

Compact pyrometer for temperature measurement of glass and quartz glass surfaces or measurements of glass if a small penetration into the glass is required.

Series

IN 5/5 • IN 5/5 plus • IN 5/4 plus



- Series IN 5/5: pyrometers in two wire form with analog output 4 to 20 mA, several temperature ranges available

Series IN 5/5 plus: pyrometers with analog output 0 or 4 to 20 mA, digital interface RS232 or RS485 and laser targeting light sighting system

- High accuracy due to digital linearisation of the output
- Small spot sizes, min. 1.1 mm
- Adjustable exposure time
- Compact housing



The pyrometer **IN 5/5** as well as the instruments of series **IN 5/5 plus** are specially designed for non-contact temperature measurement of glass surfaces and quartz surfaces.

The **IN 5/4 plus** is used if a small penetration into the glass is required (e.g. glass drop); a further application is the measurement of metal parts in flame heated furnaces i.e. through flames and flue gas.

The instruments differ in their specification:

The **IN 5/5** is a digital pyrometer in two wire technique. This technique combines the high accuracy of the digital signal processing with the simple connection and operating with two wires.

Additionally to the analog output the **plus types** are digital pyrometers equipped with a digital interface, enabling temperature indication and storage on a PC. Also a temperature sub range can be configured and the instrument parameters can be adjusted remotely.

The version **IN 5/5-L plus** is equipped with optics with better fields of view for the measurements of small objects.

The high-speed version **IN 5/5-H plus** has a shorter exposure time of only 10 ms and is suited for fast measuring tasks.

For optimal match of the instrument to the application (size of the measuring object, distance) different optics are available.

For a precise alignment of the pyrometers to the measuring object, most of the *plus* types are equipped with a laser targeting light.

Typical measurement materials and applications:

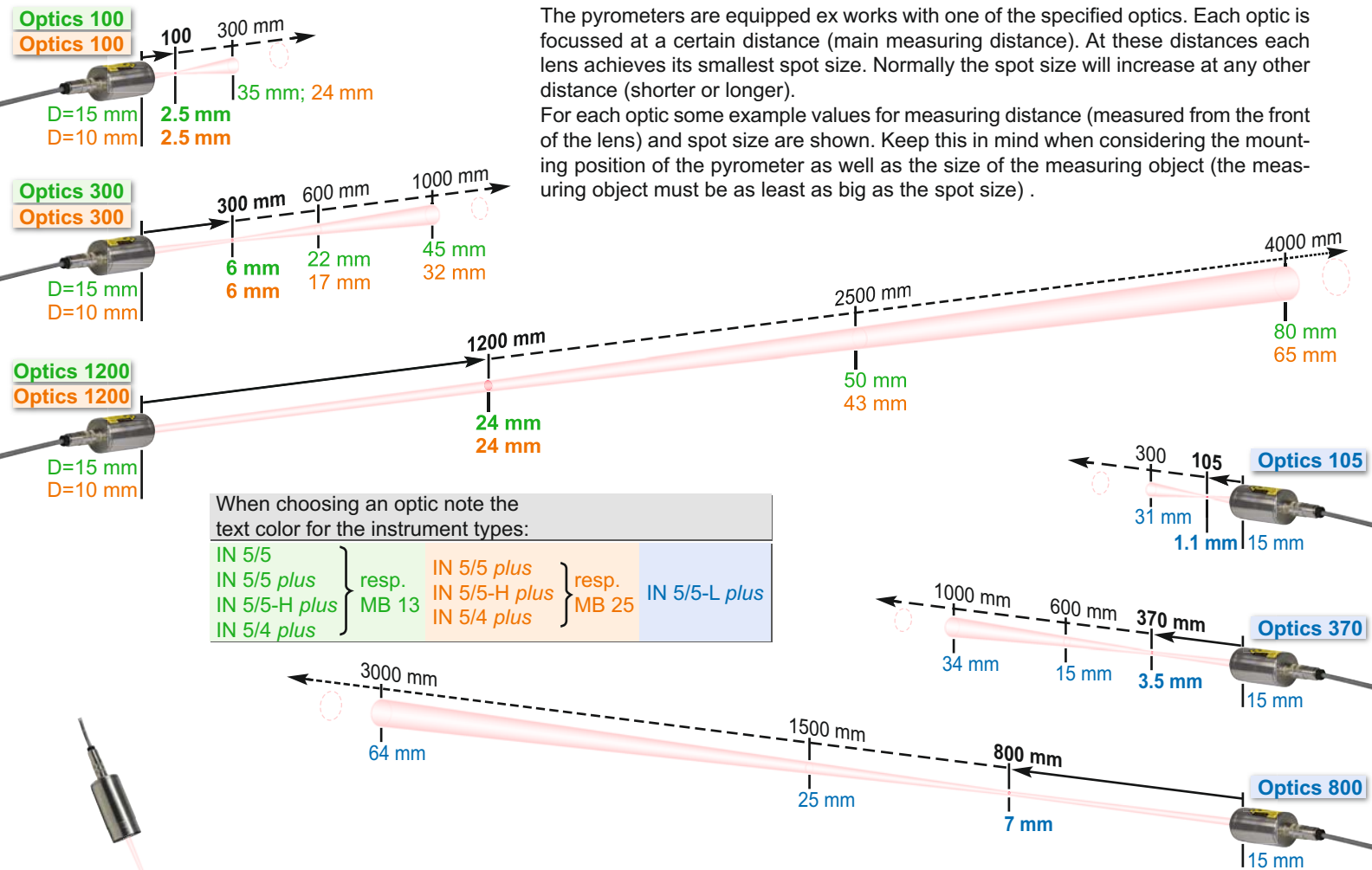
- Float glass
- Hollow glass
- Glass drop
- Glass hardening
- Glass bending
- Bulb production
- Heat treatment

Technical data

| | | |
|---|--|---|
| Temperature ranges: | IN 5/5: 100 to 600°C (MB 6) 200 to 800°C (MB 8) 100 to 1300°C (MB 13) 400 to 2500°C (MB 25) (further MB on request) | IN 5/5 plus: 100 to 1300°C (MB 13) 400 to 2500°C (MB 25) IN 5/5-H plus; IN 5/5-L plus: 200 to 1300°C (MB 13) 400 to 2500°C (MB 25) IN 5/4 plus: 300 to 1300°C (MB 13) 500 to 2500°C (MB 25) |
| Sub range: | The <i>plus</i> instruments are user adjustable with minimum span of 51°C | |
| IR detector: | Thermopile | |
| Data handling: | Digital | |
| Spectral range: | IN 5/5; IN 5/5 plus; IN 5/5-H plus; IN 5/5-L plus: 5.14 μm IN 5/4 plus: 3.9 μm | |
| Optics: | Zinc-Sulfide lens (ZnS) | |
| Power supply: | IN 5/5: 24 V DC (10 to 30 V); <i>plus</i> instruments: 24 V DC (18 to 30 V); nominal, ripple must be less than 0.5 V | |
| Power consumption: | IN 5/5: max. 20 mA; <i>plus</i> instruments: max. 70 mA | |
| Analog output: | IN 5/5: 4 to 20 mA (linear); <i>plus</i> instruments: 0 to 20 mA or 4 to 20 mA (linear), adjustable | |
| Load: | IN 5/5: max. 700 Ω at 24 V (max. 100 Ω at 12 V) <i>plus</i> instruments: max. 500 Ω at 24 V (max. 200 Ω at 18 V) | |
| Interface (<i>plus</i> instruments): | RS232 or RS485 (addressable, half duplex), baud rate 1.2 up to 19.2 kBd, resolution 0.1°C | |
| Isolation (<i>plus</i> instruments): | Power supply, analog outputs and digital interfaces are electrically isolated from each other | |
| Parameters: | Adjustable on the pyrometer: Emissivity, exposure time. Additionally on <i>plus</i> instruments: analog output to 0 or 4 to 20 mA, online- / offline switch. Via interface / PC adjustable and readable (only <i>plus</i> instruments in online mode): Emissivity, exposure time, 0 or 4 to 20 mA analog output, sub temperature range, max./min value storage with different clear times or automatic or external clearing mode, address, baud rate, internal temperature, display in °C or °F, activation of ambient temperature compensation | |
| Maximum / minimum value storage (<i>plus</i> instruments): | Built-in single and double storage. clearing with clear time t_{clear} (0.1 s; 0.25 s; 0.5 s; 1 s; 5 s; 25 s), external contact or via interface or also automatically with each new item to be measured | |
| Emissivity ϵ : | 0.2 to 1 adjustable | |
| Exposure time t_{90} : | IN5/5: 0.08 s; adjustable in the pyrometer: 0.5 s; 1 s; 2 s; 5 s, IN 5/5 plus: 0.08 s } adjustable in the pyrometer: 0.5 s; 1 s; 2 s; 5 s, IN 5/5-H plus: 0.01 s } adjustable via interface: 0.5 s; 1 s; 2 s; 5 s; 10 s; 30 s IN 5/5-L plus: 0.18 s } | |
| Measurement uncertainty: | T < 1300°C: 0.6% (IN 5/5-L <i>plus</i> : 0.8%) of reading in °C or 2°C ($T_{amb}=15$ to 30°C) *) 1% of reading in °C or 1.5°C ($T_{amb}=0$ to 15 or 30 to 63°C) *) T=1300 to 1800°C: 0.8% of reading in °C ($T_{amb}=15$ to 30°C) 1.2% of reading in °C ($T_{amb}=0$ to 15 or 30 to 63°C) T=1800 to 2500°C: 1% of reading in °C ($T_{amb}=15$ to 30°C) 1.4 % of reading in °C ($T_{amb}=0$ to 15 or 30 to 63°C) | |
| Dependent on object temperature T and ambient temperature T_{amb} ($\epsilon = 1, t_{90} = 1$ s) | *) Whichever value is greater. The instrument must be at a constant ambient temperature for a minimum of 15 minutes (30 min for IN 5/5-L <i>plus</i> for 200 to 1300°C at $T_{amb} = 0$ to 15 or 30 to 63°C) and has to be connected to the power supply. | |
| Repeatability: ($\epsilon = 1, t_{90} = 1$ s) | 0.3% of reading in °C or 0.6°C (Whichever value is greater. The instrument must be at a constant ambient temperature for a minimum of 15 min. (30 min for IN 5/5-L <i>plus</i> for 200...1300°C at $T_{amb} = 0$ to 15 or 30 to 63°C)) | |
| Noise Equivalent Temperature Difference (NETD): ($\epsilon = 1, T_{amb} = 23$ °C) | IN 5/5; IN 5/5 plus: at $t_{90} = 80$ ms: 0.7°C (at 110°C measuring temperature) at $t_{90} = 1$ s: 0.4°C (at 110°C measuring temperature) IN 5/5-H plus: at $t_{90} = 10$ ms: 0.5°C (at 500°C measuring temperature) at $t_{90} = 10$ ms: 0.3°C (at 1100°C measuring temperature) IN 5/5-L plus: at $t_{90} = 80$ ms: 1.5°C (at 300°C measuring temperature) at $t_{90} = 80$ ms: 0.6°C (at 500°C measuring temperature) at $t_{90} = 1$ s: 0.4°C (at 300°C measuring temperature) at $t_{90} = 1$ s: 0.2°C (at 500°C measuring temperature) IN 5/4 plus: at $t_{90} = 80$ ms: 0.6°C (at 500°C measuring temperature) at $t_{90} = 80$ ms: 0.2°C (at 1100°C measuring temperature) | |
| Dimensions [mm]: | | |
| Ambient temperature: | IN 5/5: 0 to 70°C; <i>plus</i> instruments: 0 to 63°C; IN 5/5 plus MB 25: 0 to 60°C | |
| Storage temperature: | -20 to 70°C | |
| Protection class: | IP65 (DIN 40050) | |
| Weight: | 410 g | |
| Housing: | Stainless steel | |
| Sighting (<i>plus</i> instruments): | Laser targeting light (max. power level < 1 mW, $\lambda = 630$ -680 nm, CDRH class II) | |
| Relative humidity: | Non condensing conditions | |
| CE-label: | According to EU directives about electromagnetic immunity | |



Optics



When choosing an optic note the text color for the instrument types:

| | | | | |
|---|-------------|---|-------------|---------------|
| IN 5/5 IN 5/5 plus IN 5/5-H plus IN 5/4 plus | resp. MB 13 | IN 5/5 plus IN 5/5-H plus IN 5/4 plus | resp. MB 25 | IN 5/5-L plus |
|---|-------------|---|-------------|---------------|

The determination of the main spot size "M" in the main measuring distance "a" occurs at 90% measuring signal.

When measuring the temperature of very large and hot surfaces (for example by the float glass production), additional radiation is received by the pyrometer's detector due to unavoidable effects (diffraction, multiple reflection). These effects increase the temperature output.

To get correct temperature values in this case, the pyrometer must be prepared ex works. The effect will be compensated by the so-called **float glass calibration**.

Instrument settings

The most important parameters such as emissivity, exposure time and analog output can be set directly in the instrument. On *plus* instruments additionally the analog output can be selected. After removing the cover on the back side of the pyrometer, the corresponding adjustments are available.

IN 5:

Emissivity ϵ

Exposure time t_{90}



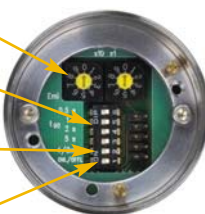
plus types:

Emissivity ϵ

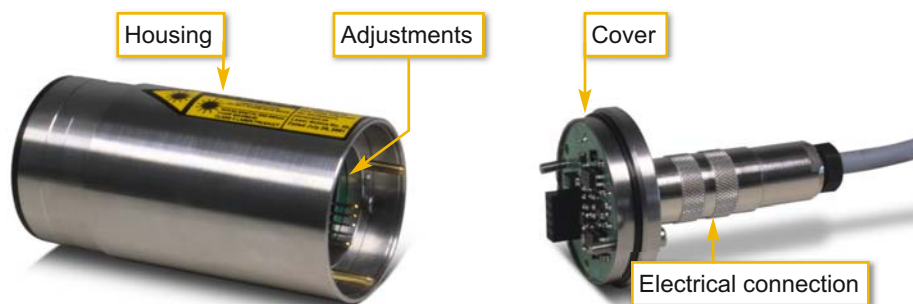
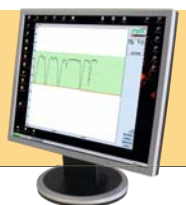
Exposure time t_{90}

Analog output
0 or 4 ... 20 mA

Online / Offline



"plus" types can alternatively be switched in online mode to enable the communication via serial interface and software *InfraWin* (in scope of delivery) on a PC. This allows additional setting options as well as the graphical temperature display combined with subsequent analysis of the measurement values.



Reference numbers

| | Optics | Temperature range | with laser targeting light | | without laser targ. light | | Optics | Temperature range | with laser targ. light | | | | |
|-------------|---|-------------------|----------------------------|-----------------|---------------------------|-----------------|---------------|-------------------|------------------------|-----------------|-----------|-----------|--|
| | | | Interface RS232 | Interface RS485 | Interface RS232 | Interface RS485 | | | Interface RS232 | Interface RS485 | | | |
| IN 5/5 plus | 100 | 100 to 1300°C | 3 869 460 | 3 869 470 | 3 869 260 | 3 869 270 | IN 5/5-H plus | 100 | 200 to 1300°C | 3 871 260 | 3 871 270 | | |
| | | 400 to 2500°C | 3 869 520 | 3 869 530 | 3 869 320 | 3 869 330 | | | 400 to 2500°C | 3 871 320 | 3 871 330 | | |
| | 300 | 100 to 1300°C | 3 869 480 | 3 869 490 | 3 869 280 | 3 869 290 | | 300 | 200 to 1300°C | 3 871 280 | 3 871 290 | | |
| | | 400 to 2500°C | 3 869 540 | 3 869 550 | 3 869 340 | 3 869 350 | | | 400 to 2500°C | 3 871 340 | 3 871 350 | | |
| | 1200 | 100 to 1300°C | 3 869 500 | 3 869 510 | 3 869 300 | 3 869 310 | | 1200 | 200 to 1300°C | 3 871 300 | 3 871 310 | | |
| | | 400 to 2500°C | 3 869 560 | 3 869 570 | 3 869 360 | 3 869 370 | | | 400 to 2500°C | 3 871 360 | 3 871 370 | | |
| IN 5/5 | When ordering please select one optics (optics a = 100, 300 or 1200). | Temp. range *) | | | without laser targ. light | | IN 5/5-L plus | | Temp. range *) | | | | |
| | | 100 to 600°C | | | 3 869 110 | | | | 200 to 1300°C | 3 871 660 | | 3 871 670 | |
| | | 200 to 800°C | | | 3 869 120 | | | | 400 to 2500°C | 3 871 720 | | 3 871 730 | |
| | | 100 to 1300°C | | | 3 869 130 | | | | 200 to 1300°C | 3 871 680 | | 3 871 690 | |
| | | 400 to 2500°C | | | 3 869 140 | | | | 200 to 1300°C | 3 871 740 | | | |
| | | | | | | | | | 400 to 2500°C | 3 871 700 | | | |
| | | | | | | | | | 200 to 1300°C | 3 871 710 | | | |
| | | | | | | | | | 400 to 2500°C | 3 871 760 | | | |
| | | | | | | | | | 300 to 1300°C | 3 869 600 | | | |
| | | | | | | | | | 500 to 2500°C | 3 869 760 | | | |
| | | | | | | | | | 300 to 1300°C | 3 869 620 | | | |
| | | | | | | | | | 500 to 2500°C | 3 869 780 | | | |
| | | | | | | | | | 300 to 1300°C | 3 869 640 | | | |
| | | | | | | | | | 500 to 2500°C | 3 869 800 | | | |

*) Other temperature ranges on request

Scope of delivery: Instrument with selected optic, works certificate, PC measurement and evaluation software *InfraWin*.

Ordering note: - A connection cable is not included with the instrument and has to be ordered separately

- The float glass calibration has to be ordered additionally to the instrument with the reference number 3 891 050.

Accessories:

| | | | |
|-----------|---|-----------|--|
| | Connection cable for IN 5/5: | 3 852 440 | Protocol converter RS485/RS232 (switchable) ⇔ Profibus-DP for 1 instrument |
| | 2 m | 3 852 460 | Protocol converter RS485 ⇔ Profibus-DP for 32 instruments |
| | 5 m | | Converter I-7520; RS485 ⇔ RS232 (half duplex) |
| | 10 m | | Galvanic separator for IN 5/5 (DIN rail mounting) |
| | 15 m | | Converter IW 5-C (4 to 20 mA in 0 to 20 mA) |
| | 20 m | | Adjustable mounting support |
| | 30 m | | Air purge unit |
| 3 820 ... | ... 210 | | Air purge unit, stainless steel |
| | ... 560 | | Water cooling jacket (heavy design) with integrated air purge unit (metric mounting threads) |
| | ... 570 | | (same with UNC mounting threads) |
| | ... 580 | | Heavy water cooling jacket with protection window (with metric mounting threads) |
| | ... 590 | | (same with UNC mounting threads) |
| | Connection cable for <i>plus</i> instruments (straight plug): | | |
| | 5 m | 3 852 430 | Water cooling jacket (lightweight design) with integrated air purge unit (metric mounting threads) |
| | 10 m | 3 890 610 | (same with UNC mounting threads) |
| | 15 m | | Lightweight water cooling jacket with protection window (with metric mounting threads) |
| | 20 m | | (same with UNC mounting threads) |
| | 25 m | | |
| | 30 m | | |
| 3 820 ... | ... 330 | | |
| 3 820 320 | ... 500 | | |
| 3 820 320 | ... 510 | | |
| 3 820 740 | ... 810 | | |
| | ... 820 | | |
| | ... 520 | | |
| 3 820 290 | Power supply NG DC (100...240 V AC ⇒ 24 V DC, 1 A) | | |
| 3 890 640 | DA 4000-N: LED digital display (specify 230 or 115 V AC) | | |
| 3 890 650 | DA 4000: as DA 4000-N, additionally with 2 limit switches (specify 230 or 115 V AC) | | |
| 3 890 560 | DA 6000-N: LED digital display with digital input RS232 and possibility for pyrometer parameter settings | | |
| 3 890 570 | DA 6000-N with RS485 | | |
| 3 890 520 | DA 6000: LED digital display, digital and analog input, 2 limit switches, maximum value storage, analog output, RS232 | | |
| 3 890 530 | DA 6000 with RS485 | | |
| 3 826 500 | HT 6000: portable battery driven indicator and instrument for pyrometer parameter settings; RS232 and RS485 interface | | |
| 3 826 510 | PI 6000: programmable PID controller | | |

Accessory overview:



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