



MANUAL

IMPAC Pyrometer IGA 6/23 Advanced



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2 Introduction

2.1 Appropriate use

The IMPAC IGA 6/23 is a short wave infrared temperature measuring device with digital signal processing. It is used for non-contact temperature measurements on metals, ceramics, graphite, etc. with a temperature range between 50 and 1800 °C.

2.2 Scope of delivery

Pyrometer, PC adjustment, and evaluation software *InfraWin*, works certificate, and operating instructions.




Note: A connection cable is not included with the instrument and has to be ordered separately (see Chapter 8, **Reference numbers**).

2.3 Technical Data

Measurement

Temperature Ranges:	50 to 1000 °C (MB 10) 75 to 1300 °C (MB 13) 150 to 1800 °C (MB 18)		
Sub Range:	Any range adjustable within the temperature range, minimum span 50 °C		
Spectral Ranges:	2 to 2.6 µm (main wavelength 2.3 µm)		
Resolution:	0.1 °C or 0.2 °F at interface; < 0.0015% of adjusted temperature range at analog output, 16 bit; 1 °C or 1 °F on display		
Emissivity ε :	0.050 to 1.000 in steps of 1/1000		
Transmittance τ :	0.050 to 1.000 in steps of 1/1000		
Response Time t_{90} :	0.5 ms (with dynamic adaptation at low signal levels) adjustable to min; 1 ms; 3 ms; 5 ms; 10 ms; 50 ms; 250 ms; 1 s; 3 s; 10 s		
Measurement Uncertainty: ($\varepsilon = 1$, $t_{90} = 1$ s, $T_{Umg.} = 25$ °C)	< 1500 °C: 0.3% of reading in °C + 2 °C > 1500 °C: 0.6% of reading in °C		
Repeatability: ($\varepsilon = 1$, $t_{90} = 1$ s, $T_{Umg.} = 25$ °C)	0.15% of reading in °C + 1 °C		
Noise Equivalent Temperature Difference (NETD): ($\varepsilon = 1$, $\sigma = 1$, $T_{Umg.} = 25$ °C, $t_{90} = \text{min}$)	MB 10	Temperature / °C 60 100 150	NETD 0.9 0.5 0.1
	MB 13	100 200 250	1.2 0.6 0.1
	MB 18	200 300 400	1.5 0.6 0.2

Optics

Sighting:		Built-in laser aiming light (max. power level < 1 mW, $\lambda = 630$ to 680 nm, CDRH class II) or through-lens sighting
Optics:		Manually focusable from rear cover measuring distance $a = 210$ to 5000 mm
Distance Ratio:		MB 10: approx. $50 : 1$ MB 13: approx. $100 : 1$ MB 18: approx. $350 : 1$

Environment

Protection Class:	IP 65 IEC 60529 (value in mated condition)
Operating Position:	Any
Ambient Temperature:	0 to 70 °C at housing
Storage Temperature:	-20 to 80 °C
Relative Humidity:	Non condensating conditions
Weight:	0.6 kg
Housing:	Stainless steel
CE-Label:	According to EU directives about electromagnetic immunity

Interface

Connection:	12-pin connector
Display (in rear cover):	LED, 4 digit matrix, 5 mm high temperature signal or measuring distance
Parameters:	Adjustable via interface: emissivity, sub range, ambient temperature compensation, wait time t_w , settings for maximum value storage, address, baud rate, transmittance, response time t_{90} , 0 to 20 mA or 4 to 20 mA analog output range, °C/°F Readable via interface: measured value, internal temperature of the unit, measuring distance

Communication

Analog Output:	Adjustable 0 to 20 mA or 4 to 20 mA, linear (via digital interface)
Digital Interface:	RS485 addressable (half-duplex) Baud rate: 1200 Bd to 115.2 kBd or RS232
Maximum Value Storage:	Built-in single or double storage. Clearing with adjusted time t_{clear} (off; 10 ms; 50 ms; 250 ms; 1 s; 5 s; 25 s), via interface, automatically with the next measuring object, hold-function

Electrical

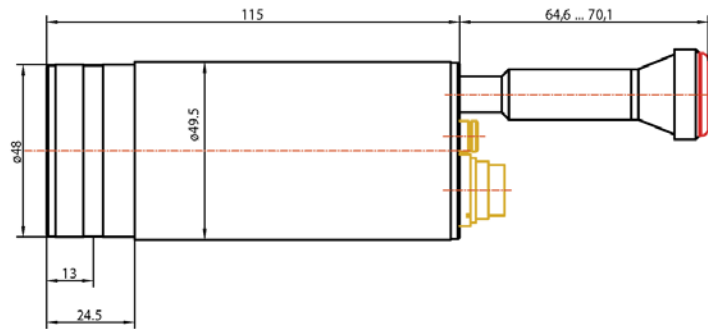
Power Supply:	24 V DC $\pm 25\%$, ripple must be less than 50 mV
Power Consumption:	Max. 3 W (incl. laser)
Load (analog output):	0 to 500 Ohm
Isolation:	Power supply, analog output, and digital interface are galvanically isolated from each other



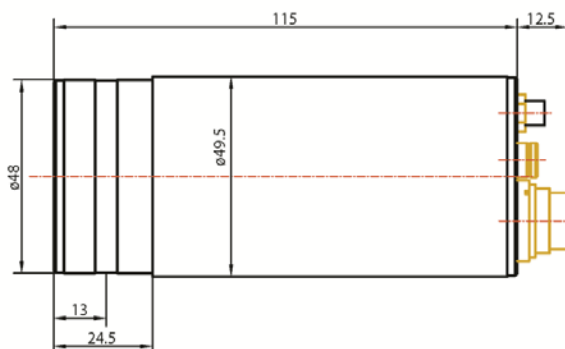
Note: The calibration / adjustment of the instruments was carried out in accordance with VDI/VDE directive "Temperature measurement in industry, Radiation thermometry, Calibration of radiation thermometers", VDI/VDE 3511, Part 4.4. For additional details on this directive, see <http://info.lumasenseinc.com/calibration> or order the directive from "Beuth Verlag GmbH" in D-10772 Berlin, Germany.

2.4 Dimensions

IGA 6/23 Advanced with the view finder



IGA 6/23 Advanced with laser sighting



2.5 Physical User Interface



IGA 6/23 Advanced
with laser sighting



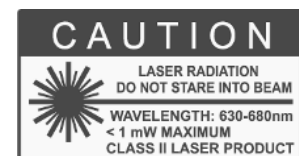
IGA 6/23 Advanced
with the view finder

- 1 12-pin connector
- 2 Digital display
- 3 Optional sighting
- 4 Screw to adjust the focus
- 5 LED distance display
- 6 LED indicator light
- 7 Adjusting for the view finder



Warning: If selected, the IGA 6/23 Advanced laser light option is a Class 2 and emits laser light.

To minimize the risk of eye injury, do not look directly into the beam, and do not point the laser beam of the pilot light into the eyes of another person.



2.6 Accessories (Optional)

Numerous accessories guarantee easy installation of the pyrometer. The following overview shows a selection of suitable accessories. You can find the entire accessory program with all reference numbers in Chapter [8, Reference numbers](#).

2.6.1 Mounting

Mounting brackets are available for safe mounting and alignment of the pyrometer to the measuring object.



Mounting angle

2.6.2 Cooling Jacket

The stainless steel housing with integrated water-cooling air purge allows use of the pyrometer above the maximum permissible ambient temperature. The pyrometer can be operated in ambient temperatures up to 180 °C.



Water cooling jacket with integrated air purge

2.6.3 Air Purge

The air purge protects the lens from contamination of dust and moisture. It has to be supplied with dry and oil-free pressurized air and generates an air stream shaped like a cone.



Air purge

2.6.4 Vacuum Pickup

The vacuum pickup KF16 with window allows the user to easily mount the pyrometer on vacuum systems.



Vacuum Pickup

2.6.5 Scanning Mirror

The scanning mirror unit SCA 5 allows the measured object to be scanned over a certain range. The measuring beam of the pyrometer moves straight in one line across the object and collects temperature data of this line. This is useful when used in combination with the maximum value storage (peak picker) to measure objects, which move out of the target area. The scanning angle of the mirror is 0 to 12° and the scanning frequency 0 to 5 Hz. Both values are easily adjustable at the scanner.

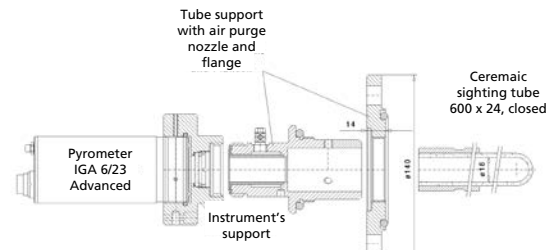


Scanning Mirror

2.6.6 Flange System

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. It may consist of an equipment rack, flange, and an open or closed ceramic tube. The equipment rack can be equipped for vacuum applications with a fused silica.



Schematic drawing of the flange system

3 Controls and Installation

3.1 Electrical Installation

The IGA 6/23 Advanced is powered by a voltage of 24 V DC \pm 25% (ripple < 50 mV). It is important to ensure correct polarity when connecting the device to the power supply. The length of the 24 V supply line should not be longer than 30 m. Hence, the use of 24 V site internal supply network is also not recommended. This length restriction does not apply for the analog and digital signal lines.

To meet the electromagnetic requirements (EMV), a shielded connecting cable must be used. LumaSense offers connecting cables, which are not part of the standard scope of delivery. The shield of the connecting cable has to be connected only on the pyrometer's side. If the connecting cable is extended, the shield of the extension also needs to be extended. The shield must be open on the power supply side (switch board), to avoid ground loops.

The connecting cable has wires for the power supply, interface, analog output, switch contact, and external clearing of the maximum value storage via contact and 12-pin connector (see Chapter [8](#), **Reference numbers**).

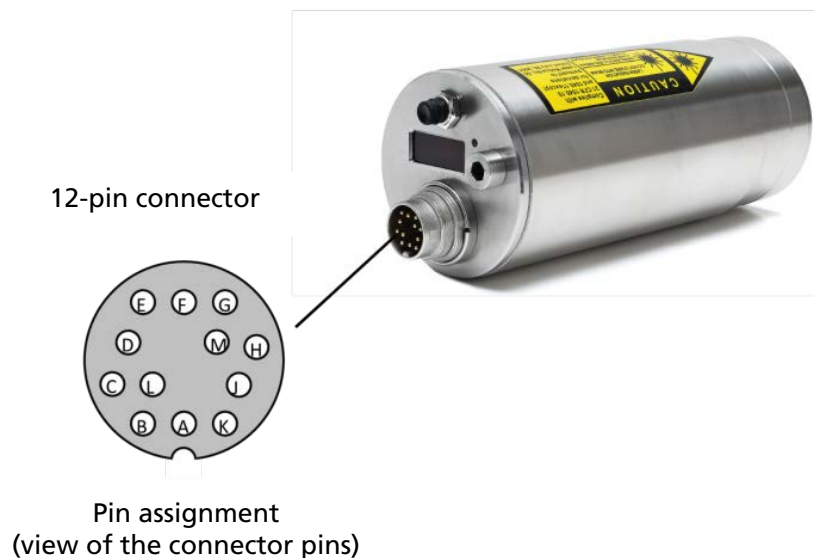


Attention: When connecting the power supply, ensure the polarity is correct.

Once the instrument has been connected to the power supply, it is immediately ready for use. Although it does not need to be warmed up, it does need to run for approximately 15 to 30 minutes before achieving full accuracy. The instrument can be switched off by interrupting the power supply or unplugging the electrical connector.

3.1.1 Pin assignment of the connector

Pin	Color	Function
K	white	+24 V DC power supply
A	brown	0 V DC power supply
L	green	+ I _{Ausg.} analog output
B	yellow	– I _{Ausg.} analog output
H	gray	Targeting light activate / deactivate via external switch (bridged with K)
J	pink	External clearing of max. value storage (bridge to K) or hold function*
G	red	DGND (GND for interface)
F	black	B1 (RS485) or RxD (RS232)
C	violet	A1 (RS485) or TxD (RS232)
D	gray-pink	B2 (RS485) (bridged with F)
E	red-blue	A2 (RS485) (bridged with C)
M	orange	Screen only for cable extension, don't connect at the switchboard



*The connector pin J can be used for two different functions:

1. **External clearing of the maximum value storage:** When the pyrometer is in operating mode, pin J can be used for external clearing of maximum value storage. When external clearing is selected from the tclear dropdown menu, pin J is connected for a short time to pin K (power supply voltage) to clear the stored maximum value. The function "external clearing" is triggered when the clear time is set to "extern".
2. **Hold function:** When the hold function mode is activated, the current temperature reading is frozen as long as pin J and pin K are connected. (See section 4.6 for clear time for the maximum value storage).

3.1.2 Connecting the pyrometer to a PC

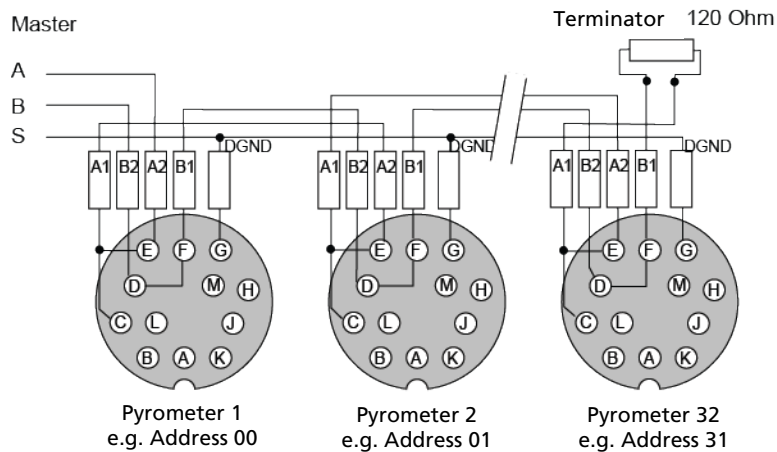
The pyrometer is equipped with an RS485 serial interface. With the RS485, long transmission distances can be realized and the transmission is, to a large extent, free of problems. The RS485 also allows several pyrometers to be connected in a bus system.

If an RS485 connection is not available at the PC, it can be accomplished using the RS485 to USB connector. When using a RS485 to USB adapter, make sure that the adapter is fast enough to receive the pyrometer's answer to an instruction of the master. Most of the commonly used adapters are too slow for fast measuring equipment, so it is recommended to use the RS485 ⇔ USB converter "USB nano" (ref. no. 3 852 600).

3.1.3 Connection to RS485

Half-duplex mode: A1 and A2 as well as B1 and B2 are bridged in the 12-pin round connector of the connecting cable, to prevent reflections due to long stubs. It also safeguards against the interruption of the RS485 bus system, should a connecting plug be pulled out. The master labels mark the connections on the RS485 converter.

The transmission rate of the serial interface in Baud (Bd) is dependent on the length of the cable. Adjusted values are from 1200 to 115200 Bd.



RS485 Bus System

3.1.4 Connection of Additional Units

For temperature indication of the pyrometer, LumaSense offers pure indicators (series DA 4000). LumaSense also offers indicators with features to change pyrometer parameters (DA 6000 and DA 6000-N) as well as a fast digital PID controller PI 6000.



Digital Display

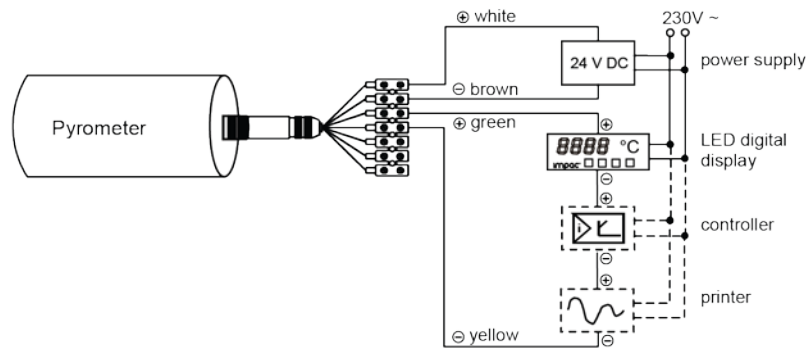


Parameterizing Indicator



Digital Controller

Additional analyzing instruments, including LED digital displays only need to be connected to a power supply and the analog outputs of the pyrometer (exception: the digital display DA 6000 can also be connected with its serial interface, whereas the digital display DA 6000-N has to be connected with its serial interface).



Connection of additional units

Other instruments like an analog controller or printer can be connected to the display in a series as shown above (total load of resistance max. 500 Ohm).

3.2 Sighting

The IGA 6/23 Advanced can be purchased with Through-Lens Sighting (viewfinder) or with a Laser Targeting Light. These sighting options allow you to easily align the pyrometer to the measuring object.

3.2.1 Viewfinder

The IGA 6/23 Advanced can be equipped with a viewfinder which offers through-lens sighting. The viewfinder is true-sided and parallax-free. A circle marks the position of the measuring spot, but not the exact spot size.

The viewfinder is equipped with an adjustable eye-protection filter, which allows you to view hot objects without exposing your eye to high intensity light. When you are viewing hot objects, turn the adjustment ring on the viewfinder so the filter will let in less light.



Warning: To ensure eye protection, make sure you use the shaded filter when viewing objects with temperatures of 1500 °C or higher.



Viewfinder Adjustment Ring



Note: You can turn the adjustment ring on the viewfinder in both a clockwise and counterclockwise direction to change the filter from light to dark.

When you are viewing low temperature objects, turn the viewfinder adjustment ring so the filter will let in more light.

3.2.2 Laser Targeting Light

The IGA 6/23 Advanced can be equipped with a laser targeting light to assist with aligning the pyrometer to the measuring object. The laser targeting light is a visible red light with a wavelength between 630 and 680 nm and a maximum power of 1 mW. The laser is classified as product of laser class II.

The laser spot marks the center of the measuring spot on the target. The diameter does not correspond to the spot size. The smallest diameter of the laser spot approximately indicates the measuring distance.



Warning: The instrument is equipped with a class II laser that emits radiation.

To reduce the risk of injury to the eyes, do not look directly into the targeting laser and do not point the targeting laser into anyone's eyes.



Never look directly into the laser beam. The beam and spot can be watched safely from side. Also, make sure that the beam will not be reflected into eyes of people by mirrors or shiny surfaces.

The laser targeting light can be switched on and off by pressing the button of the rear cover of the housing.



Note: The laser warning signs on the pyrometer should be easily viewable at all times, even after it has been installed.

The laser targeting light can also be switched on and off by using an external contact (see section 3.1.1 Pin Assignment) or through the InfraWin software. If it is not switched off by one of the above-mentioned methods, it will be switched off automatically after approximately 2 minutes.

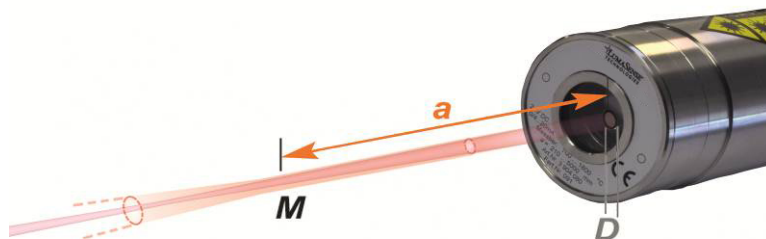
To prevent damage to the laser, the targeting light is also switched off automatically if the internal temperature of the pyrometer exceeds 61 °C. It can only be used again once the temperature falls below 61 °C.

3.3 Optics

3.3.1 Spot Sizes

The IGA 6/23 Advanced has a Vario optics, which can be manually adjusted at all distances between 210 mm and 5000 mm.

The table of Spot Sizes in Relation to Measuring Distance shows examples of the pyrometer's spot size M [mm] in relation to the measuring distance a [mm] (min. 90% of the radiation intensity). Increasing or decreasing the measuring distance will change the spot size.



Note: Since these are 1-color (mono) pyrometers, they can measure objects at any distance (whether focused or non-focused). However, the object has to be bigger than, or at least as big as, the spot size of the pyrometer in the measuring distance.

Aperture D for all temperature ranges is 13 to 15 mm with the aperture being the effective diameter of the lens. This is dependent on the optical setting. The largest value applies to a very small measuring distance, while the minimum value applies to the largest measuring distance.

Measuring Distance a [mm]	Spot Diameter M [mm] MB 10	Spot Diameter M [mm] MB 13	Spot Diameter M [mm] MB 18
210	4.2	2.1	0.6
300	6	3	0.9
500	10	5	1.5
800	16	8	2.3
1300	26	13	3.7
2000	40	20	5.8
5000	100	50	15

Examples of Spot Sizes in Relation to Measuring Distance

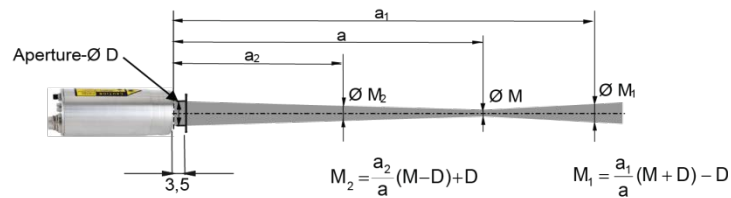


Note: Effective aperture D for all temperature ranges is 13 mm (focused to longest distance) to 15 mm (focused to shortest distance).

Focused spot sizes between the listed distances can be found by linear interpolation between the listed values.

3.3.2 Deviation from the focused measuring distance

Spot sizes for non-focused distances (shorter or longer than the focused distance) may be calculated by using the formula below.



Formula for Calculating Spot Sizes

The InfraWin software also includes a Spot Size Calculator that calculates the data for the non-focused regions, if you enter the values of aperture D, focused measurement distance a, and focused measuring field diameter M as found in the above table (see section 3.3.1).

3.3.3 Finding the right measuring distance

The measuring distance can be set using the Focus Adjustment Screw on the back of the device. The focused distance value can be adjusted at all distances between 210 mm and 5000 mm. To focus, turn the focus adjustment set screw to make the target image appear sharp and clear.



Note: The optics are manually focusable with a measuring distance of a = 210 to 5000 mm.



The LED Distance Indicator Light (labeled mm) will turn red and the approximate focused measuring distance in mm will automatically be shown on the Digital Display for a few seconds after making an adjustment using the Focus Adjustment Set Screw.



Note: Turning the focus adjustment screw counterclockwise will shorten the measuring distance.

Turning the focus adjustment screw clockwise will lengthen the measuring distance.

4 Settings / parameter descriptions

The pyrometer is equipped with a wide range of settings for optimal adaptation to the required measuring condition and to measure the temperature correctly.



All settings can be read and set only in the **pyrometer parameters** window of the software *InfraWin*. Adjusting the settings at the instrument is not possible (detailed description of the software see Chapter [5](#), **Software *InfraWin***).

Selecting the pyrometer parameters window shows the current settings of the pyrometer. Changing a value can either be done by typing a value in an input box or by selecting a preset value from the list field.

4.1 Factory Settings

Temperature display (°C / °F) = °C

Emissivity (ε) = 100%

Transmittance (W) = 100%

Exposure time (t_{90}) = min

Dynamical adaptation dm = 4

Clear time (t_{clear}) = off

max / min = maximum value storage preset

Analog output (out) = 0 ... 20 mA

Sub range same as basic temperature range

Ambient temperature compensation = auto

Address = 00

Baud rate = 19200 Bd

4.2 Temperature Display

The Digital Display on the back of the pyrometer will show the temperature measurement in either °C or °F. You can select which temperature scale you wish to use through the *InfraWin* software or by using the UPP Data Format commands.

The Measuring Value can also be viewed at any time through the *InfraWin* Software or by using the UPP Data Format commands.

4.3 Emissivity ε

Different materials have different emissivities ranging between 0% and 100%. The emissivity is also dependent upon on the surface condition of the material, the spectral range of the pyrometer, and the measuring temperature. The emissivity setting of the pyrometer has to be adjusted accordingly.

Emissivity settings between 5% and 100% can be established through the InfraWin software or by using the UPP Data Format commands.

Measuring object	Emissivity [%] (at 2.3 μm)	Measuring object	Emissivity [%] (at 2.3 μm)
"Black body furnace"	100	Steel, molten	20 to 30
Extruded Aluminum	13	Nickel	15 to 20
Brass	18	Titanium, non-oxidized	50
Brass oxidized (tarnished)	65 to 70	Titanium, oxidized	75 to 80
Copper	5	Molybdenum	10
Copper, oxidized	70 to 80	Molybdenum, oxidized	75 to 80
Inconel	30	Black Carbon	95
Inconel, oxidized	85	Graphite	80 to 90
Oxidized Iron	85 to 90	Stoneware, glazed	60
Steel rolling scale	80 to 88	Porcelain rough	80 to 90



Note: Emissivity ε can be set from 5% to 100% in steps of 0.1%.

4.4 Transmittance τ

Transmittance is a parameter that can compensate for signal loss due to external windows etc. For example, if the emissivity of the material is 0.6 and the transmittance of an additional window is 0.9, then the product would be 0.54 which is well inside the allowed range.

The product of transmittance and emissivity ($\tau \times \varepsilon$) must not be less than 5%.



Note: Transmittance τ can be set from 5% to 100% in steps of 0.1%.

4.5 Response Time (t_{90})

The response time t_{90} is the time interval for the analog output of the pyrometer to go from a low temperature value up to 90% of the temperature step to a high value when measuring an abrupt increase from said low to said high temperature.

The dynamic exposure time adjustment prolongs the exposure time at the lower range limit. With the InfraWin software and the UPP Data Format commands it is possible to configure the dynamic exposure time.

Dependency of the response time on the temperature value				
MB 10	Temperature value	60 °C	120 °C	150 °C
	t_{90} min	2 ms	1 ms	0.5 ms
MB 13	Temperature value	100 °C	150 °C	200 °C
	t_{90} min	2 ms	1 ms	0.5 ms
MB 18	Temperature value	200 °C	250 °C	300 °C
	t_{90} min	4 ms	1 ms	0.5 ms

Independently of this, the pyrometer performs a measurement every 25 μs and updates the analog output. Slower response times can be used to achieve a constant temperature reading for measuring objects that have rapidly fluctuating temperatures.

The response time is set using the InfraWin software or by using the UPP Data Format commands. When the setting is set to min., the IGA 6/23 Advanced operates using a time constant of approximately 0.5 ms. The response time can be extended to 1 ms; 3 ms; 5 ms; 10 ms; 50 ms; 250 ms; 1 s; 3 s; 10 s.



Note: Settings for Response Time t_{90} min, 1 ms; 3 ms; 5 ms; 10 ms; 50 ms; 250 ms; 1 s; 3 s; 10 s

4.6 Clear Peak Memory (t_{CLEAR})

The integrated maximum value storage is activated when the parameter t_{clear} is set to something other than "OFF" or "HOLD".

If the maximum value storage is switched on, the highest last temperature value will always be displayed and stored. As such, it may be beneficial to periodically clear and reset the stored maximum values in order to obtain new temperature readings.

This storage also has to be cleared at regular intervals when fluctuating object temperatures cause the display or the analog outputs to change too rapidly or when the pyrometer is not constantly viewing an object to be measured.

Settings:

off
10 ms
50 ms
250ms
1 s
5 s
25 s
extern
auto

4.6.1 Single and Double Storage Modes

Depending upon the selected settings, the maximum value storage will either work in single storage mode or in double storage mode.

Single Storage Mode:

Single storage mode is used when you want to reset the stored value using an external impulse via one contact closure from an external relay (such as between two measured objects). The relay contact is connected directly to the pyrometer between pins J and K. This mode allows a new value to be established after each impulse from the reset signal. Single storage mode also comes into effect when the Clear Peak Memory t_{clear} is set to AUTO.

Double Storage Mode:

Double storage mode comes into effect when selecting one of the reset intervals. This mode utilizes two memories. With the first memory, the highest measured value is held and is deleted alternately in the time interval set (clear time). The other memory retains the maximum value throughout the next time interval. The disadvantages of fluctuations in the display with the clock frequency are thereby eliminated.



Note: The maximum value storage setting coincides with adjustments made to the response time.

The response time setting (working like a low-pass filter) is applied first. After that, the maximum storage is processed. So when using both, the maximum storage takes the peak of the signal that was previously smoothed by the response time filter.

4.6.2 Clear Time Settings

The following settings are available through the InfraWin software or by using the UPP data format commands.

OFF	When set to OFF , the maximum value storage is switched off and all new temperature values are measured but not stored.
10 ms...25,0 s	If the clear time is set between 10 ms and 25.0 s , the maximum value is held in double storage mode. After the entered time, the value will be cleared alternately from one of the storages, while the value of the other storage is shown.
EXTERN	With the external clearing function, the storage operates in single storage mode. The values are immediately cleared from the storage by contacting the wires connected to pins J and K, if the EXTERN mode was selected.
AUTO	<p>The AUTO mode is used for discontinuous measuring tasks. For example, when objects are being transported on a conveyer belt and pass the measuring beam of the pyrometer only for a few seconds. In this case, the maximum value for each object has to be obtained.</p> <p>With the AUTO mode, the maximum value is stored until a new hot object appears in the measuring beam. The temperature, which has to be recognized as "hot" is defined by the low limit of the adjusted sub range.</p> <p>The stored maximum value will be deleted once the temperature of the new hot object exceeds the low limit of the sub range by 1% (transition in positive direction) or by at least 2 °C. This is also valid if the sub range equals the basic range.</p>
HOLD	<p>The HOLD function allows you to freeze the current temperature reading at any moment. This feature is activated using an external switch that has been connected between connector pins J and K.</p> <p>The temperature reading will remain frozen as long as the contact remains closed.</p>

4.7 Analog Output

The analog output has to be selected according to the signal input of the connected instrument (controller, PLC, etc.). If 4 to 20 mA is set, the analog output gives 3.9 mA for temperatures below lower range limit.

<u>Einstellungen:</u> 0 ... 20 mA 4 ... 20 mA



Note: Settings for Analog Output: 0 to 20 mA or 4 to 20 mA

0 to 20 mA/21 Low or 4 to 20 mA/21 Low (setting /21 Low = Analog Out shows 21 mA if signal intensity falls below Switch-Off level).

4.8 Sub Range

You have the opportunity to choose a sub range (minimum span 50 °C) within the basic measuring range of the pyrometer. This sub range corresponds to the analog output.

Example: Range 150...1800 °C, Sub Range 925...975 °C.

The sub range setting also affects the maximum value storage when the Clear Peak Memory t_{clear} is set to AUTO. For more information on the t_{clear} AUTO setting, refer to section [4.6](#).



Note: Settings for Sub Range - any range adjustable within the temperature range with a minimum span of 50 °C.

4.9 Device Address

When connecting several pyrometers to one serial interface with RS485, it is necessary for each instrument to have its own device address for communication purposes. First, it is necessary to connect each instrument separately to give it an address. After that, all instruments can be connected and addressed individually.

Settings:

00
:
97



Note: Only via own communication program with interface command (not possible with InfraWin, because InfraWin automatically detects a connected pyrometer): If parameters should be changed simultaneously on all pyrometers, the global **Address 98** can be used. This allows you to program all pyrometers at the same time, regardless of the addresses that have already been assigned. If the address of a pyrometer is unknown, it is possible to communicate with it using the global **Address 99** (connect only one pyrometer).

4.10 Focused Distance

The focused distance value can be adjusted at all distances between 210 mm and 5000 mm using the Focus Adjustment Screw on the back of the device.

The LED Distance Indicator Light will turn red and the focused measuring distance in mm will automatically be shown on the Digital Display within a few seconds of making an adjustment using the Focus Adjustment Set Screw.

The focused distance can be viewed at any time through the InfraWin software or by using the UPP Data Format commands.



4.11 Baud Rate

The transmission rate of the serial interface in Baud (Bd) is dependent on the length of the cable. A maximum cable length for 19200 Bd with RS485 is 2 km. The baud rate is reduced by 50% if the transmission distance is doubled.

Baud Rates can be set at 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200.

4.12 Pyrometer Internal Temperature

The internal temperature of the pyrometer can be read through the PC interface using the InfraWin software or by using the UPP Data format commands. It is a few degrees higher than the ambient temperature due to the heat generated by the electronics.



When using the Laser Targeting Light, the targeting light is switched off automatically if the internal temperature of the pyrometer exceeds 61 °C. This safety feature is used to prevent damage to the laser. It can only be used again once the temperature falls below 61 °C.

4.13 Ambient Temperature Compensation

The compensation of the ambient temperature can be set for temperatures within the basic measuring range. This compensation is only used for very few special applications. The standard setting of this parameter is "auto", because the temperature of the air around the pyrometer is normally the ambient temperature of the measured object. Should the measured object be placed in an area with a higher wall temperature (e.g. inside a furnace), the measurement might be falsified (probably too high temperature indication). This influence can be compensated by presetting the ambient temperature of the object (presetting within the measuring range of the instrument). After switching over to "man" the corresponding data field T_{amb} is activated so that the ambient temperature value can be entered.

<u>Settings:</u> auto 00 °C (32 °F) ⋮ 70 °C (158 °F)
--



Attention: It has to be considered that this method only improves the results if the ambient temperature at the place of the measured object is always constant and the emissivity is well known.

5 Software InfraWin

The operating and analyzing *InfraWin* software is included with delivery of the pyrometer. In addition to allowing you to make parameter adjustments via PC, the *InfraWin* software also provides temperature indication, data logging, and measurement analysis features.

A software description can be found in the program's help menu. Click on the F1 button after loading *InfraWin* or click on the ? in the menu bar.

The latest version is available for free as download from the homepage www.lumasenseinc.com.

5.1 Connecting the pyrometer to a PC

The program *InfraWin* can operate up to two devices. Two devices using RS485 may be operated simultaneously by the same interface, if two different addresses have been properly entered (see section **4.9 Device Address** for more information).

5.2 Installation

To install the *InfraWin* software, select setup.exe from the *InfraWin*-CD or from the downloaded and unpacked zip file from the internet and then follow the installation instructions.

5.3 Program start

The first time you load *InfraWin* 5, you will be prompted to select a default language. The *InfraWin* software is available in German, English, Spanish, French, Portuguese, and Chinese. Once installed, click **Language/Languages** if you would like to select another language.

6 Maintenance

6.1 Cleaning the front window

Since the device does not contain parts that require regular maintenance, the only regular maintenance required is periodic inspection of the front window for build-up of foreign particiles. If allowed to build up, the particles can influence the energy received by the instrument.

The IGA 6/23 Advanced window is not water soluable and can be cleaned with standard lens tissue dampened with a commercially available glasses or camera lens cleaning solution. Use a soft blower/brush (available in camera stores) to remove any grit on the window before you rub the lens with lens tissue and solution.



Attention: NEVER CLEAN THE IGA 6/23 Advanced WINDOW WITH A DRY TISSUE OF ANY KIND! The only time dry lens tissue may be used is to dry a window which has already been cleaned with wet lens tissue.

6.2 Calibration

LumaSense calibrated your IGA 6/23 Advanced pyrometer at the factory and delivered your instrument with a Works Certificate. Normally we advise against changing the factory set calibration. If you believe that the calibration may have changed, perhaps because your operating environment is severe, an approximate field (on-site) calibration is possible. You have the choice of an on-site calibration or arranging a more precise calibration at the LumaSense factory.



Note: The calibration / adjustment of the instruments was carried out in accordance with VDI/VDE directive "Temperature measurement in industry, Radiation thermometry, Calibration of radiation thermometers", VDI/VDE 3511, Part 4.4. For additional details on this directive, see <http://info.lumasenseinc.com/calibration> or order the directive from "Beuth Verlag GmbH" in D-10772 Berlin, Germany.

6.2.1 Laboratory Calibration

Contact LumaSense for information about calibration at the LumaSense factory. For most of our customers who do not have large numbers of infrared thermometers in service, we recommend that our laboratory be chosen to do calibration. When you have many infrared thermometers, you may find it most convenient and economical to have your own calibration laboratory. LumaSense has a variety of blackbody calibration sources including very economical ones. Among these you may find the source most suitable for your own laboratory.

6.2.2 On-Site Calibration

See Chapter 9 Troubleshooting before attempting to perform your own calibration. The instrument was calibrated at the factory to its original accuracy as stated.

Nearly all erroneous temperature readings are caused by application problems such as:

- **Reflections:** Unexpectedly high readings may be caused by the IGA 6/23 Advanced “seeing” a reflection of another hotter source, especially if the target emissivity is less than 0.8.
- **Spot Sizes:** Ensure the IGA 6/23 Advanced is using a **proper focused distance** and takes into account the spot size in relation to measuring distance. The pyrometer can measure objects at any distance. However, the object has to be bigger than or at least as big as the spot size of the pyrometer in the measuring distance.
- **Obscured window:** Clean the window. Refer to the cleaning window section 6.1.

7 Data format UPP (Universal Pyrometer Protocol)

Software commands can be exchanged directly with the pyrometer through an interface using suitable communication software or by using the "Test" function located in the "Pyrometer Parameters" window of the InfraWin software package.

The data exchange occurs in ASCII format with the following transmission parameters:

- The data format is: 8 data bits, 1 stop bit, even parity (8,1,e) no handshake;
- The device responds to the entry of a command with output (such as the measuring value) + CR (Carriage Return, ASCII 13), to pure entry commands with "ok" + CR, or "no" + CR.
- Every command starts with the 2-digit device address AA followed by two lower case command letters and finished with CR.

Example Read Command: Entry: "00em" + <CR>

The emissivity setting (ε) of the device with the address 00 is returned.

Answer: "0970" + <CR> means Emissivity = 0.97 or 97.0%

- The ASCII parameter "X" indicates a change to be made in a parameter. When used, the command contains the new value.

Example Write Command: Entry: "00emXXXX" + <CR>

The parameter used for the emissivity setting (ε) with the address 00 is changed.

Answer: "00em0853" + <CR> changes the Emissivity to 0.853 or 85.3%

- A "?" after the lower case command letters answers with the limits of the respective settings (only at setting commands, not at query commands).

Example Read Limits Command: Entry: "00em?" + ~CR!

Answer: Could be 00501000 + <CR>, which means that E can vary between 0.050 and 1.000 (or 5% and 100%)

Description	Command	Parameters
Analog Output	AAasX	X=0 (0 to 20 mA) X=1 (4 to 20 mA)
Reference Number	AAbn	Output: XXXXXX (hex 6-digit)
Baud rate (set)	AAbrX	X = 0 to 6 or 8 (dec.) 0 = 1200 Baud 1 = 2400 Baud 2 = 4800 Baud 3 = 9600 Baud 4 = 19200 Baud 5 = 38400 Baud 6 = 57600 Baud 7 = is not allowed 8 = 115200 Baud
Emissivity ε	AAemXXXX AAem	XXXX = 0050 to 1000 ε =0.050 to 1.000 Answer: DDDD 4 decimal digits 0050 to 1000

Description	Command	Parameters
Transmittance τ of window	AAetXXXX AAet	XXXX = 0050 to 1000 $\varepsilon=0.050$ to 1.000 Answer: DDDD 4 decimal digits 0050 to 1000
Response time t_{90}	AAezX	X=0 to 9 0=min 1=1 ms 2=3 ms 3=5 ms 4=10 ms 5=50 ms 6=250 ms 7=1 s 8=3 s 9=10 s
Dynamic exposure time	AAadmX	X=0 to 9 0 = off, 1 = min, 9 = max
Temp display °C or °F	AAfhX	Output: X=0 Display in °C X=1 Display in °F
Device address	AAgaXX	XX=(00 to 97) 00 to 97=regular device addresses 99=global address with response
Internal temperature (read)	AAgt AAtm	Answer: DDD 3 decimal digits (000 to 098 °C or 032 to 210 °F) gt=current temp. tm=maximum temp. (memory)
Ambient temperature compensation	AAutXXXX	XXXX = value of ambient temperature, 4-digit, hex XXXX e.g. FFEC corresponds to -20 degrees -99dez = FF9Dhex means: automatic, no manual compensation
Laser	AAlaX AAla	X=0 off X=1 on Answer: 1-digit: "0" or "1"
Wait time	AAtwXX	XX = 00 ... 99 (decimal, in bit time of the current baud rate)
Software simulation of external clearance	AAlx	Clears maximum storage
Clear peak memory t_{clear}	AAlzX	X=0 to 9 0=OFF 1=10 ms 2=50 ms 3=250 ms 4=1 s 5=5 s 6=25 s 7=EXTERN 8=AUTO 9=HOLD
Basic range (read)	AAmb	Answer: XXXXYYYY 2x4 hex-digit for lower and upper range limit (°C or °F)



Description		Command	Parameters
Sub range (read)		AAme	Answer: XXXXYYYY 2x4 hex-digit for lower and upper range limit (°C or °F)
Sub range (set)	1.	AAm1XXXXYYYY	XXXXYYYY=2x4 hex-digit for lower and upper sub range limit (°C or °F)
	2.	AAm2	AAm2 confirms the change (auto reset)
Measuring value		AAms	Answer: QQQQ (88880=Overflow) 5 decimal digit (in °C or °F, last digit is 1/10 °C or °F)
Device type		AAAna	Output: "IGA 6/23 Advanced" (16 ASCII-characters)
Read Parameters		Aapa	Answer: 15 decimal digits DD. : Emissivity (see em) . . D. : Response time (see ez) . . . D. : Clear peak memory (see lz) D. : Analog output (see as) DD. : Internal temperature (see gt) DD. : Device address (see ga) D. : Baud rate (see br) 01000 : Fixed value
Serial number		AAsn	Output: XXXXX (hex 5-digit)
Device type / Software version		AAve	Answer: VVMMJJ VV=27 MM=Month JJ = Year of software version
Communication Module/ software version in detail		AAvc	tt.mm.jj XX.YY tt = day; mm = month; jj = year; XX.YY = Software version
Software version in detail		AAvs	tt.mm.jj XX.YY tt = day; mm = month; jj = year; XX.YY = Software version

Note: the letter "l" means the lower case letter of "L".

Additional instruction for the RS485 interface:

Requirements to the master system during half-duplex operation:

1. After an inquiry, the bus should be switched into a transmission time of 3 bits (some older interfaces are not fast enough for this).
2. The pyrometer's response will follow after 5 ms, at the latest.
3. If there is no response, there is a parity or syntax error and the inquiry has to be repeated.
4. After receiving the response, the master has to wait at least 1.5 ms before a new command can be entered.

8 Reference Numbers

8.1 Reference numbers instrument

Temperature Range	With Laser Targeting		With Viewfinder	
	RS485	RS232	RS485	RS232
50 to 1000 °C (MB 10)	3 914 210	3 914 330	3 914 220	3 914 340
75 to 1300 °C (MB 13)	3 914 250	3 914 370	3 914 260	3 914 380
150 to 1800 °C (MB 18)	3 914 290	3 914 410	3 914 300	3 914 420

Ordering note:

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

8.2 Reference numbers accessories

3 820 320 Special connection cable with angled connector and additional targeting light push button, 5 m long

3 820 330 Connection cable, 5 m, with straight connector

3 820 500 Connection cable, 10 m, with straight connector

3 820 510 Connection cable, 15 m, with straight connector

3 820 810 Connection cable, 20 m, with straight connector

3 820 820 Connection cable, 25 m, with straight connector

3 820 520 Connection cable, 30 m, with straight connector

3 820 340 Connection cable, 5 m, with right angle connector

3 820 530 Connection cable, 10 m, with right angle connector

3 820 540 Connection cable, 15 m, with right angle connector

3 820 830 Connection cable, 20 m, with right angle connector

3 820 840 Connection cable, 25 m, with right angle connector

3 820 550 Connection cable, 30 m, with right angle connector

(All connection cables include a short adapter cable with a 9-pin D-SUB connector. This connector may be used in combination with the RS485 to USB adapter.)

3 852 290 Power supply NG DC for DIN rail mounting; 100 to 240 V AC \Rightarrow 24 V DC, 1 A

3 852 550 Power supply NG 2D for DIN rail mounting; 85 to 265 V AC \Rightarrow 24 V DC, 600 mA with two settable limit switches

3 826 750 USB to RS485 adapter cable, HS-Version, 1.8 m long

3 852 440 Protocol transducer RS485/RS232 (switch.) \leftrightarrow Profibus-DP for 1 device

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 V AC
- 3 890 650 DA 4000: LED-display, 2-wire power supply, 2 limit switches (relay contacts), 230 V AC
- 3 890 570 DA 6000-N digital display to allow adjustment of the Pyrometer through the RS485 interface
- 3 890 530 DA 6000: like DA 6000-N with analog input and 2 limit switches for the RS485 interface
- 3 826 510 PI 6000: PID programmable controller, very fast, for digital IMPAC pyrometers
- 3 890 630 LD24-UTP; large digital indicator, 57 mm height of digits
- 3 843 490 SCA 5, External Scanner Series 5 & 6 with fused silica window, 24 V AC/DC
- 3 846 260 Instrument's support (Series 5 & 6)
- 3 834 210 Adjustable mounting support (Series 5 & 6)
- 3 846 290 Instrument's support (Series' 5 & 6) with fused silica window
- 3 835 590 90° mirror for Series 5 and Series 6, quartz glass window
- 3 843 250 ROT5 scanning mirror attachment up to 70°
- 3 843 430 Scanning mirror attachment up to 12°
- 3 835 160 Air purge unit, aluminum
- 3 837 230 Water cooling jacket (heavy duty) with integrated air purge
- 3 837 280 Water cooling jacket (heavy duty) with fused silica window
- 3 837 500 Water cooling jacket (light duty, with air purge unit (only for instruments with laser targeting)
- 3 837 510 Water cooling jacket (light duty), with fused silica window (only for instruments with laser targeting)
- 3 837 540 Cooling plate for series 5 and 6, with air purge
- 3 846 590 Vacuum support KF16 with quartz glass window

上海麦兴仪器设备有限公司

Shanghai MaxSun Industrial Co., Ltd.

地址：上海市浦东新区张杨路188号汤臣中心A座

邮编：200122

电话：(86 21) 5888 6718 / 133 8186 8102

传真：(86 21) 5888 7876

邮箱：mx@imaxsun.com

麦兴（中国）有限公司

MaxSun (China) Limited.

地址：香港湾仔告士打道151号国卫中心11楼

电话：(852) 2836 8361

传真：(852) 3011 5863

邮箱：mx@imaxsun.com