METIS M311 / M322

Versatile 2-Color Pyrometer Series

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)
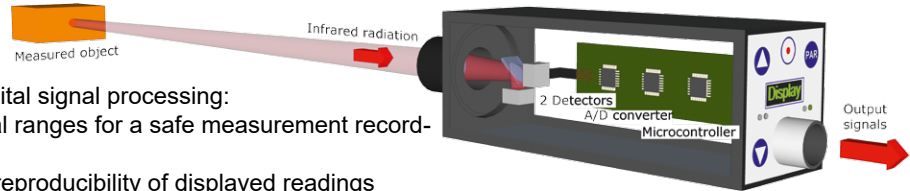
Response time / Exposure time

< 1 ms
< 0.5 ms

Smallest possible spot size

0.8 mm

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

Model	M311	M322
Temperature ranges	600–1400°C 800–2100°C 1100–3300°C *) 650–1500°C 900–2500°C 750–1800°C 1000–3000°C *)	300–1000°C 500–1800°C 1000–3300°C *) 350–1300°C 600–2300°C 400–1600°C 800–3000°C *)
Temp. sub ranges	Any temperature sub-range adjustable within the temperature range (minimum span 50°C)	
Spectral range	Channel 1: 0.93–1.1 µm / channel 2: 0.75–0.93 µm *) Channel 1: 0.99 µm / channel 2: 0.87 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
Detector	2 x Silicon	2 x InGaAs
Response time t_{90}	< 1 ms (with dynamical adaptation at low signal levels), adjustable up to 10 s	
Exposure time	< 0.5 ms	
Uncertainty ($\varepsilon = 1$, $t_{90} = 1$ s, $T_A = 23$°C)	Full-scale value ≤2500°C: 0.3% of meas.value in °C+2 K Full-scale value >2500°C: 0.5% of meas.value in °C	0.5% of measured value in °C+2 K
Repeatability ($\varepsilon = 1$, $t_{90} = 1$ s, $T_A = 23$°C)	0.1% of measured value in °C + 1 K	
Temperature coefficient	Deviations from 23°C: from 10°C to 60°C: 0.04%/K; from 0 to 10°C and 60 to 80°C: 0.06%/K	
2 analog outputs	0 or 4–20 mA, max. load: 500 Ω, resolution 0.0015% of the (adjusted) temperature (sub) range (16 Bit). 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.	
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 switch, 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 PROFINET	optional for 12-pin devices	Supports PROFIBUS DP-V0 (and DP-V1) according to IEC61158 type 3 Supports PROFINET-RT and IRT according to specification 2.3. Pre-certified, supports class A, B and C functionalities
Ethernet		Compliant with IEEE802.3/802.3u (Fast Ethernet) and ISO 802-3/IEEE 802.3 (10BASE-T)
Display (only 12-pin devices)	Dot Matrix, green-yellow, 128 x 32 dots, 5.6 mm high, for temperature display (resolution 0.1°C / °F) or parameter settings	
Device parameters	2-color or 1-color temperature measurement (optionally of channel 1 or 2), temperature sub range, response time (<1 ms–10s), emissivity slope (0.800–1.200), emissivity (0.050–1.200), transmittance (5–100%), spot size fill factor (5–100%), peak picker (clear settings: automatic, time clear, externally), device address (00–97), baud rate (RS232: 4.8–115.2 kBd / RS485: 4.8–921,6 kBd), analog outputs (0 or 4–20 mA), interface (RS232/RS485), temperature unit (°C/°F), device menu language (only 12-pin devices: English/German), focus distance (motorized focus devices)	
Power requirement	24 V DC (18–30 V DC), max. 6 VA; protected against reverse polarity	
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, green: λ=515 nm, P< 1 mW, laser class 2 acc. to IEC 60825-1) ■ Color CCD camera (field of view: ca. 3.6% x 2.7% of measuring distance; output signal: FBAS, ca. 1 V_{pp}, 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) Storage: -20 to 85°C (-4 to 185°F)	
Relative humidity	Non-condensing conditions	
Housing / protection class	Aluminum / IP65 (with plugged in connector)	
Weight	min. 660 g	
CE label	According to EU directives	

Ordering Specifications

Model to be specified with 12- or 17-pin connector, with temperature range, sighting method (red or green for laser targeting light), optics, if required Profibus, Profinet or Ethernet. For fiber optic devices, the optical fiber length between 2.5 and 30 m (in 2.5 m increments) is also required.
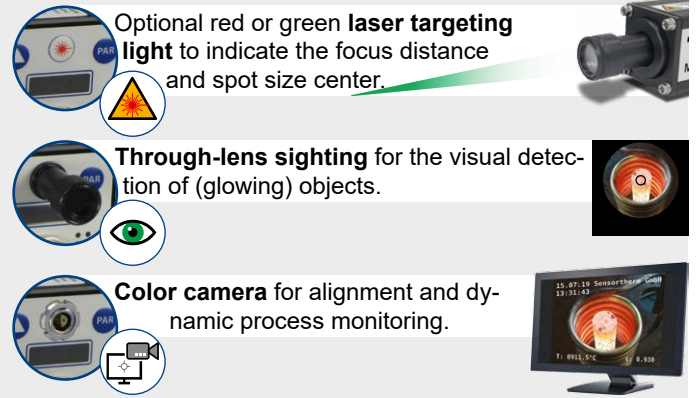
Scope of delivery: Device (fiber optic devices optionally with optics OQ12 or OQ25, special optics OQ30 with smaller spot sizes on request and at extra charge. Fiber optic: 2.5 m; each additional 2.5 m at extra cost), works certificate, operating manual, *SensorTools* software. Connection cables are not included and have to be ordered separately.
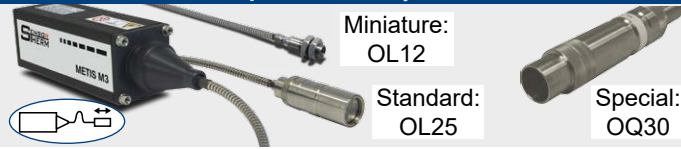
Optics / Device Versions / Features

Integrated Optics

With motorized focus

Manually focusable

Fiber optics, manually focusable

Miniature: OL12

Standard: OL25

Special: OQ30

Sighting methods

Optional red or green **laser targeting light** to indicate the focus distance and spot size center.

Through-lens sighting for the visual detection of (glowing) objects.

Color camera for alignment and dynamic process monitoring.

Connections / Equipment options

All devices with
- **2 analog outputs**
- **RS232 / RS485 interface** (switchable)

- With **12-pin connector:** with display, adjustment keys and LED's for displaying operational readiness and active switching outputs, 3 configurable inputs / outputs, optional with integrated PID controller or with Profinet, Profibus or Ethernet.
- With **17-pin connection:** 4 digital inputs, 2 digital outputs, 1 analog input, PID controller

Ambient temperature

All models are optimized for **changing ambient** or **housing temperatures** between **0** and **80°C** (32 and 176°F).

Influences due to temperature fluctuations are continuously digitally compensated.

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.

M [mm]   a [mm]   D [mm]
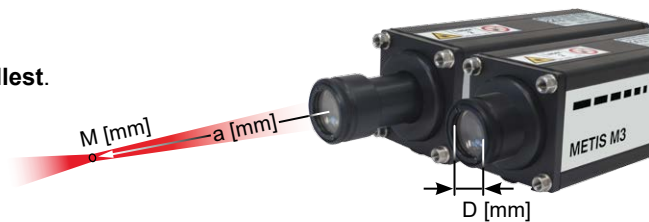
Optics:	Fiber optics						Integrated optics			
Designation:	OQ12-E3		OQ25-B1 (M311) / B2 (M322)		OQ30-90		OQ11 (M311)- / OQ22 (M322)- A1 (M311) / A2 (M322)		F1 (M311) / F2 (M322)	
Models:	M322	M311 M322	M322	M311 M322	M322	M311 M322	M322	M311 M322	M322	M311 M322
FSC *):	1000	rest	1000	rest	1000	rest	1000	rest	1000	rest
Focus distance a [mm]	Spot size Ø M [mm]									
120	2.2	1.2								
240	4.8	2.4	2	1						
340	7.6	3.8	2.7	1.6	1.4	0.8	1.4	0.8		
500	12	6	3.7	2.5	2.7	1.5	2.7	1.5		
700			5.2	3.5	3.7	1.8	3.7	1.8		
1000			7.7	5	5.6	2.8	5.6	2.8	5.6	2.8
2000			15.4	10	10	5.8	10	5.8	10	5.8
3000			23	15	15	8	15	8	14	7.8
4000									19	11
5000									24	14
10000									51	29
Aperture D:	7 mm		13 mm				16 mm (FSC ≤ 1400°C); 8 mm (FSC > 1400°C)			
Fiber Ø:	0.4 mm	0.2 mm	0.4 mm	0.2 mm	0.4 mm	0.2 mm				

*) FSC = Full scale temperature value

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

Typical Applications

Soldering

Semiconductor

Pipe bending

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)
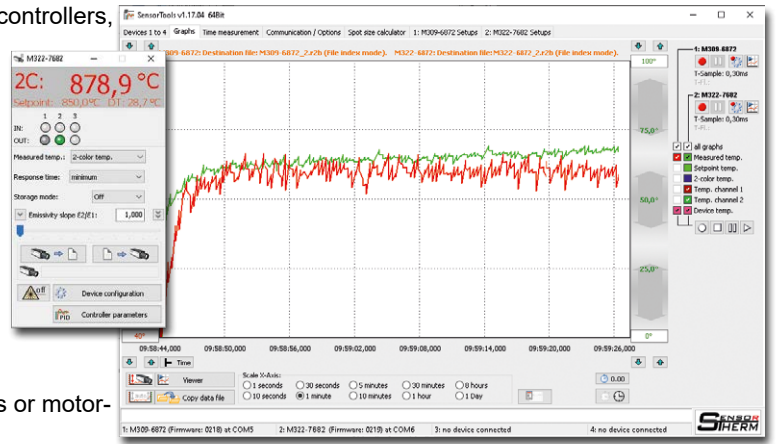
Accessories (selection)

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: AS54
Optional: with interface converter, integrated or via sub-D adapter
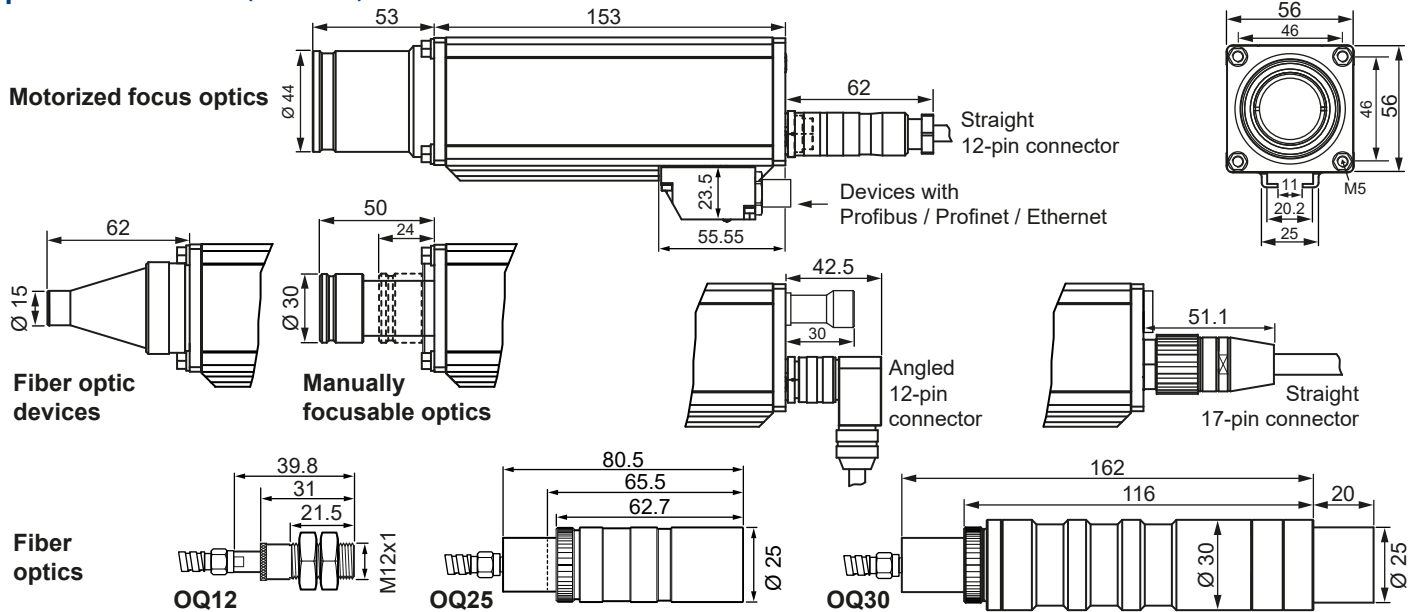(all cables available in 5m increments)

Electrical

Pyrometer connection kit, ready made:	Wiring-Box
DIN rail power supply 24 V / 1.3 A: NG12-10	

Protection

Water cooling housing (aluminum):	KG10
Air purge unit:	BL12
Mounting bracket:	HA12
Heavy ball joint bracket:	HA22
Air purge units:	
for devices with integrated optics:	BL10 BL11
for devices with fiber optics:	BL80

PID controller, programmable: Regulus RF/RD

LED digital display: IF00

Dimensions (in mm)

Motorized focus optics
53 · 153 · Ø 44 · 62 · Straight 12-pin connector · 23.5 · 55.55 · Devices with Profibus / Profinet / Ethernet

56 · 46 · 46 · 56 · 11 · 20.2 · 25 · M5

Fiber optic devices
62 · Ø 15

Manually focusable optics
50 · 24 · Ø 30

42.5 · 30 · Angled 12-pin connector

51.1 · Straight 17-pin connector

Fiber optics
OQ12: 39.8 · 31 · 21.5 · M12x1
OQ25: 80.5 · 65.5 · 62.7 · Ø 25
OQ30: 162 · 116 · 20 · Ø 30 · Ø 25

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

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