

LUMASENSE IMPAC PYROMETERS

Product Overview

Highly Accurate Infrared Thermometers for Non-contact Temperature Measurements

LumaSense's IMPAC pyrometers are temperature measurement instruments that operate on the principle of infrared radiation, i.e. they detect infrared radiation of objects to determine the temperature.

In many industry sectors, the use of non-contact temperature measurement instruments is an important technology. For example, it is used for controlling complete factory processes or measuring even the smallest components to ensure a consistent quality level.

With a huge pyrometer product portfolio developed from years of research and customer contact, LumaSense Technologies provides solutions for nearly every application request. Special solutions that are not listed in this brochure can also be quickly adapted to customer or application specific specifications.

This overview gives an impression of the possibilities that pyrometry provides. The instruments are classified in application areas and thereunder in instrument grades, starting from the smallest and moving up to instruments for harsh industries.

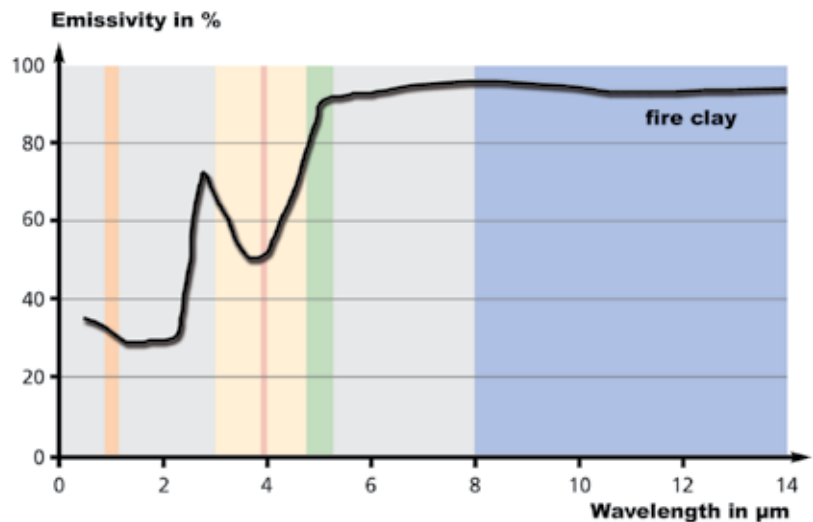


GENERALLY NON-METALLIC SURFACES

Emissivity of Non-Metallic Surfaces

The group of non-metals includes organic materials, such as foodstuffs, wood or paper, as well as inorganic materials such as ceramics or fire clay.

The emissivity of non-metals rises with increasing wavelength. Generally speaking, from a certain wavelength, the emissivity is nearly constant. The color of the object as seen in the visible light spectrum, has practically no influence on the emissivity behavior in the mid-and long-wave infrared.



Example emissivity of non-metallic surfaces

PORTABLES

SMALL, LOW-PRICED

Dedicated Version for
Coke Industry



Model	IGA 315-K	M 90-ZB	IN 2000	IN 3000	IN 510, IN 510-N
Description	Pyrometer for non-contact temperature measurement of nozzle bricks and air stages in coking ovens at standard distances between 1 and 12 m.	Portable pyrometer with precision optics for general purpose applications. Data logger, peak, valley and variable averaging functions of a measurement series.	Small, good value, simple sensor, different linear measuring outputs are available.	Small, good value, simple sensor, different linear measuring outputs are available.	Digital pyrometers with separate miniature sensor head. Sensor head/cable usable in ambient temperatures without cooling up to 85°C.
Temperature Ranges (between... and...)	600...1600°C	-50...1000°C	-32...900°C	0...500°C	-40...700°C
Spectral Range	1.58...1.8 µm	8...14 µm	8...14 µm	8...14 µm	8...14 µm
Field of View (Minimum spot size Ø in mm)	min 34:1 (30 at 9 m)	min 180:1 (min 5.6)	10:1	10:1	2:1 or 10:1
Exposure time t_{90} ⁽¹⁾	10 ms	750 ms	95 ms	300 ms	180 ms adjustable up to 30 s
Output	USB interface adapter	analog output 1 mV/°C or 0 - 1 V, RS232	4 - 20 mA, digital output	10 mV/°C, thermocouple type J or K	0/4 - 20 mA, 0 - 5 V, thermocouple J / K, RS232/ RS485 (switchable)

SMALL, LOW-PRICED

COMPACT CLASS



Instrument for glass surfaces
or thin foils

Model	IN 520, IN 520-N	IN 210	IN 300	M67S	M67S
Description	Digital pyrometers with separate miniature sensor head. Sensor head/ cable usable in ambient temperatures without cooling up to 180°C. Can also be used as a temperature switch.	Digital pyrometer with analog output (2 wire design) and service interface (for programming emissivity, response time and temperature range).	Good value, small 2-wire pyrometer with fixed focus and adjustable emissivity, easy installation.	Analog 2-wire pyrometer with view finder. Special filter for thin plastic films or thin glass.	Analog 2-wire pyrometer with view finder for general purpose and low temperature applications with high emissivity.
Temperature Ranges (between... and...)	-40...700°C	-32...900°C	-20...600°C	0...600°C	0...1000°C
Spectral Range	8...14 µm	8...14 µm	8...14 µm	7.9 µm	8...14 µm
Field of View (Minimum spot size Ø in mm)	2:1 or 10:1	3 fixed optics 50:1 (min 2)	15:1	3 fixed optics 15 or 30:1 (min 1.5)	3 fixed optics 15 or 30:1 (min 1.5)
Exposure time t_{90} ⁽¹⁾	180 ms adjustable up to 30 s	120 ms adjustable up to 10 s	300 ms	100 ms up to 10 s	100 ms up to 10 s
Output	0/4 - 20 mA, 0 - 5 V, thermocouple J / K, RS232/ RS485 (switchable)	4 - 20 mA	4 - 20 mA	4 - 20 mA	4 - 20 mA

1) According to IEC/TS 62492-1

2) With dynamic adaption at low signal levels

COMPACT CLASS



Model	IN 5	IN 5 Plus	IN 5-H Plus	IN 5-L Plus
Description	2-wire pyrometer for general applications.	Digital pyrometers for general applications. With analog output, digital interface, max. / min. value storage, adjustable measuring range, different optics, laser targeting light.		
			-H: high speed version	-L: better field of view
Temperature Ranges (between... and...)	-32...900°C	-32...900°C	-32...900°C	-32...900°C
Spectral Range	8...14 μm	8...14 μm	8...14 μm	8...14 μm
Field of View (Minimum spot size Ø in mm)	3 fixed optics 50:1 (min 2)	3 fixed optics 50:1 (min 2)	3 fixed optics 50:1 (min 2)	3 fixed optics 100:1 (min 1)
Exposure time t_{90} ⁽¹⁾	80 ms adjustable up to 5 s	80 ms adjustable up to 30 s	10 ms adjustable up to 30 s	180 ms adjustable up to 10 s
Output	4 - 20 mA	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)

COMFORT CLASS



Model	IPE 140/34	IPE 140/45
Description	Version of the IPE 140: for measuring of thin PE and PP foils with a minimum material thickness of only 30 μm.	Version of the IPE 140: for measurement of combustion flames and hot gases containing CO ₂ .
Temperature Ranges (between... and...)	50...500°C	400...2000°C
Spectral Range	3.43 μm	4.5 μm (CO ₂ absorption band)
Field of View (Minimum spot size Ø in mm)	3 focusable optics min 50:1 (min 2.1)	3 focusable optics min 200:1 (min 1.1)
Exposure time t_{90} ⁽¹⁾	1.5 ms adjustable up to 10 s ⁽²⁾	1.5 ms adjustable up to 10 s ⁽²⁾
Output	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)

1) According to IEC/TS 62492-1

2) With dynamic adaption at low signal levels



LUMASENSE
TECHNOLOGIES
IMPAC ISR 6 Advanced

24V DC
0/4...20mA
Messber. 700 ... 1800 °C
a = 210 ... 5000 mm
Art.Nr. 3 904 070
Fert.Nr. 090

CE



METALLIC SURFACES

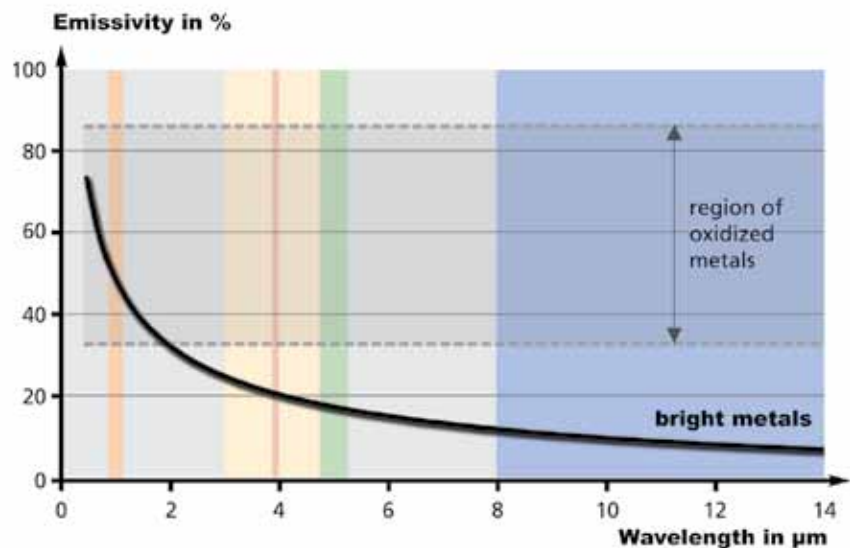
Emissivity of Metals

The emissivity of bright metal surfaces is high at short wavelengths and decreases with lengthening wavelengths. In the presence of oxidized and soiled metal surfaces, results are not necessarily consistent; emissivity may be strongly influenced by temperature and/or wavelength.

Metal components are often bright after machining, and their surfaces change when heated. At temperatures above 300 °C, tarnishing colors and increasing oxidation scale usually appear. This needs to be taken into consideration to avoid measurement errors.

Shiny metal surfaces strongly reflect infrared radiation, i.e. their reflection coefficient is high and their emission coefficient is low.

A hot object has a high reflection coefficient, and if it is close to where a temperature reading needs to be taken, it affects the value of that reading (especially with hotter objects).



Example emissivity of metals

PORTABLES

INFRARED SWITCH



Model	IGA 15 plus	IS 8 pro	IS 8-GS pro	IGA 8 pro	KTS 218
Description	Measurement of metals, ceramics, graphite, etc. Laser targeting light, min./max./ avg., data storage, close-up lens for spot sizes up to 1.25 mm.	Very fast portables for measurements on metals and ceramics. Very small spot sizes, maximum value storage, temperature indicator.	Especially designed for measurements on molten metals in the pouring stream.	Very fast portables for measurements on metals and ceramics. Very small spot sizes, maximum value storage, temperature indicator.	Infrared temperature switch. Recognizes without contact, hot objects located in its measuring beam to trigger a switch process.
Temperature Ranges (between... and...)	250...1800°C	600...2500°C	1000...2000°C	250...1600°C	700...1500°C
Spectral Range	1.45...1.8 µm	0.78 ... 1.1 µm	0.55 µm	1.45...1.8 µm	0.85...1.05 µm
Field of View (Minimum spot size Ø in mm)	200:1 (min 1.25)	min 500:1 (min 0.5)	min 180:1 (min 1.4)	min 230:1 (min 1.1)	10 fixed optics 68-85:1 (min 2.5)
Exposure time t_{90} ⁽¹⁾	20 ms	1 ms	500 ms	1 ms	600 µs (switch time)
Output	USB	USB	USB	USB	Switch output 20 V, max. 30 mA

SMALL, LOW-PRICED



Model	IS 310	IGA 310	IS 210	IGA 210	IN 210/4
Description	Good value, small, fast, medium / high temperature 2 wire pyrometers with fixed focus, adjustable emissivity and LED targeting light.		Fast medium/high temperature digital pyrometers in 2 wire design with analog output, service interface (for programming emissivity, response time and temperature range) and LED targeting light.		Version for measurement of objects in flame heated furnaces, sees through clean combustion flames and hot gases.
Temperature Ranges (between... and...)	650...2500°C	300...1500°C	650...2500°C	300...1800°C	300...1000°C
Spectral Range	0.8...1.1 µm	1.45...1.8 µm	0.8...1.1 µm	1.45...1.8 µm	3.9 µm
Field of View (Minimum spot size Ø in mm)	3 fixed optics min 310:1 (min 1.8)	3 fixed optics min 155:1 (min 2)	3 fixed optics min 240:1 (min 2.5)	3 fixed optics min 175:1 (min 1.8)	3 fixed optics min 50:1 (min 2.5)
Exposure time t_{90} ⁽¹⁾	10 ms	10 ms	20 ms adjustable up to 10 s	20 ms adjustable up to 10 s	120 ms adjustable up to 10 s
Output	4 - 20 mA	4 - 20 mA	4 - 20 mA	4 - 20 mA	4 - 20 mA

1) According to IEC/TS 62492-1

2) With dynamic adaptation at low signal levels

INFRARED SWITCH

COMPACT CLASS



Model	KTG 218	M67S	M67S	M67S	M67S
Description	Infrared temperature switch. Recognizes without contact, hot objects located in its measuring beam to trigger a switch process.	Analog 2-wire pyrometers with view finder for high temperature applications.		Special version for measurement of objects in flame heated furnaces, sees through clean combustion flames and hot gases.	For measurement of combustion flames and hot gases containing CO ₂ .
Temperature Ranges (between... and...)	400...1400°C	220...1100°C	525...3000°C	300...1750°C	320...2200°C
Spectral Range	0.85...1.8 μm	1...1.6 μm	0.78...1.06 μm	3.86 μm	CO ₂ hot band
Field of View (Minimum spot size Ø in mm)	10 fixed optics 68-85:1 (min 2.5)	2 fixed optics <400°C: 30:1 (min 1.8) >400°C: 90:1 (min 1.8)	2 fixed optics 90:1 or 180:1 (min 1.8)	Fixed optics 30:1 (min 11.9)	Fixed optics 30:1 (min 1.8)
Exposure time t₉₀⁽¹⁾	600 μs (switch time)	50 ms up to 10 s	50 ms up to 10 s	100 ms up to 10 s	100 ms up to 10 s
Output	Switch output 20 V, max. 30 mA	4 - 20 mA	4 - 20 mA	4 - 20 mA	4 - 20 mA

COMPACT CLASS

COMPACT CLASS WITH FIBER OPTICS



Model	IN 5/4	IN 5/4 plus	IS 50-LO plus	IGA 50-LO plus	IS 50/67-LO plus
Description	Version of the IN 5 (analog core) to measure objects in flame heated furnaces, sees through clean combustion flames and hot gases.	Version of the IN 5 plus (digital core) to measure objects in flame heated furnaces, sees through clean combustion flames and hot gases.	Very fast, digital fiber optic pyrometers. Two optical heads available, very small spot sizes. Laser targeting light, display, and buttons for instrument settings.		Version of the IS 50-LO plus with extremely short wavelength for metal measurements with high emissivity.
Temperature Ranges (between... and...)	300...2500°C	300...2500°C	550...3300°C	250...2500°C	1100...3500°C
Spectral Range	3.9 μm	3.9 μm	0.7...1.1 μm	1.45...1.8 μm	0.676 μm
Field of View (Minimum spot size Ø in mm)	3 fixed optics 50:1 (min 2)	3 fixed optics 50:1 (min 2.5)	optical head I min 100 : 1 (min 1.2), optical head II min 200 : 1 (min 0.45)	optical head I min 100 : 1 (min 1.2), optical head II min 200 : 1 (min 0.45)	optical head I min 100 : 1 (min 1.2), optical head II min 200 : 1 (min 0.45)
Exposure time t₉₀⁽¹⁾	80 ms adjustable up to 30 s	80 ms adjustable up to 30 s	< 1 ms adjustable up to 10 s	< 1 ms adjustable up to 10 s	< 1 ms adjustable up to 10 s
Output	4 - 20 mA	0/4 - 20 mA, RS232 or RS485	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)

1) According to IEC/TS 62492-1

2) With dynamic adaption at low signal levels

COMPACT CLASS



IS 5	IGA 5	IS 320	IGA 320	IGA 320/23	Model
Very fast digital pyrometers with analog output and digital interface. Maximum value storage, adjustable measuring range, laser targeting light or view finder or integrated TV camera.		Small and very fast digital pyrometers with fixed focus and LED targeting light.		Low temperature version of the IGA 320 for temperature measurement on metals starting at 75°C	Description
600...3000°C	250...3000°C	550...1800°C	300...1800°C	75...1800°C	Temperature Ranges (between... and...)
0.8...1.1 μm	1.45...1.8 μm	0.8...1.1 μm	1.45...1.8 μm	2...2.6 μm	Spectral Range
Optics N min 160:1 (min 0.5) Optics F min 200:1 (min 1)	Optics N min 160:1 (min 0.5) Optics F min 200:1 (min 1)	3 fixed optics min 200 : 1 (min 1.3)	3 fixed optics min 230 : 1 (min 1.2)	2 fixed optics min 200 : 1 (min 0.25)	Field of View (Minimum spot size Ø in mm)
≤ 2 ms adjustable up to 10 s	≤ 2 ms adjustable up to 10 s	2 ms adjustable up to 10 s	2 ms adjustable up to 10 s	2 ms adjustable up to 10 s	Exposure time t_{90} ⁽¹⁾
0/4 - 20 mA, RS232 or RS485, PID controller (option)	0/4 - 20 mA, RS232 or RS485, PID controller (option)	0/4 - 20 mA, RS485	0/4 - 20 mA, RS485	0/4 - 20 mA, RS485	Output

COMPACT CLASS WITH DIFFERENT OPTICS

RATIO PYROMETERS (ALSO SUITABLE FOR GLASS APPLICATIONS)



PhotriX Series	M 90-R1	M 90-R2	ISR 6 Advanced	Model
Digital, extremely sensitive pyrometer to measure small signals and lower temperatures. Configurable collection optics: Lens optic, lightpipe optics, fiber optics to remote lens, fiber optics to lightpipe.	Portable ratio pyrometers with precision optics. Data logger, peak, valley and variable averaging functions of a measurement series. (Metal Housing available as an option)		Highly accurate digital, fast pyrometers in 2-color design (switchable to mono mode) with analog output and digital interface, LED Display and focusable optics.	Description
30...2600°C	700...2000°C	900...3000°C	600...3000°C	Temperature Ranges (between... and...)
5 ranges: between 0.65 and 1.65 μm	channel 1: 0.92 μm; channel 2: 0.98 μm	channel 1: 0.92 μm; channel 2: 0.98 μm	channel 1: 0.9 μm channel 2: 1.05 μm	Spectral Range
Optics or lightpipes adapted to customers request: min 0.5 mm	60:1 (min 8.4)	180:1 (min 2.8)	min 360:1 (min 0.7)	Field of View (Minimum spot size Ø in mm)
1 ms adjustable up to 60 s	500 ms	500 ms	2 ms adjustable up to 10 s	Exposure time t_{90} ⁽¹⁾
4 - 20 mA, 0 - 10 V, RS232, RS422	analog output 1 mV/°C or 0 - 1 V, RS232	analog output 1 mV/°C or 0 - 1 V, RS232	0/4 - 20 mA, RS485	Output

1) According to IEC/TS 62492-1

2) With dynamic adaption at low signal levels

RATIO PYROMETERS (ALSO SUITABLE FOR GLASS APPLICATIONS)



Model	ISQ 5-TV	ISQ 5-LO	ISR 50-LO	ISR 12-LO	IGAR 12-LO
Description	Digital, fast pyrometers in 2-color design (switchable to mono mode) with analog output and digital interface, max. value storage, adjustable temp. range. - Integrated TV camera	- Two optical heads available	Fast digital, fiber optic ratio pyrometer (switchable to 1-color design). Analog output, digital interface, maximum value storage. Small spot sizes	Fully digital, very fast pyrometers in 2-color design (switchable to mono mode), with long fiber optic cable lengths up to 30 m, display and laser targeting light, very small spot sizes, analog output and digital interface, maximum value storage.	
Temperature Ranges (between... and...)	600...3000°C	700...2500°C	700...3000°C	600...3300°C	300...2500°C
Spectral Range	channel 1: 0.9 µm channel 2: 1.05 µm	channel 1: 0.9 µm channel 2: 1.05 µm	channel 1: 0.9 µm channel 2: 1.05 µm	channel 1: 0.8 µm channel 2: 1.05 µm	ch. 1: 1.52 µm, ch2: 1.64 µm or 1.28 µm and 1.65 µm
Field of View (Minimum spot size Ø in mm)	min 200:1 (min 1.5)	opt. head I: min 100:1 (min 1.2); II (focusable): min 200:1 (min 0.45)	optical head II-HD min 400:1 (min 0.9)	optical head I min 100:1 (min 1.2) optical head II (focusable) min 200:1 (min 0.45)	
Exposure time t_{90} ⁽¹⁾	< 10 ms adjustable up to 10 s	< 10 ms adjustable up to 10 s	< 10 ms adjustable up to 10 s	2 ms ⁽²⁾ adjustable up to 10 s	2 ms ⁽²⁾ adjustable up to 10 s
Output	0/4 - 20 mA, RS232 or RS485	0/4 - 20 mA, RS232 or RS485, PID controller (option)	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)

COMFORT CLASS








Model	IS 140	IGA 140	IS 140/67	IP 140	IPE 140
Description	Fully digital, very fast pyrometers. View finder or laser targeting light or color TV camera. Very small spot sizes, focusable optics. Display, buttons for instrument settings. Analog output, digital interface, maximum value storage.		Version of the IS 140 with extremely short wavelength for measurements of metals with high emissivity.	Fully digital, very fast pyrometers for measurements of low temperatures on metals. View finder or laser targeting light, very small spot sizes, focusable optics. Display, setting keys, max.value storage. Analog output, digital interface.	
Temperature Ranges (between... and...)	550...3300°C	220...3000°C	1100...3500°C	50...1300°C	5...1200°C
Spectral Range	0.7...1.1 µm	1.45...1.8 µm	0.676 µm	2...2.8 µm	3...5 µm
Field of View (Minimum spot size Ø in mm)	3 focusable optics min 300:1 (min 0.35)	3 focusable optics min 300:1 (min 0.35)	3 focusable optics min 300:1 (min 0.35)	4 focusable optics min 400:1 (min 0.3)	4 focusable optics min 150:1 (min 0.9)
Exposure time t_{90} ⁽¹⁾	< 1 ms adjustable up to 10 s	< 1 ms adjustable up to 10 s	< 1 ms adjustable up to 10 s	1.5 ms adjustable up to 10 s ⁽²⁾	1.5 ms adjustable up to 10 s ⁽²⁾
Output	0/4 - 20 mA, RS232/485 (switch.), Profibus-DP (option), Profinet (option), PID controller (option)	0/4 - 20 mA, RS232/485 (switch.), Profibus-DP (option), Profinet (option), PID controller (option)	0/4 - 20 mA, RS232 or RS485 (switchable), Profibus-DP (option)	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)

1) According to IEC/TS 62492-1

2) With dynamic adaption at low signal levels







ROBUST INDUSTRY DESIGN

					Model
<p>Fully digital, highly accurate, very fast pyrometers. Built in digital display, view finder and optional targeting light, very small spot sizes, variable or fixed optics, analog output, digital interface, maximum value storage.</p> <p>Option: built-in scanner (-S).</p>					Description
<p>Dedicated version of the IS 12, designed for measuring aluminium.</p>					
<p>Dedicated version of the IS 12-AI: with built-in scanner, scanning angle adjustable between 0...4°, scanning frequency between 0...10 Hz.</p>					
<p>Dedicated version of the IS 12, designed for measuring silicon wafers.</p>					
550...3500°C	250...2300°C	350...1050°C	350...1050°C	350...1800°C	Temperature Ranges (between... and...)
0.7...1.1 µm	1.45...1.8 µm	aluminum absorption filter	aluminum absorption filter	silicon absorption filter	Spectral Range
6 fixed optics min 900:1 (min 0.1); 3 focusable optics min 800:1 (min 0.4)	6 fixed optics min 900:1 (min 0.1); 3 focusable optics min 800:1 (min 0.4)	6 fixed optics min 60:1 (min 1.1)	6 fixed optics min 60:1 (min 1.1)	3 foc. optics min 130:1 (min 2.3) 6 fixed optics min 370:1 (min 0.6)	Field of View (Minimum spot size Ø in mm)
1 ms adjustable up to 10 s ⁽²⁾	1 ms adjustable up to 10 s ⁽²⁾	< 1.5 ms adjustable up to 10 s ⁽²⁾	< 1.5 ms adjustable up to 10 s ⁽²⁾	10 ms adjustable up to 10 s	Exposure time t₉₀ ⁽¹⁾
0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)	Output

COMFORT CLASS

HIGH SPEED

PRECISION CLASS

					
IP 140-LO	IPE 140/39	IGA 740	IGA 740-LO	IS 12-TSP	IGA 12-TSP
Version of the IP 140, with fiber optics, two available optics for very small spot sizes and laser targeting light.	Versions of the IPE 140: For measurement of objects in flame heated furnaces, sees through clean combustion flames and hot gases.	Ultra fast pyrometer with targeting light, very small spot sizes, and variable or fixed optics. Option: view finder	Ultra fast pyrometer with fiber optics, targeting light, small spot sizes and various optical heads.	Transfer-Standard-Pyrometer specially designed for the exact verification of the temperature of a blackbody calibration source. Resolution 0.01°C, extremely high accuracy and long term stability. Traceable works certificate with 5 measuring points.	
100...750°C	20...1800°C	160...2500°C	200...2500°C	600...3000°C	200...1400°C
2...2.6 µm	3.9 µm	1.58...1.8; 1.58...2.2 µm or 2...2.2 µm	1.58...1.8; 1.58...2.2 µm or 2...2.2 µm	2 types: 0.94 µm / 0.65 µm	1.57 µm
optical head I min 35:1 (min 3.4); optical head II min 80:1 (min 1.1)	3 focusable optics min 200:1 (min 0.7)	Focusable or macro optics min 200:1 (min 0.7)	2 standard optical heads 90:1 (min 1.6); 10 special optical heads with dedicated distance to spot ratio available	3 focusable optics min 400:1 (min 0.7)	3 focusable optics min 250:1 (min 1.1)
1.5 ms adjustable up to 10 s ⁽²⁾	1.5 ms adjustable up to 10 s ⁽²⁾	6 µs	6 µs	1 ms adjustable up to 10 s ⁽²⁾	1 ms adjustable up to 10 s ⁽²⁾
0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, 0 - 10 V	0/4 - 20 mA, 0 - 10 V	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)

1) According to IEC/TS 62492-1

2) With dynamic adaption at low signal levels



GLASS SURFACES

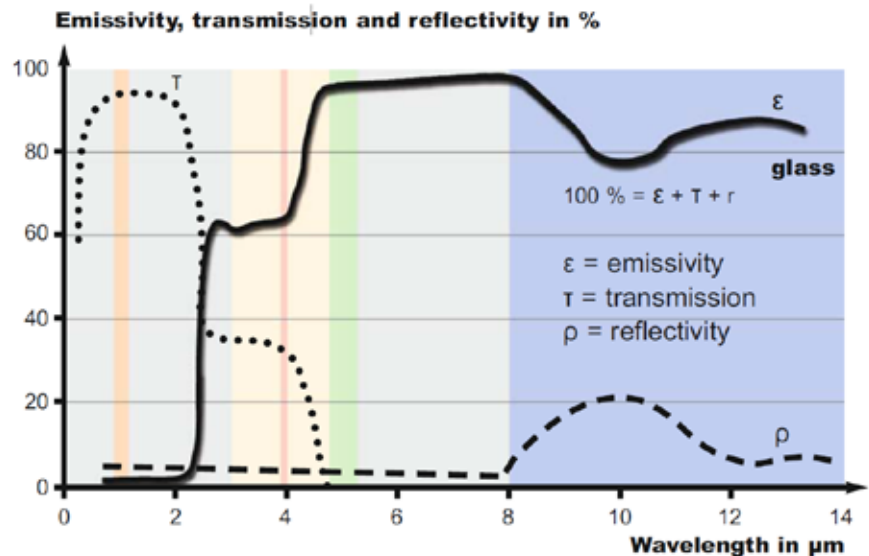
Emissivity of Glass Surfaces

Partially transparent materials such as glass and quartz have their own unique, emissivity. The emissivity of glass is characterized by wavelength ranges where infrared radiation largely passes through the glass material (transmission), others in which it is absorbed almost completely (absorption), and where it penetrates into the glass surface depending on the glass type. In small absorption bands these materials are opaque to radiation, which is why these bands are particularly suited for temperature measurements.

Glass is transparent in the visible light and near infrared ranges (to about $3 \mu\text{m}$), which means that its transmission is high, and consequently its emissivity is low. As you can see in the figure to the right, the emissivity of glass is very high in the range from 4.5 to $8.5 \mu\text{m}$, because glass has a wide absorption band in this spectral range. Above $8 \mu\text{m}$ the reflection ρ of glass increases sharply, making accurate measurements difficult.

As a rule, the wavelength range used for temperature measurements on glass surfaces lies around $5.14 \mu\text{m}$ (for glass thicknesses of 1 mm and more at medium to high temperatures), or $7.75 \mu\text{m}$ (for glass thicknesses below 1 mm and low to medium temperatures).

Depending on the wavelength chosen for the measurements, there will be different values for emissivity, transmissivity and reflectivity.



Example emissivity of glass surfaces

SMALL, LOW-PRICED

COMPACT CLASS

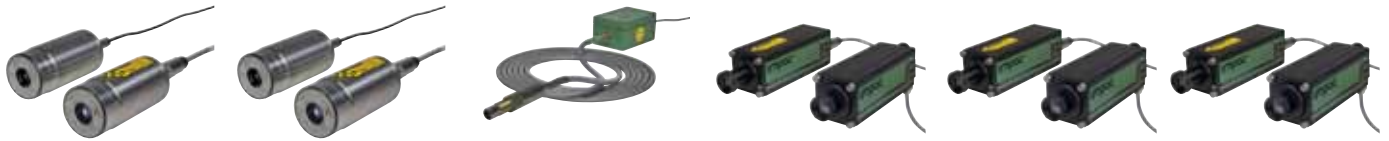


Model	IN 300/5	IN 210/5	M67S	M67S	IN 5/5	IN 5/5 plus
Description	Glass surface measurement version of IN 300, 2 wire design, spectral range 5.14 μm .	Glass surface measurement version of IN 210, 2 wire design and service interface. Programmable measuring range, spectral range 5.14 μm .	Analog 2-wire pyrometer with view finder in 2 wire design for measurement of glass surfaces or very thin glass.	Analog 2-wire pyrometer with view finder in 2 wire design for measurement of glass drops.	2-wire pyrometers for glass surface measurement, spectral range 5.14 μm .	Digital pyrometers for glass surface measurement. Analog output, digital interface, max./min. value storage, adjust. sub-range, laser targeting light.
Temperature Ranges (between... and...)	300...1300°C	100...1200°C	100...1300°C	525...3000°C	100...2500°C	100...2500°C
Spectral Range	5.14 μm	5.14 μm	4.8...5.2 μm	0.78...1.06 μm	5.14 μm	5.14 μm
Field of View (Minimum spot size \varnothing in mm)	2 fixed optics 35:1 (min 2.5)	3 fixed optics 50:1 (min 2.5)	3 fixed optics 15 or 30:1 (min 1.8)	3 fixed optics 90 or 180:1 (min 1.8)	3 fixed optics 50:1 (min 2.5)	3 fixed optics 50:1 (min 2.5)
Exposure time t_{90} ⁽¹⁾	100 ms	120 ms adjustable up to 10 s	100 ms (up to 10 s)	50 ms (up to 10 s)	80 ms adjustable up to 5 s	80 ms adjustable up to 30 s
Output	4 - 20 mA	4 - 20 mA	4 - 20 mA	4 - 20 mA	4 - 20 mA	0/4 - 20 mA, RS232 or RS485

COMPACT CLASS

WITH FIBER

COMFORT CLASS



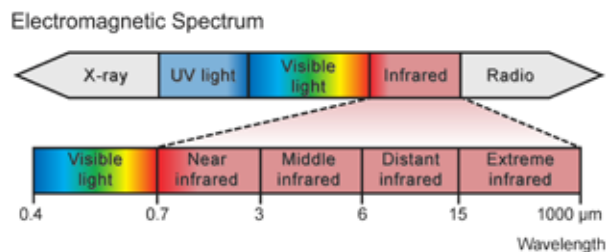
IN 5/5-H plus	IN 5/5-L plus	IS 50-LO/GL	IN 140/5	IN 140/5-H	IN 140/5-L
Digital pyrometers for glass surface measurement, spectral range 5.14 μm . With analog output, digital interface, max./min. value storage, adjust. sub-range, laser targeting light.		Fiber optic pyrometers for measurement of molten glass for forehearth, feeder and gobs. Adjustable measuring ranges. 2 wire design, analog output, (service interface).	Pyrometer for glass surface measurement, spectral range 5.14 μm . Laser targeting light or thru-lens view finder or color TV camera. Focusable optics with small spot sizes.		
-H: high speed version	-L: better field of view			-H: high speed version	-L: better field of view
200...2500°C	200...2500°C	600...1800°C	250...2500°C	250...2500°C	250...2500°C
5.14 μm	5.14 μm	0.8...1.1 μm	5.14 μm	5.14 μm	5.14 μm
3 fixed optics 50:1 (min 2.5)	3 fixed optics 100:1 (min 1.1)	optical head 100:1 (min 12)	3 focusable optics min 150:1 (min 1)	3 focusable optics min 150:1 (min 1)	focusable optics 180:1 (min 0.9)
10 ms adjustable up to 30 s	180 ms adjustable up to 30 s	250 ms adjustable up to 10 s	40 ms adjustable up to 10 s	10 ms adjustable up to 10 s	40 ms adjustable up to 10 s
0/4 - 20 mA, RS232 or RS485	0/4 - 20 mA, RS232 or RS485	4 - 20 mA	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)	0/4 - 20 mA, RS232 or RS485 (switchable)

1) According to IEC/TS 62492-1

2) With dynamic adaption at low signal levels

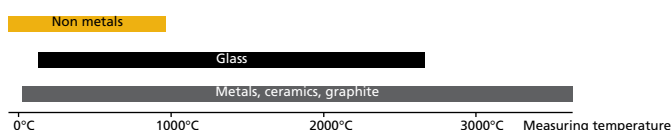
Infrared Temperature Measurement

The non-contact temperature measurement (pyrometry) is an optical measurement based on the property of all materials to send out electromagnetic radiation (infrared radiation). The infrared thermometer (pyrometer) uses this radiation to determine the temperature. The pyrometer aims with the optics at a certain spot of the object and determines the temperature of this spot. Today typically spectral responses of pyrometers are in the near, middle and long infrared.



Selection of the Appropriate LumaSense IMPAC Pyrometer

To choose the appropriate pyrometer for a specific application, different properties of the measuring object have to be taken into consideration, such as temperature, material and size. You can also check our pyrometer search function at www.lumasenseinc.com/EN/solutions/find-products/.



Temperature Range

Our pyrometers measure temperatures from -50 to 3500°C. The instruments are available in different temperature ranges. The ranges stated in the technical specifications do not show one single temperature range but give an overview over all available measurable temperatures.

Spectral Range

The material of the measured object demands the correct selection of the optimum spectral range of the pyrometer for a specific application. Therefore the correct spectral range is one of the most important parameters. Typical spectral ranges are:

0.55 μm or 0.676 μm	Measurement of molten metals (min. 1100°C)
0.8...1.1 μm	Measurement of molten glass, metals, ceramics (min. 600°C)
1.45...1.8 μm	Measurement of metals, ceramics (min. 250°C)
2.0...2.6 μm	Measurement of metals (min. 75°C)
2.0...2.8 μm	Measurement of metals (min. 50°C)
3...5 μm	Measurement of metals, ceramics (min. 5°C)
3.43 μm	Measurement of PE and PP foils (min. 50°C)
3.9 μm	Measurement in flame heated furnaces (min. 75°C)
4.5 μm	Measurement of CO ₂ (min. 400°C)
5.14 μm	Measurement of glass surfaces (min. 100°C)
8...14 μm	Measurement of non-metal surfaces and coated metals (min. -40°C)

Response Time

The response time is the time interval between the instant of an abrupt change in the value of the measuring temperature and the instant from which the measured value of the pyrometer remains within specified limits.

Design

Our pyrometers are designed for the use in industry under rough conditions. The housings of the fixed pyrometers are made of stainless steel or die cast aluminum with the protection class of IP65. The housings of the portables are made of robust plastics.

Available are:

- Compact pyrometers with integrated lens
- Fiber optic pyrometers (LO)
- Portables

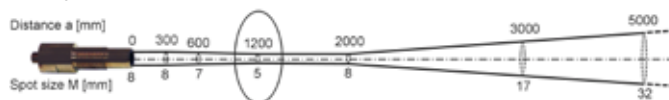
Field of View

The dimensions of the measured object determine the required spot size of the pyrometer. The measured object must at least fill the spot size to achieve a correct temperature measurement. Spot sizes are dependent on the type of pyrometer and measuring distance and can be calculated using the distance ratio or field of view (FOV).

$$FOV = \text{measuring distance} / \text{spot size}$$

(e.g. 240:1 means: in a distance of 1200 mm the spot size is 5 mm).

Example:



Output

Different pyrometers provide different outputs. Analog outputs and digital interfaces are available. Some pyrometers have various switchable outputs.

- Analog output 0 - 20 mA or 4 - 20 mA or 10 mV/°C or 0 - 5 V or thermo couple type J or K
- Digital interface RS232 or RS485
- Fieldbus-connection, integrated ProfiBus, ProfiNet)
- (switch output for IR switch: 20 V, max. 30 mA)

Controller

For control processes, some pyrometers are equipped with an integrated PID controller. For digital pyrometers without a controller output, a very fast programmable PID controller is available.

Sighting

For easy alignment of the pyrometers to the measuring object, different sighting systems are available:

- Aiming (LED or laser)
- View finder
- TV camera

Service

The mission of the LumaSense services organization is to deliver consistent world-class customer support so you can focus on your business. Our highly trained engineers, scientists and PhDs are ready to partner with you to deliver the right sensing solutions with the best performance and longest-life.

You expect the highest quality from your investments in LumaSense technology; therefore, our promise is to:

- Deliver responsive customer care
- Assist in keeping your assets reliable and working
- Provide you the knowledge and expertise required to solve complex problems quickly

The Customer Care Group at LumaSense Technologies is your single point of contact for:

- Technical and product support
- Order, shipment, repair and parts
- Service scheduling
- Warranty services

Technical and Product Support

Since our pyrometers are available in many different designs and specifications for almost any application, questions regarding the correct use, the settings or the installation of the instruments may occur. Many of these questions can only be answered in an individual dialogue. Accordingly, our experienced personnel are at your disposal to help you when you need it.

Field Services

We understand that successful assembly of one or more pyrometers into an existing system often requires a careful inspection of your facility. Our field application engineers are available to ensure you gain optimal performance by way of on-site repairs, calibrations, and/or training.

Order, Shipment, Repair and Parts

LumaSense Technologies produces high quality temperature measuring instruments, which operate efficiently, even under the toughest conditions. Nevertheless a repair of an instrument may become necessary. Our repair services provides a fast turn round of your repair order so that your instruments will be available to you again as quickly as possible.



Measurement in Hardening Processes

Calibration Services

LumaSense pyrometers work accurately and within their technical specifications for many years. However, periodic calibration or ISO-certification of the instruments is highly recommended.

Our adjustment and calibration services use a wide range of our own blackbody calibration sources that are certified by all international standards bodies. Within France, Germany, and the USA, LumaSense also offers an on-site adjustment and calibration service for a wide range of pyrometer types.



Mobile Calibration Unit

In either case, if you send your pyrometer to us or take advantage of our mobile service, inspection certificates are issued. In fact, LumaSense pyrometers always includes an inspection document, which confirms the operational reliability as well as measuring accuracy stated in the technical specifications.

LumaServ™ Contract Offerings

LumaSense offers extended warranties and calibration contracts with an annual option to renew. These contracts can include preventative maintenance plus software and firmware upgrades depending on the particular contract level you choose. Additional benefits include:

- Lock in pricing per term
- Discounts on related parts, repairs, and training

If you have any questions or would like more information about our available services, please contact your local LumaSense office.

With a 50-year history of creating efficiencies through light-based measurement, LumaSense Technologies, Inc., delivers innovative temperature and gas sensing instruments for the energy, industrial, clean technology and commercial markets. Our unrivaled passion for excellence is why we have become one of the world's most trusted sensing solution provider. Beyond providing precision engineered products, our customers turn to us knowing our commitment to their success comes first. With expert application understanding and a growing portfolio of products, LumaSense can combine several technologies together into novel solutions even for the most complex environments.

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