Quick Start Manual

Detailed operation manual under **www.sensortherm.de/en/download-section**
There also the current device firmware and the *SensorTools* software can be downloaded.

Model Designs

Sightings:
- Through-lens sighting
- Laser targeting light
- Camera module

Optics:
- Fiber optics
- Manual focusable optics
- Motorized focus optics

General Information
- Read this manual and the complete user manual carefully before operating the product. All security notes and operation procedures in the manuals must be followed to ensure safety.
- 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.
- Sensortherm is not responsible for damage caused by failure to observe instructions in this manual, deviation from intended use, assignment of unskilled personnel, unauthorized modifications, technical modifications or the use of unapproved spare parts.
- For devices with integrated PID controller Sensortherm assumes no guarantee that the temperature control in all processes meet the desired requirements. Sensortherm excludes the process responsibility.

Safety
- When connecting or when working on the **mains voltage**, general safety guidelines must be observed, e.g. when connecting power transformers. Mains voltage can cause serious injury. Improper installation can cause physical damage. Only qualified personnel are allowed to work with mains voltage.
- For easy alignment, the pyrometers may be equipped with a **laser targeting light**, laser class 2 (according to IEC 60825-1). The laser emits a visible red light with a maximum power of < 1 mW and a wavelength around 650 nm. Devices with laser targeting light are marked with a LASER 2 sticker.
  Safety instructions: Never look into the direct or reflected laser beam. Do not point the laser at anyone. If laser radiation hits the eye, the eye should be averted immediately.
- Devices with **through-lens sighting** and temperature range above 1400°C 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.

Intended Use
The 2-color pyrometers of the Metis M3 and H3 series are devices for non-contact temperature measurement. The M3 models have a response time of < 1 ms. The H3 models are high-speed instruments with a response time of < 80 µs.

1   Electrical Connection

The unit is ready for operation when connection is made to the voltage supply. Interrupt the power supply to turn off the pyrometer. To prevent accidental short circuits, cable wires not in use should be secured to the supplied screw terminals.

Cable color	No.	Function
White	1	+ 24 V DC power supply (18–30 V DC, power consumption M3: max. 6 VA, H3: max. 12 VA)
Brown	2	0 V DC power supply (ground)

2   Overview

Sighting: Through-lens view finder, laser targeting button or connector for color video

Display
- 2C: Ratio temperature (2-color) measuring mode
- C1 / C2:   1-color temp. measuring mode channel 1 or 2
- – – – –:   Measured temperature below zero scale temp.
- OVER: Measured temperature above full scale temp.

LEDs 1,2,3 (Active digital outputs)
- Green: Indicates an activated digital output

LED 4 (Operating status LED)
- Orange: Self-test phase
- Green: Ready to operate
- Red: Error

3   Parameters (adjustment buttons for pyrometer configuration)

PAR Press the button repeatedly to get access to all settings sequentially (subcategory with >)

▲ ▼ For adjustment of the possible parameters in the categories

ENT Opens a parameter category or takes over a modified parameter value

DISPLAY>	Temperature on display
DISPTMP:2C	Ratio (2-color) temperature
DISPTMP: C1	Temperature channel 1 (longer spectral range)
DISPTMP: C2	Temperature channel 2 (shorter spectral range)
MEASPARA>	Measurement parameters
T90	Response time t_{90} (min–10 s)
STMOD	Storage mode peak picker: OFF, trigger (TRIG), automatic (AUTO), extern (EXT), time clear (TIME)
CLR	Clear time settings of storage mode (only if STMODE set to TIME): times for time clearing: 1 ms–25 s
SLO	Emissivity slope (0.800–1.200)
SW.OFF	Switch-off limit (2–90%)
Ɛ1	Emissivity (epsilon) channel 1 (5–120%)
TR1	Transmittance channel 1 (5–100%)
Ɛ2	Emissivity (epsilon) channel 2 (5–120%)
TR2	Transmittance channel 2 (5–100%)
FF	Fill factor of spot size (5–100%)
ZSC	Zero scale temperature
FSC	Full scale temperature
TU	Temperate unit °C / °F

OUTPUTS>	Outputs
ANALOG>	Analog outputs
A1	Analog current output 1 (0/4–20 mA)
A1TST	Test current analog output 1 (OFF, 10 mA at 0–20 mA, 12 mA at 4–20 mA)
A2	Analog current output 2 (0/4–20 mA)
A2OUT	Signal analog output 2: off (OFF), 2-color temperature (2C), temperature channel 1 (C1) or channel 2 (C2), control output (CTR; only devices with PID controller), device temperature (DTMP)
A2TST	Test current analog output 2 (OFF, 10 mA at 0–20 mA, 12 mA at 4–20 mA)
INTERFACE>	Serial interface
RSTYPE	Interface type RS232 / RS485 (only M3)
BD	Baud rate RS232: 4.8–115.2 kBd, RS485: 4.8–921.6 kBd
ADD	Address (00–97)
DELAY	Interface delay (00–20)
MISC>	Miscellaneous settings
LG	Language (English / German)
N.PIN	Set (new) pin for push button lock (OFF = no pin request)
FACT.SET	Reset the device to the factory setting (no / yes)

4   Factory Settings

- **Analog output 1**: 4–20 mA, signal of the measured temperature (always that temperature, displayed on the device)
- **Analog output 2**: no temperature output (manipulated variable for devices with PID controller)
- **Serial interface**: RS485, baud rate: 115.2 kBd
- **Emissivity slope** $Ɛ_2/Ɛ_1$=1, **emissivity** Ɛ=1 (100%)

- **Response time** t_{90}= min (corresponds M3: < 1 ms; H3: <80 µs)
- **Digital inputs / outputs**
  - **1:** Set to input: switching on / off laser targeting light (devices with view finder or camera: no function)
  - **2:** Set to input: clearing of peak picker storage
  - **3:** Set to input: no function

## 5   Adjusting the Measuring Distance / Focus Distance

In the focus point of the lens (focus distance) the spot size diameter is smallest, outside the focused distance the spot size diameter is usually bigger. Precise spot sizes can be found in the complete operating manual under "Spot size tables".
- The **laser targeting light** has its smallest and sharpest picture at the point where the spot size is the smallest.
- **View finder and camera module:** The measuring distance is found when the object is in focus.

Manual Focusable Optics

1. Release
2. Adjust
3. Lock (hand-screwed)
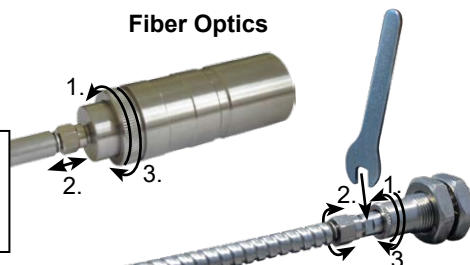
A sticker on the optics shows the focus range or distance ("a" from front of the lens)

Fiber Optics

Motorized focus optics

6   Important **Measuring Parameters**

- **Emissivity slope $\varepsilon_2/\varepsilon_1$** or **emissivity ε:** For a correct measurement result, the surface characteristics and the emissivity of the material to be measured must be considered. In 2-color temperature measurement mode this is the emissivity slope, in one-channel mode this is the emissivity (an emissivity table can be found in the operating instructions).
- **Response time t_{90}:** Short setting enable the fastest measurement. At longer response times, the measurement signal is smoothed and average values for temperature fluctuations are formed caused by the inertial measurement.
- The storage mode is turned on when the **peak value**, **minimum value** or the **average temperature** of the current measurement is to be captured and displayed or used via the outputs.
- If a viewing window is located between the measuring object and the pyrometer, the **transmittance** of the window must be considered during the measurement. Enter the transmittance of the window in order to obtain a correct measurement result.

7   Connecting **Analog Devices**

The pyrometer has 2 separate **analog outputs** for connecting additional evaluation devices:

- Adjustable to **0-20 mA** or **4-20 mA**
- **Analog output 1** always provides the measured temperature
- **Analog output 2** can be assigned to provide the 2-color temperature, the 1-color temperature, the device temperature, or the control value (manipulated variable) for devices equipped with a PID controller.

Cable color	No.	Function
Green	3	+ Analog output 1 (0 / 4–20 mA)
Yellow	4	- Analog output 1 (0 / 4–20 mA)
White-green	14	+ Analog output 2 (0 / 4–20 mA)
Brown-green	15	- Analog output 2 (0 / 4–20 mA)

8   Configure **Inputs / Outputs**

3 via software *SensorTools* configurable inputs / outputs are each available as:

- **Digital output:** output of a switching signal (50 mA) at different temperature events.
- **Digital input:** switch device functions externally via an input voltage pulse.
- **Analog input** (only M3): adjust via external 0–20 mA the emissivity slope, emissivity (at 1-color measurements), the setpoint (when equipped with a PID controller) or the measuring distance (at motorized focus optics).

Cable color	No.	Function
Grey	5	Digital input / output 1 [1]
Pink	6	Digital input / output 2 [1]
Blue	13	Digital input / output 3 / Analog input [1]

[1] Reference potential 0 V, brown

9   Use of the **Serial Interface**

The serial interface is used for digital communication with a computer, for example via the included software *SensorTools*.

- RS232: Baud rate 4.8–115.2 kBd for a short direct connection up to max. 20 m.
- RS485: Baud rate 4.8–921.6 kBd for direct connection or bus operation with up to 32 devices.

The pyrometer can be connected to a PC with USB port via a **USB interface converter** (recommended accessory).

| Cable color	No.	Function
Black	9	RS232: RxD; RS485: B (+) [2]
Grey-pink	11	
Violet	10	RS232: TxD; RS485: A (-) [2]
Red-blue	12	
Red	8	DGND (ground for interface)

[2] H3 models only RS485

## 10   *SensorTools* **Software** (min. Windows 7)

All pyrometer settings can be adjusted via software when a PC connection is established via the serial interface port (for example, via an USB interface converter). Functions such as the configuration of the inputs / outputs can only be carried out via software.

In addition, the measurement value trend is displayed numerically and graphically and can be recorded.

With connected pyrometer the device keys are locked, when pressing a key "KEY LOCK" appears.

About *SensorTools*, the pyrometer can be updated to a new firmware

version to fix bugs or add new features. *SensorTools* including the latest firmware can be downloaded from the website at www.sensortherm.de/en/download-section (given by entering the model number (first 4 characters) and serial number required).
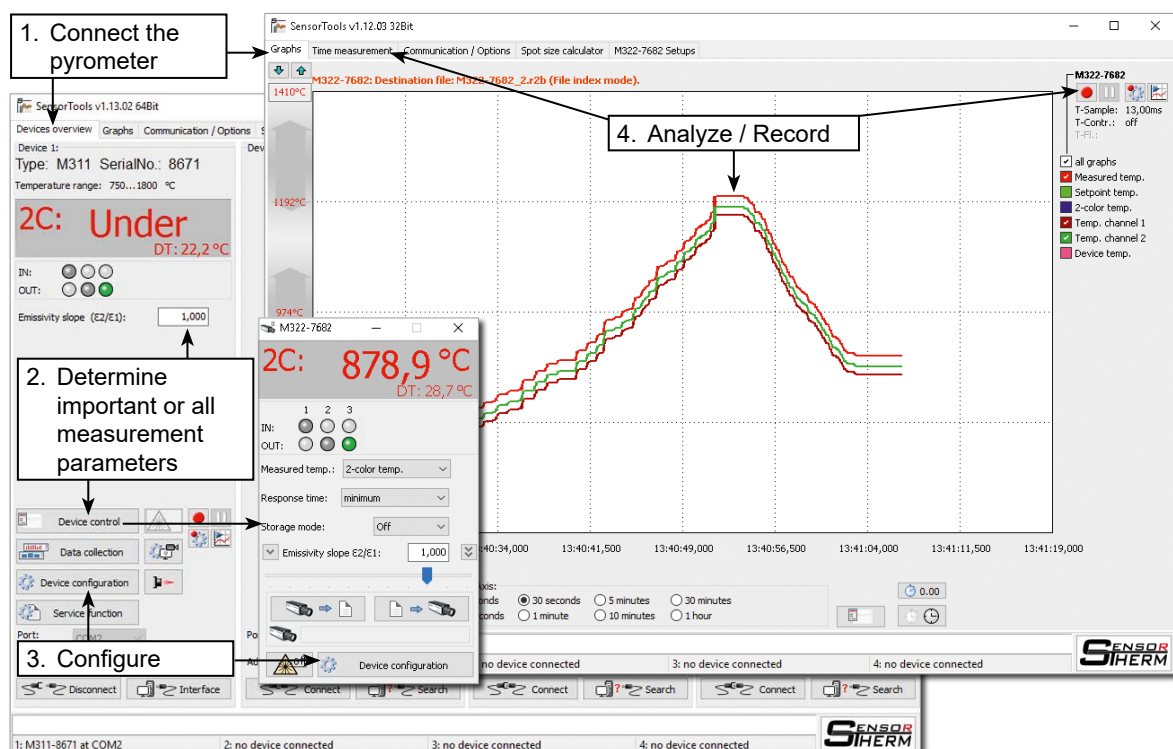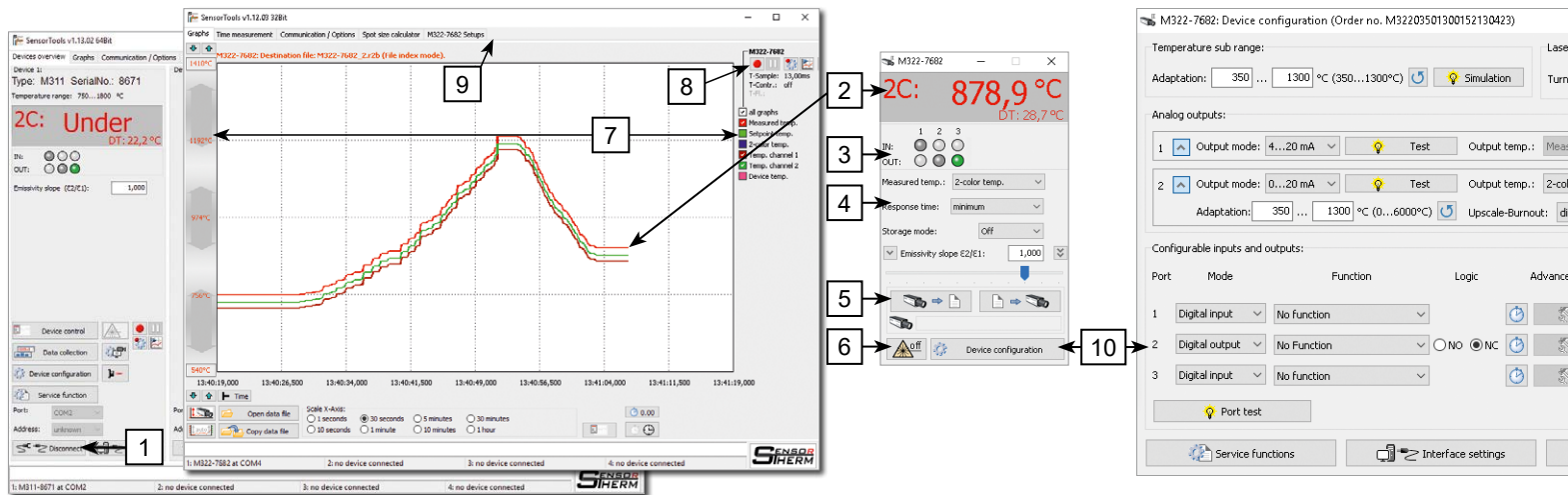
1. **Connect the pyrometer:**
   - automatically (search)
   - manually (select COM → connect)

2. **Temperature display:**
   - numerically (as on the pyrometer)
   - graphically (displayed in time)

   Measuring temperature
   DT: read out device temperature

3. **Digital inputs / outputs:**
   - shows active inputs or outputs

   IN: digital inputs , OUT: digital outputs
   Port ⊙ not activated, ◉ inactive, ● active

4. **Set measuring parameters:**
   - measuring relevant
   - rarely required
     (⌄ and ⌄ to extend)

   Measuring mode selection

   Select measurement parameters
   or type in or via
   quick adjustment (active field)

5. **Save measuring parameters:**
   - save all values under a file name

   Save pyrometer parameters in file
   Load parameters from file

   Parameters are read from pyrometer
   Parameters of currently loaded file

6. **Alignment:**
   (Icons device-dependent)
   - switching on / off laser targeting light
   - configure monitor settings of the camera module
   - set measuring distance at motorized focus

   Laser targeting light
   Measuring distance at motorized focus
   Monitor settings of camera module
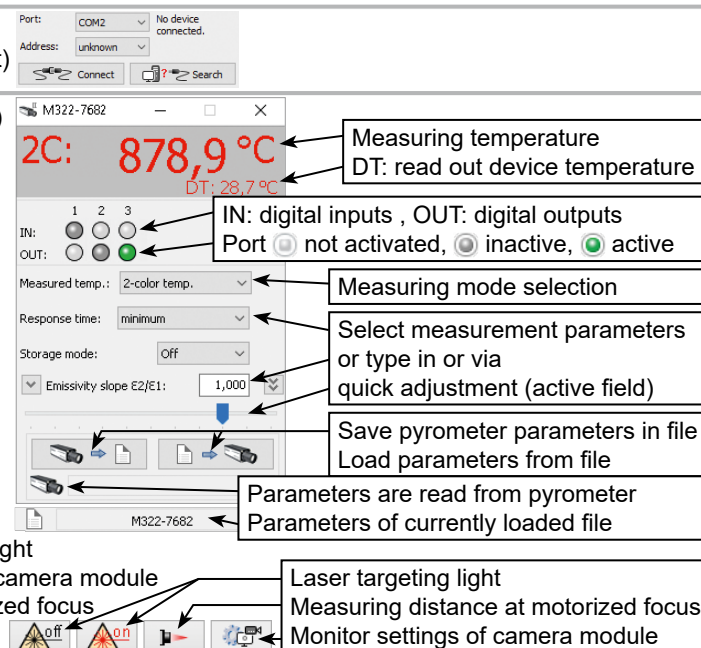
7. **Graphic presentation:**
   - customize view in the data recording window
   - select view graphs

   ☑ all graphs
   ☑ Measured temp.
   ☑ Setpoint temp.
   ☑ 2-color temp.
   ☑ Temp. channel 1
   ☑ Temp. channel 2
   ☑ Device temp.

   Scale per mouse click
   Scale per entry
   Scale with mouse drag
   Adapt to pyrometer's temp. range
   Auto-adjust (if the measured value
   runs out of the window)
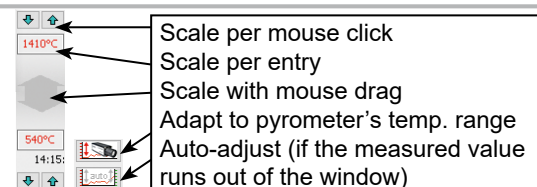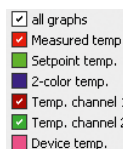
8. **Record data:**
   - save measurement data incl. all parameters
   - customize recording settings
   - show measurement information
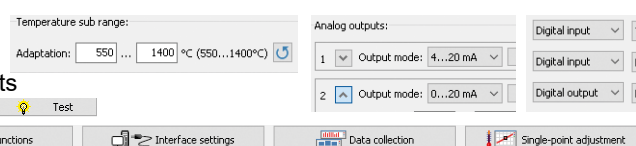   - playback and analyze in the viewer

9. **Configuration files:**
   - save complete pyrometer configurations
     (setups) and activate them on the PC or
     externally via digital inputs
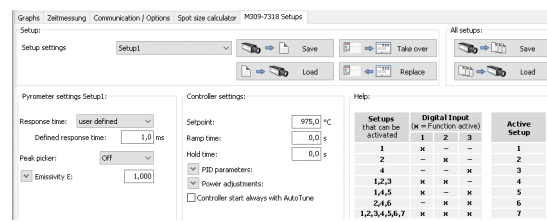
10. **Device configuration:**
    - perform basic device settings [Device configuration]
    - limit temperature range if necessary
    - adapt analog outputs to terminals
    - assign functions to digital inputs / outputs
    - test analog and digital outputs
    - access service functions
    - configure interface and data collection settings
    - adjusting the pyrometer to a specific measuring temperature value (single-point adjustment)