Pyrometer with focusable optics for non-contact temperature measurements on metals, ceramics, graphite etc. between 220 and 3500 °C

IS 140 • IGA 140 • IS 140-PB • IGA 140-PB
IS 140-PN • IGA 140-PN • IS 140-ET • IGA 140-ET

CE

- Short response times < 1 ms optional 500 µs

- Extremely small spot sizes, min 0.35 mm

- Built-in digital display

- Optimized thru-lens view finder, laser targeting light or video module

- Test current output

- Housing with precision mounting rail for safe mounting and accurate alignment

- Interface RS232 / RS485 switchable or built-in Profibus-DP, Profinet, or Ethernet interface

- Focusable optics

The pyrometers IS 140, IGA 140, IS 140-PB, IGA 140-PB, IS 140-PN, IGA 140-PN, IS 140-ET, and IGA 140-ET are digital, highly accurate pyrometers for non-contact temperature measurement on metals, ceramics, graphite etc.

The types IS 140 and IGA 140 are equipped with RS232 and RS485 serial interfaces (switchable). This enables additionally the reading of temperature and pyrometer parameters via the provided InfraWin PC software. If necessary, the parameters also can be changed via PC.

The PB types are equipped with a Profibus-DP interface and PN types are equipped with a Profinet interface. They can easily be integrated in existing Profibus and Profinet systems, respectively. As part of standard delivery, the GSD file (Profibus) and GSDML (Profinet) offer a selection of 5 different module configurations for varying requirements. The project planning can be done with any project tool. ET types are equipped with an Ethernet interface.

For optimal match of the instrument to the application, 3 different focusable optics with extremely small spot sizes are available.

The pyrometer parameters can be selected via the integrated key pad, the settings are indicated on the built-in LC-Display. In measuring mode the actual temperature is indicated.

A laser targeting light, a thru-lens view finder or a color camera module (for standard versions only) for exact align- ment of the pyrometer is available. The color camera module enables the optical alignment of the pyrometer to the measuring object via video screen or monitor.

Typical applications:

- Preheating
- Annealing
- Tempering
- Welding
- Forging
- Hardening
- Sintering
- Melting
- Soldering
- Rolling
- Brazing
- Normalizing

Technical Data

Measurement Specifications

Temperature Ranges:	See reference numbers, other temperature ranges on request
Sub Range:	Any range adjustable within the temperature range, minimum span 51 °C
Spectral Ranges:	IS 140 (all versions): 0.7 - 1.1 µm; IGA 140 (all versions): 1.45 - 1.8 µm
Signal processing:	Photoelectric current, digitized immediately
Measurement Uncertainty: ($\varepsilon = 1$, $t_{90} = 1$ s, $T_{amb.} = 23$ °C)	Up to 1500 °C: 0.3% of reading in °C + 1 °C; Above 1500 °C: 0.5% of reading in °C
Repeatability: ($\varepsilon = 1$, $t_{90} = 1$ s, $T_{amb.} = 23$ °C)	0.1% of reading in °C + 1°C
Resolution:	0.1 °C on interface; < 0.025% of the adjusted temperature sub range at the analog output
Response time t_{90}:	< 1 ms, adjustable up to 10 s ("L" temperature ranges: with dynamical adaption at low signal levels)
Emissivity ε:	10.0 to 100.0% adjustable via interface in steps of 0.1%

Environmental Specifications

Protection Class:	IP65 (DIN 40 050)
Ambient Temperature:	0 to 70 °C at housing
Storage Temperature:	-20 to 80°C
Weight:	Approx. 550 g
CE Label:	According to EU directives about electromagnetical immunity

Interface

Sighting:	Laser targeting light (max. power level < 1 mW, λ = 630-680 nm, CDRH class II) or thru-lens view finder
Parameters:	Adjustable at the instrument or via serial interface: emissivity; response time; analog output; address; baud rate; waiting period t_W; temperature unit °C or °F; setting of the maximum value storage; temperature sub range

CAUTION
LASER RADIATION
DO NOT STARE INTO BEAM
WAVELENGTH: 630-680nm
< 1 mW MAXIMUM
CLASS II LASER PRODUCT

Note: 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. See http://info.lumasenseinc.com/calibration for more information.

Communication

Analog Output:	Linear 0 to 20 mA or 4 to 20 mA, DC, switchable; load max. 500 Ohm
Test current output:	Fixed 10 mA (for 0 to 20 mA analog output) or fixed 12 mA (for 4 to 20 mA analog output)
Serial Interface:	Switchable inside the pyrometer: RS232 or RS485 addressable, half duplex; baud rate up to 115 kBd Alternatively: Profibus, Profinet, or Ethernet
Exposure Time t_{90}:	2 ms (with dynamical adaptation at low signal levels); adjustable to 0.01 s; 0.05 s; 0.25 s; 1 s; 3 s; 10 s
Maximum Value Storage:	Single or double storage; cleared by: preselected time interval; external deletion contact or via digital interface; automatically with the next measuring object

Electrical

Power Supply:	24 V AC/DC (12 to 30 V AC/DC) (AC: 48 to 62 Hz)
Power Consumption:	max. 2 VA
Isolation:	Power supply, digital interface, analog output are galvanically isolated against each other and housing

Video Module (TV Version only)

Video signal:	FBAS-Signal approx. 1 Vpp at 75 Ohm, PAL (B), 50Hz (optional NTSC (M), 60 Hz)
Resolution:	628 x 582 Pixel (510 x 492 at NTSC)
Illumination control:	Automatic or adjustable (via keyboard or software)
Field of view:	Approx. 6.3% x 4.6% (3.6° x 2.6°) of the adjusted measuring distance (5.1% x 3.9% (2.9° x 2.2°) for NTSC)
Connection video signal:	SCART- or Cinch plug (monitor's side); separate round plug (at the pyrometer); connections galvanically isolated; video signal selectable when more than one pyrometer with TV output is used
Date / time:	Real time clock with about 3 days buffer (GoldCap capacitor, free of harmful substances)
Screen display:	circular target marker; instrument's number or text to your choice (max. 12 characters); time and / or date (switchable); measured temperature, emissivity

Optics

The series 140 pyrometers are available with 3 different focusable optics. They offer the smallest possible spot size at any distance. The adjustment can be done easily without additional tools with help of the „turn and clamp" mechanism (one hand). The spot sizes are shown in the following table (all distances are measured from the front of the lens). The different optics are exchangeable without recalibration of the pyrometer. For spot sizes between those in the table, values can be found by interpolation.
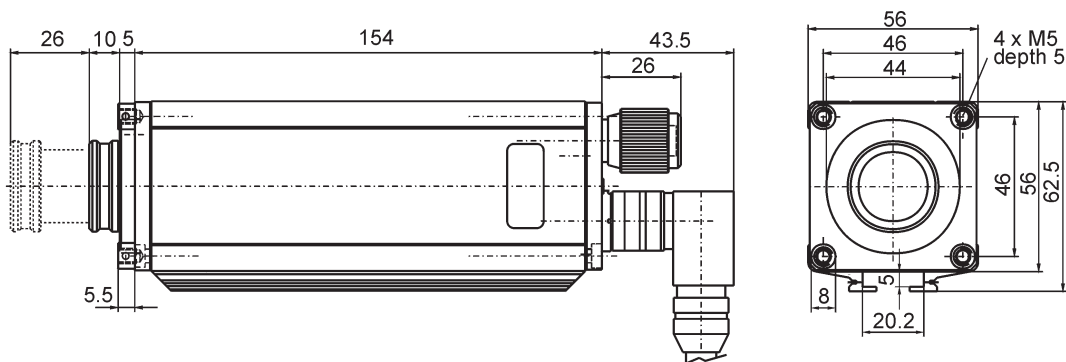
Focusable Optics		
	Measuring Distance a [mm]	**Spot Size M_{90} [mm]**
	a = 130 mm	0.35
Optics 1	a = 160 mm	0.5
	a = 200 mm	0.7
	a = 190 mm	0.5
Optics 2	a = 300 mm	0.8
	a = 420 mm	1.3
	a = 340 mm	0.9
Optics 3	a = 2000 mm	6.5
	a = 4000 mm	15

Aperture D (depends on the objective distance):
Basic temperature range up to 1500 °C: 14 ... 16 mm;
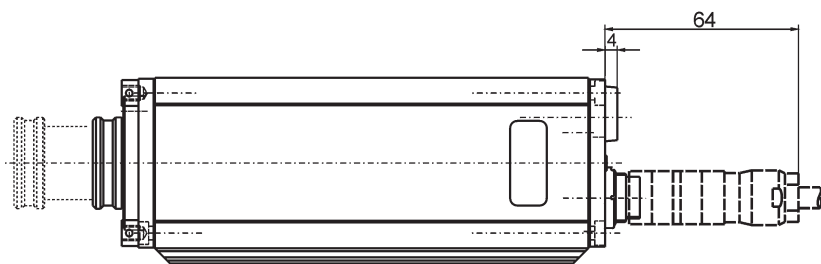Basic temperature range above 1500 °C: 8 ... 9 mm
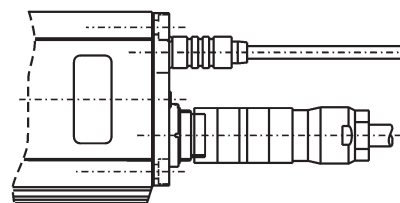

Dimensions

Pyrometer with thru-lens view finder

Pyrometer with laser targeting light

Pyrometer with video module

All dimensions in mm

Reference Numbers IS 140; IGA 140

IS 140		targeting light	view finder	PAL camera module	NTSC camera module
MB 14	550 ... 1400 °C	3 875 100	3 875 110	3 882 100	3 882 110
MB 16	600 ... 1600 °C	3 875 120	3 875 130	3 882 120	3 882 130
MB 18	650 ... 1800 °C	3 875 140	3 875 150	3 882 140	3 882 150
MB 25	750 ... 2500 °C	3 875 160	3 875 170	3 882 160	3 882 170
MB 33	900 ... 3300 °C	3 875 180	3 875 190	3 882 180	3 882 190
MB 18L	550 ... 1800 °C	3 875 200	3 875 210	3 882 200	3 882 210
MB 14 (forging version)	650 ... 1400 °C	3 875 290	-	-	-
MB 35L	750 ... 3500 °C	-	3 875 270	-	-
MB 35L (0.676 µm version)	1100 ... 3500 °C	-	3 875 280	-	-
MB 20 (0.55 µm version)	1000 ... 2000 °C	3 875 240	-	-	-

IGA 140		targeting light	view finder	PAL camera module	NTSC camera module
MB 13	300 ... 1300 °C	3 875 300	3 875 310	3 882 300	3 882 310
MB 18	350 ... 1800 °C	3 875 320	3 875 330	3 882 320	3 882 330
MB 25	450 ... 2500 °C	3 875 340	3 875 350	3 882 340	3 882 350
MB 11.5L	220 ... 1500 °C	3 875 440	-	-	-
MB 13.5L	250 ... 1350 °C	3 875 360	3 875 370	3 882 360	3 882 370
MB 20L	300 ... 2000 °C	3 875 380	3 875 390	3 882 380	3 882 390
MB 25L	350 ... 2500 °C	3 875 400	3 875 410	3 882 400	3 882 410
MB 30L	300 ... 3000 °C	-	3 875 470	-	-

Scope of Delivery

Pyrometer with one optics, works certificate, InfraWin operating and analyzing software

Ordering Notes

- When ordering please select one focusable optics.
- A connection cable (and a video cable for the instruments with video module) is not included in scope of delivery and and has to be ordered separately.

Ordering Example

3 875 150   IS 140 with thru-lens view finder, focusable optics 2, temperature range 650 to 1800 °C
3 820 530   Connection cable, length 10 m, with 90° connector

Pyrometer Alignment

For exact aiming to the object different alignment systems are available:

- **Laser targeting light:** the laser targeting light is a red laser beam used to align the pyrometer to a target. The laser marks the center of the measuring spot. The laser targeting light can be used during operation without effecting the measurement.

- **Thru-lens view finder**: the view finder can be used to align the measured object through direct observation. The view finder is true-sided and parallax-free; a circle marks the position of the measuring area.

- **Color camera module:** The camera module enables the optical alignment of the pyrometer to the measuring object via video screen or monitor.
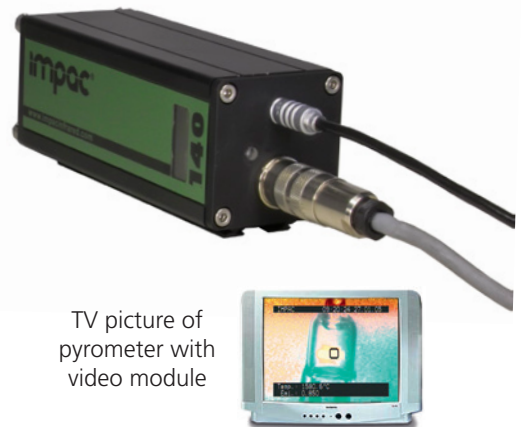
IS 140; IGA 140

Pyrometer with
laser targeting light

Pyrometer with
viewfinder

Pyrometer with
color camera module

Laser button

View finder

TV picture of
pyrometer with
video module

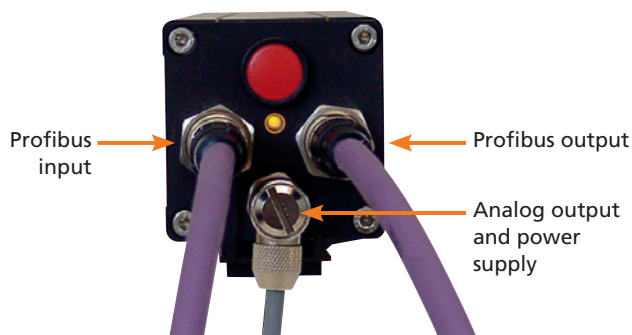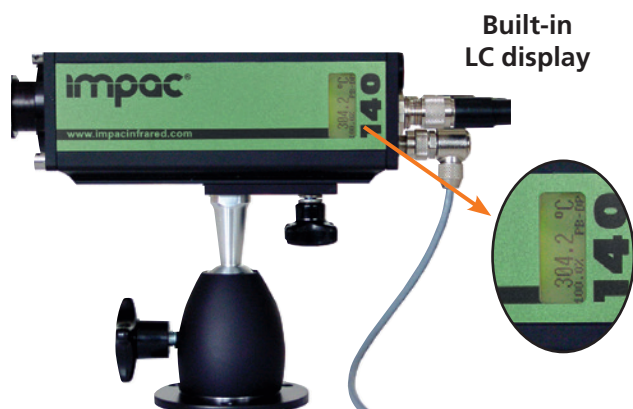# Advantages of the Digital Signal Processing

The signal processing of series 140 pyrometers is fully digital, i.e. the detector signal is digitized immediately and digitally processed. With this technique an extremely high accuracy and repeatability as well as very long measuring ranges are achieved.

Accuracy: The high accuracy is achieved by the digital linearization of the sensor output as well as the digital compensation of the ambient temperature.

Temperature range: Due to the digital technique the user can set any temperature sub range within the full temperature range. The minimum span of the sub range is 51 °C. The analog measuring output corresponds automatically to the selected sub range. This setting of a sub range can be done without recalibration of the pyrometer and does not effect the high accuracy and repeatability. As almost any sub range is adjustable, the storage of spare instruments or the replacement of other pyrometers is simplified.

Output: The analog measuring outputs 0 to 20 mA or 4 to 20 mA are selectable as well as the serial digital interfaces RS232 or RS485 or, alternatively, Profibus, Profinet or Ethernet. Additionally, the interface allows the controlling of the pyrometer via PC.

Bus control: The serial interface RS485 or, alternatively, Profibus-DP, Profinet, or Ethernet, facilitates the integration of the pyrometer into existing field bus systems.

Calibration: If a suitable calibration source is available, a calibration of the pyrometers can be done via serial interface without opening the housing.

Profibus, Profinet, and Ethernet Interface

Alternatively to the RS232/RS485 interface the pyrometers are also available with built in Profibus-DP (PB types), Profinet (PN types) or Ethernet (ET types) interface. The PB respectively PN types can easily be integrated in existing Profibus respectively Profinet systems. The GSD file (Profibus) respectively the GSDML file (Profinet) (part of standard delivery) offer a selection of 5 different module configurations corresponding your requirements. The project planning can be done with any project tool.

Example Profibus

**Built-in
LC display**

Profibus input →

← Profibus output

Analog output and power supply

**Pyrometer with
laser targeting light**

Laser targeting button
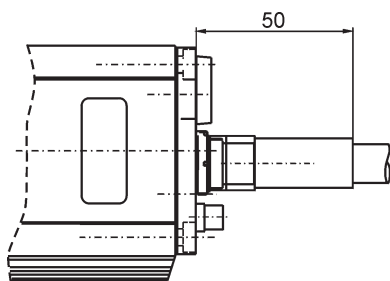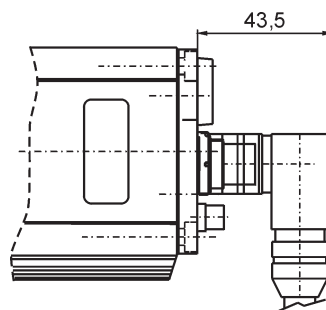
**Pyrometer with
view finder**

View finder

Dimensions

Straight Profibus, Profinet, or Ethernet connector

50

Angled Profibus, Profinet, or Ethernet connector

43,5

All dimensions in mm

Profibus, Profinet, and Ethernet Reference Numbers

IS 140 -PB, -PN, & -ET		Profibus DP		Profinet		Ethernet	
		targeting light	view finder	targeting light	view finder	targeting light	view finder
MB 14	550 ... 1400 °C	3 876 100	3 876 110	3 908 100	3 908 110	3 912 100	3 912 110
MB 16	600 ... 1600 °C	3 876 120	3 876 130	3 908 120	3 908 130	3 912 120	3 912 130
MB 18	650 ... 1800 °C	3 876 140	3 876 150	3 908 140	3 908 150	3 912 140	3 912 150
MB 25	750 ... 2500 °C	3 876 160	3 876 170	3 908 160	3 908 170	3 912 160	3 912 170
MB 33	900 ... 3300 °C	3 876 180	3 876 190	3 908 180	3 908 190	3 912 180	3 912 190
MB 18L	550 ... 1800 °C	3 876 200	3 876 210	3 908 200	3 908 210	3 912 200	3 912 210
MB 35L	1100 ... 3500 °C	3 876 280	3 876 290	-	-	-	-

IGA 140 -PB, -PN, & -ET		Profibus DP		Profinet		Ethernet	
		targeting light	view finder	targeting light	view finder	targeting light	view finder
MB 13	300 ... 1300 °C	3 876 300	3 876 310	3 908 300	3 908 310	3 912 300	3 912 310
MB 18	350 ... 1800 °C	3 876 320	3 876 330	3 908 320	3 908 330	3 912 320	3 912 330
MB 25	450 ... 2500 °C	3 876 340	3 876 350	3 908 340	3 908 350	3 912 340	3 912 350
MB 13.5L	250 ... 1350 °C	3 876 360	3 876 370	3 908 360	3 908 370	3 912 360	3 912 370
MB 20L	300 ... 2000 °C	3 876 380	3 876 390	3 908 380	3 908 390	3 912 380	3 912 390
MB 25L	350 ... 2500 °C	3 876 400	3 876 410	3 908 400	3 908 410	3 912 400	3 912 410

Ordering Notes

When ordering please specify the following:
- One focusable optics
- If required, the adjustment of a sub range
- Analog output:
  0 to 20 mA or 4 to 20 mA

A connection cable for power supply and analog output is not included in scope of delivery and must be ordered separately.

The Profibus, Profinet, or Ethernet cables are customer provided.

Accessory Reference Numbers

3 820 340	Connection cable, length 5 m, 90° connector
3 820 530	Connection cable, length 10 m, 90° connector
3 820 540	Connection cable, length 15 m, 90° connector
3 820 830	Connection cable, length 20 m, 90° connector
3 820 840	Connection cable, length 25 m, 90° connector
3 820 550	Connection cable, length 30 m, 90° connector
3 820 330	Connection cable, length 5 m, straight connector
3 820 500	Connection cable, length 10 m, straight connector
3 820 510	Connection cable, length 15 m, straight connector
3 820 810	Connection cable, length 20 m, straight connector
3 820 820	Connection cable, length 25 m, straight connector
3 820 520	Connection cable, length 30 m, straight connector
3 820 740	Connection cable, length 5 m, straight connector, temperature resistant up to 200°C
3 820 750	Connection cable, length 5 m, 90° connector, temperature resistant up to 200°C
3 820 430	Video cable with cinch connector and adaptor to SCART, 5 m long (optional 10 m, 15 m, 30 m)
3 834 280	Adjustable mounting angle
3 834 270	Ball and socket mounting
3 835 230	Air purge

3 837 290	Cooling jacket, stainless steel
3 835 060	Air purge for cooling jacket
3 834 200	Ball and socket mounting for cooling jacket
3 835 450	90° mirror with quartz glass window
3 843 520	Rugged scanner SCA 140, (scanning angle adjustable 0 ... 12°, scanning frequency adjustable 1 ... 5 Hz), with quartz glass window
3 835 290	Air purge for scanner SCA 140
3 852 290	Power supply NG DC for DIN rail mounting; 100 to 240 V AC $\Rightarrow$ 24 V DC, 1 A 2 limit switches
3 890 640	LED digital display DA 4000-N
3 890 650	LED digital display DA 4000: with 2 limit switches
3 890 560	LED digital display DA 6000-N: with possibility for pyrometer parameter settings for digital IMPAC pyrometers; RS232 interface
3 890 520	LED digital display DA 6000; DA 6000-N additional with 2 limit switches and analog input and output
3 826 500	HT 6000, portable battery driven indicator and instrument for pyrometer parameter setting

Connection cables for instruments with Profibus, Profinet or Ethernet interface

3 821 070	Connection cable (cables for power supply and analog output), 5 m, with angled connector
3 821 080	Connection cable (cables for power supply and analog output), 10 m, with angled connector

3 821 090	Connection cable (cables for power supply and analog output), 15 m, with angled connector
3 821 100	Connection cable (cables for power supply and analog output), 30 m, with angled connector

Accessory Overview

Ball and socket mounting

Cooling plate

90° mirror

air purge

Mounting angle

Stainless steel cooling jacket

Scanner SCA 140 for small angles up to 12°

LED digital display