Heavy-Duty Measuring System

Pyrometer Measuring System in Heavy Stainless Steel Design

Precise measurements under hardest conditions

- Use up to 250°C on the measuring head without additional cooling
- With ratio or radiation pyrometers for 2-channel or 1-channel measurements
- Extremely resistant stainless steel braided hose
- Air flushing and air purge of the optics system
- With high-speed models for measurements at high rolled strip speeds

Applications in

- Hot strip rolling mills
- Continuous casting plants
- Casting machines / automatic casting units
- Pipe welding machines

- Protection tubes in lengths up to 630 mm
- Stainless steel braided hose in lengths up to 30 m
- Measuring distance adjustable ex works up to 4.5 m
- Combination with radiation or ratio pyrometers for measurements with high emissivity or for measurements through dust and smoke
- Pyrometers in the short wavelength range for accurate measurements on metals
- Very fast pyrometers applicable for immediate system control

Temperature Measurement in the Steel Industry

The heavy-duty measuring system is the successor of our proven rolling mill and continuous casting series Metis MW, designed for continuous temperature measurement in rolling mills, continuous casting plants and under similarly harsh industrial conditions. The system is optimally adapted to the application conditions in the steel industry. The optics system is designed for up to 250°C, the purge air provides additional cooling and keeps the optics tube and thus the pyrometer field of vision free from contamination. The electronics of the measuring system is mounted in up to 30 meters in a protected position.

- Flexible application by remotely adjustable emissivity and innovative automatic process adaptation (APA)
- Special pouring stream mode available as an option
- Customer-specific recalibration possible
- Highly accurate measurements by latest processor technology and fully digital signal processing
- Fastest exposure times with smallest spot sizes
- Using the peak picker allows to detect even smallest scale cracks which represent the “real” temperature to be measured

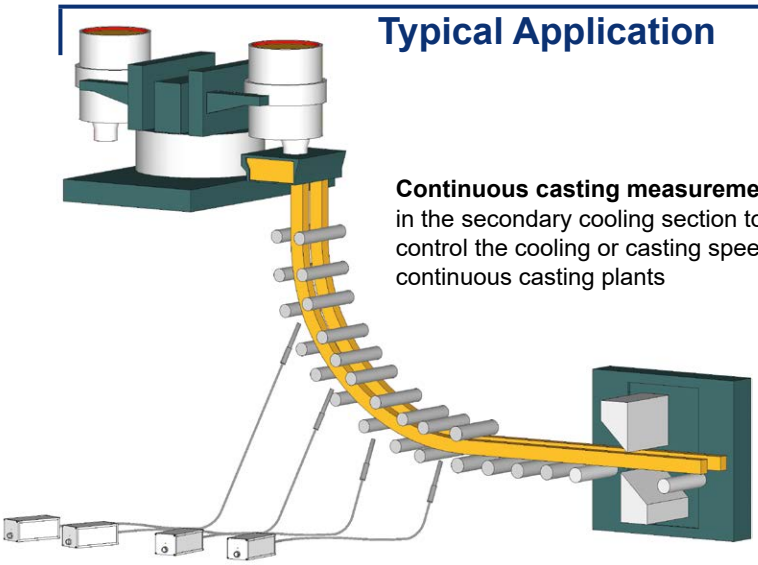




Technical Data

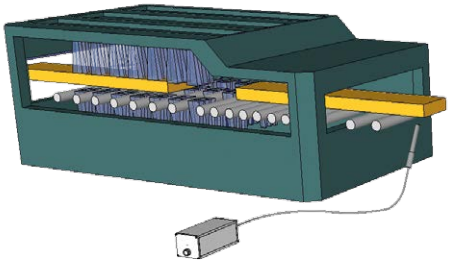
Model	Radiation Pyrometers (1-color)			Ratio Pyrometers (2-color)	
	M309	**M316**	**M318**	**M311**	**M322**
Temperature ranges	550 – 1400°C 600 – 1600°C 650 – 1800°C 750 – 2500°C	200 – 1300°C 250 – 1300°C 350 – 1800°C 400 – 2500°C	100 – 700°C 150 – 1200°C 180 – 1300°C	600 – 1400°C 650 – 1500°C 750 – 1800°C 900 – 2500°C	300 – 1000°C 350 – 1300°C 500 – 1800°C
Temp. sub ranges	Any temperature sub-range adjustable within the temperature range (minimum span 50°C)				
Spectral range	0.7–1.1 µm	1.45–1.8 µm	1.65–2.1 µm	0.75–0.93 µm / 0.93–1.1 µm	1.45–1.65 µm / 1.65–1.8 µm
Detector	Silizium	InGaAs	InGaAs	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 (ε = 1, t_{90} = 1s, T_A = 23°C)	0.25% of measured value in °C + 2 K			0.5% of measured value in °C + 2 K	
Repeatability (ε = 1, t_{90} = 1s, T_A = 23°C)	0.1% of measured value in °C + 1 K				
Emissivity	Adjustable 0.050–1.200			0.800–1.200 (emissivity slope)	
Analog output signal	2 configurable analog outputs 0 or 4–20 mA, max. load: 500 Ω Resolution 0.0015% of the adjusted temperature (16 Bit).				
Serial interface	RS232 (max. 115 kBd) or RS485 (max. 921 kBd), switchable. Resolution 0.1°C or 0.1°F				
3 configurable Inputs / outputs	■ Digital inputs: laser targeting light on/off, external clearing of peak picker, trigger input for start / stop of measured value recording, load pyrometer configuration. ■ Digital outputs: limit switch, exceeding the beginning of temperature range (for material recognition), device ready after self-test, device over-temperature.			Additionally: signal strength too low	
	■ Analog input (0–20 mA): analog adjustment of Emissivity			Emissivity slope	
Peak picker	Automatic hold mode or manual time settings to clear (reset)				
Display	10-digit, LED (5 mm high) for temperature or settings of IR sensor parameters, resolution 0.1°C or 0.1°F				
Parameter settings	Device parameters via push buttons on the device or via serial interface and PC software *SensorTools* or via self compiled communication program				
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				
Sighting	Laser targeting light (red, λ=650 nm, P<1 mW, class II to IEC 60825-1)				
Ambient temperature	On optics side: -20–250°C, on pyrometer’s side: 0–80°C, storage: -20–85°C				
Relative humidity	No condensing conditions				
Weight	ca. 10 kg (with 10 m hose length, 630 mm protection tube and pyrometer)				
CE label	According to EU directives for electromagnetic immunity				

Typical Application

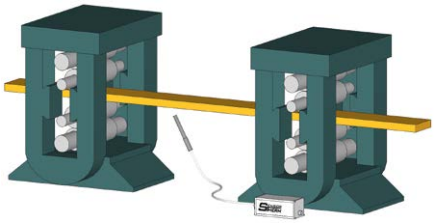


Continuous casting measurement in the secondary cooling section to control the cooling or casting speed of continuous casting plants

Measurements at the **descaling** of slab and billet temperatures.

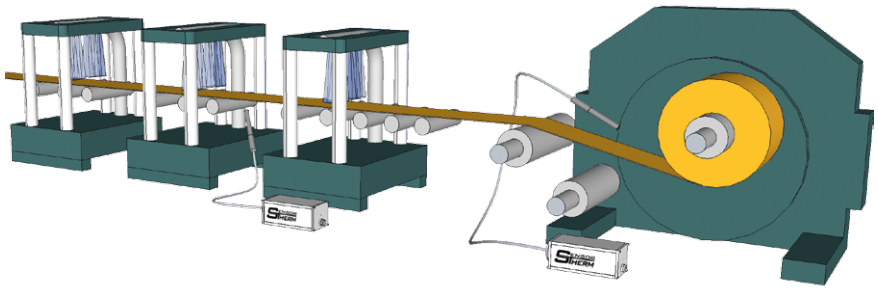


Bottom side strip measurement through the roller table on slabs, strips and billets, so that the measurement result is not affected by scale or water puddles on the strip.



At the **cooling section** of the hot strip mill for determining the cooling curve.

For quality control during winding of the **rolled steel strips** at the hot coil box.

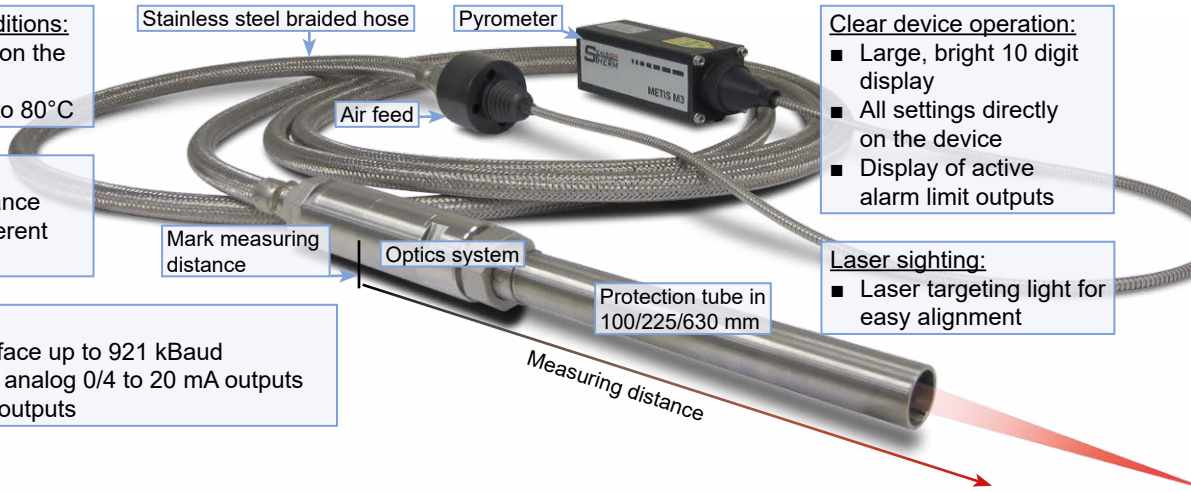


Features

Harsh environmental conditions:
- Ambient temperatures on the optics up to 250°C
- On pyrometer side up to 80°C

Robust optics system:
- Preset measuring distance
- Protection tubes in different lengths

Fast, Accurate Outputs:
- Serial high-speed interface up to 921 kBaud
- 2 high resolution 16 bit analog 0/4 to 20 mA outputs
- 3 configurable inputs / outputs



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

Laser sighting:
- Laser targeting light for easy alignment

Optics System

The measuring distance must be set ex works to a value within the optics limits and is with that installed into the optics system. (The measuring distance is measured from the mark on the lens system, therefore observe protective tube length).

Measuring distances radiation pyrometers

Optics	Measuring distance a [mm] Adjustable ex works		Spot size diameter M [mm]	
			M318 (100–700°C)	**M309** (all temp. ranges) **M316** (all temp. ranges) **M318** (150–1200°C 180–1300°C)
OL25-H0	from	170 mm	1.6 mm	1 mm
		500 mm	5 mm	3.2 mm
	...	700 mm	7.5 mm	4.8 mm
		1000 mm	11 mm	7 mm
		2000 mm	23 mm	15 mm
	to	4500 mm	52 mm	34 mm
Fiber Ø			0.4 mm	0.2 mm

Measuring distances ratio pyrometers

Optics	Measuring distance a [mm] Adjustable ex works		Spot size diameter M [mm]	
			M322 300–1000°C	**M311 / M322** (all other temp. ranges)
M311: OQ25-B1 M322: OQ25-B2	from	240 mm	2 mm	1 mm
		500 mm	3.7 mm	2.5 mm
	...	700 mm	5.2 mm	3.5 mm
		1000 mm	7.7 mm	5 mm
		2000 mm	15.4 mm	10 mm
	to	3000 mm	23 mm	15 mm
Fiber Ø			0.4 mm	0.2 mm

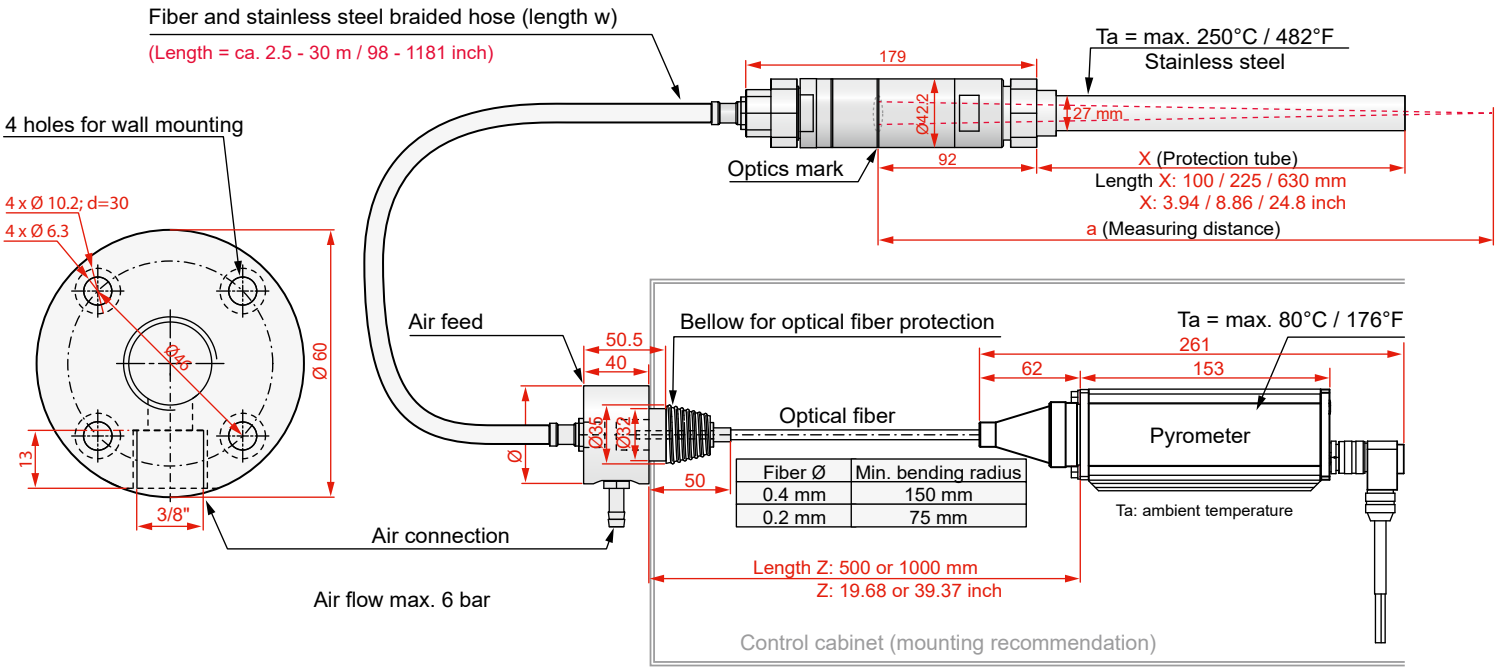
SensorTools Software

The PC software *SensorTools* is included in the standard delivery and helps to set up the pyrometer. It allows the

- Measured value display, both graphically and numerically
- Measured value recording
- Processing the results
- Display internal devices temperature
- Changing pyrometer parameters

Dimensions

Dimensions in mm



Recommended Accessories

HA10	Mounting bracket
AM11 / AM43	Connection cable, 14-wire (available in 5 m steps) with right angle connector / straight connector incl. 1 m interface cable
DK4000	Interface converter RS485⇔USB, 1.7 m cable, 9-pin Sub-D connector
IF0000	LED digital indicator for remote adjustment of IR sensor parameters
NG12	DIN-rail power supply 24 V DC 24 V DC / 1.3 A
PN10	Profinet adapter for connection of up to 5 pyrometers via RS485 to a superordinate control system
PB70	External Profibus-DP converter in wall mount housing

Ordering Information

Heavy-Duty Measuring System, specify with:

- Pyrometer type and temperature range
- Protection tube length 100, 225 or 630 mm (other lengths on request)
- Hose length 2.5–30 m in 2.5 m steps (other lengths on request)
- Optical fiber between pyrometer and air feed 0.5 or 1 m (other lengths on request)
- Optics and preset measuring distance (note: the measurement distance must be larger than the protection tube + 92 mm)

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

Sensortherm-Datasheet_M3_H3_Heavy-Duty-MeasuringSystem (May 02, 2018)

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