Highest Quality Measurements by
- Digital signal processing
- Continuous ambient temperature compensation
- Optimized optical components

2-Color Pyrometers for Non-Contact Temperature Measurement
- Shortwave spectral ranges
  for measurements on metals, shiny materials, ceramics, graphite and many more
- Measurement through polluting window, dust, smoke or objects that are smaller than the pyrometer's spot size
- Versatile model types due to modular design
  - Optics: focusable, optical fiber version or with motorized focus
  - Sighting method: laser targeting light, through-lens sighting or color camera
  - Optional integrated features: Profibus, Profinet or PID controller

Temperature ranges
from 300 – 1000°C (572°F) to 1000 – 3300°C (5972°F)

Response time / Exposure time
< 1 ms
< 0.5 ms

Smallest possible spot size
0.8 mm

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Digital, Precise, Versatile

2-color pyrometers of the M3 series are fast and high-precision measuring instruments that combine modern 2-color technology with the advantages of digital signal processing:

- 2 separate measuring detectors for the two spectral ranges for a safe measurement recording even at low signal strengths
- Digital microcontroller signal processing for 100% reproducibility of displayed readings
- IR signal monitoring, used for warning of optic or window contamination

### Technical Data

<table>
<thead>
<tr>
<th>Model</th>
<th>M311</th>
<th>M322</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature ranges</strong></td>
<td>600 – 1400°C</td>
<td>300 – 1000°C</td>
</tr>
<tr>
<td></td>
<td>900 – 2500°C</td>
<td>600 – 2300°C</td>
</tr>
<tr>
<td></td>
<td>650 – 1500°C</td>
<td>1000 – 3000°C</td>
</tr>
<tr>
<td></td>
<td>800 – 2100°C</td>
<td></td>
</tr>
</tbody>
</table>

**Temp. sub ranges**

Channel 1: 0.93–1.1 μm / channel 2: 0.75–0.93 μm

| Detector | 2 x Silicon |

**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, t90 = 1 s, TA = 23°C)

- Full-scale temp. ≤ 2500°C: 0.3% of meas.value in °C+2 K
- Full-scale temp. > 2500°C: 0.5% of meas.value in °C

**Repeatability**

(ε = 1, t90 = 1 s, TA = 23°C)

- Temperature coefficient: 1.0% of measured value in °C + 1 K

**Temperature sub ranges**

Any temperature sub-range adjustable within the temperature range (minimum span 50°C)

**Spectral range**

| Channel 1: 0.9 µm / channel 2: 0.75–0.93 μm |

| Channel 1: 0.99 μm / channel 2: 0.78 μm |

| Channel 1: 1.65–1.8 μm / ch. 2: 1.45–1.65 μm |

| Channel 1: 1.64 μm / channel 2: 1.4 μm |

**2 analog outputs**

0 or 4–20 mA, max. load: 500 Ω, resolution 0.0015% of the (adjusted) temperature (sub) range (16 Bit).

**Serial interface**

RS232 (4.8–115.2 kBd) or RS485 (4.8–921.6 kBd), switchable. Resolution 0.1°C/F

**Inputs / outputs**

12-pin connector: 3 configurable connectors (digital input, output or one analog input)

17-pin connector: 4 digital inputs, 2 digital outputs, 1 analog input.

- Digital inputs (via supply voltage): laser targeting light on/off, clearing of peak picker, PID controller start, load a set of parameters, trigger input for start / stop of measured value recording.
- Digital outputs (12-pin devices: max. 50 mA, 17-pin devices: max. 100 mA): limit shift, exceeding the beginning of temperature range, device measuring readiness, device over-temperature, signal strength too low. Devices with PID controller: controller active, control process within limits, control process finished.
- Analog input (12-pin: 0–20 mA, 17-pin: 0–10 V): analog adjustment of emissivity slope, emissivity, focus distance (devices with motorized focus) or setpoint (devices with PID controller).

**PROFIBUS**

Optional for 12-pin devices: Supports PROFIBUS DP-V0 (and DP-V1) according to IEC61158 type 3

**PROFINET**

Optional for 12-pin devices: Supports PROFINET-RT and IRT according to specification 2.3.

Pre-certified, supports class A, B and C functionalities

**Display**

Dot Matrix, greenyellow, 128 x 32 Dots (5.6 mm high) for temperature or parameter settings;

- Temperature setting: resolution 0.1°C / °F

**Device parameters**

2-color or 1-color temperature measurement (optionally of channel 1 or 2), device temperature, control output (devices with PID controller).

Output 1: output of the measured temperature, output 2 adjustable: 2-color or 1-color temperature (optionally of channel 1 or 2), device temperature, control output (devices with PID controller).

- Outputs can be set within or outside the temperature range.
- Pre-certified, supports class A, B and C functionalities

**Power requirement**

Voltage supply, analog outputs and serial interface are galvanically isolated from each other

**Isolation**

Voltage supply, analog outputs and serial interface are galvanically isolated from each other

**Sightings (optional)**

- Through-lens sighting (with adjustable attenuation filter for eye protection of bright targets)
- Laser targeting light (red, λ=650 nm, P< 1 mW, laser class 2 according to IEC 60825-1)
- Color CCD camera (field of view: ca. 3.6% x 2.7% of measuring distance; output signal: FBAS, ca. 1 Vpp, 75 Ω, CCIR, NTSC / PAL switchable; Resolution: NTSC: 720 x 480 pixels; PAL: 720 x 576 pixels; frame rate: NTSC: 60 Hz, PAL: 50 Hz)

**Ambient temperature**

0 to 80°C (32 to 176°F), fiber optic devices on optics side: -20 to 250°C (-4 to 482°F)

**Relative humidity**

Non-condensing conditions

**Housing / protection class**

Aluminum / IP65 to DIN 40 050 with connector

**Weight**

650 g

**CE label**

According to EU directives for electromagnetic immunity

### Ordering Specifications

**Model:** Specify each model in 12- or 17-pin, with temperature range, sighting method as well as optics type. For fiber-optic devices additional the optical fiber length between 2.5 and 30 m (in 2.5 m increments).

**Scope of delivery:** Device (optical fiber devices optionally with optics OQ12 or OQ25, special optics OQ30 for an additional charge. Optical fiber: 2.5 m; surcharge for each additional 2.5 m), works certificate, operating manual, SensorTools software. Connection cables are not included and have to be ordered separately.
Optics / Device Versions / Features

Optics Data

The focus distance is the measuring distance in which the spot size is smallest. It can be continuously adjusted in the specified range for all optics. Measurements outside the focus distance are also possible, but the spot size diameter is usually larger.

Optics: OQ12- OQ25- OQ30- OQ11 (M311)- / OQ22 (M322)-

<table>
<thead>
<tr>
<th>Diameter D [mm]</th>
<th>FSC: 1000</th>
<th>rest</th>
<th>1000</th>
<th>rest</th>
<th>1000</th>
<th>rest</th>
<th>1000</th>
<th>rest</th>
<th>1000</th>
<th>rest</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 mm</td>
<td>0.4 mm</td>
<td>0.2 mm</td>
<td>0.4 mm</td>
<td>0.2 mm</td>
<td>0.4 mm</td>
<td>0.2 mm</td>
<td>0.4 mm</td>
<td>0.2 mm</td>
<td>0.4 mm</td>
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</tr>
</tbody>
</table>

The values in the tables are exemplary, intermediate values can be interpolated.

Typical Applications

Soldering

Pipe bending

Semiconductor
**SensorTools Software** (included in delivery)

Communication and evaluation software for all pyrometers, controllers, digital displays and calibration sources.

- Measured value display, graphically and numerically. 2-color temperature + 1-color temperature display simultaneously and device temperature
- Measured value recording incl. parameters
- View and compare up to 4 measurement data files simultaneously in the SensorTools Viewer
- Make all device settings
- Special recording settings: externally start / stop, retroactive or extended recording via signal input
- Print or save pyrometer settings, or transfer settings to other devices or export to csv files
- Switch on / off laser targeting light, adjust camera settings or motorized focus (depending on features)

**Accessories (selection)**

**Pyrometer assembly**
- Mounting bracket for pyrometers: HA10
- Ball joint bracket for pyrometers: HA20
- Mounting bracket for fiber optics: OL12: HA80, OL25 / OQ30: HA14

**Connection cable**
- 12-pin: with angled plug / straight: AL11 / 43
- 17-pin: only straight plug
- Optional: with interface converter, integrated or via sub-D adapter (all cables available in 5m increments)

**Protection**
- Water cooling housing (aluminum): KG10
- Air purge unit: BL12
- Mounting bracket: HA12
- Heavy ball joint bracket: HA22

**Electrical**
- Pyrometer connection kit, ready made: Wiring-Box
- DIN rail power supply: 24 V / 1.6 A: NG12
- PID controller, programmable: Regulus RF/RD
- Air purge units: for devices with integrated optics: BL10, BL11, BL80
- for devices with fiber optics: BL12
- LED digital display: IF00

**Dimensions (in mm)**

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

Sensortherm-Datasheet_Metis_M311_M322 (Nov. 05, 2020)