LUMASENSE TECHNOLOGIES

IMPAC Infrared Thermometers

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*

CE

- 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.

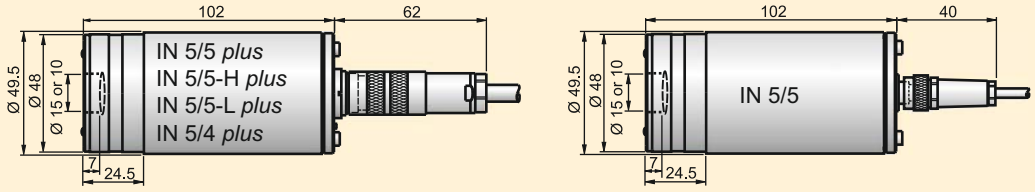
For optimal match of the instrument to the application (size of the measuring object, distance) different optics are available.

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:

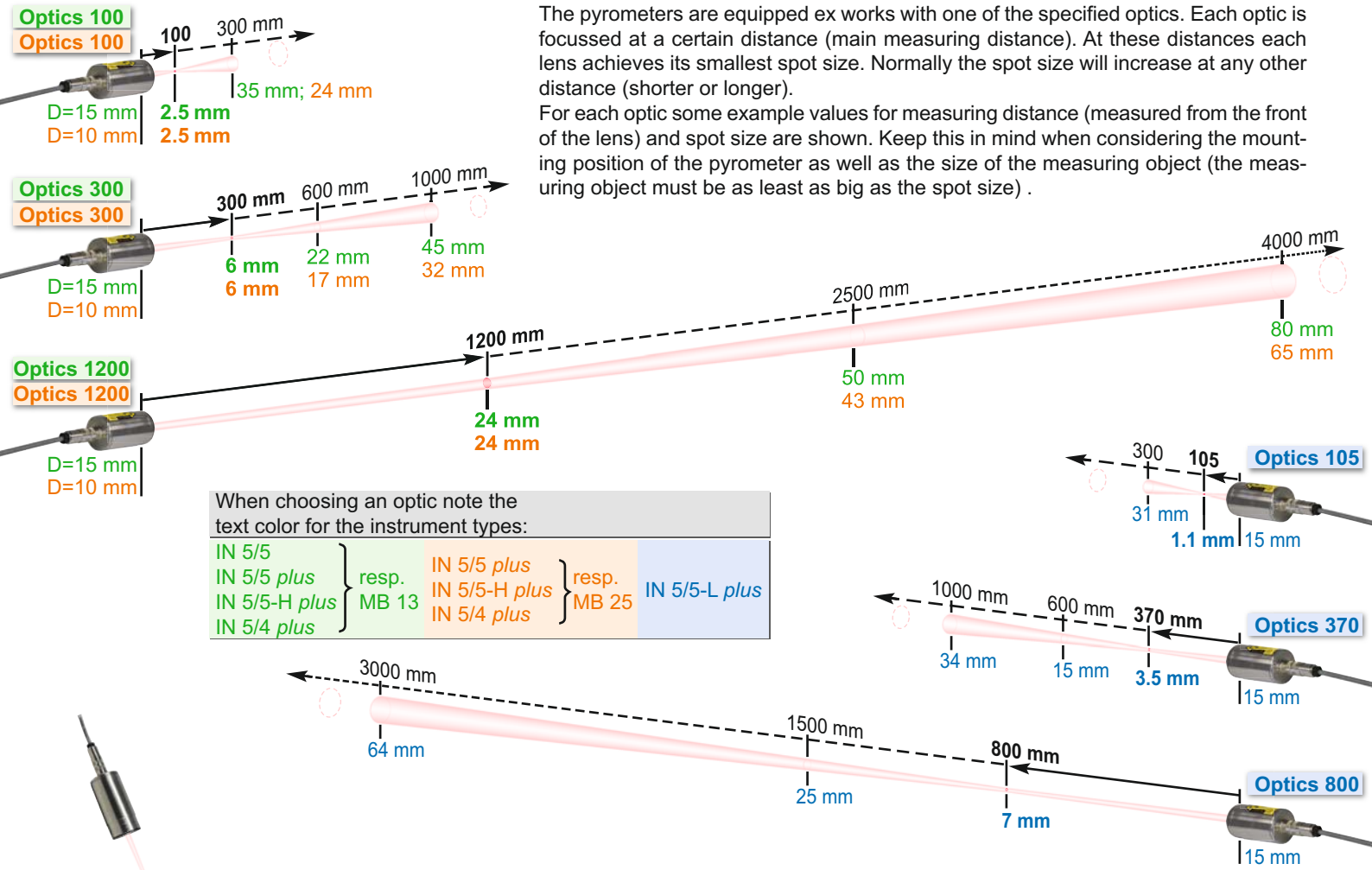
- Float glass
- Hollow glass
- Glass drop
- Glass hardening
- Glass bending
- Bulb production
- Heat treatment

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 *plus* 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); *plus* 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; *plus* instruments: max. 70 mA
Analog output:	IN 5/5: 4 to 20 mA (linear); *plus* 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) *plus* instruments: max. 500 Ω at 24 V (max. 200 Ω at 18 V)
Interface (*plus* instruments):	RS232 or RS485 (addressable, half duplex), baud rate 1.2 up to 19.2 kBd, resolution 0.1°C
Isolation (*plus* instruments):	Power supply, analog outputs and digital interfaces are electrically isolated from each other
Parameters:	Adjustable on the pyrometer: Emissivity, exposure time. Additionally on *plus* instruments: analog output to 0 or 4 to 20 mA, online- / offline switch. Via interface / PC adjustable and readable (only *plus* 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 (*plus* 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 IN 5/5-H *plus*: 0.01 s IN 5/5-L *plus*: 0.18 s } adjustable in the pyrometer: 0.5 s; 1 s; 2 s; 5 s, adjustable via interface: 0.5 s; 1 s; 2 s; 5 s; 10 s; 30 s
Measurement uncertainty: Dependent on object temperature T and ambient temperature T_{amb} (ε = 1, t_{90} = 1 s)	T < 1300°C: 0.6% (IN 5/5-L *plus*: 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) *) 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 *plus* 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: (ε = 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 *plus* for 200...1300°C at T_{amb} = 0 to 15 or 30 to 63°C)
Noise Equivalent Temperature Difference (NETD): (ε = 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; *plus* 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 (*plus* instruments):	Laser targeting light (max. power level < 1 mW, λ = 630-680 nm, CDRH class II)
Relative humidity:	Non condensing conditions
CE-label:	According to EU directives about electromagnetic immunity

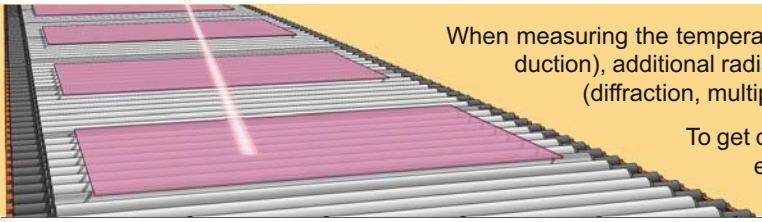
Optics

The pyrometers are equipped ex works with one of the specified optics. Each optic is focussed at a certain distance (main measuring distance). At these distances each lens achieves its smallest spot size. Normally the spot size will increase at any other distance (shorter or longer).
For each optic some example values for measuring distance (measured from the front of the lens) and spot size are shown. Keep this in mind when considering the mounting position of the pyrometer as well as the size of the measuring object (the measuring object must be as least as big as the spot size) .



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

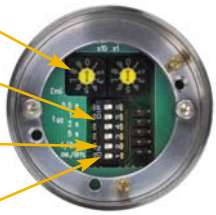
The most important parameters scuh as emissivity, exposure time and analog output can be set directly in the instrument. On *plus* instruments additionally the analog output can be selected. After removing the cover on the back side of the pyrometer, the corresponding adjustments are available.

IN 5:

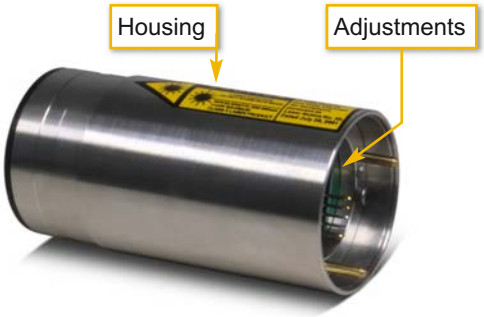
- Emissivity ε
- Exposure time t_{90}

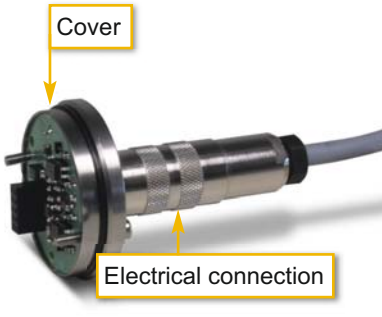
***plus* types:**

- Emissivity ε
- Exposure time t_{90}
- Analog output 0 or 4 ... 20 mA
- Online / Offline



***"plus"* types** can alternatively 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 Interface RS232	with laser targeting light Interface RS485	without laser targ. light Interface RS232	without laser targ. light Interface RS485
IN 5/5 *plus*	100	100 to 1300°C	3 869 460	3 869 470	3 869 260	3 869 270
		400 to 2500°C	3 869 520	3 869 530	3 869 320	3 869 330
	300	100 to 1300°C	3 869 480	3 869 490	3 869 280	3 869 290
		400 to 2500°C	3 869 540	3 869 550	3 869 340	3 869 350
	1200	100 to 1300°C	3 869 500	3 869 510	3 869 300	3 869 310
		400 to 2500°C	3 869 560	3 869 570	3 869 360	3 869 370

	Optics	Temp. range *)	without laser targ. light
IN 5/5	When ordering please select one optics (optics a = 100, 300 or 1200).	100 to 600°C	3 869 110
		200 to 800°C	3 869 120
		100 to 1300°C	3 869 130
		400 to 2500°C	3 869 140

	Optics	Temperature range	with laser targ. light Interface RS232	with laser targ. light Interface RS485
IN 5/5-H *plus*	100	200 to 1300°C	3 871 260	3 871 270
		400 to 2500°C	3 871 320	3 871 330
	300	200 to 1300°C	3 871 280	3 871 290
		400 to 2500°C	3 871 340	3 871 350
	1200	200 to 1300°C	3 871 300	3 871 310
		400 to 2500°C	3 871 360	3 871 370
IN 5/5-L *plus*	105	200 to 1300°C	3 871 660	3 871 670
		400 to 2500°C	3 871 720	3 871 730
	370	200 to 1300°C	3 871 680	3 871 690
		400 to 2500°C	3 871 740	3 871 750
	800	200 to 1300°C	3 871 700	3 871 710
		400 to 2500°C	3 871 760	3 871 770
IN 5/4 *plus*	100	300 to 1300°C	3 869 600	3 869 610
		500 to 2500°C	3 869 760	3 869 770
	300	300 to 1300°C	3 869 620	3 869 630
		500 to 2500°C	3 869 780	3 869 790
	1200	300 to 1300°C	3 869 640	3 869 650
		500 to 2500°C	3 869 800	3 869 810

*) 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:

	2 m	5 m	10 m	15 m	30 m
3 820 ...	... 210	... 560	... 570	... 580	... 590

Connection cable for *plus* instruments (straight plug):

	5 m	10 m	15 m	20 m	25 m	30 m
3 820 ...	... 330	... 500	...510	... 810	... 820	... 520

3 820 320 Connection cable for *plus* instruments, 5 m (angled connector, additional laser targeting light push button)
3 820 740 Connection cable *plus* instruments, 5 m, (straight connector, temperature resistant up to 200°C)
3 852 290 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
3 852 440 Protocol converter RS485/RS232 (switchable) ⇔ Profibus-DP for 1 instrument
3 852 460 Protocol converter RS485 ⇔ Profibus-DP for 32 instruments
3 852 430 Converter I-7520; RS485 ⇔ RS232 (half duplex)
3 890 610 Galvanic separator for IN 5/5 (DIN rail mounting)
3 863 010 Converter IW 5-C (4 to 20 mA in 0 to 20 mA)
3 834 210 Adjustable mounting support
3 835 160 Air purge unit
3 835 440 Air purge unit, stainless steel
3 837 230 Water cooling jacket (heavy design) with integrated air purge unit (metric mounting threads)
5 837 230 (same with UNC mounting threads)
3 837 340 Heavy water cooling jacket with protection window (with metric mounting threads)
5 837 340 (same with UNC mounting threads)
3 837 370 Water cooling jacket (lightweight design) with integrated air purge unit (metric mounting threads)
5 837 370 (same with UNC mounting threads)
3 837 390 Lightweight water cooling jacket with protection window (with metric mounting threads)
5 837 390 (same with UNC mounting threads)
3 846 100 Mounting tube
3 846 120 Flange tube
3 846 620 Vacuum flange KF16 with protection window
3 846 650 Spare protection window, Ø 25 x 3 with Viton-O-ring

Accessory overview:


Water cooling jackets (heavy and lightweight design)


Mounting support


Air purge units

LED digital display DA 6000


Power supply NG DC