

Metis H311 / H322

Highly Advanced, Full Featured 2-Color High-Speed Pyrometers

METIS
High-Speed



High-Speed 2-color pyrometer for non-contact temperature measurement in short wavelength spectral range, primarily for measurements on metals and bright and shiny materials, ceramics and graphite.

- Measurement through polluting sight-glasses, dust or smoke
- Measurements of measuring objects that are smaller than the pyrometer's spot size
- Ideally suited for temperature measurement and control in laser processes.

- Fully digital and very fast with response time < 80 μ s for more than 25,000 measurements per second
- Temperature ranges between 350°C and 3300°C (662°F and 5972°F)
- Highest accuracy and repeatability
- Dirty window programmable alarm
- Different optics with small spot sizes from 0.9 mm available
- Laser targeting light, color video or through lens sighting
- 10-digit matrix display for temperature and IR sensor parameters
- Push button device configuration or via software
- 2 high resolution 16 bit analog 0/4 to 20 mA outputs
- 3 versatile configurable inputs or outputs
- Serial RS485 high-speed interface
- Optional equipment: PID controller or fieldbus systems, analog input for external setpoint adjustment with PID controller

Technical Data

| Model | H311 | H322 |
|--|---|--|
| Temperature ranges | 600–1100°C 650–1300°C 750–1400°C 900–1800°C | 1000–2000°C 1100–2200°C 1300–2500°C 1600–3300°C *) |
| Temp. sub ranges | 350–800°C 400–1200°C 500–1300°C 550–1400°C | |
| Spectral range | 700–2300°C 1000–2500°C 1300–3000°C **) | Channel 1: 0.75–0.93 μm / Channel 2: 0.93–1.1 μm *) Channel 1: 0.78 μm / Channel 2: 0.99 μm |
| Detector | 2 x Silicon | 2 x InGaAs |
| Response time t_{90} | Channel 1: 1.45–1.65 μm / Channel 2: 1.65–1.8 μm **) Channel 1: 1.4 μm / Channel 2: 1.64 μm | |
| Exposure time | 2 x Silicon | |
| Uncertainty ($\epsilon = 1$, $t_{90} = 1$ s, $T_A = 23^\circ\text{C}$) | 2 x InGaAs | |
| Repeatability ($\epsilon = 1$, $t_{90} = 1$ s, $T_A = 23^\circ\text{C}$) | < 80 μs, adjustable up to 10 s | |
| Slope / ratio | < 40 μs | |
| Emissivity ϵ | 0.5% of measured value in °C | |
| Transmittance | 0.2% of measured value in °C + 1 K | |
| Fill factor spot size | 0.800–1.200 | |
| Analog output | 0.050–1.200 (per channel, corresponds 5–120% in 0.1% steps) | |
| Serial interface | 0.050–1.000 (per channel, corresponds 5–100% in 0.1% steps) | |
| Configurable inputs / outputs | 0.050–1.000 (per channel, corresponds 5–100% in 0.1% steps) | |
| Peak picker | 2 configurable analog outputs 0 or 4–20 mA, max. load: 500 Ω. Resolution 0.0015% of the adjusted temperature (16 Bit). User selectable: 2-color temperature, 1-color channel 1 or 1-color channel 2 temperature or control output (if equipped with a controller) Outputs can be set individually, inside or outside the measuring range. | |
| Display | RS485 (max. 921 kBd), resolution 0.1°C or 0.1°F | |
| Parameter settings | 12-pin connector model: 3 ports, configurable as digital input or output. 17-pin connector model: 4 digital inputs, 2 digital outputs, 1 analog input <ul style="list-style-type: none"> Inputs (protected against reverse polarity): laser targeting light on/off, clear peak picker, trigger input for start / stop recording of measured values, load pyrometer configurations, controller start. Analog input (0–20 mA, analog 0–10 V setpoint preset for PID controller (only with 17-pin connector model)). Outputs (12-pin models: max. 50 mA, protected against short circuit; 17-pin models: max. 100 mA): limit switch, exceeding the beginning of temperature range (for material recognition), device ready after self-test, device over-temperature, signal strength too low. When equipped with PID controller: controller active, control process within limits, control process finished. | |
| Power requirement | Automatic hold mode or manual time settings to clear (reset) | |
| Isolation | Only 12-pin connector models: 10-digit LED display (5 mm high) for temperature or settings of IR sensor parameters. Resolution 0.1°C or 0.1°F | |
| Sightings (optional) | 12-pin connector models: via push buttons on the device, serial interface or software <i>SensorTools</i> . 17-pin connector models: only via serial interface / software <i>SensorTools</i> . Settings: Slope/ratio, switch-off level for measurement, switch-off level for dirty window alarm, emissivity, transmittance, fill factor, temperature sub range, peak picker settings, device address, baud rate, response time, selecting analog outputs 0/4–20 mA, Temperature unit °C/°F, language (English / German). | |
| Optics | 24 V DC (18–30 V DC), max. 6 VA; protected against reverse polarity | |
| Ambient temperature | Voltage supply, analog outputs and serial interface are galvanically isolated from each other | |
| Relative humidity | <ul style="list-style-type: none"> Through lens sighting with adjustable attenuation filter for eye protection of bright targets Laser targeting light (red, $\lambda=650$ nm, $P<1$ mW, class II to IEC 60825-1) High dynamic color CCD camera, field of view: ca. 3.6% x 2.7% of measuring distance output signal: FBAS signal ca. 1 V_{pp}, 75 Ω, CCIR, NTSC / PAL switchable Resolution: NTSC: 720 x 480 Pixels; PAL: 720 x 576 Pixels | |
| Housing / protection class | Manual focusable optics (integrated or as fiber optic version) | |
| Weight | Operation: 0 to 60°C (32 to 140°F), fiber optic and optics on optics side: -20 to 250°C (-4 to 482°F) Storage: -20 to 85°C (-4 to 185°F) (The camera module is deactivated at a device temperature from 55°C to prevent its overheating) | |
| CE label | No condensing conditions | |
| | Aluminum, IP65 to DIN 40 050 with connector | |
| | 650 g | |
| | According to EU directives for electromagnetic immunity | |

Reference Numbers

Metis H311 Specify with temperature range, 12 pin or 17 pin model, sighting method and optics
 Metis H322 Specify with temperature range, 12 pin or 17 pin model, sighting method and optics

Note: *SensorTools* software is included in scope of delivery,
 Connection cables are not included in scope of delivery and have to be ordered separately.

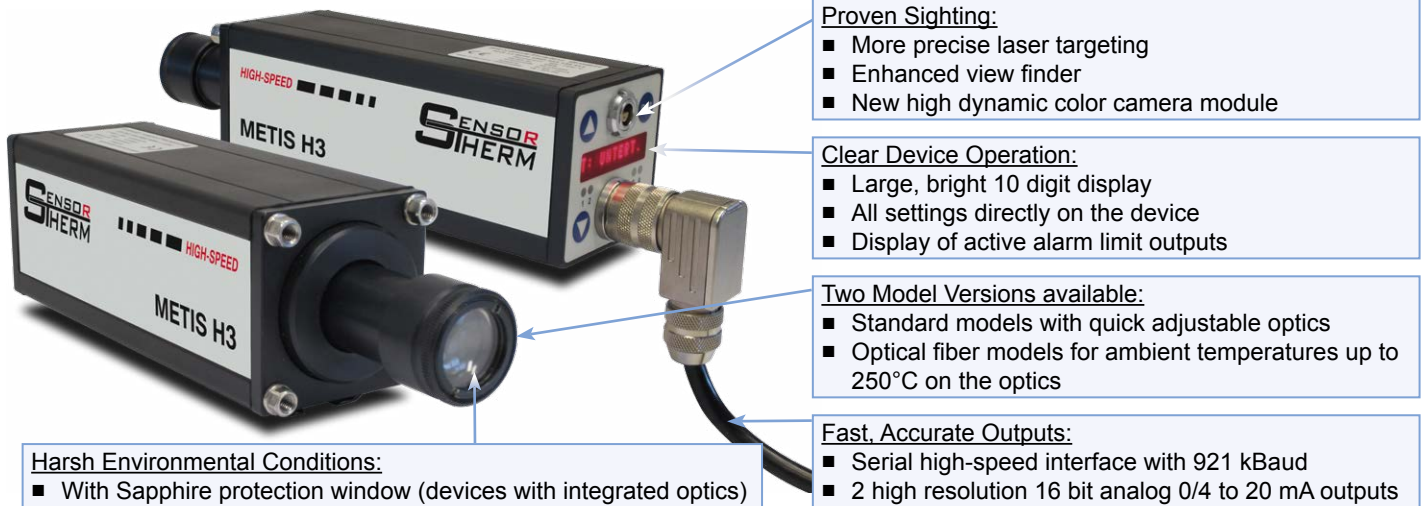
25,000 Measurements per Second

The H3 series is everywhere used where normal pyrometers stop. With an exposure time of only 40 μ s the pyrometers measure 25,000 times per second, the response time is 80 μ s (the response time or exposure time is the time it takes, until the actual temperature from the measuring object is captured by the pyrometer and converted to an output signal). This is fast enough e.g. to perform a laser power control in near real-time and respond to complex workpiece geometries.

Metis H3 pyrometers are stand alone, self contained IR thermometers with direct outputs for easy integration in nearly all application environments.

The short-wave spectral ranges of the various models are specially designed for accurate temperature measurements of metals and other bright, reflective materials.

Features



Proven Sighting:

- More precise laser targeting
- Enhanced view finder
- New high dynamic color camera module

Clear Device Operation:

- Large, bright 10 digit display
- All settings directly on the device
- Display of active alarm limit outputs

Two Model Versions available:

- Standard models with quick adjustable optics
- Optical fiber models for ambient temperatures up to 250°C on the optics

Fast, Accurate Outputs:

- Serial high-speed interface with 921 kBaud
- 2 high resolution 16 bit analog 0/4 to 20 mA outputs

Harsh Environmental Conditions:

- With Sapphire protection window (devices with integrated optics)

Comprehensive Settings

■ For Material Properties

- **Emissivity slope:** Measuring objects whose emissivity is different at the two wavelengths (e.g. bright, unoxidized metal surfaces), the emissivity ratio can be adjusted. Targets with the same emissivity at the two wavelengths can be measured without adjustment of the slope/ratio setting.
- **Emissivity:** Each material has a max. emissivity of 1.00 which can be set, an adjustment up to 1.20 can be used. The emissivity adjustment above 1.00 allows for temperature corrections due to higher background reflection.
- **Transmittance:** For measurements through windows signal losses occur by transmission of the window. This value can be adjusted based on the window material.
- **Fill factor measurement field:** Measuring on cold background, the measurement object can be smaller than the spot size. At this point you can enter the percentage of the pyrometer's spot size that is filled.

■ Measuring Mode

- 2-color mode
- Switchable in 1-color modes (channel 1 or 2) for use as a standard radiation pyrometer.
- Simultaneous output of 2-color and 1-color temperature to the 2 analog outputs

■ Dirty Window Alarm

A signal strength monitoring function detects the degree of contamination of the pyrometer's optics, viewing window or identify interferences (dust...) in the IR sensor's sight path and triggers an alarm if activated.

■ Switch-off Level

The switch-off level defines a signal level at which the temperature measurement is switched off, due to low level signal strength (e.g. if too much of the pyrometer's field of view is blocked).

■ Maximum Value Storage (Peak Picker)

The maximum value storage is a useful feature when the measured object appears only briefly in the pyrometer's field of view, or to capture peak temperatures while measuring a series of objects. The hottest value of the measured object is stored and disregards temperature valleys, e.g. steel surfaces with scale in hot rolling mill application. The maximum value can be reset automatically or manually or by a selectable clear time.

■ Equipment Versions

- Pyrometers with integrated **PID controller** measure the temperature and thus control a given temperature level.
- **Fieldbus systems** Profinet or Profibus

Intelligent Installation Possibilities

Serial RS485 Interface

Via serial interface, the pyrometer communicates with other digital devices such as a PLC, computer with free *SensorTools* software or a self-written communication software program. Measured values can be recorded and device parameters can be set directly on the device. Via RS485 long distance connections with high transmission speeds of up to 921 kbd can be realized, the devices can be addressed and can be used in bus configuration.

An interface converter RS485 to USB (accessory) allows for easy connection to a PC.

2 Analog Outputs

Each of the high-resolution analog outputs can be used for independent devices with 0/4-20 mA inputs, e.g. to connect additional temperature displays or other devices with PID controller (optional) as a control value output.

The outputs allow measuring range limits beyond the pyrometer's temperature range and allows either the limitation of the temperature range in order to increase the accuracy of the analog output even more, or to expand the temperature range to replace the pyrometer in systems that work with other temperature measurement devices with different temperature ranges.

Configurable Inputs / Outputs

12-pin device versions have 3 freely configurable digital inputs / outputs,

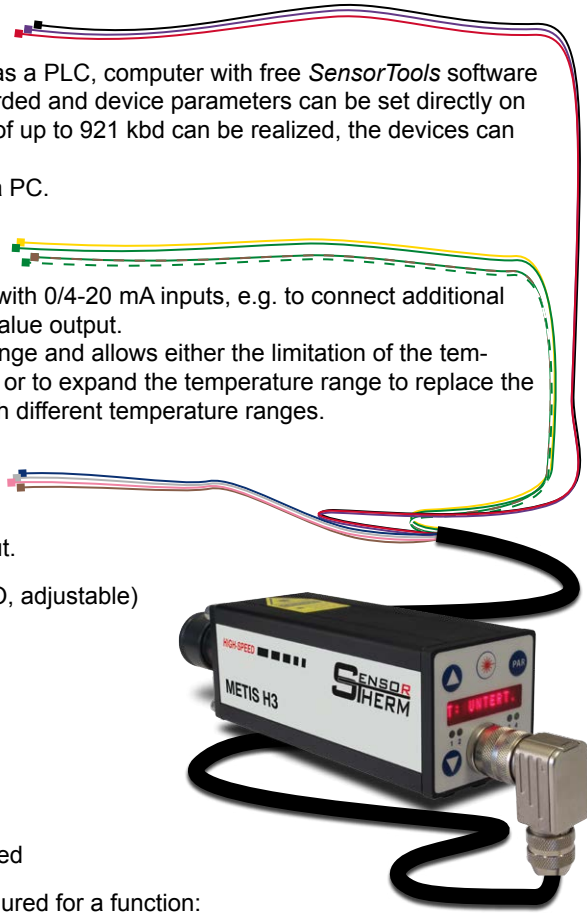
17-pin device versions have 4 digital inputs, 2 digital outputs and one analog input.

- Each **digital output** switches a low voltage output active or inactive (NC or NO, adjustable) with several selectable states (Rear panel LEDs indicate the switching state):
 - Limit switch for decreasing or exceeding a certain temperature threshold
 - Material detection (exceeding the beginning of temperature range)
 - Device state (device is ready for operation)
 - Over temperature, if the maximum allowed device temperature is exceeded
 - Signal strength is too low
 - Devices with PID controller: Controller active
 - Devices with PID controller: Control within defined setpoint limits
 - Devices with PID controller: Controlling finished successful, hold time finished
- Each **digital input** can be connected to an external contact closure and configured for a function:
 - Laser targeting light on and off
 - Manually delete (reset) of maximum value storage
 - Start / stop recording of measured values via the *SensorTools* software
 - Up to 7 pyrometer configurations (devices with PID controller also control parameters) can be saved and retrieved
 - Devices with PID controller: Start the control process on the device and the recording of the control process in the software
- Using the **analog input** (available soon and to install via firmware update) a current can be fed for
 - 17-pin devices with PID controller: 0–10 V analog specification of setpoint value

17-pin Device Design

The 17-pin version omitted the display and the settings keys, all parameters will be changed via PC.

- 4 digital inputs, 2 analog outputs, integrated PID controller, analog input for analog specification of the setpoint value.



Sighting Method Selection

Sighting is used to pinpoint the location of the measured target.

- **Devices with integrated optics:** Through lens sighting, laser targeting light or color camera module
- **Devices with fiber optics:** Laser targeting light



The **view finder** provides upright imagery so that the target under measurement can be viewed visually. A circular reticle shows the measuring spot. Recommended for glowing measurement objects, as a red laser is difficult to detect.

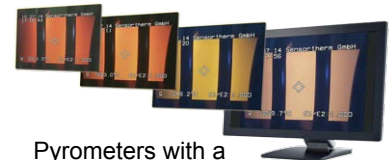
For devices with measuring range above 1800°C, the eyepiece can be darkened for eye protection.



Laser targeting uses a red laser dot showing the center of the measuring field. At the focus point, the laser dot is the smallest and provides the sharpest image, so that the measuring distance for the smallest spot size can be easily determined.

Focus

Targeting light on / off



Pyrometers with a **color camera module** provide a composite video output that can be connected to a video monitor or PC with a converter. The pyrometer is aligned via a circular reticle on the TV screen and is recommended for remote observation of glowing hot targets or viewing down sight tubes. The camera provides automatic, highly dynamic adjustment of the picture brightness.

Device Designs / Optics

Sensortherm 2-color pyrometers are equipped with two separate silicon or indium-gallium-arsenide detectors, which achieve in contrast to sandwich detectors very high signal strengths on both channels and thus ensure safe data logging. Specially designed lenses compensate the color aberration at the two measurement wavelengths and ensure that the focal distances of the two wavelengths are collimating at the same position. In comparison to radiation pyrometers, 2-color pyrometers measure in two spectral ranges simultaneously (at two wavelengths) and determine the temperature by forming the radiation ratio (quotient). In this method it is not necessary to know the emissivity of the target material or fulfill the sensor's spot size with the target.

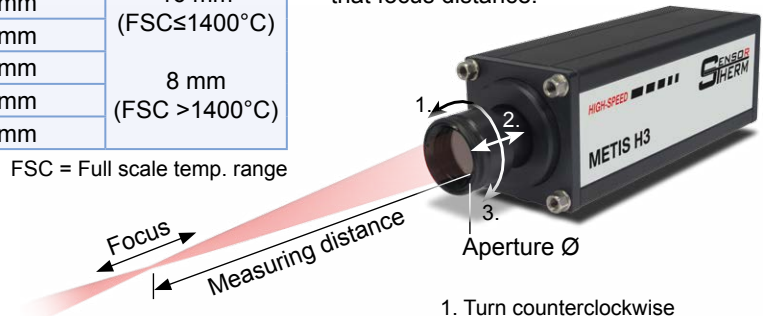
The pyrometer must be properly aligned to the measurement object to detect the temperature correctly. In the focus point of the lens (focal distance) the spot size diameter is smallest. Measurements out of the focus distance are also possible (in a shorter or longer distance than the focus distance) to determine the average temperature of a bigger spot.

Values in the optics tables illustrate the focused measuring distances and respective spot sizes. The spot size diameter for distances not given in the table can be interpolated. The pyrometer can be used at distances other than its' focal distance, however the spot size is generally larger and therefore the target size must be larger.

Focusable Optics

| Optics | Measuring distance a [mm] | Spot size M [mm] | | | | Aperture Ø D [mm] |
|---------------|---------------------------|------------------|--------------|-------------------------|--------------|-------------------|
| | | H311 <1200°C | H322 <1200°C | H311 ≥1200°C | H322 ≥1200°C | |
| H311: OQ11-A1 | 340 mm | 1.5 mm | 0.9 mm | 16 mm (FSC ≤ 1400°C) | | |
| | 500 mm | 3 mm | 1.7 mm | | | |
| | 750 mm | 4 mm | 2 mm | | | |
| H322: OQ22-A2 | 1000 mm | 5.6 mm | 2.8 mm | 8 mm (FSC > 1400°C) | | |
| | 2000 mm | 10 mm | 4.6 mm | | | |
| | 3000 mm | 17 mm | 8.8 mm | | | |

FSC = Full scale temp. range



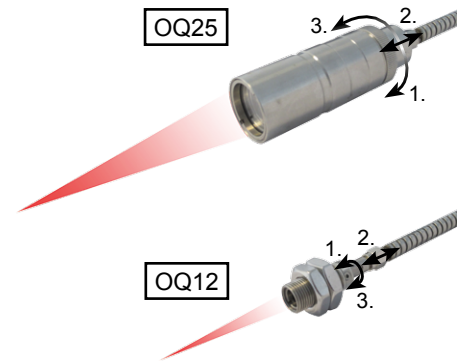
Focusable optics

can be continuously adjusted within the minimum and maximum specified measurement distance, providing the smallest possible spot size diameter at that focus distance.

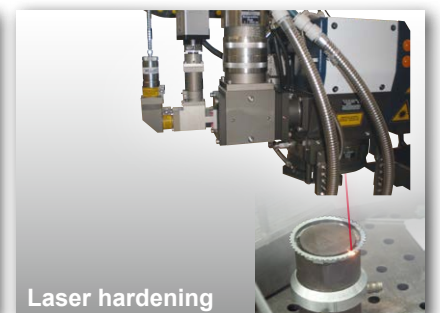
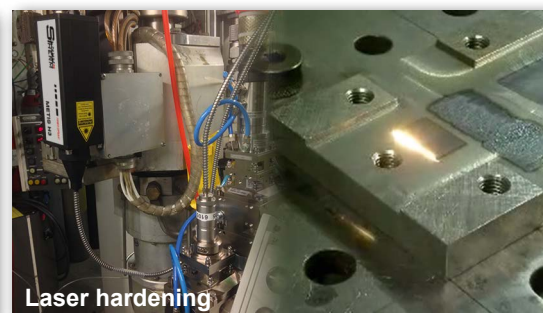
1. Turn counterclockwise
2. Pull / push in
3. Lock turn clockwise

Focusable Fiber Optics (Standard 25 mm outside diameter or Miniature 12 mm)

| Optics | Measuring distance a [mm] | Spot size M [mm] | | | | Aperture Ø D [mm] |
|---------------|---------------------------|------------------|----------------|--------------|--------------|-------------------|
| | | H311 <1200°C | H322 <1200°C | H311 ≥1200°C | H322 ≥1200°C | |
| Standard: | 240 mm | 2 mm | 1 mm | 13 mm | | |
| | 500 mm | 3.7 mm | 2.5 mm | | | |
| | 750 mm | 5.6 mm | 3.8 mm | | | |
| H311: OQ25-B1 | 1000 mm | 7.7 mm | 5 mm | 7 mm | | |
| | 2000 mm | 15.4 mm | 10 mm | | | |
| H322: OQ25-B2 | 3000 mm | 23 mm | 15 mm | 7 mm | | |
| | 120 mm | 2.2 mm | 1.2 mm | | | 7 mm |
| Miniature: | 250 mm | 5 mm | 2.5 mm | | | |
| | 500 mm | 12 mm | 6 mm | | | |
| H311: OQ12-C0 | | Fiber Ø 0.4 mm | Fiber Ø 0.2 mm | | | |
| H322: OQ12-C0 | | | | | | |

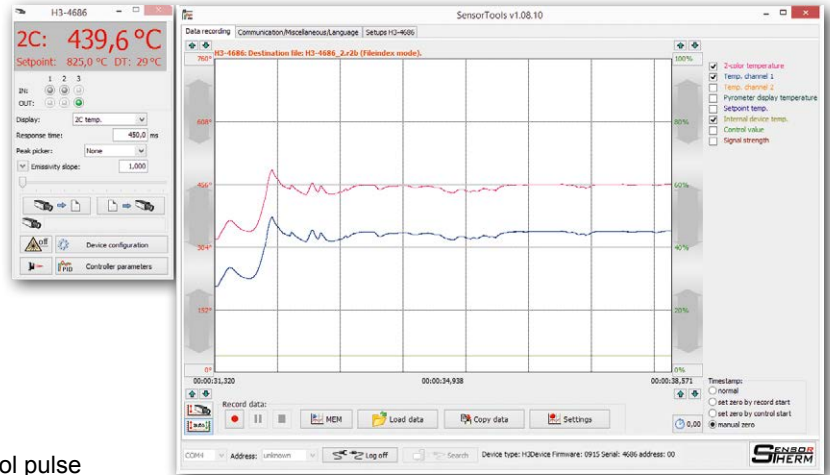


Typical Applications



SensorTools Software

- Measured values of all channels:
2-color temperature + 1-color temperatures,
at the same time, graphical and numerical
- Measured value recording
- Processing the results
- Display internal devices temperature
- Changing pyrometer parameters



Program functions:

- Change pyrometer parameters
- Playback of recorded data
- Adapted graphics mode to computer performance
- Export measured values in csv files
- Record interval setting for acceptable data size.
- Back time recording of measured values after control pulse
- Laser targeting light switching on and off / configuring the camera display
- External start and stop of the recording measured values (via control input on the pyrometer)
- Create a service file with settings for remote diagnostics

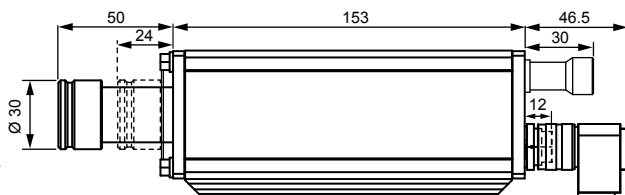
Recommended Accessories (Excerpt)

| | |
|-----------------|--|
| HA20 | Ball and socket swivel mount for sensor alignment |
| HA10 | Mounting bracket |
| HA14 / HA15 | Adjustable mounting bracket for fiber optics OQ25 / OQ12 |
| KG10 | Aluminum water cooling housing |
| KG20 | Aluminum cooling plate |
| BL10 / BL11 | Air purge for devices with motor focus / manually focusable optics |
| BL13 / BL14 | Air purge for fiber optics OQ12 / OQ25 |
| AL11 / AL43 | Connection cable (available in 5 m steps) with 12-pin right angle connector / straight connector |
| AS51 / AS53 | Connection cable (available in 5 m steps) with 17-pin right angle connector / straight connector |
| AV11 / AV43 | Connection cable, interface converter RS485<=>USB with 12-pin right angle connector / straight connector |
| AS61 / AS63 | Connection cable, interface converter RS485<=>USB with 17-pin right angle connector / straight connector |
| AK50 | Connection cable for camera module (Limosa-plug <=> Cinch-plug, available in 5 m steps) |
| IF0000 | LED digital indicator for remote adjustment of IR sensor parameters |
| Regulus RD / RF | PID program controller as bench top model / for panel mounting |

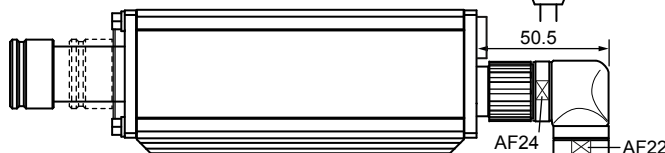


Dimensions

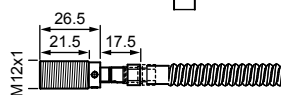
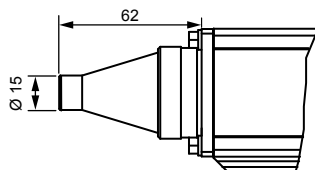
Manual focusable optics, version with 12-pin connector



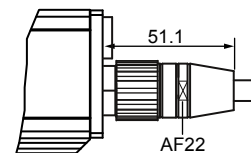
version with 17-pin connector



Fiber optic devices, focusable optics

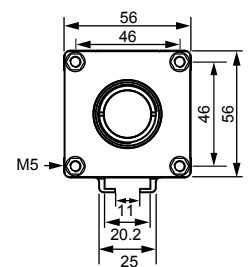


OQ12: Optics 12 mm



OQ25: Optics 25 mm

Dimensions in mm



Sensortherm reserves the right to make changes in scope of technical progress or further developments.

Sensortherm-Datasheet_Metis_H311_H322 (May 28, 2015)

Sensortherm GmbH

Infrared Temperature Measurement and Control
Hauptstr. 123 • D-65843 Sulzbach/Ts.
Phone.: +49 6196 64065-80 • Fax: -89
www.sensortherm.com • info@sensortherm.com

**SENSOR
SIHERM**