IMPAC IN 5/9 PLUS

Digital pyrometer for non-contact temperature measurement of sapphire and sapphire wafers between 0 and 1500°C (32 and 2732°F).

The Impac® IN 5/9 plus infrared thermometer is specially designed for non-contact temperature measurement of sapphire and sapphire wafers between 0 and 1500°C. The instrument is a pyrometer equipped with a digital interface, enabling temperature indication and storage on a PC. A temperature sub range can be configured and the instrument parameters can be adjusted remotely.

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 pyrometer to the measuring object, the instrument is equipped with a laser targeting light.

PRODUCT HIGHLIGHTS

- Specifically designed for measurement on sapphire and sapphire wafers
- Analog output 0 or 4 to 20 mA, digital interface RS232
- Laser targeting light sighting system
- High accuracy due to digital linearization of the output
- Adjustable exposure time
- Compact housing

TYPICAL APPLICATIONS

- Sapphire
- Sapphire wafers

AT A GLANCE

Temperature Range

0 to 1500°C

Spectral Range

8 to 9.7 µm

Repeatability

0.3% oR or 0.6°C

Optics

6 fixed optics:
a = 95 mm
a = 112 mm
a = 160 mm
a = 280 mm
a = 400 mm
a = 620 mm

Alignment

Laser targeting

Output

0/4 to 20 mA, RS232 (RS485 on request)

TECHNICAL DATA

Measurement Specifications	
Temperature Range	0 to 1300°C (32 to 2732°F)
Sub Range	Any range adjustable within the temperature range, minimum span 51°C
Spectral Range	8 to 9.7 µm
Resolution	0.1°C on interface
	< 0.1% of temperature range at the analog output
Emissivity ε	0.2 to 1.2 switchable in the instrument (offline mode: adjustable from 0.2 to 1.0) or with the software InfraWin (online mode) in steps of 0.01
Measurement Uncertainty ($\varepsilon = 1$, $t_{90} = 1$ s, T_{amb} = const.)	0.6% of reading in °C or 3°C (T_{amb} = 15 to 30°C)[1]
	1% of reading in °C or 5°C (T_{amb} = 0 to 15°C or 30 to 63°C)[1]
Repeatability ($\varepsilon = 1$, $t_{90} = 1$ s)	0.3% of reading in °C or 0.6°C[2]

Noise Equivalent Temperature Difference (NETD) ($\sigma=1$, $\varepsilon =1$, $T_{amb} = 23°C$)	350°C	@ t_{90} = 180 ms: 0.5°C
		@ t_{90} = 1 s: 0.2°C
	950°C	@ t_{90} = 180 ms: 0.4°C
		@ t_{90} = 1 s: 0.1°C

Optics	Zinc-Sulfide (ZnS)
Sighting	Laser targeting light 650 nm, Laser power level < 1 mW, Laser class 2 per IEC60825-1-3-4

Electrical	
Power Supply	24 VDC (18 to 30 V); nominal, ripple must be less than 0.5 V
Power Consumption	Max 70 mA
Load	Max 500 Ω @ 24 V (max 200 Ω @ 18 V)
Isolation	Power supply, analog outputs, and digital interfaces are electrically isolated from each other

Environmental Specifications	
Protection Class	IP 65 (DIN 40050)
Ambient Temperature	0 to 63°C (32 to 145.4°F)
Storage Temperature	-20 to 70°C (-4 to 158°F)
Relative Humidity	Non-condensing conditions
Weight	Approx 410 g (~14.47 ounces)
Housing	Stainless steel
CE Label	According to EU directives about electromagnetical immunity

[1] Whichever value is greater. The instrument must be at a constant ambient temp. for a minimum of 60 min and has to be connected to the power supply.

[2] The instrument must be at a constant ambient temp. for a minimum of 30 min.

[2] MB is a shortcut used for temperature range (in German: Messbereich).
The determination of the technical data of this pyrometer is carried out in accordance with VDI/VDE IEC TS 62942-2, the calibration / adjustment in accordance with VDI/VDE 3511, Part 4.4.

Advanced Energy

TECHNICAL DATA (CONTINUED)

Communication	
Analog Output	0 to 20 mA or 4 to 20 mA (linear), adjustable
Interface	RS232 (RS485 on request)
Maximum / minimum value storage	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
Exposure Time t_{90}	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

Interface		
Parameters	Adjustable on the pyrometer (in offline mode)	Emissivity, exposure time, 0/4 to 20 mA analog output range, online/offline switch
	Readable and adjustable via interface / PC (in online mode)	Emissivity, exposure time, 0/4 to 20 mA analog output range, sub temperature range, automatic clearing of the max/min value storage, external clearing of the max/min value storage, clear times of the max/min value storage, address, baud rate, internal temperature °C / °F, max/min. selection, activation of ambient temperature correction
Connection	12-pin connector	

DIMENSIONS
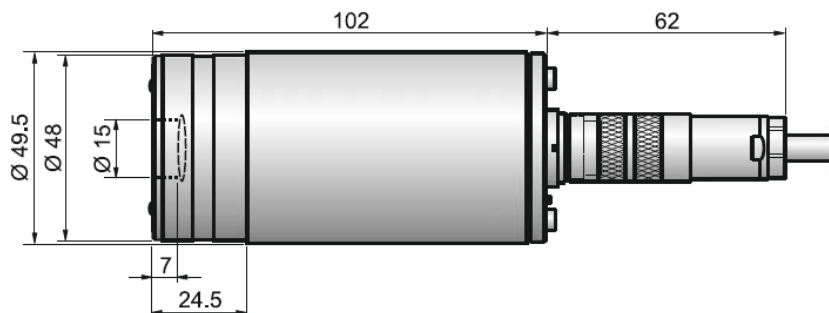
Dimensions in mm

OPTICS

The pyrometers are equipped ex works with one of the specified optics. Each optic is focused 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).

The IN 5/9 plus is supplied with one fixed optics shown in the table. Select one optics corresponding to the required measuring distance of the application.

For each optic, some example values for measuring distance (measured from the front of the lens) and spot size are listed in the table. 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 at least as big as the spot size).
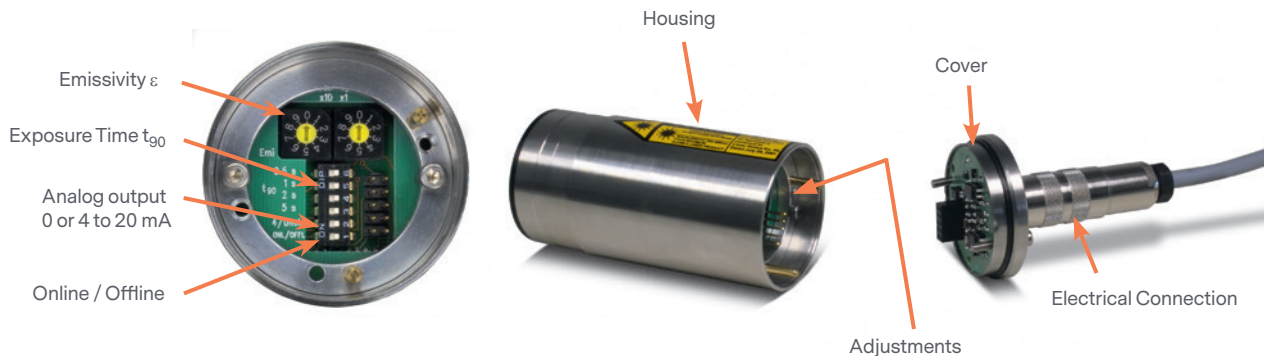
Effective aperture D for all optics is 14.8 mm.

Optics for IN 5/9 plus		
	Measuring Distance a [mm]	Spot Diameter M_{90} [mm]
Optics 1 a = 95 mm	95	1.7
	150	11.3
	250	28.6
Optics 2 a = 112 mm	112	1.9
	200	15
	300	29.9
Optics 3 a = 160 mm	160	2.8
	250	12.7
	350	23.7
Optics 4 a = 270 mm	270	4.5
	500	19.7
	750	36.9
Optics 5 a = 400 mm	400	6.4
	750	25
	1000	38.2
Optics 6 a = 620 mm	620	10
	1000	25.2
	1500	45.2

Spot sizes differing from the values in the table can be calculated with the equations shown below.

$$M_2 = \frac{a_2}{a_1}(M_1 + D) - D \qquad M_3 = \frac{a_3}{a_1}(M_1 - D) + D$$

Advanced Energy
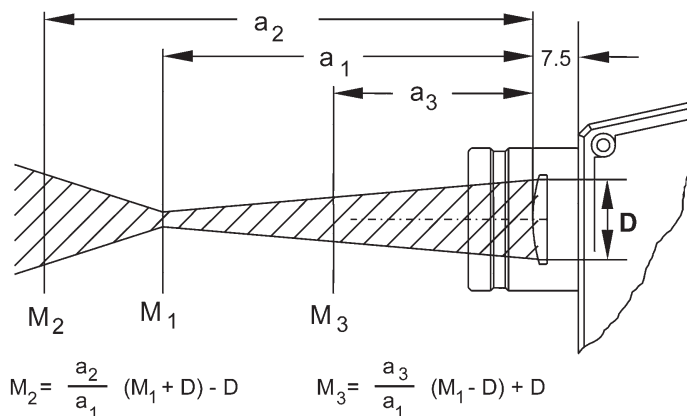
INSTRUMENT SETTINGS

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

Emissivity ε

Exposure Time t_{90}

Analog output 0 or 4 to 20 mA

Online / Offline

Housing

Cover

Electrical Connection

Adjustments

The instrument can alternatively be switched to 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

IN 5/9 plus	
Optics	**PN**
Instrument with optics a = 95 mm	3 871 800
Instrument with optics a = 112 mm	3 871 810
Instrument with optics a = 160 mm	3 871 820
Instrument with optics a = 270 mm	3 871 830
Instrument with optics a = 400 mm	3 871 840
Instrument with optics a = 620 mm	3 871 850

Scope of Delivery

Instrument with selected optic, works certificate, PC measurement and evaluation software InfraWin

Ordering Note

A connection cable is not included in scope of delivery and must be ordered separately.

ACCESSORIES

PN	Description
3 820 330	Connection cable, 5 m, straight connector
3 820 500	Connection cable, 10 m, straight connector
3 820 510	Connection cable, 15 m, straight connector
3 820 810	Connection cable, 20 m, straight connector
3 820 820	Connection cable, 25 m, straight connector
3 820 520	Connection cable, 30 m, straight connector
3 820 320	Connection cable 5 m (angled connector, additional laser targeting light push button)
3 820 740	Connection cable 5 m (straight connector, temperature resistant up to 200°C)
3 852 290	Power supply NG DC 100 to 240 VAC $\Rightarrow$ 24 VDC, 1 A
3 852 430	Converter I-7520; RS485 $\Leftrightarrow$ RS232 (half duplex)
3 852 440	Protocol converter RS485/RS232 (switchable) $\Leftrightarrow$ Profibus-DP for 1 instrument
3 852 460	Protocol transducer RS485 $\Leftrightarrow$ Profibus DP for 32 devices
3 852 620	Protocol converter UPP RS485 or RS232 $\Leftrightarrow$ ProfiNet, for 1 pyrometer
3 852 630	Protocol converter UPP RS485 $\Leftrightarrow$ ProfiNet, for max 32 pyrometers
3 891 220	DA 4000: LED-display, 2-wire power supply, 2 limit switches (relay contacts), 115 VAC
3 890 650	DA 4000: LED-display, 2-wire power supply, 2 limit switches (relay contacts), 230 VAC
3 890 560	DA 6000-N: LED digital display with digital input RS232 and possibility for pyrometer parameter settings
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: like the DA 6000-N, but with analog input and 2 limit switches for the RS485 interface.
3 826 500	HT 6000: portable battery driven indicator and instrument for pyrometer parameter settings; RS232 / RS485
3 826 510	PI 6000: PID programmable controller, extremely fast, for digital Impac pyrometers
3 834 210	Adjustable mounting support (Series 5 and 6)
3 835 160	Air purge unit, aluminium
3 835 440	Air purge unit, stainless steel
3 837 230	Water cooling jacket (heavy duty) with integrated air purge unit (with metric mounting threads)
3 837 350	Water cooling jacket (heavy duty) with protection window (with metric mounting threads)
3 837 370	Water cooling jacket (light duty) with integrated air purge unit (with metric mounting threads)
3 837 400	Water cooling jacket (light duty) with protection window (with metric mounting threads)
3 846 100	Mounting tube
3 846 120	Flange tube[1]
3 846 630	Vacuum flange KF16 with protection window
3 846 660	Spare protection window, Ø 25 x 3 with Viton-O-ring

[1] The flange system is a modular mounting system to fix the pyrometer on furnaces, vacuum chambers, etc. It can consist of e.g. mounting support, tube support with air purge and flange and an open or closed ceramic sighting tube. The mounting support can be equipped with a quartz window for vacuum applications.

INFRAWIN 5 OVERVIEW

InfraWin is easy-to-use measurement and evaluation software for remote configuration of stationary, digital Impac brand pyrometers.

This software allows the user to remotely adjust and control settings for one or two pyrometers from a single computer. InfraWin also allows the user to simultaneously monitor and control temperatures.

- Display temperature data as color bars and online graphics
- Capture downstream evaluations as tables, graphics or text files
- Calculate the spot size for different measuring distances
- Features UPP standard (Universal Pyrometer Protocol)

Pyrometer Settings
An Impac digital pyrometer connected to a PC will be automatically detected by the software. All available parameters are adjustable, including emissivity, response time, maximum value storage, output signal and sub range.

Further special functions are adjustable for example controllers or TV parameters on instruments available with these functions. Changes are transmitted directly to the pyrometer.
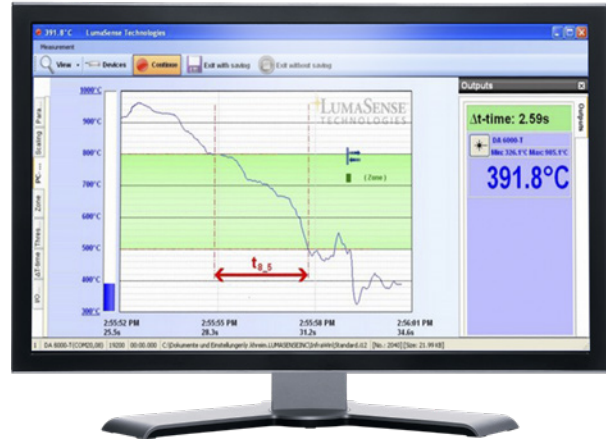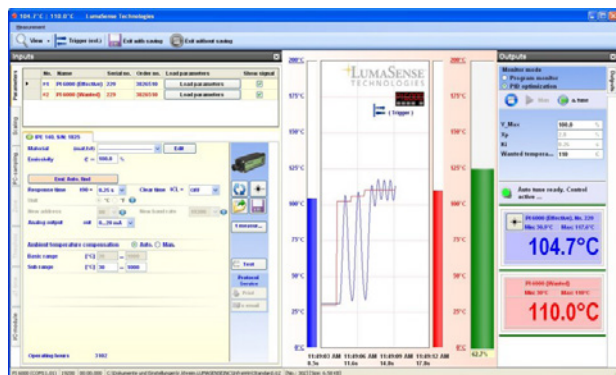
Measurement with Color Bar
In this window a temperature value for the upper or lower limit can be adjusted numerically or with the mouse.
The acquired minimum and maximum value is indicated as well as the inner temperature of the pyrometer. The emissivity is changeable during the measurement at any time.

Infrared Calculator
After input of the aperture and the focused spot size per datasheet, the calculation of spot sizes at non-focused distances is possible.

Measurement with Internal Temperature of radiation temperature and internal instrument temperature. Parameters can be changed during the measurement.
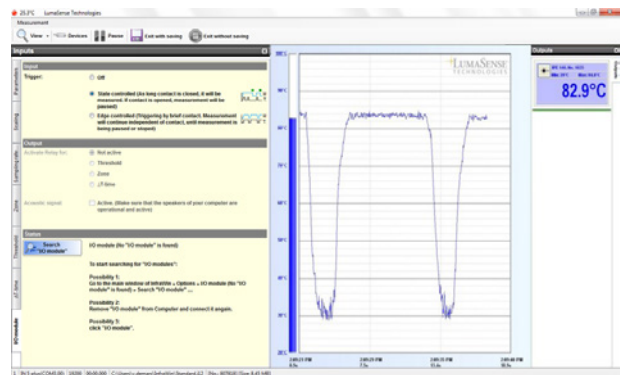
I/O Module allows users to trigger measurement externally and gives a potential free output contact.

ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

AE's power solutions enable customer innovation in complex semiconductor and industrial thin film plasma manufacturing processes, demanding high and low voltage applications, and temperature-critical thermal processes.

With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

PRECISION | POWER | PERFORMANCE

For international contact information,
visit advancedenergy.com.

sales.support@aei.com
+1 970 221 0108