

Stationary, digital ratio pyrometer with a built-in video camera system with infrared filter for non-contact temperature measurement and display of thermal images in ranges between 700 and 1800 °C

## ISR 6-TI Advanced



- Combination of pyrometry and thermal imaging in a single solution
- Built-in video camera with short wavelength infrared filter
- Auto calibration of thermal image relative to accurate pyrometer temperature reading
- Inclusive video cable and Video-to-USB grabber for use with InfraWin software
- "Dirty Window" Warning
- Very fast 2 ms response time for highly dynamic processes
- Robust, stainless steel sensor for harsh environments (IP65)



The ISR 6-TI Advanced infrared thermometer combines accurate (2-color) pyrometry and thermal imaging in one non-contact temperature measurement system. It accurately measures the temperature of the center spot and uses an infrared filter to show an auto-calibrated thermal image based on the accurate (and to a large extent emissivity independent) ratio pyrometer temperature reading.

The system is based on the high quality 2-color (ratio) pyrometer ISR 6 Advanced in combination with a video camera with a short wavelength infrared filter.

The analog video output signal is converted to USB (using an external video-to-USB grabber) and fed into a PC using the standard pyrometer software InfraWin. InfraWin generates and shows a pseudo-color

image from this signal relative to the accurate temperature reading of the central measuring spot (measured by the ratio pyrometer).

The response time of only 2 ms facilitates the measurement of fast processes. The ISR 6-TI Advanced is also equipped with all ISR 6 Advanced standard features such as a built-in "dirty window" warning.

The ISR 6-TI Advanced provides valuable measuring data for all applications where not only an accurate temperature reading in one spot is required but also a display of the temperature distribution (around and relative to that spot) is of interest.

### Typical applications:

- Metal Industry - e.g. melting processes, melting furnaces, vacuum furnaces, coating processes, welding processes, induction heating processes, and sintering processes
- Glass Industry - e.g. glass gob
- Semiconductor Industry - e.g. sapphire growth
- Other Industry - e.g. waste combustion

# Technical Data

## Measurement Specifications

Temperature Range:	700 to 1800 °C (MB 18)
Sub Range:	Any range adjustable within the temperature range, minimum span: 50 °C
Spectral Ranges:	Channel 1: 0.9 µm; Channel 2: 1.05 µm
Resolution:	0.1 °C or 0.2 °F at interface; < 0.0015% of selected sub range at analog output, min. 0.1 °C, 16 bit; 1 °C or 1 °F on display
Emissivity $\epsilon$ :	0.050 to 1.000 in steps of 1/1000 (1-color mode)
Transmittance $\tau$ :	0.050 to 1.000 in steps of 1/1000 (1-color mode)
Emissivity Slope $K$ :	0.800 to 1.200 in steps of 1/1000 (2-color mode)
Measurement Uncertainty:	< 1500 °C: 0.3% of reading in °C + 2 °C ( $K = 1$ , $t_{90} = 1$ s, $T_{amb.} = 25$ °C) > 1500 °C: 0.6% of reading in °C
Repeatability:	0.15% of reading in °C + 1 °C ( $K = 1$ , $t_{90} = 1$ s, $T_{amb.} = 25$ °C)

## Optical Specifications

Sighting:	Thermal image with marked pyrometer spot
Optics:	Manually focusable from rear cover measuring distance $a = 210$ to 5000 mm
Distance Ratio:	approx. 190 : 1

## Environmental Specifications

Protection Class:	IP 65 IEC 60529 (value in mated condition)
Operating Position:	any
Ambient Temperature:	0 to 65 °C at housing
Storage Temperature	-20 to 80 °C
Relative Humidity:	Non condensating conditions
Weight:	0.755 kg
Housing:	Stainless steel
CE Label:	According to EU directives about electromagnetical immunity

## Electrical

Power Supply:	24 V DC $\pm$ 25%, ripple must be less than 50 mV
Power Consumption:	Approximately 8.5 W
Load (analog output):	0 to 500 $\Omega$
Isolation:	Power supply, analog output and digital interface are electrically isolated from each other

Note: MB is a shortcut used for temperature range (in German: Messbereich)

Note: The calibration / adjustment of this pyrometer is carried out in accordance with VDI/VDE 3511, Part 4.4. See <http://info.lumasenseinc.com/calibration> for more information.

## Interface

Connection:	12-pin connector
Connection Video signal:	Separate triaxial contact at pyrometer for double screened signal transmission.  Connection cable with BNC-connector on user's side.
Display (in rear cover):	LED, 4 digit matrix, 5 mm high for 2-color or 1-color temperature signal or measuring distance
Parameters:	Adjustable via interface: 2-color / 1-color temperature signal, accordingly emissivity slope or emissivity, temperature sub range, settings for maximum value storage, address, baud rate, switch off limit, warning level lens contamination monitoring system, transmittance, response time $t_{90}$ , 0 to 20 mA or 4 to 20 mA analog output range, °C/°F, settings for thermal images.  Readable via interface: measured value, internal temperature of the unit, measuring distance

## Communication

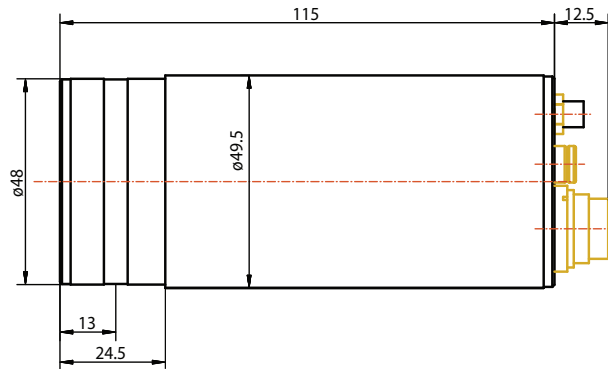
Analog Output:	Adjustable 0 to 20 mA or 4 to 20 mA, linear (via digital interface)
Digital Interface:	RS485 addressable (half-duplex) Baud rate: 1200 to 115.2 kBd (on request RS232, not addressable)
Video-Signal:	FBAS-Signal approx. 1 VSS on 75 Ohm, PAL (B), 50 Hz, CCIR656
Switch Off Limit:	2% to 50% (adjustable via interface)
"Dirty Window" Warning:	Relay contact, max. continuous current 0.4 A, setting of the warning level: 0 (off) to 99%
Response Time $t_{90}$ :	<2 ms (with dynamic adaption at low signal levels); adjustable to min; 0.01 s; 0.05 s; 0.25 s; 1 s; 3 s; 10 s
Maximum Value Storage:	Built-in single or double storage. Clearing with adjusted time $t_{clear}$ (off; 0.01 s; 0.05 s; 0.25 s; 1 s; 5 s; 25 s), via interface, automatically with the next measuring object, external contact, hold-function

## Thermal Imaging Feature\*

Relative temperature span in one image (depends on temperature):	100...200 °C distributed around the spot temperature (for one dynamic range).  Possible combination of multiple ranges can be used so complete temperature range of pyrometer can be displayed.
Pixels:	768 x 576
Frequency (fps):	up to 25 Hz
Signal:	Analog Video (PAL), USB
Field of view:	6.0° x 4.5° (e.g. 105 mm x 78 mm at 1000 mm distance)
Calibration of thermal image:	relative to central pyrometer spot

\*Note: Displaying the thermal image is only possible if the pyrometer is operated in 2-color mode!

# Product Schematic



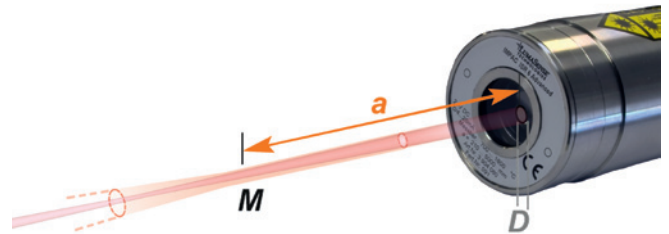
Dimensions in mm

# Optics

## ISR 6-TI Advanced

700 to 1800 °C	
distance a [mm]	Spot diameter M [mm]
210	1.1
300	1.6
500	2.7
800	4.2
1300	6.9
2000	10.6
5000	27

The optics can be manually adjusted at all distances between 210 mm and 5000 mm. The table shows examples of distances and the corresponding spot diameters.



Effective aperture D for all temperature ranges:  
12 mm (focused to longest distance) to 14 mm (focused to shortest distance)

# Thermal Imaging Feature

The built-in video camera system has an infrared filter close to the wavelength range of the pyrometer. This makes it possible to display a "simple" thermal image using the standard pyrometer software InfraWin.

Temperature in pyrometer spot

Temperature in pyrometer spot

Temperature of current cursor position:

"Low" if temperature is below the dynamic range

"Over" if temperature is above the dynamic range

Coordinates and temperature of cursor position:

"Low" if temperature is below the dynamic range

"Over" if temperature is above the dynamic range

Pyrometer spot (actual size)

## Reference Numbers

Type	Temperature Range	Reference Number
ISR 6-TI Advanced	700 to 1800 °C (MB 18) (includes video grabber and 5 m video cable)	3 904 620

**Scope of delivery:** Pyrometer, Video Grabber, Video cable (5 m), PC adjustment, and evaluation software InfraWin, works certificate, and operating instructions.

**Ordering note:** A connection cable is not included in scope of delivery and must be ordered separately

## Accessories

3 820 330	Connection cable, 5 m, straight connector*	3 890 640	DA 4000-N: LED digital display to be built into the switchboard
3 820 500	Connection cable, 10 m, straight connector*	3 890 650	DA 4000: like the DA 4000-N, but additionally with 2 limit switches
3 820 510	Connection cable, 15 m, straight connector*	3 890 570	DA 6000-N digital display, to allow adjustment of Pyrometer through RS485 interface
3 820 810	Connection cable, 20 m, straight connector*	3 890 530	DA 6000: like the DA 6000-N, but with analog input and 2 limit switches for the RS485 interface.
3 820 820	Connection cable, 25 m, straight connector*	3 890 630	LD24-UTP; large digital indicator, 57 mm height of digits
3 820 520	Connection cable, 30 m, straight connector*	3 920 710	Surcharge for instrument with video cable total length 10 m
3 820 340	Connection cable, 5 m, 90° connector*	3 920 730	Surcharge for instrument with video cable total length 20 m
3 820 530	Connection cable, 10 m, 90° connector*	3 920 760	Surcharge for instrument with video cable total length 40 m
3 820 540	Connection cable, 15 m, 90° connector*	3 920 600	5 m Video Cable f. Series 6, BNC connector, adapter Cinch**
3 820 830	Connection cable, 20 m, 90° connector*	3 920 610	10 m Video Cable f. Series 6, BNC connector, adapter Cinch**
3 820 840	Connection cable, 25 m, 90° connector*	3 920 630	20 m Video Cable f. Series 6, BNC connector, adapter Cinch**
3 820 550	Connection cable, 30 m, 90° connector*	3 920 660	40 m Video Cable f. Series 6, BNC connector, adapter Cinch**
3 826 510	PI 6000: PID programmable controller, very fast, for digital IMPAC pyrometers	3 826 730	Video grabber with USB cable**
3 826 720	USB to RS485 adapter cable, 1.8 m long		
3 834 210	Mounting support, adjustable		
3 835 160	Air purge unit, aluminium		
3 835 590	90° mirror for Series 5, quartz glass window		
3 837 230	Water cooling jacket (heavy duty) with integrated air purge unit		
3 846 260	Mounting support		
3 846 290	Mounting support with fused silica window		
3 846 590	Vacuum flange KF16 with quartz glass window		
3 852 290	Power supply NG DC for DIN rail mounting; 100 to 240 V AC ⇒ 24 V DC, 1 A		
3 852 550	Power supply NG 2D for DIN rail mounting; 85 to 265 V AC ⇒ 24 V DC, 600 mA with 2 settable limit switches		

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

\*\*For replacement only: please note that video cable and grabber needs to be calibrated with the instrument. If a replacement video cable or grabber is ordered the instrument will have to be calibrated in the factory!



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## Awakening Your 6<sup>th</sup> Sense

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