted to transfer these instructions to third parties, duplication in any kind and form - including excerpts - as well as recovery and / or notification of contents without written permission of the manufacturer, except are internal purposes.

Contraventions are liable for damages. All other rights reserved.

1.6 Customer Service / Spare Parts

For technical information contact our customer service.
It is recommended to purchase spare parts and accessories direct from Sensortherm (manufacturer).

In addition, our employees are always interested in new information and experiences arising from the application and can be valuable for improvement of our products.

1.7 Returning Goods

We ask you to request an **RMA number** for each returned goods. Due to system technical reasons it is not possible to edit the process without RMA number.
You will receive an RMA form, which has to be completed and sent to us by e-mail before delivery of the goods. It is important to pay attention to a short, accurate error description, as this can considerably reduce the repair time. You will immediately receive an RMA number. In order to be able to perform a warranty check in advance, we require the serial number(s) of the device(s).
Please return the items in suitable packaging to avoid damage during transport.
If you need to send this device back to us, the battery must be removed and may not be sent. Exceptions apply to trained resellers who have knowledge of the special transport and labeling regulations of the dangerous goods.

- Also observe the IATA (International Air Transport Association) guidelines for dangerous goods for lithium-ion batteries.
- For shipping lithium batteries within the US, see the published regulations of US Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA).

1.8 Disposal

Do not dispose of the product in the household waste (WEEE Directive).
Dispose of the product properly when it is no longer usable: pyrometers include electrical and electronic waste and have to be recycled or disposed environmentally friendly or to send to the manufacturer for disposal.

2 Safety

2.1 Use of the Manual

- Any person who is tasked to carry out work with the device must have read and understood the operating manual before beginning.
- Operation and maintenance of the system may only be performed by trained personnel.
- Save this user manual and hand-over with the device when passed on.

2.2 Supplementary Information about the Operation

The following symbol is used to simplify the search for useful information:

This **INFO** symbol indicates useful tips, recommendations and information for efficient and trouble free operation.

2.2.1 Responsibility of the Operators / Process Responsibility

If the device is used in the commercial sector the operator is subject to the legal responsibilities for workplace safety.
In addition to the safety instructions in this manual follow the regulations of safety, accident prevention and environmental protection. If the device is integrated into a system, the safety of the system in which the device is integrated is in the responsibility of the installer of the system.
Sensortherm does not guarantee that the temperature control in all processes will meet the desired requirements. Sensortherm excludes the process responsibility.

2.2.2 Warning Notes

The following symbols are used in this manual and, if applicable, on the device as a mark for information, restrictions, preventive measures and security notes. This information indicates risks and how they can be avoided.
Please pay attention to this symbols for safety reasons.

⚠ CAUTION This combination of symbol and signal word indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

SAFETY INSTRUCTIONS indicate specific safety-related instructions or procedures.

2.2.3 Safety Labels / Symbols

Additionally to the warning notes used in this manual, the following warning symbols are used. Warning symbols are also to find on the device. Follow all measures marked with the label to avoid injury.

Indicates **general hazards**.

Indicates the hazard for the eyes due to a class 2 **laser targeting light**.

Indicates the hazard for the eyes due to **glare at high radiation temperatures** above 1400°C / 2552°F.

2.3 Device Labels

On the device there is the type label (nameplate) as well as a warning sticker for the laser targeting light.

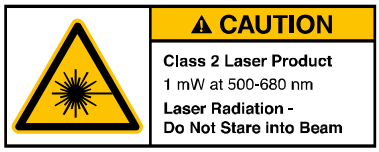
- Keep the warning signs in always legible condition
- Replace damaged labels

2.4 Laser Targeting Light

For alignment the pyrometers are equipped with a **laser targeting light laser class 2** (according to IEC 60825-1).
The laser emits a visible green light with a spectral range around 515 nm and has a maximum power of < 1 mW.

Laser warning label on the device (depending on the country of delivery):

US sticker



EU sticker

SAFETY INSTRUCTIONS:

- Never look into the direct or reflected laser beam.
- Do not point the laser to anyone.
- If laser radiation hits the eye, the eyes must be intentionally closed and the head immediately moved out of the beam.

2.5 Through-lens Sighting / View Finder

The devices are equipped with an adjustable eye protection filter in the eyepiece to reduce glare at high measurement temperatures. The unprotected look at temperatures >1400°C can damage the eyes function permanently.

SAFETY INSTRUCTIONS:

- Only look with darkened eyepiece at objects with temperatures above 1400°C / 2552°F to protect the eyes against glare at high radiation temperatures.
- Before looking at the high temperatures, always first adjust the eyepiece by turning it to the darkest position.

2.6 Rechargeable Lithium-Ion Battery

Safety precautions:

- Operation temperature: -20–60°C / -4–140°F
- Charging temperature: 0–45°C / 32–113°F
- Always charge the rechargeable battery via the USB port on the device. Power is supplied via a PC or the included USB plug-in power supply.
- Do not place in the sun during use or charging.
- Keep away from heat, flames and corrosive liquids.
- Li-ion batteries must not be short-circuited. They can ignite due to internal short circuit and in contact with air. Damaged lithium-ion batteries may therefore no longer be used. They must be disposed in protective containers and in accordance with environmental regulations.
- If possible, do not extinguish a burning battery with water, but with sand.

Storage

- Storage temperature: -20–45°C / -4–113°F (max. 3 month), -20–25°C / -4–77°F (max. 1 year).
- Charge state 30–50%.
- Remove the battery when the device is not in use for an extended period of time or when stored at temperatures above 45°C / 113°F. If the battery is not removed, leaking the battery may damage the device.
- Do not store the battery in conductive packaging material or a container in which the terminals can be short-circuited. If necessary, mask the poles.

3 Overview

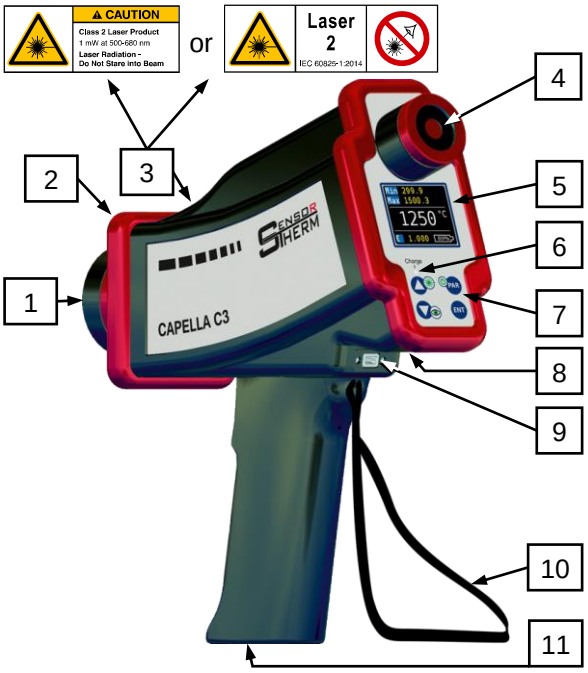
3.1 Intended Use

The here described Capella C3 series pyrometers are fast measuring devices with small spot sizes for non-contact infrared temperature measurement.
With their short-wave spectral range, they are suitable for measuring metals, ceramics, graphite and similar. Depending on the model, temperature ranges between 180 and 3300°C are available

3.2 Scope of Delivery

Device with Li-ion battery, carrying strap, USB cable, USB charger (plug-in power supply), protective and transport case, works certificate, user manual, software *SensorTools*.

3.3 Device Overview

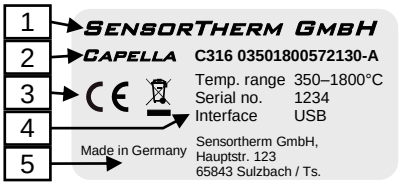


1	Optics with adjustable focus distance from 380 mm to 10 m
2	Rubber bumpers
3	Laser warning label (design country specific)
4	Through-lens view finder
5	Display
6	Charge LED: Battery charging indicator
7	Keys for switching on / off, for device adjustments and switching between laser targeting light / view finder
8	Identification label
9	USB port to charge the battery and read out measured data
10	Carrying strap
11	Photo tripod thread for installation in stationary measurements

3.4 Identification Label

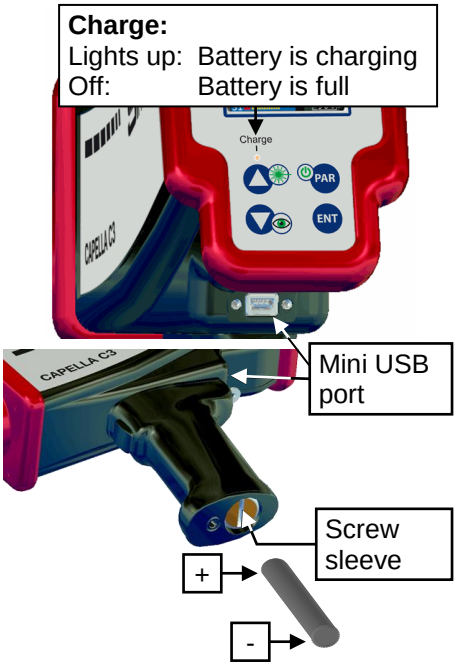
The nameplate on the top of the device contains the following information:

1) Manufacturer
3) Series / order number (decoding see chapter **6.2**)
2) CE marking and product marking crossed waste container
4) Technical data: temperature range, device number, interface
5) Country of manufacture, manufacturer address



4 Device Operation

4.1 Power Supply

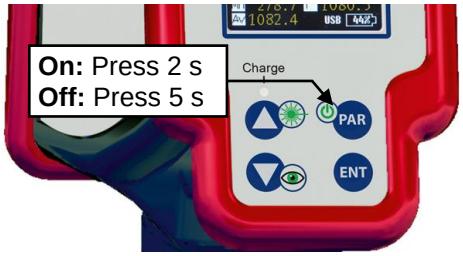


The Capella is powered by a Li-Ion battery, which is placed in the handle. When exchanging, the special dimensions by the integrated protection circuit must be taken into account (see **6**, Technical Data).

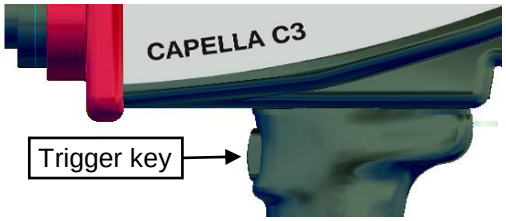
- **Battery charging:** via the mini USB port on the device.
  - via PC or the supplied USB plug-in power supply.
  - The current consumption is limited to 500 mA.
    Charging time: The shortest charging time is reached when the device is switched off. Device activity such as data transfer or measurements will increase the load time.
    Charging symbol: When charging via USB, a charging symbol appears in the display ( ), without USB cable, the battery remaining capacity is displayed in%.
- **Charge- LED:** As long as the battery is charged, the charge diode lights up on the device. When fully charged, it is off.
- **Removing the battery:** To remove the battery, switch off the device and, using a suitable screwdriver or a coin (for example, 2 €), unscrew the screw sleeve at the bottom of the handle together with the battery.
  An internal Goldcap capacitor ensures that the device clock is held even for several weeks without the battery.

INFO for measured data: An empty rechargeable battery has no influence on stored measurement data, these are stored on an internal SD card.

4.2 Switch On / Off / Energy Saving Mode



- To **switch on**, press and hold the **PAR** button for **2 seconds**.
  The startup screen displays the device firmware for a moment. Then the device is ready to measure and measures depending on the setting of the main display (T / Min / Max or Avg, see **4.7.1**) as well as from the set storage mode with or without data storage (also see **4.3.4**).
- **Ready / Energy saving mode:** If the measurement button or another button is not pressed for a while, the device switches to energy saving mode (the screen will become darker and turns off soon after). Pushing a button, it is immediately ready to measure again.
- To switch off completely, hold down the **PAR** button for **5 s**.
  After some time without pressing a button, the device switches off completely independently.



Setting the switch-off times: The times for the energy-saving mode and when the device is switch off are adjustable under PAR → **Device configuration** → **Power adjustment** → **Display of time** und **Device of time** (also see **4.11**).

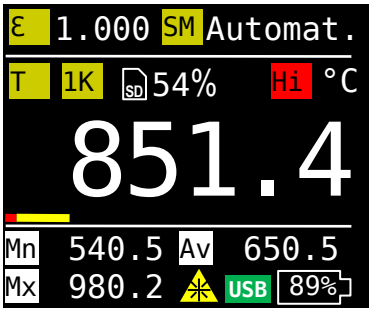
INFO for measurement accuracy: Like any pyrometer, the accuracy of measurement specified in the technical data is reached until the instrument has been switched on for at least 5 minutes (radiation pyrometers) or 20 minutes (2-color pyrometers). Therefore, if individual measurements are to be carried out again and again, it makes sense to set the device switch-off time a little longer.

4.3 Display Size

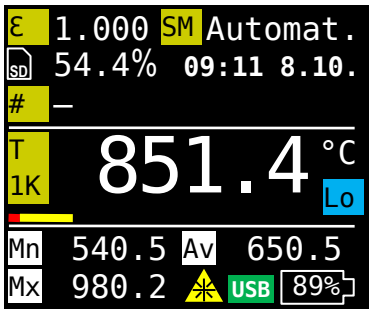
For the display on the back of the device, 2 display sizes with more or less details can be selected (selectable under: PAR → **Display → Display mode**; also see **4.7.1**).

The view finder always displays the temperature in white and $^{1}/_{10}$° resolution.

Large display



Detailed display



4.3.1 Meaning of the Display Symbols

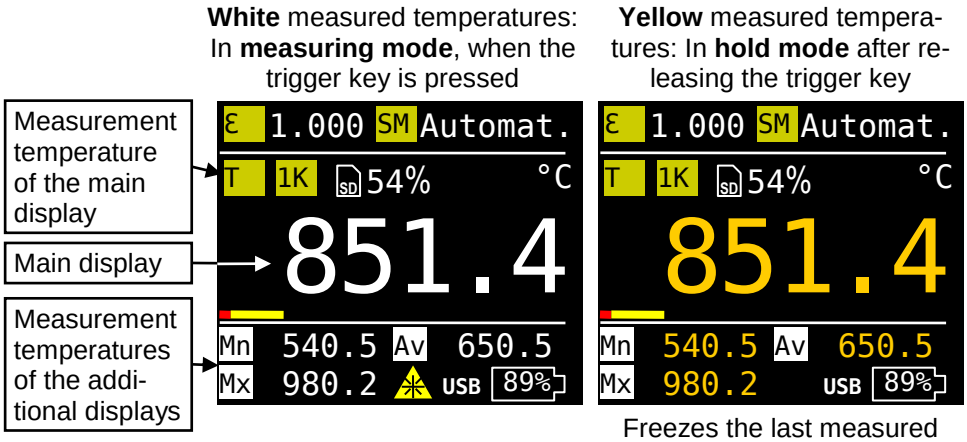
Large display	Detailed display	Meaning
ε εV		**Emissivity** (Epsilon) or **Emissivity slope** (only 2-color pyrometers)**:** Adjustable material properties
SM		**Storage mode:** Settings for the measured value storage
SD SD		**Storage:** Remaining capacity of the internal SD card. **Symbol highlighted in red:** During storage (briefly where applicable).
°C / °F		**Temperature unit** for all displayed measured values
Measuring temperature		**Display** in $^{1}/_{10}$°C or °F **– – – –** Temperature range underflow / no measurement **OVER** Exceeding maximum temperature
2C / 1C		**Measuring mode** (only 2-color pyrometers)**:** 2C: 2-color measuring temperature 1C: 1-color measuring temperature
T / T Mn / Mn Av / Av Mx / Mx		**Measuring temperature** (current value) **Minimum value** (updated continuously) **Average** (determined as long as the trigger key is pressed, is displayed after releasing the trigger key) **Maximum value** (is updated continuously)
Hi Lo		**Hi- or Lo-alarm:** Set measurement temperature is exceeded or has fallen below (is always measured, regardless if the trigger key is pressed)
#		**Measuring location:** ▪ „– “ (none) uses all measurement parameters set on the device ▪ Via software created: uses measuring points with respective measuring parameters and measuring mode
–	**Time / date**	Each measured value data set is saved with date and time, which are displayed here (setting by PC time synchronization).
		Infrared signal indicator (only 2-color pyrometers)**:** Informs whether there is enough signal for a sufficient measurement. In the red beginning area a larger measurement inaccuracy is to expect by increased signal noise. Below 10%, a measurement is not possible.
		Laser targeting light is switched on.
USB USB		**USB:** USB interface is available for PC data transfer. **Symbol highlighted in green:** With detected connection to the PC port.
		Battery indicator: **Symbol black:** Residual capacity in percent. Memory full: display 100% **Symbol red:** Residual capacity <15%. At 10% the device switches off. **Charging symbol:** with charging voltage connection via USB. In addition, the "charge" LED lights up.

4.3.2 Measured Value Display / Measured Value Colors

The main display can show:

- Current value (T)
- Maximum value (Mx)
- Minimum value (Mn)
- Average (Av)

The additional displays then show the other measured values accordingly (selection: see **4.7.1 Display** and 4.3.3 **Quick menu**).



White measured temperatures: In **measuring mode**, when the trigger key is pressed

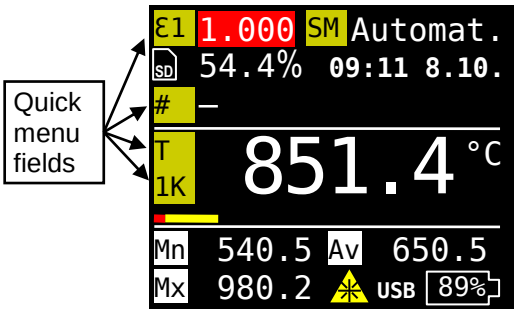
Yellow measured temperatures: In **hold mode** after releasing the trigger key

Freezes the last measured values until the trigger key is pressed again.

4.3.3 Quick Menu

The quick menu allows you to change frequently used settings without having to go to the main menu. All light yellow highlighted fields can be called up in sequence and change:

- ENT activates the first quick menu item, the changeable entry is highlighted in red.
- ENT pressed again: selects the next setting field. After the last field the quick menu will be left. PAR also leaves the quick menu and takes over the current selection.
- ▲ ▼ Change settings, the selection is immediately active.



Note: Quick menu fields can only be changed if no measuring location ("–" at #) is selected. For these, measuring parameters and the measuring mode are preset (via software, see also 4.8 **measuring locations**).

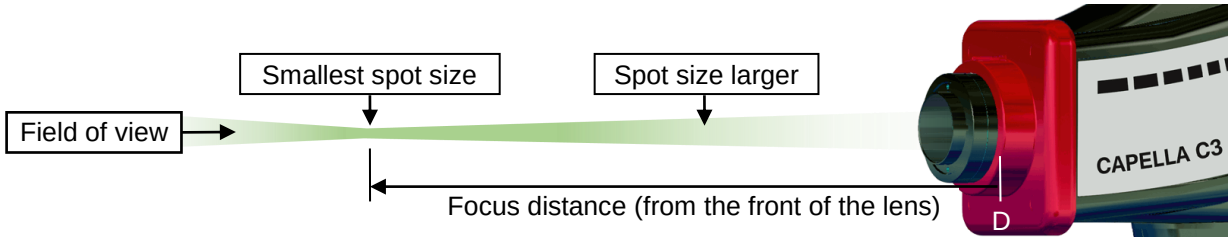
4.3.4 Storage Mode / Trigger Key Functions

SM: Setting whether values are stored in the device or not when the trigger key is pressed.

Storage mode	Storage of measured values	Trigger key function
Display	Without	Pressing the trigger key displays measured values.
Automatic	One reading	When releasing the trigger key, the value measured at this time is automatically saved.
Confirmation	One reading	When releasing the trigger key, the value measured is held (display is yellow). A red confirmation field appears, the measured value is saved after confirmation with ENT. Pressing the trigger key will continue the measurement without saving.
Continuous (1 ms)	Continuously every millisecond	Saves as long as the trigger key is held down
Interval measurement	According to measuring and idle times	Trigger key starts the measurement trigger key stops the measurement.

4.4 Optics Adjustment / Spot Size

The pyrometer measures object temperatures throughout its field of view. In the focus distance of the optics (infrared focus distance), the pyrometer's spot size is the smallest. For measurements outside the focus distance (the defocused area), the average temperature of a larger measurement area is measured.



4.4.1 Close-up lens

If the close-up lens lens is to be used for close range, it must be screwed in place of the protective window.

4.4.2 Adjusting the Focus Distance

To adjust the focus distance, rotate the optics so that the required distance is aligned with the arrow on the upper front of the device.

INFO for simplified adjustment: Often it is not necessary, always to measure with the smallest spot size, so that it is sufficient to adjust the optics to 5 m for example. Measurement objects with a shorter distance are thus also detected, although not with the smallest possible spot size.

4.4.3 Spot Size Table

The table gives some example values for focus distances and the corresponding spot size diameters of the different device versions (the values refer to 90% of the received energy), intermediate values must be interpolated. The table details apply from the front of the arrow.
In general, the focus distance corresponds to the measured distance and is therefore described in the table that way. Values in parentheses are with close up lens.

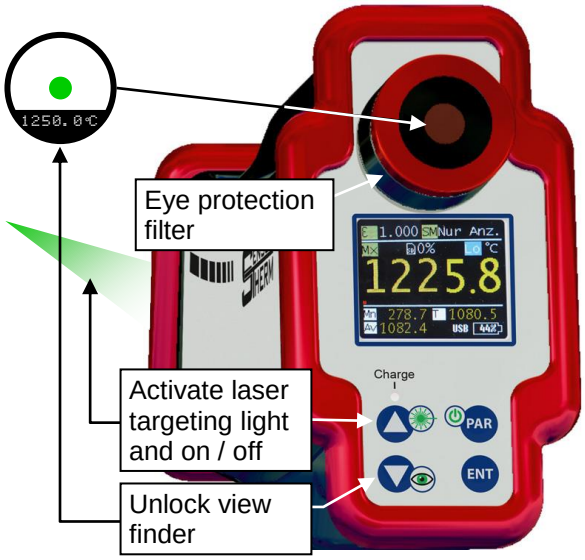
				Measuring / focus distance a [m]									
		Standard optics		0.4	0.5	0.6	0.7	0.8	1	1,5	3	5	10
		With close up lens		(0,15)									(0,8)
Model	C309	all TR	**Spot size Ø M [mm**	1.2 (0.4)	1.5	1.7	2	2.3	2.8	4	7.8	14	29 (0.8)
	C316	all TR											
	C318	all TR											
	C311	all TR											
	C322	FSC ≥ 1300°C											
	C322	FSC < 1300°C		1.7 (0.7)	2.7	3	3.7	4	5.6	8	14	24	51 (1.6)

TR = temperature range, FSC = Full scale temperatures

4.5 Alignment to the Measuring Object

It can be used either the view finder or the laser targeting light. When the laser targeting light is activated, the view finder is closed to prevent the eye from being endangered by possible laser back reflections.

- The **view finder** is equipped with an adjustable eye protection filter (polarizing filter). The brightness is changed by turning the eyepiece, it does not stop, but will change alternately from light to dark.



INFO about the target point size: The spot size mark in the form of a green circle shows the spot size in the focus point.

CAUTION
SAFETY INSTRUCTIONS

Risk of eye damage at measurement temperatures above 1400°C.

- Only look with darkened eyepiece at objects with temperatures above 1400°C / 2552°F to protect the eyes against glare at high radiation temperatures.
- Before looking at the high temperatures, always adjust the eyepiece by turning it to the darkest position using an alternative light source. A safe method is the adjustment by looking at a lamp.

- The **laser targeting light** has its largest diameter directly at the lens and the smallest and sharpest at the focused distance, i.e. at the point where the spot size is smallest.

INFO about the laser spot size: The size of the laser spot does not match to the target diameter, this is indicated in the spot size tables (see **4.4.3**).

CAUTION
SAFETY INSTRUCTIONS

Laser radiation, laser class 2, do not look into the beam.

- Never look into the direct or reflected laser beam.
- Do not point the laser to anyone.
- If laser radiation hits the eye, the eyes must be intentionally closed and the head immediately moved out of the beam.

The laser targeting light is activated as soon as the laser button is pressed to allow alignment for stationary measurements without having to press the trigger button. It turns off automatically after 60 seconds, but is limited by the display off-time, i.e. it also turns off when the display turns off (adjustable under **4.11 Device Configuration → Power adjustment**).
Otherwise, the laser is activated when the trigger button is pressed and de-activated when the button is released. This also means that with interval measurements the laser flashes according to the set measuring and pause times.

4.6 Measurement Conditions for Safe Measured Value Acquisition

The non-contact temperature measurement can be performed with radiation pyrometers or 2-color pyrometers.
Radiation pyrometers measure infrared radiation from objects in one spectral range, while 2-color pyrometers measure in two different spectral ranges simultaneously and determine the temperature from the ratio of the two radiation intensities. With 2-color pyrometers, it is not necessary to know the emissivity of the measurement material, it is canceled in the ratio formation.

The following measuring conditions must be observed:

4.6.1 Radiation Pyrometers

- The measured object must always be larger than the pyrometer's spot size, since the mean value of the radiation is detected via the spot size. If the measured object is smaller than the spot size diameter, measuring errors occur because background temperatures are included in the measurement.
- As an aid in alignment, the device can be aligned to maximum temperature.
- The pyrometer's field of view must be free from fumes, smoke or dust. These lead to a signal weakening and thus to a lower indication of the temperature.
- Measurements through windows are possible if they have constant transmittance properties in the spectral range of the pyrometer. The transmittance losses must be entered into the pyrometer (PAR → **Meas. parameters → Transmittance**, also see **4.7.2**).

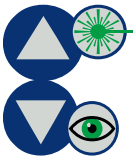
4.6.2 2-Color Pyrometers

- If the target is smaller than the spot size diameter, a warm background temperature effects the measurement. But an effect is to see from about 300°C and above the influence is also low.
- If the target is smaller than the spot size diameter, a lower signal strength occurs. Safe measurement is possible up to a signal strength of 10%. If this value is not reached, the measurement is switched off and the display no longer displays any measured value.
- Aligning the device to maximum temperature, such as with radiation pyrometers, does not work here, but it can aligned to maximum signal strength.
- If the emissivities of the target are different at the two pyrometer measurement wavelengths (for example, at bare metal surfaces), the emissivity slope of the target must be considered and entered into the device (see **4.7.2**).
- If the emissivity changes due to the surface or depending on the temperature for the two wavelengths (also, for example, at an oil film on the lens), large deviations of the 2-color temperature may result.
  A 2-color pyrometer behaves several times more sensitive to wavelength-dependent signal changes than a radiation pyrometer, the larger the difference and the lower the absolute value of the emissivity.
- Measurements through polluting viewing windows or through smoke or dust in the pyrometer's field of view are possible because the radiation ratio remains constant in this case. Prerequisite: The signal attenuation is homogeneous on both wavelength ranges.
- For measurements through windows, the window material is to be observed. If the transmission properties are not uniform (for example for quartz glass), the corresponding emissivity slope must be entered (see **4.7.2**).

4.6.3 Settings / Key Functions

Switching on / off and parameter menu:
- To switch on, press and hold for 2 s
- To switch off, press and hold for 5 s.
- Opens the device settings (not possible with active measurement).
- Goes back one step from each menu item and takes over changed settings.

Enter:
- Activates the quick menu (see **4.3.3**).
- The selected menu item is called up in the settings menu.
- Changed settings are taken over and the measurement display is displayed again.

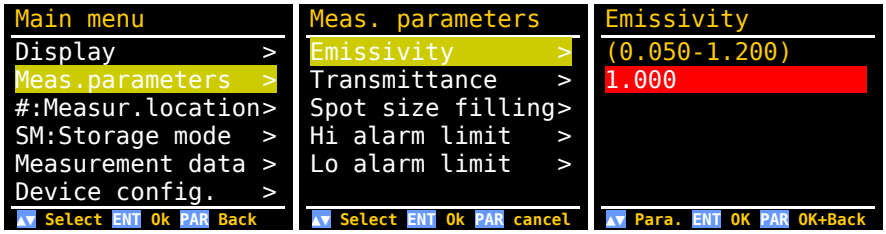


Arrow keys / laser targeting light / view finder:
- Select menu items.
- Change settings. Press and hold speeds up the run.
- Switching between laser targeting light and view finder.
- After 60 s without inputs, the measurement display is activated again.

CAUTION
SAFETY INSTRUCTIONS

Laser radiation, laser class 2, do not look into the beam.
- Never look into the direct or reflected laser beam.
- Do not point the laser to anyone.
- If laser radiation hits the eye, the eyes must be intentionally closed and the head immediately moved out of the beam.

- **Blue highlighted** menu items are selected.
- A **>** indicates a submenu.
- **Highlighted in red** is an active parameter that can be accepted or that can be set using the arrow keys.



- **Yellow text in parentheses** shows the adjusting limits.
- The bottom line gives a brief information about the key functions:
  - ▲▼ **Selection** of a menu item with the arrow keys
    ▲▼ **Para**meter setting with the arrow keys
  - ENT **Ok** takes over the parameter and jumps back directly to the measurement display
  - PAR **Back** goes back one step in the menu.
    PAR **Ok + Back** takes over the parameter and goes one step back in the menu.

When connected to a PC, all settings can also be made using the supplied *SensorTools* software (see **4.11**, **Software *SensorTools***).
Furthermore, interface commands can be used to communicate directly with the pyrometer, if necessary, the command table can be requested from us.

4.6.4 Factory Settings

Main display value	Current value
Display details	Large display
Display brightness	4
Meas. channel	2-color temp. [1]
Emissivity slope	1.000 [1]
Emissivity	1.000
Transmittance	100%
Hi-alarm limit	Beginning of temp. range
Lo-alarm limit	End of temp. range
Measuring location	no measuring location
Storage mode	none, only display
Interval storage	Measuring time: 1 s, idle time: 1 s
Temperature unit	°C (EU), °F (US)
Display off-time	1 min
Device off-time	15 min
Laser switch-off	60 s

[1] only 2-color pyrometers

4.7 Menu Items / Parameters

The settings are available with the latest firmware. If settings listed here are missing, the firmware is not up-to-date and can be updated via the ***SensorTools*** software (see **5.4.4**). When switching on, the current firmware version is displayed briefly.

4.7.1 Display

- The **main display** sets the display mode at the center of the display.
  - **Current temperature value (T):** Always displays the current measured temperature. Additionally Min / Max / Avg on the small additional displays.
  - **Average (Av)** value after measurement. In addition, T / Min / Max are displayed on the small additional displays.
  - **Minimum value (Mn)** value during the measurement. In addition, T / Avg / Max are displayed on the small additional displays.
  - **Maximum (Mx)** value during the measurement. In addition, T / Min / Avg are displayed on the small additional displays.

Main menu	Sub menu	Settings
Main menu Display >* Meas.parameters >* #:Measur.location>* SM:Storage mode >* Measurement data >* Device config. >*	Display Main display >* Display size >* Brightness >*	Main display Average (Av)* Minimum value (Mn)* Maximum value (Mx)* Current value (T)*
	Display Main display >* Display size >* Brightness >*	Display mode Large display* Detailed display*
	Display Main display >* Display size >* Brightness >*	Display brightness (0-9)* 4*

- **Display size:** Display size of the display (see **4.3**).
- The **brightness** of the display can be adapted to the ambient conditions.

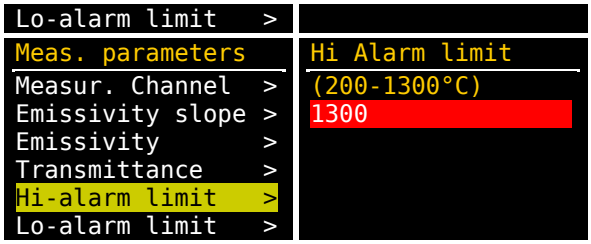
4.7.2 Measurement Parameters

- **Measurement channel:** Switches the measurement method from 2-color temperature measurement to 1-color temperature measurement.
- **Emissivity slope $\varepsilon_2/\varepsilon_1$:** (only 2-color pyrometers)**:**
  For 2-color temperature measurements, the emissivity slope of the target must be considered if the emissivity of the material at the two measurement wavelengths is different (e.g. at bare metal surfaces) and does not change during the thermal process being observed.
  Measuring objects that emits identical at both pyrometer measurement wavelengths (e.g., oxidized iron or steel surfaces) can be measured without correction with setting 1.00.
- **Emissivity ε:**
  With radiation pyrometers or with 2-color pyrometers in 1-color mode, the emissivity of the measured object must be considered.
  It indicates the heat radiating ability of the measurement object (see **4.7.2.1 Emissivity table**).
- **Transmittance:**
  If there is a viewing window between the measuring object and the pyrometer, the transmittance of the

Main menu	Sub menu	Settings
Main menu Display >* Meas. parameters >* #:Measur.location>* SM:Storage mode >* Measurement data >* Device config. >*	Meas. parameters Measur. Channel >* Emissivity slope >* Emissivity >* Transmittance >* Hi-alarm limit >* Lo-alarm limit >*	Measur. Channel Two-Color temp.* One channel temp.*
	Meas. parameters Measur. Channel >* Emissivity slope >* Emissivity >* Transmittance >* Hi-alarm limit >* Lo-alarm limit >*	Emissivity slope (0.50-1.500)* 1.000*
	Meas. parameters Measur. Channel >* Emissivity slope >* Emissivity >* Transmittance >* Hi-alarm limit >* Lo-alarm limit >*	Emissivity (0.050-1.200)* 1.000*
	Meas. parameters Measur. Channel >* Emissivity slope >* Emissivity >* Transmittance >* Hi-alarm limit >*	Transmittance (5.0-100.0%)* 100.0*

window must be taken into account during measurement and entered here.

- **Hi / Lo Alarm limit:** The display shows a Hi or Lo if the measured values entered here are exceeded or fallen below



4.7.2.1 Emissivity Table

In principle applies: to measure metals in a short-wavelength spectral range as possible, as here the emissivity is higher than in the long-wave range.
The specified values are guide values, which were determined in the laboratory and confirmed in application-oriented measurements. They can vary due to material-dependent conditions, as in metals additionally to the surface texture alloy components play an important role for the emissivity.

- Is a range given, this is related to differences in the nature of the surface from smooth to rough, rough surfaces have higher emissivities (for determining the correct emissivity also a comparison measurement can be performed with a thermocouple).
- The emissivities with "shiny" refer to applications that are performed under an inert gas or in a vacuum.
- "n.s." means that no values exist for this wavelength range (not specified), e.g. because a reasonable measurement in this wavelength or temperature range is not possible.

Measuring object	**Emissivity Ɛ** (Epsilon)		
	C309 **C311** 0.7–1.1 µm	**C316** **C322** 1.45–1.8 µm	**C318** 1.65–2.1 µm
Black body source	1	1	1
Aluminum, shiny	n.s.	0.05-0.2	0.02-0.4
Aluminum, oxidized	n.s.	0.3-0.4	0.3-0.65
Alu, sandblasted, rough	n.s.	0.4-0.5	0.4-0.7
Alu, black anodized	n.s.	0.9	0.9
Lead oxidized	n.s.	n.s.	0.2-0.7
Bronze	0.2-0.4	0.2-0.4	n.s.
Iron, liquid	0.15-0.3	0.1-0.25	0.1-0.2
Iron, shiny	0.3-0.4	n.s.	n.s.
Iron, oxidized	0.7-0.9	0.65-0.85	0.6-0.8
Graphite	0.8-0.92	0.8-0.9	0.8-0.9
Gold, shiny	0.02-0.05	0.02-0.05	0.02
Inconel, shiny	0.35-0.45	0.4	0.35
Inconel, oxidized	0.65-0.75	0.6-0.7	0.5
Copper, shiny	0.10	0.05-0.1	0.05
Copper, oxidized	0.3-0.7	0.2-0.8	0.2-0.7
Magnesium, shiny	n.s.	0.15-0.2	0.15-0.2
Magnesium, oxidized	n.s.	0.3-0.5	0.3-0.55
Brass, shiny	0.5-0.7	0.5-0.7	0.4-0.7
Brass, oxidized	0.6-0.8	0.6-0.7	0.5-0.6
Molybdenum, oxidized	0.7-0.9	0.7-0.85	0.65-0.8
Nickel	0.22	0.15-0.2	0.15-0.2
Porcelain, glazed	0.6	0.6	0.6
Porcelain, rough	0.8-0.9	0.8-0.9	0.8-0.9
Platinum	0.4	0.35	0.35
Soot	0.95	0.95	0.95
Chamotte	0.45-0.6	0.45-0.6	n.s.
Slag	0.85	0.8-0.85	n.s.
Silver, oxidized	0.1-0.2	0.05-0.2	0.05-0.2
Steel, shiny	0.4-0.55	0.3-0.45	0.3-0.4
Steel, oxidized	0.8-0.9	0.7-0.9	0.7-0.9
Steel, rolled	0.8-0.9	0.8-0.9	0.8-0.9
Stoneware, glazed	0.86-0.9	0.8-0.9	k.A.
Stainless steel	0.4-0.9	0.4-0.9	0.4-0.9
Titanium, shiny	0.35-0.45	0.3-0.4	0.3-0.4
Titanium, oxidized	0.55-0.85	0.55-0.85	0.5-0.7
Tungsten, shiny	0.3-0.45	0.3-0.4	0.15-0.25
Tungsten, oxidized	0.7-0.9	0.7-0.85	0.65-0.85
Brick	0.85-0.9	0.8-0.9	n.s.
Zinc	0.45-0.58	0.45-0.55	0.35-0.55

Measurement deviations at a 10% false set emissivity at a temperature of 700°C:	+10%	-6.5°C	-10.5°C	-12°C
	-10%	+7°C	+11.5°C	+13°C

To determine the correct emissivity, also a comparative measurement with a thermocouple can be performed.

INFO about the emissivity setting above 100%:
Materials has a maximum emissivity of 1 (100%). However, a setting of up to 1.2 can be used to compensate for temperature corrections due to higher background reflection.

4.8 Measuring Locations

Via software up to 100 own designations can be defined with preset measuring parameters and storage mode (see **5.4.1**). These can then be called up on the device without the measurement parameters can be changed on the device.
The function can also be used e.g. to create material lists with preset emissivities.

Main menu

```
Main menu
Display          >
Meas. parameters >
#:Measur.location>
SM:Storage mode  >
Measurement data >
Device config.   >
```

Settings

```
Measur.location
None (Standard)
Measuring parameters
can be adjusted

Next >>
```

INFO for changing measuring parameters and storage mode: If measuring parameters on the device have to be changed, no measuring location („–“ at #) may be selected.

4.9 Storage Mode

Main menu

```
Main menu
Display          >
Meas. parameters >
#:Measur.location>
SM:Storage mode  >
Measurement data >
Device config.   >
```

Settings / sub menu

```
Storage mode
Display only
Confirmation
Automatic
Continuous (1 ms)
Interval         >
```

Sub menu

```
Interval parameter
Measuring time   >
Idle time        >
```

Settings

```
Measuring time
(0.1-60.0 s)
1.0
```

Main menu

```
Main menu
Display          >
Meas. parameters >
#:Measur.location>
SM:Storage mode  >
Measurement data >
Device config.   >
```

Settings / sub menu

```
Storage mode
Display only
Confirmation
Automatic
Continuous (1 ms)
Interval         >
```

Sub menu

```
Interval parameter
Measuring time   >
Idle time        >
```

Settings

```
Idle time
(0.1-6000.0 s)
1.0
```

Storage mode	Storage of measured values	Function
Display	Without	Pressing the trigger key displays measured values.
Automatic	One reading	When releasing the trigger key, the value measured at this time is automatically saved.
Confirmation	One reading	When releasing the trigger key, the measured value is held. A red confirmation field appears, the measured value is saved after confirmation with ENT.
Continuous (1 ms)	Continuously every millisecond	Saves as long as the trigger key is held down
Interval measurement	According to measuring and idle times	Trigger key starts the measurement, Trigger key ends the measurement.

4.10 Measurement Data

Allows deletion of all measured values. Measuring location names with the corresponding settings are not deleted.

Main menu	Sub menu	Settings
Main menu Display >` Meas. parameters >` #:Measur.location>` SM:Storage mode >` Measurement data >` Device config. >	Measurement data Delete storage >	Measurement data Attention! All measurement data be deleted! Proceed? No Yes

4.11 Device Configuration

Main menu	Sub menu	Settings / sub menu	Settings
Main menu Display >` Meas. parameters >` #:Measur.location>` SM:Storage mode >` Measurement data >` Device config. >	Device config. Language >` Date/time >` Celsius/Fahrenh. >` Power adjustment >` Factory settings >	Language English Deutsch	
	Device config. Language >` Date/time >` Celsius/Fahrenh. >` Power adjustment >` Factory settings >	Date/Time 22.06.18 09:21:25 Adjustment only via PC!	
	Device config. Language >` Date/time >` Celsius/Fahrenh. >` Power adjustment >` Factory settings >	Celsius/Fahrenheit Celsius Fahrenheit	
	Device config. Language >` Date/time >` Celsius/Fahrenh. >` Power adjustment >` Factory settings >	Power adjustment Display off time >` Device off time >	Display off time 15 Sek. 30 Sek. 1 Min. 5 Min. 15 min. 30 Min.
	Device config. Language >` Date/Time >` Celsius/Fahrenh. >` Power adjustment >` Factory settings >	Power adjustment Display off time >` Device off time >	Device off time 1 Min. 5 Min. 15 Min. 30 Min. 1 Std.
	Device config. Language >` Date/Time >` Celsius/Fahrenh. >` Power adjustment >` Factory settings >	Factory settings Attention! All parameters will be reset! Proceed? No Yes	
	Device config. Language >` Date/time >` Celsius/Fahrenh. >` Power adjustment >` Factory settings >` Info >	Info Capella: C32203001000 Serial: 9926 Firmware: 55/2018 Calib.: 20.04.2018	

- **Language** selects the menu language.
- **Date** and **time** can be synchronized with the PC time via a PC connection (see **5.3.1**). The display depends on the selected temperature unit:
  - °C: day.month.year and 24h time
  - °F: month/day/year and 12h time with am/pm
- **Celsius / Fahrenheit** changes the temperature unit accordingly. The choice affects the display of time and date.
- **Power adjustment:**
  - **Display off time:** Defines when the device turns off the screen to save energy when no button has been pressed for a while.
  - **Device off time:** Defines when the device turns off automatically when no button has been pressed for a while.
- **Factory settings:** Resets all adjustable parameters to the factory settings (see **4.6.4 Factory settings**).
- **Info:** Shows device information such as device with temperature range, serial number, firmware and last calibration date.

5 Software *SensorTools*

5.1 Installation

With the minimum requirements devices can be connected, read out and configured.

Min. system requirement:	Pentium IV processor with min. 1.6 GHz and 2 GB RAM 20 MB hard drive capacity for the program, USB 2.0
Screen resolution	min. 1024x768
Operation system:	Windows Vista Ultimate, 7, 8, 8.1, 10

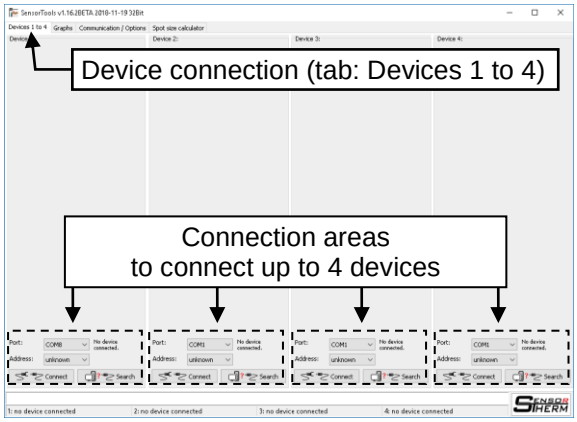
- To install, start the setup program. It can be found on the supplied CD or can be downloaded from sensortherm.de/en/download-section.
- Follow the on-screen instructions

INFO: There are regularly provided software and firmware upgrades available that add functionality or fix bugs. It is recommended always to install the latest software and firmware (via software check in *SensorTools* (see **5.4.4**) or on the homepage in the download area under www.sensortherm.de/en/download-section

5.2 Program Start / Connecting the Pyrometer

The device connection takes place in the very left tab "Devices 1 to 4", where up to 4 pyrometers can be connected to the software.
The device must be switched on.

For connection in one of the connection areas, proceed as follows:



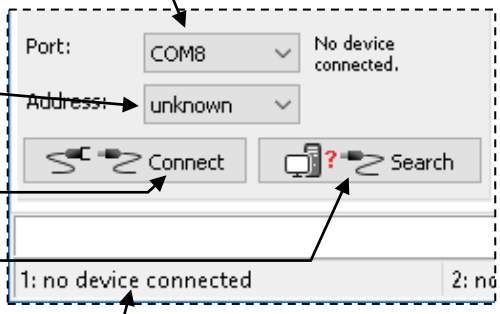
Port: Select PC interface (if known, otherwise try out all available ports in sequence)

Address: Enter device address (if known, select "Unknown" to let the software search automatically)
Note: It is not possible to connect 2 devices with the same device address.

Connect / Disconnect to software.

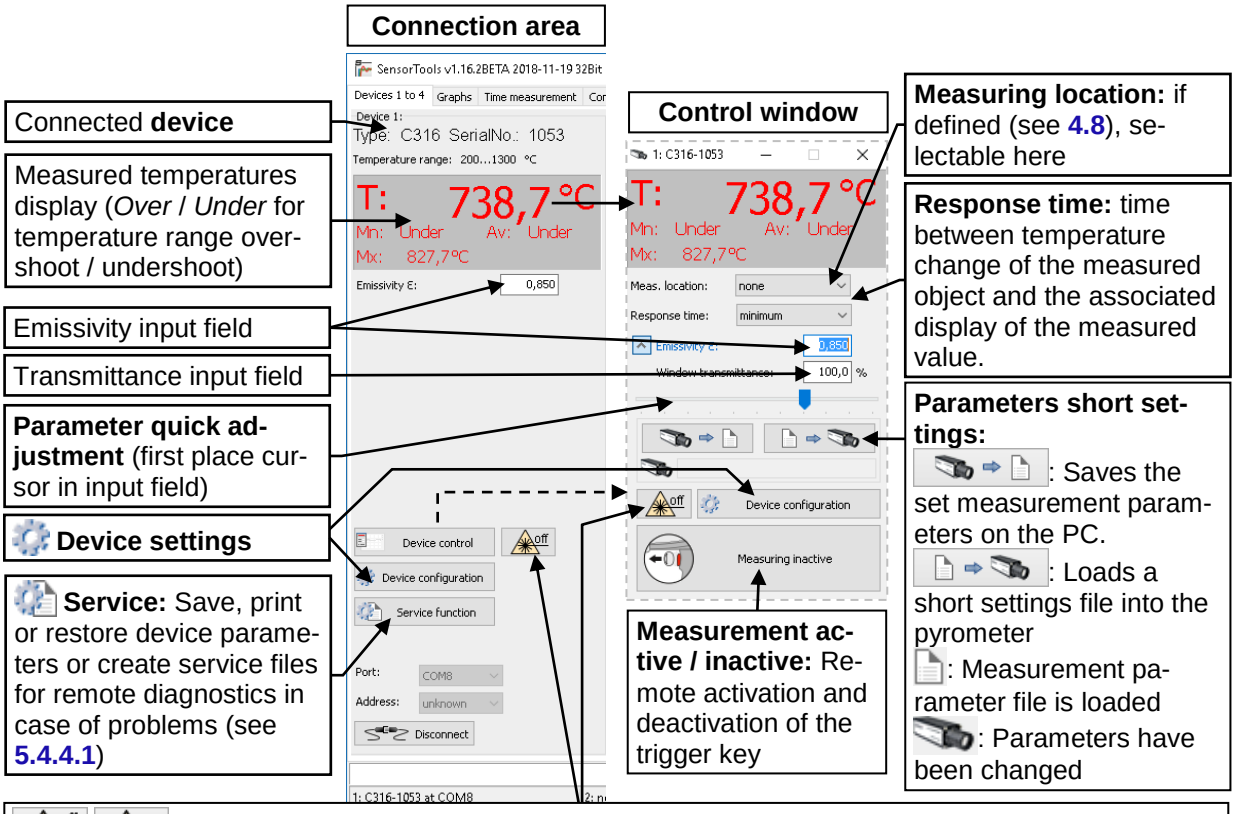
Search: Searches all PC ports in order and automatically connects the found device.

The **status line** informs you after connection about the found device type, serial number and COM port.



5.3 Connection Area / Control Window

- All **pyrometer settings** are read and displayed when the device is connected.
- **Parameter changes** are immediately transferred to the pyrometer.
- **Key lock on the device:** With connected pyrometers, the control buttons on the device are blocked to prevent simultaneous adjustment. When pressing the key, "**Key locked**" appears on the device.
- The **graph tab** is only available for stationary pyrometers and allows to display the temperature profile online.



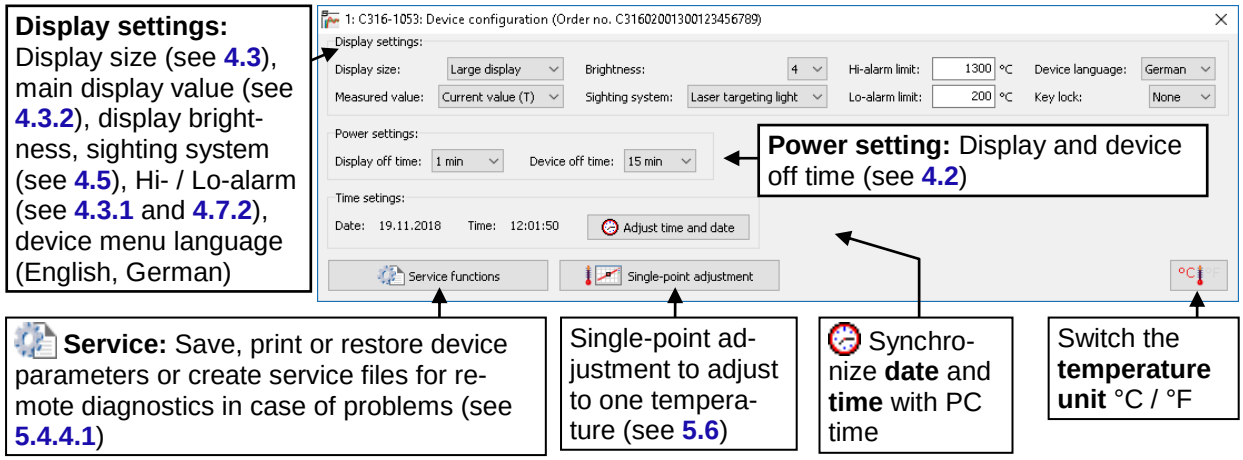
Laser targeting light: Can be switched on and off.

CAUTION
SAFETY INSTRUCTIONS

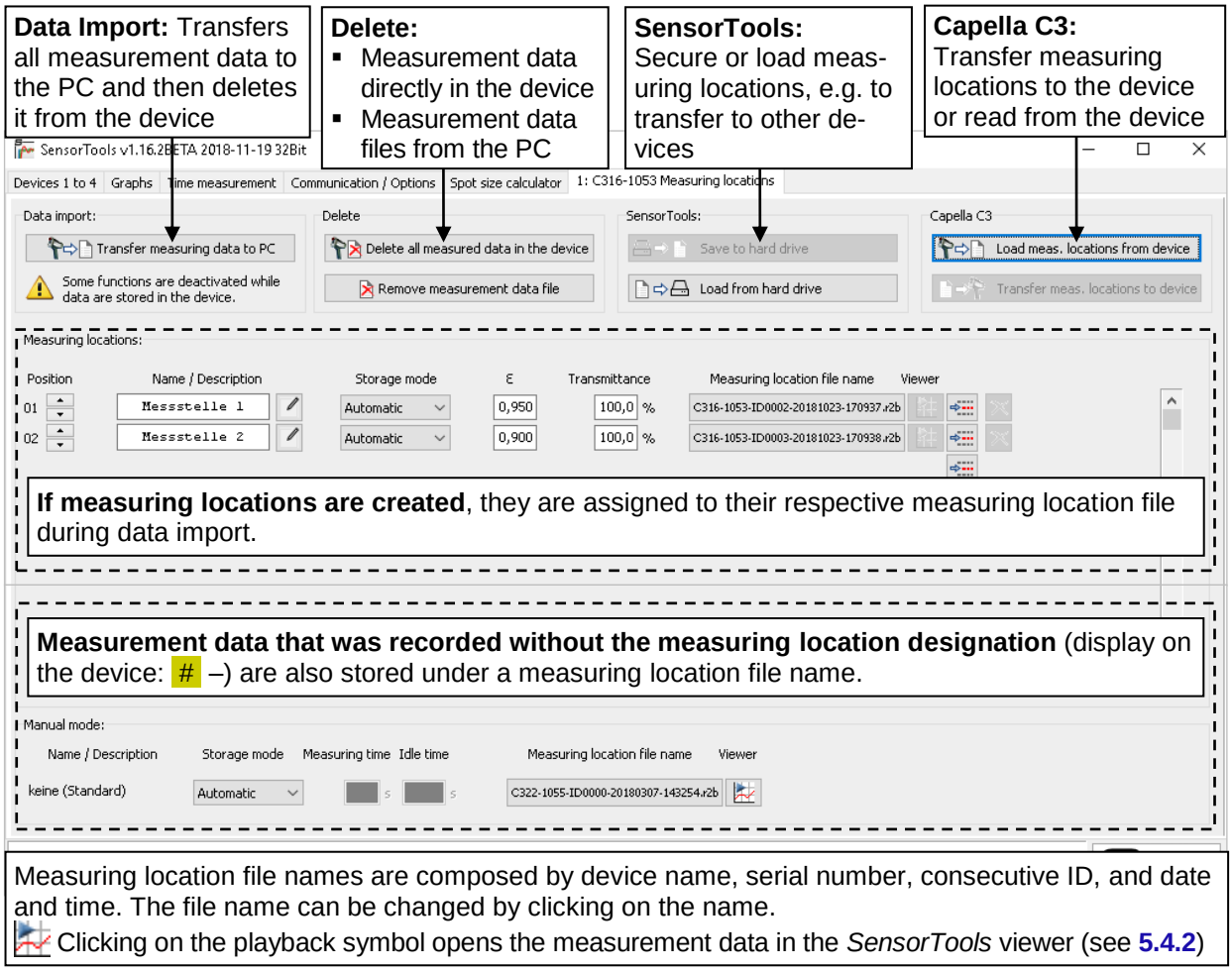
Laser radiation, laser class 2, do not look into the beam.

- Never look into the direct or reflected laser beam.
- Do not point the laser to anyone.
- If laser radiation hits the eye, the eyes must be intentionally closed and the head immediately moved out of the beam.

5.3.1 Device Configuration

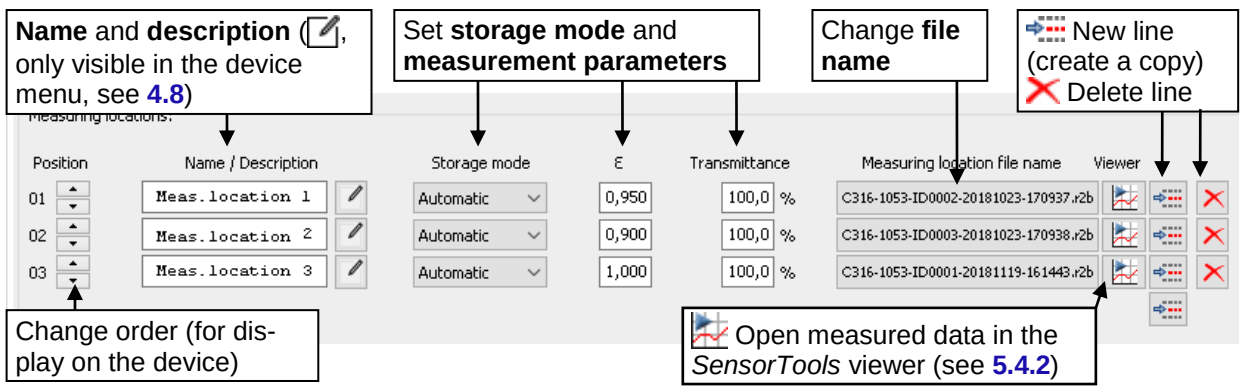


5.4 Read Out and Display Measured Data

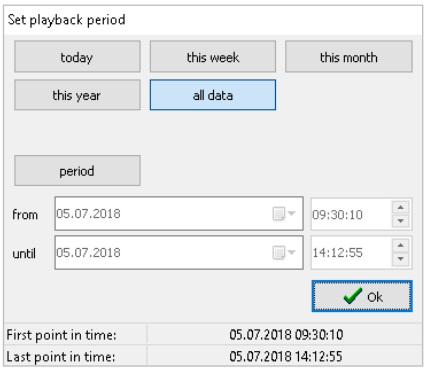


5.4.1 Define / Editing Measuring Locations

Measuring locations are own designations with preset measuring parameters and storage mode. These designations can be called up on the device via the quick menu or the main menu, so that these settings can be used to measure. In this settings the measurement parameters cannot be changed on the device. The function can also be used to e.g. create material lists with preset emissivities. Up to 100 measuring locations can be stored.
Note: Measuring locations can only be deleted if measured data contained in them has been transferred to the PC (top left "Transfer measuring data to PC").



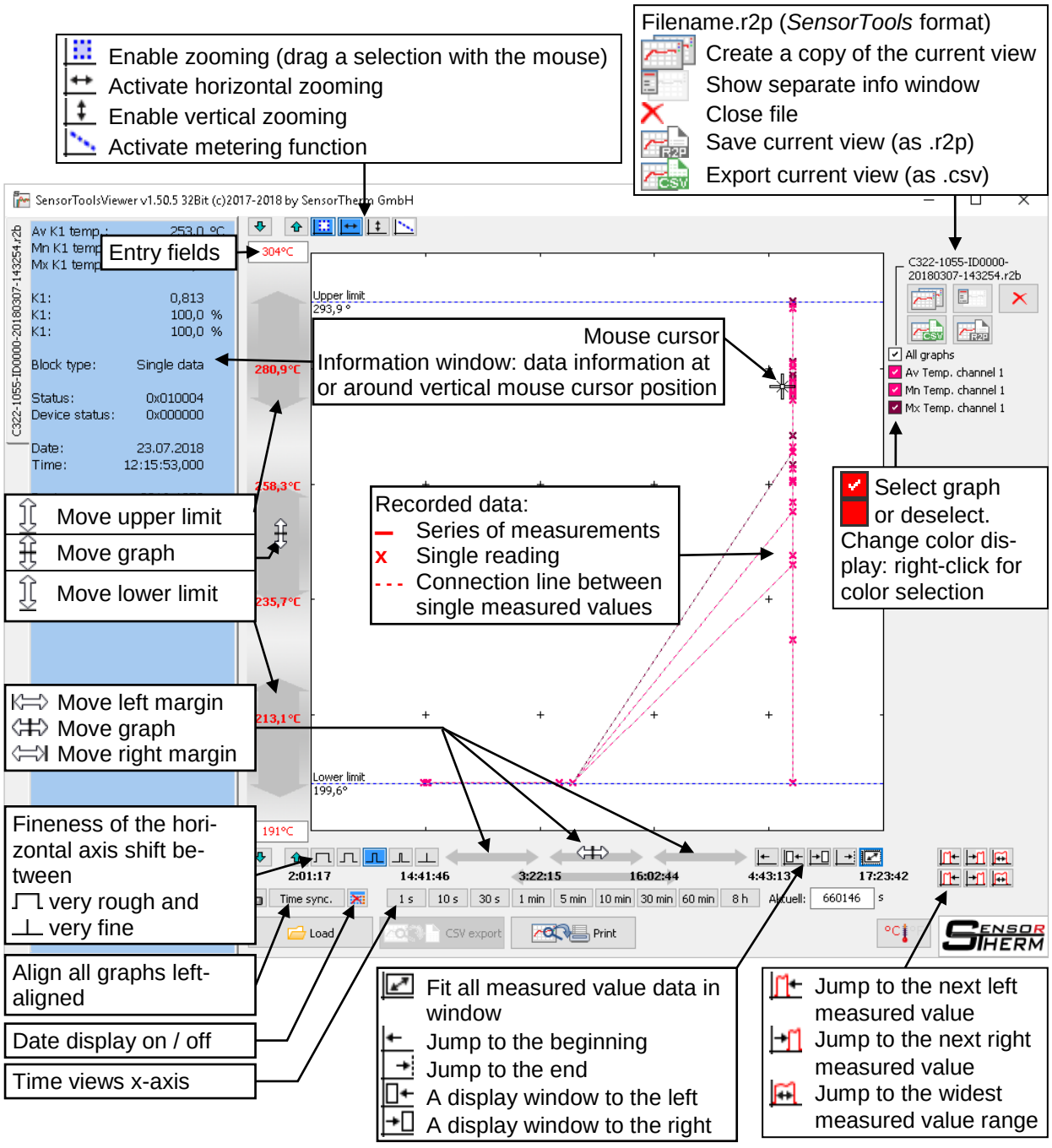
5.4.2 Displaying Measurement Data Graphically in the *SensorTools* Viewer



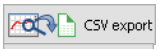
The **playback button** behind each measurement data file opens the *SensorTools* viewer and displays the file content graphically.

Defining the playback period: The measuring data are saved with a time stamp so that the playback period can be limited for clear presentation when loading data.

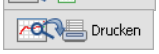
Each measurement storage consists of a data set: T, min, max, avg, date, time, emissivity, or emissivity slope (depending on device type and measurement mode).



Load up to four r2b files (click: from last used file path, Shift + click: from standard working directory (standard working directories can be set in *SensorTools* in the "Communication / Options" tab).
Data files can also be dragged and dropped into the viewer window.
Double-clicking on a data file opens a separate viewer window.

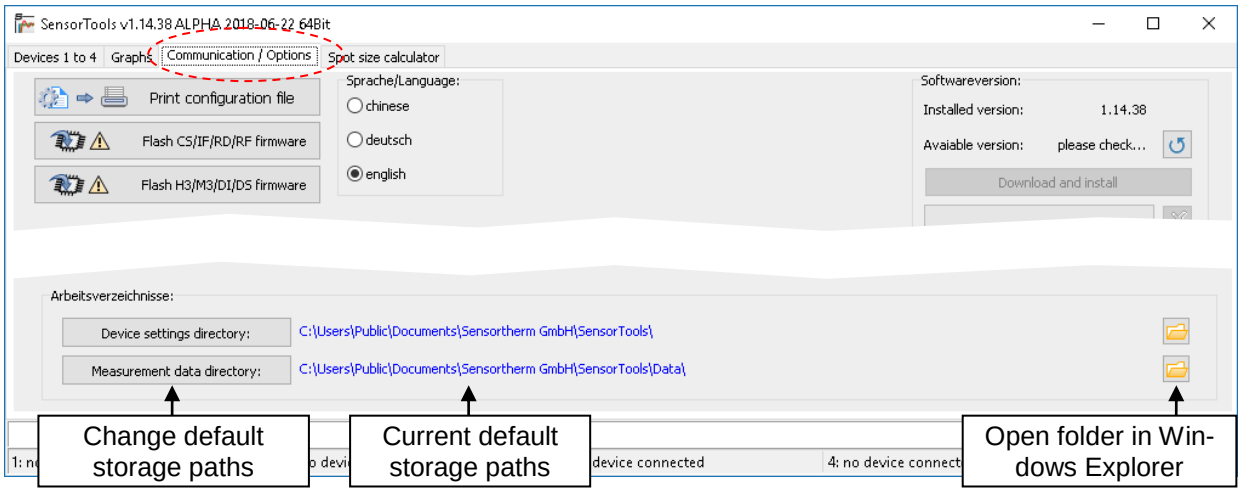


Exports the current view of all loaded files to a csv file (for example, for Excel).



Prints the current view.

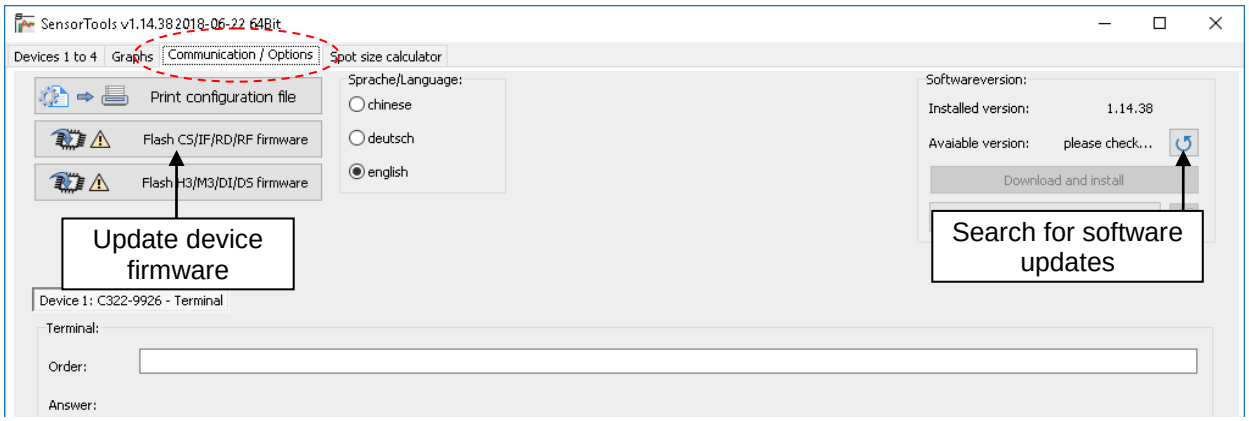
5.4.3 Select Default Storage Paths in *SensorTools*



Device settings directory: Path for all software-internal and device-specific data, including defined measuring locations or parameter files (short setting files, saved via the control window).
Measurement data directory: Path for all data read from the device.

INFO: The storage paths can only be changed if no device is connected.

5.4.4 Language, Updates, Service Options

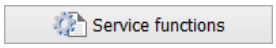


- **Sprache / Language:** Selects the language of the program interface.
- **Print configuration file** has the same function as in the device configuration under "service functions": Prints a stored device settings file.
- **Software version:** A click on "please check" checks if a *SensorTools* update is available. In a newer version than the one installed, the "Download and Install" button is activated. Every *SensorTools* software has with the delivery date the latest firmware files integrated.
  Note: If the software check does not work, this possibility may not be possible due to internal company

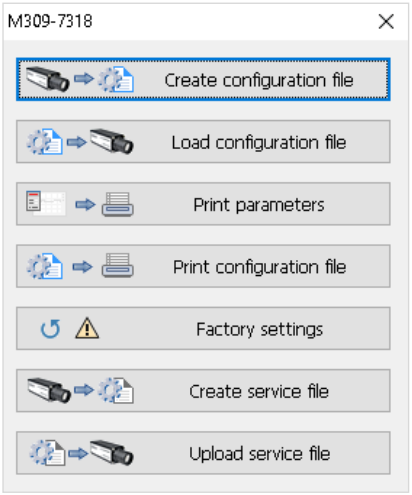
network restrictions. The latest software and firmware are also available on the homepage in the download area at www.sensortherm.de/en/download-section.

- **Firmware update C3 / CS / IF / RD / RF:** If a new firmware file is available (with the delivery date each *SensorTools* software has the latest firmware integrated), this can be installed here. To do this, the correct port must be selected in the update window, then the c3f file can be selected from the suggested directory (or from the downloaded and saved file) by clicking on *firmware update*. The firmware is then automatically installed, a note box informs about the completion.
- **Firmware update H3 / M3 / DI / DS:** The update process of pyrometers of this type is done by calling the SensorFlash software, the further process is described in the device instructions.
- The **terminal field is** used to communicate with the pyrometer via interface commands. A command table is not printed here because this type of data exchange usually does not occur in handheld devices. If necessary, contact our customer service (address last page below).

5.4.4.1 Service Functions

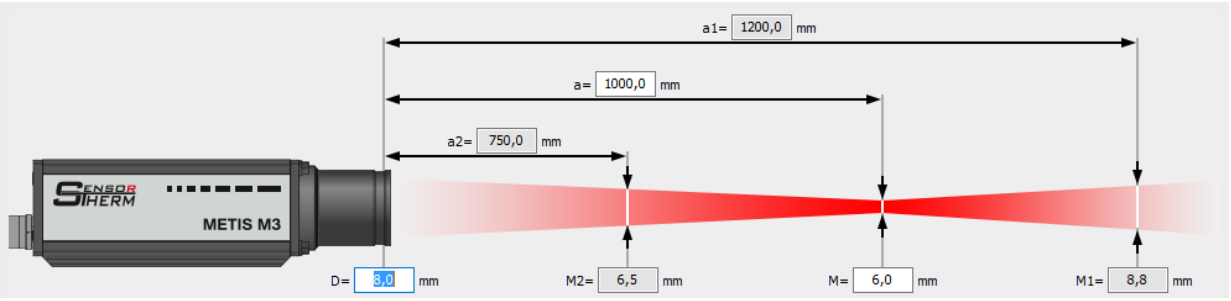


To back up, for printing or restore device parameters or create service files for remote diagnosis of problems.



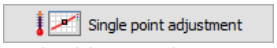
- **Create configuration file:** A configuration file includes all device settings made by user. This can be used e.g. to setup a new pyrometer with the same values and settings or to save the current status in case of a device replacement.
- **Load configuration file:** load a previously saved configuration data in the pyrometer.
- **Print parameters:** Prints the parameters of the currently connected device.
- **Print configuration file:** Prints a saved file.
- **Factory settings:** Resets the device to its factory defaults.
- **Create service file:** A service file includes all device data and all software settings made by user. Creating such a file can be useful if a problem can't be solved and help from our service could be useful.
- **Upload service file:** Transmitting a (possibly modified) file to the device it was created from.

5.5 Spot Size Calculator



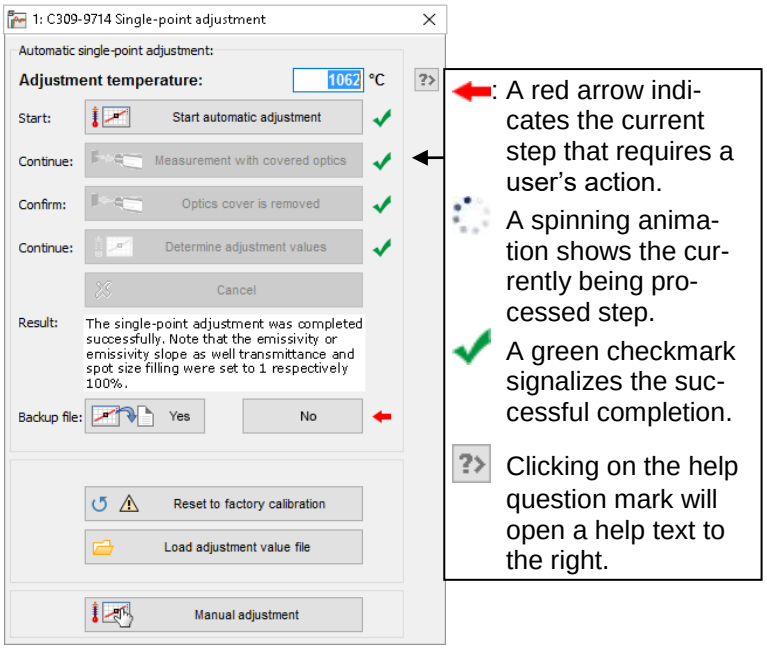
The spot size calculator is used to calculate the spot size diameter in front and behind the focused measuring distance. It is usually only required for stationary devices.
To do this, first fill in the white fields with the basic data (see **4.4.3 Spot size table**, then values in the gray fields can be calculated.

5.6 Single-Point Pyrometer Adjustment

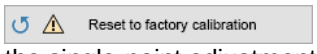


The single-point adjustment function can be used to automatically compensate optical losses in measurements through windows or lenses with unknown transmittance. For this purpose, a calibration source is set to the required process temperature, and then a temperature measurement through the windows or lenses is taken to newly define the measured value.

This function adjusts the pyrometer to one specific temperature and ensures accurate measurements in the range around this temperature. In this case, the original calibration curve is attenuated in percentage terms, so that the adjustment has a greater impact at high measuring temperatures than at low ones. The calibration temperature should not be directly at the beginning of the temperature range, preferably around 20% of the total measuring range above the beginning of the temperature range.
Info: Each one-point adjustment deletes an existing one and replaces it with the new one.



- Enter the **adjustment temperature**.
- Align the pyrometer to calibration source and click on "**Start automatic adjustment**.
  Note: This will set the emissivity as well as the emissivity slope (only 2-color pyrometers) to 1 (100%), will switch off the peak picker and set the response time to 5 ms.
  These values are not automatically set back to their previously set values and then have to be readjusted afterwards!
- **Measurement with covered optics:** Cover the lens so it is opaque and start the measurement. Leave the lens covered until the green tick appears on the right and the next step is active (can take up to 20 seconds).
- Remove the optics cover and **confirm** that the **optics cover is removed**.
- **Determine adjustment values** continues the automatic adjustment in front of the calibration source.
- **Result:** After finishing the adjustment of the success or failure will be displayed in text form.
- A **backup file** can be created with the determined adjustment values (an adjustment value file). This can be used to write the values back into the device at any time, e.g. if the instrument has been reset to factory calibration or to save different calibration value files.

- 

Resetting to factory calibration will restore the pyrometer to the state before the single-point adjustment.
- 

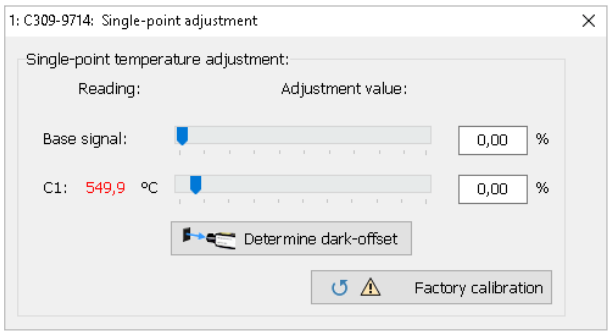
Load adjustment value file loads adjustment values from a saved file into the pyrometer.

Manual adjustment The single-point adjustment function also can be performed **manually with sliding controllers**. In this case the numerical value of the adjustment can be observed.

- **Preparation:** First, the parameters emissivity, emissivity slope (for 2-color pyrometers), transmittance and spot size filling should be set to 100%, as well as switch off the maximum value storage and set the response time to 10 ms.

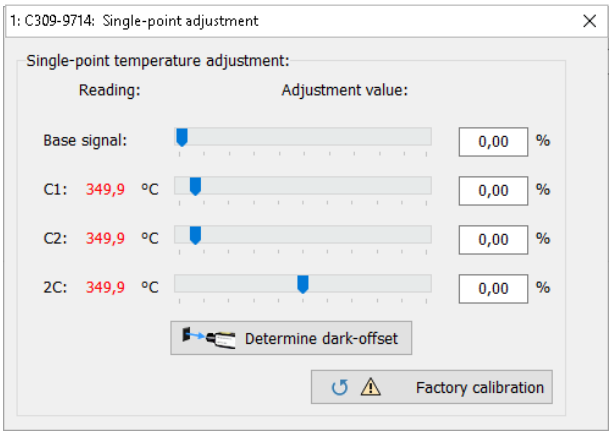
- Then move the sliders one by one:

  - **Radiation pyrometers:**
    - **Base signal:** move as long as C1 has reached the target temperature.
    - Determine dark-offset **Measurement with covered optics:** Cover the lens so it is opaque and start the measurement. Leave the lens covered until the green tick appears on the right and the next step is active (can take up to 20 seconds). If the temperature deviates by several degrees after the dark offset, this indicates that the lens was not 100% darkened and extraneous light has penetrated. Then repeat the step.



    - If the adjustment temperature deviates after that step, use the **C1 controller** for readjustment.

  - **2-color pyrometers:**
    - **Base signal:** Move until the higher value of C1 or C2 has reached the target temperature.
    - Determine dark-offset **Measurement with covered optics:** Cover the lens so it is opaque and start the measurement. Leave the lens covered until the green tick appears on the right and the next step is active (can take up to 20 seconds). If the temperature deviates by several degrees after the dark offset, this indicates that the lens was not 100% darkened and extraneous light has penetrated. Then repeat the step.



    - **C1 or C2:** Then readjust the other channel (C1 or C2) to the target temperature. When determining the dark-offset, under circumstances the values of C1 or C2 can be slightly misaligned. In this case C1 and C2 must are readjusted to the desired value.
    - **2C:** Finally, adjust the 2-color temperature until the temperature value of the calibration source is shown correctly.

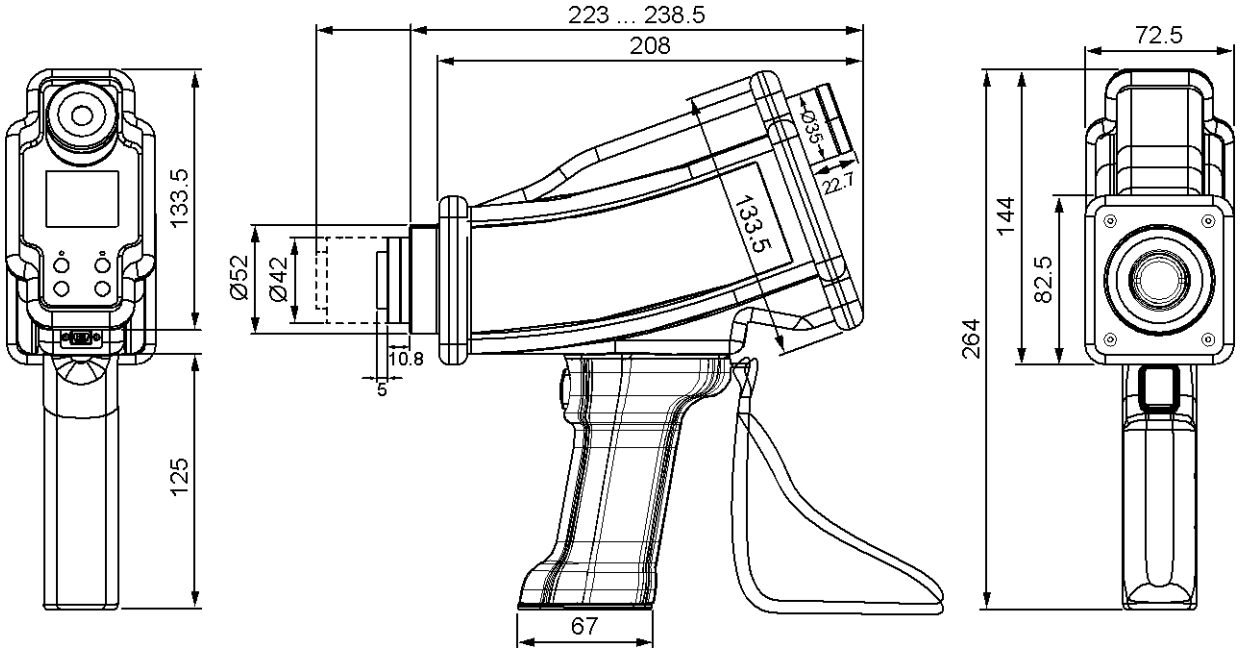
- Factory calibration: Resetting to factory calibration will restore the pyrometer to the state before the single-point adjustment.

6 Technical Data

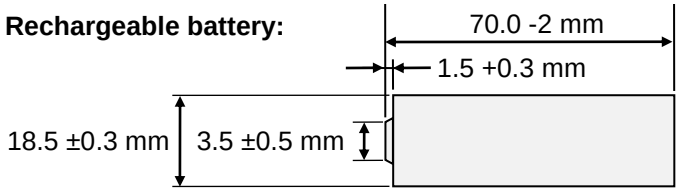
Models	Radiation pyrometers			2-color pyrometers	
	C309	C316	C318	C311	C322
Temperature ranges [°C]	600–1600 750–2500 900–3000 *) 1000–3300 *)	250–1300 350–1800 400–2500	180–1300	600–1400 750–1800 900–2500	300–1000 350–1300 500–1800
Temperature ranges [°F]	1112–2912 750–2500 900–3000 *) 1000–3300 *)	250–1300 350–1800 400–2500	180–1300	600–1400 750–1800 900–2500	300–1000 350–1300 500–1800
Spectral range [µm]	0.7-1.1 *) 0.87	1.45-1.8	1.65-2.1	0.75-0.93 / 0.93-1.1	1.45-1.65 / 1.65-1.8
Detector	Silicon	InGaAs	InGaAs	2 x Silicon	2 x InGaAs
Response time t90	< 1 ms (with dynamical adaptation at low signal levels), adjustable up to 10 s				
Exposure time	< 0.5 ms				
Uncertainty (ε = 1, t_{90} = 1s, T_A = 23°C)	Full-scale temp. up to 2500°C: 0.25% of reading in °C+1K Full-scale temp. above 2500°C: 0.5% of reading in °C		0.4% of reading in °C +1K (min. 2°C)	0.5% % of reading in °C + 2K	
	Note: The measurement uncertainty is reached after a warm-up phase min. 5 min (C309 / C316 / C318 or 20 min (C311 / C322) (device must be switched on)				
Repeatability (ε = 1, t_{90} = 1s, T_A = 23°C)	0.1% of reading in °C + 1 K		0.2% of reading in °C +1K (min. 1.6°C)	0.1% of reading in °C + 1K	
Interface	USB 2.0				
Display	OLED display, 160 x 128 px., temperature resolution 0.1°C/°F with detailed display, 1°C/°F with large display				
Display temperatures	Instantaneous value, minimum value, maximum value (peak picker), average value				
Device parameters	Adjustable via 4 buttons on the device: emissivity (0.050–1.200), emissivity slope (only C311 / C322: 0.650–1.450), transmittance (5-100%), Hi and Lo alarm limit, selection of measuring locations, storage modes (only display without storage), 1 value automatically, 1 value with key confirmation, continuously (1 ms), interval (with adjustable measuring and pause times), language (English + German), temperature unit (°C/°F). Adjustable via interface: measuring locations (100).				
Power supply	Rechargeable Li-Ion battery type 18650 with protection board 8 Button Top), 3.6 V, 3500 mAh, changeable. Charge via USB port. Battery life > 8 h. Ambient temperature: 0–45°C / 32–113°F charge -20–60°C / -4–140°F discharge -20–25°C / -4–77°F storage max. 1 year -20–45°C / -4–113°F storage max. 3 month long time storage: preferred charge state 30–50% at 20°C / 68°F				
Data storage	Internal SD card for 32000 measured values including date, time, measuring parameters, measuring location designation, not replaceable.				
Sightings (switchable)	▪ Laser targeting light (green, λ=515 nm, P< 1 mW, laser class 2 acc. to IEC 60825-1) ▪ Parallax-free through-lens view finder with aiming mark and temperature display, with polarizer in the eyepiece (adjustable brightness attenuation for high measuring temperatures)				
Protective window	Scratch resistant Gorilla glass protective window				
Mounting thread	Tripod thread 1/4 “UNC				
Ambient temperature	0–60°C				
Relative humidity	None-condensing conditions				
Housing / protect. class	Aluminum, IP65 to DIN 40 050, handle: plastic				
Weight	Approx. 1200 g				
E label	According to EU directives for electromagnetic immunity				

6.1 Dimensions

Device:



Rechargeable battery:



6.2 Composition of the Type Number

The equipment version of the pyrometer is encoded in the 20-digit model number as follows (Example type number C309 with 600–1600°C; laser targeting light + view finder, optics A):

Digit	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
Example:	C	3	0	9	0	6	0	0	1	6	0	0	5	7	2	1	3	0	A

Digit	**Indication of the various points**	**Code**	**Meaning / Example**
01-02	Device series C3	C3	Metis C3
03-04	Spectral range	09	0.7–1.1 µm or 0.87 µm (Si)
		16	1.45–1.8 µm or 1.4 µm (InGaS)
		18	1.65–2.1 µm (InGaS)
		11	0.75–1.1 µm (2 x Si)
		22	1.45–1.8 µm (2 x InGaS)
05-08	Beginning of temperature range [°C]	0600	600°C
09-12	End of temperature range [°C]	1600	1600°C
13	Sighting	5	Laser targeting light (green) + view finder
14	Interface	7	USB
15	Lens type	2	Manual focusable optics
16-17	Minimum response time	13	<1 ms
18	Configuration	0	Standard
19	Measuring distance / Optics	A	(integrated) optics A, 380 mm – 10 m

7 Maintenance

7.1 Cleaning

CAUTION **Turn off the device before performing any maintenance.**
Switch off the device before beginning any maintenance work in order to prevent the risk of injury from accidentally activated laser light.

The optics lens or protective screen can be cleaned with a soft cloth and a little acetone. Use only high-purity acetone to avoid residue.

- Do not clean the objective lens with acidic solvents.
- Do not place the objective lens in water or other liquids for cleaning

The housing can be cleaned with a damp cloth.

- Do not use acetone to clean plastic parts and plastic stickers.

7.2 Pyrometer Calibration

To obtain the measurement accuracy, we recommend to re-calibrate the pyrometer periodically (annually) with the help of calibration sources and optionally adjust at Sensortherm.

7.3 Trouble-Shooting

If necessary, a device malfunction can be read out. To do this, the terminal box must be called up via SensorTools, where it can be typed in via the fs command. Contact us to interpret the answer so that we can find a solution to the problem.

To further limit the possibilities, a service file can be created via the software *SensorTools* (see under **5.4.4.1** → **Service functions**) and from which we may possibly draw conclusions about the cause of the failure.

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