Very robust high-end IMPAC pyrometer for non-contact temperature measurements on metals, ceramics, graphite etc. between 250 and 3500°C

IS 12 • IS 12-S
IGA 12 • IGA 12-S

CE

- Temperature ranges between 250 and 3500°C
- Short response times < 1 ms
- Extremely small spot sizes min 0.1 mm
- Distance ratio up to 900 : 1
- Built-in 5 digit LED display
- Thru-lens view finder,
  or with additional laser targeting light
- Test current output
- 2 fast limit switches
- Interfaces RS232 / RS485 switchable
- With fixed or focusable optics

The **IS 12**, **IS 12-S**, **IGA 12** and **IGA 12-S** are very robust, digital and highly accurate pyrometers for non-contact temperature measurement on metals, ceramics, graphite etc.

For optimal match of the instrument to the application 6 different fixed optics and 3 different focusable optics with extremely small spot sizes are available.

The pyrometer parameters can be selected via keys, the settings are indicated on the built-in LED display. In measuring mode the actual temperature is indicated.

The pyrometers are equipped with RS232 and RS485 serial interfaces (switchable via the keys). This additionally enables the reading of temperature and pyrometer parameters via the provided *InfraWin* PC-software. If necessary the parameters also can be changed via PC.

Two adjustable limit switches can be used to trigger a switch process, e.g. to recognize hot objects located in the measuring beam.

A thru-lens view finder or additionally a laser targeting light for exact alignment of the pyrometer is available.

The instruments IS 12-S and IGA 12-S are equipped with an integrated scanner which moves the measuring beam adjustable up and down up to 4°.

Typical applications:

- preheating
- annealing
- tempering
- welding
- forging
- hardening
- sintering
- melting
- soldering
- rolling
- brazing
- normalizing

Technical Data

	IS 12; IS 12-S	IGA 12; IGA 12-S
Temperature ranges:	MB 14: 550 to 1400°C MB 16: 600 to 1600°C MB 18: 650 to 1800°C MB 25: 750 to 2500°C MB 20L: 550 to 2000°C MB 35L: 700 to 3500°C	MB 10: 250 to 1000°C MB 13: 300 to 1300°C MB 18: 350 to 1800°C MB 23: 400 to 2300°C MB 14L: 250 to 1400°C
Subrange:	any range adjustable within the temperature range, minimum span 51°C	
Spectral range:	0.7 to 1.1 µm	1.45 to 1.8 µm
Signal processing:	fotoelectric current, digitized immediately	
Accuracy: (ε = 1, t_{90} = 1 s, $T_{amb.}$ = 23°C)	below 1500°C: 0.3% of measured value in °C + 1°C above 1500°C: 0.5% of measured value in °C	
Amb.temp.dependency:	$t_K \leq$ 0,01% of reading (in °C) x dT (temperature of pyrometer housing - 23°C)	
Display:	built-in 5 digit LED display, additional function LED's	
Resolution:	interface and display: 0.1°C, analog output: < 0.025 % of temperature range	
Repeatability :	0.1% of measured value in °C + 1°C	
Exposure time t_{90}:	< 1 ms („L" temperature ranges with dynamical adaptation at low signal levels), adjustable up to 10 s	
Emissivity ε:	0.100 ... 1.000 in $^1/_{1000}$ steps	
Analog output:	linear 0 ... 20 mA or 4 ... 20 mA, DC, switchable; load max. 500 Ohm	
Test current output:	fixed 10 mA	
Power supply:	24 V DC (15 to 40 V DC) or 24 V AC (12 to 30 V AC), 48 to 62 Hz	
Power consumption:	max. 7 W	
Serial interface:	switchable at the pyrometer: RS232 or RS485 addressable, half duplex; baud rate 2.4 up to 115 kBd	
Limit switches:	2 relay outputs (change-over contacts), switch power max. 30 W (I_{max}: 1 A, U_{max}: 60 V DC)	
Control panel:	4 keys, operate with tipp of ball-point pen	
Parameters:	adjustable at the instrument or via serial interface: emissivity e, response time t_{90}, clear time for maximum value storage t_{CL}, subrange, 0 to 20 or 4 to 20 mA, switch points for limit switches, °C / °F, interface RS232 or RS485, address, baud rate, test current output Additionally adjustable (only via interface): keyboard lock, recalibration (with special software)	
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	
Isolation:	power supply, digital interface, analog output are galvanically isolated against each other and housing	
Sighting:	built-in parallax free thru-lens view finder; additionally laser targeting light (max. power level < 1 mW, λ = 630-680 nm, CDRH class II)	
Ambient temperature:	0 to 70°C at housing, no condensating conditions	
Storage temperature:	-20 to 70°C	
Rel. humidity:	Non condensing conditions	
Protection class:	IP65 (DIN 40 050)	
Weight:	2.2 kg	
CE-label:	according to EU directives about electromagnetic immunity	

Advantages of the digital signal processing

The signal processing of series 12 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 will be achieved by the digital linearisation 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 ... 20 mA or 4 ... 20 mA are selectable as well as the serial digital interfaces RS232 or RS485. Additionally the interface allows the controlling of the pyrometer via PC.

Bus control: The serial interface RS485 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.

Features

Optics

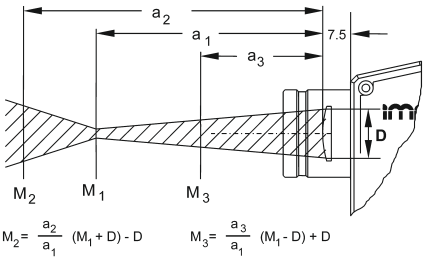
The pyrometers are equipped with fixed or focusable optics. The spot size for the fixed optics is shown for the specified measuring distance. The focusable optics offer the smallest possible spot size at the required distance. The spot sizes are shown in the following tables (all distances are measured from the front of the lens). For spot sizes between those in the table, values can be found by interpolation. The optics can be changed at any time to another of the same type without recalibrating the pyrometer.

The selection of a suitable optics depends on different factors:

- Very short measuring distances up to 250 mm to achieve extremely small spot sizes are only available as fixed optics.
- The rotary mirror attachment ROT 10 can only be used in combination with fixed optics.
- The 3 focusable optics allow the exact adjustment of any required measuring distance from 277 mm.
- Focusable optics offer high flexibility to adapt the instrument to applications with different measuring distances.

	Fixed optics IS 12, IS 12-S, IGA 12, IGA12-S				
	IS 12; IS 12-S:	MB 14		MB 16; 18; 20L	MB 25; 35L
	IGA 12; IGA 12-S:	MB 10	MB 13; 14L	MB 18	MB23
Optics	**Meas. distance**	**Spot size M_{90} [mm]**			
1	a = 80 mm	0.9	0.7	0.3	0.1
2	a = 160 mm	0.7	0.6	0.4	0.2
3	a = 250 mm	1	0.8	0.5	0.3
4	a = 660 mm	2.3	2	1.2	0.7
5	a = 1300 mm	5.5	3.8	2.8	1.4
6	a = 5600 mm	19	15	12	6.4
	Aperture *D*:	19	13.5	10	7

Spot sized differing from the stated values can be calculated with the following equations:



	Focusable optics IS 12				
	Measuring distance a [mm]	**Spot size M_{90} [mm]**			
		MB 14	MB 16	MB 18 MB 20L	MB 25 MB 35L
Optics 1	277 mm	0.9	0.6	0.6	0.4
	400 mm	1	0.8	0.8	0.5
	533 mm	1.4	1.1	1.1	0.7
Optics 2	388 mm	1	0.8	0.8	0.45
	700 mm	1.8	1.5	1.5	0.8
	1170 mm	3	2.4	2.4	1.4
Optics 3	550 mm	1.5	1	1	0.6
	3000 mm	9	6	6	3.3
	9500 mm	25	9	9	10.6
	Aperture D *):	13.5 to 17		10 to 13	5 to 7

	Focusable optics IGA 12				
	Measuring distance a [mm]	**Spot size M_{90} [mm]**			
		MB 10	MB 13 MB 14L	MB 18	MB 23
Optics 1	279 mm	1.3	0.9	0.5	0.4
	400 mm	1.7	1.1	0.7	0.5
	520 mm	2	1.2	0.8	0.7
Optics 2	390 mm	1.4	1	0.6	0.45
	700 mm	2.6	1.5	1	0.8
	1190 mm	4.1	2.4	1.6	1.3
Optics 3	550 mm	2	1.2	0.8	0.6
	3000 mm	10.7	5.9	4.3	3.8
	5600 mm	20	11	8	7
	Aperture D *):	13.5 to 17			10 to 13

*) depending on the objective distance

Reference numbers

Type	Temperature range	with view finder, fixed optics	with view finder, fixed optics, laser targeting light	with view finder, focusable optics, laser targeting light	with view finder, fixed optics, laser targeting light, scanner (type -S)
IS 12	550 to 1400°C (MB 14)	3 839 100	3 839 110	3 839 120	3 839 130
	600 to 1600°C (MB 16)	3 839 150	3 839 160	3 839 170	3 839 180
	650 to 1800°C (MB 18)	3 839 200	3 839 210	3 839 220	3 839 230
	750 to 2500°C (MB 25)	3 839 250	3 839 260	3 839 270	3 839 280
	550 to 2000°C (MB 20L)	3 839 300	3 839 310	3 839 320	3 839 330
	700 to 3500°C (MB 35L)	3 839 350	3 839 360	3 839 370	3 839 380
IGA 12	250 to 1000°C (MB 10)	3 839 600	3 839 610	3 839 620	3 839 630
	300 to 1300°C (MB 13)	3 839 650	3 839 660	3 839 670	3 839 680
	350 to 1800°C (MB 18)	3 839 700	3 839 710	3 839 720	3 839 730
	400 to 2300°C (MB 23)	3 839 750	3 839 760	3 839 770	3 839 780
	250 to 1400°C (MB 14L)	3 839 800	3 839 810	3 839 820	3 839 830

Ordering note: When ordering please select one optics (included in scope of delivery).
A connection cable or an additional cable for limit contacts is not included in scope of delivery.

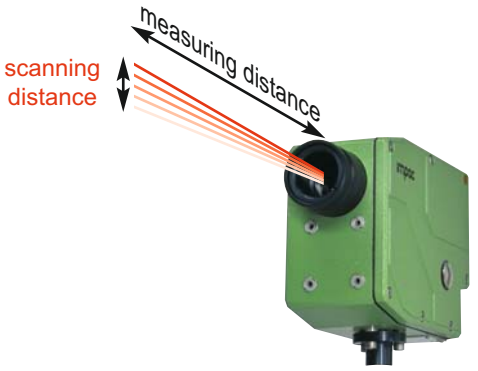
Scope of delivery: Pyrometer with optics of your selection, *InfraWin* operating and analizing software, works certificate, user manual.

Accessories:

3 846 610	exchangeable fixed optics 1
3 846 620	exchangeable fixed optics 2
3 846 630	exchangeable fixed optics 3
3 846 640	exchangeable fixed optics 4
3 846 650	exchangeable fixed optics 5
3 846 660	exchangeable fixed optics 6
3 848 670	exchangeable focusable optics 1
3 848 680	exchangeable focusable optics 2
3 848 690	exchangeable focusable optics 3
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
3 820 750	connection cable, length 5 m, 90°connector, temperature resistant up to 200°C
3 821 120	additional cable for limit contacts, 5 m
3 821 130	additional cable for limit contacts, 10 m
3 821 140	additional cable for limit contacts, 15 m
3 821 150	additional cable for limit contacts, 20 m
3 821 160	additional cable for limit contacts, 25 m
3 821 170	additional cable for limit contacts, 30 m
3 821 200	additional cable for limit contacts, 5 m, temperature resistant up to 200°C
3 852 290	Power supply NG DC for DIN rail mounting; 100 to 240 V AC ⇒ 24 V DC, 1 A
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
3 890 630	LDP 1224, LED display, large, height of digits 57 mm
3 835 060	air purge
3 837 200	cooling plate
3 837 230	cooling jacket
3 834 200	ball and socket mounting
3 834 140	ball and socket mounting (steel) for rough ambience or for cooling jacket
3 843 260	rotary mirror attachment ROT 10

IS 12-S, IGA 12-S with integrated scanner

The pyrometers IS 12-S and IGA 12-S with fixed optics are equipped with a scanning mechanism built into the pyrometer housing which moves the measuring beam up and down. In combination with the pyrometer's maximum value storage (peak picker) the scanner is optimally used for scanning of thin oscillating wires, for finding scale-free spots on heavily scaled surfaces or for measuring small, hot objects whose position is not exactly determined.
All instruments are equipped with a thru-lens view finder and an additional laser targeting light for exact alignment to the position of the measuring object.
The scanning angle is adjustable between 0 and 4°, the scanning frequency between 4 and 10 Hz.



Fixed optics	
Distance *a*	**Scanning distance at 4° scanning angle**
a = 80 mm	5.6 mm
a = 160 mm	11.2 mm
a = 250 mm	17.5 mm
a = 660 mm	46 mm
a = 1300 mm	91 mm
a = 5600 mm	391 mm

The moving measuring beam does not increase the spot sizes due to the very fast exposure time of the pyrometers.

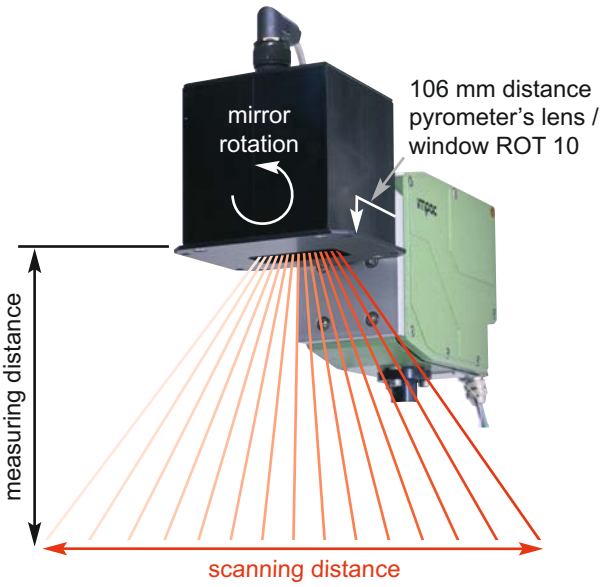
The scanning length increases with increasing measuring distance. An overview of the scanning length at the different distances of the optics is shown in the table.

Rotary mirror attachment ROT 10 (accessory)

For larger scanning distances than the integrated scanner, the **rotary mirror attachment ROT 10** can be mounted on the IS 12 and IGA 12 with fixed optics. So a scanning angle between 63 and 73° can be achieved (depending on the measuring range).

Typical applications of the rotary mirror attachment are measurements of thin oscillating wires or moving sheets and capturing the maximum temperature of bulk material or scaled metals.
With help of a rotating mirror the measuring beam of the pyrometer is moved over the measuring object in a line. If the instrument is equipped with a laser targeting light the scanning distance can be followed visually.

The rotary mirror attachment only can be mounted onto the fixed optics pyrometers. The distance of the pyrometer's lens to the window of the scanner is 106 mm. The required optic has to be selected accordingly.
An overview of the scanning distances of the different measuring distances is shown in the following table:



With fixed optics	Measuring distance	Scanning distance
2	54 mm	130 mm
3	144 mm	261 mm
4	554 mm	857 mm
5	1194 mm	1768 mm
6	5494 mm	8035 mm

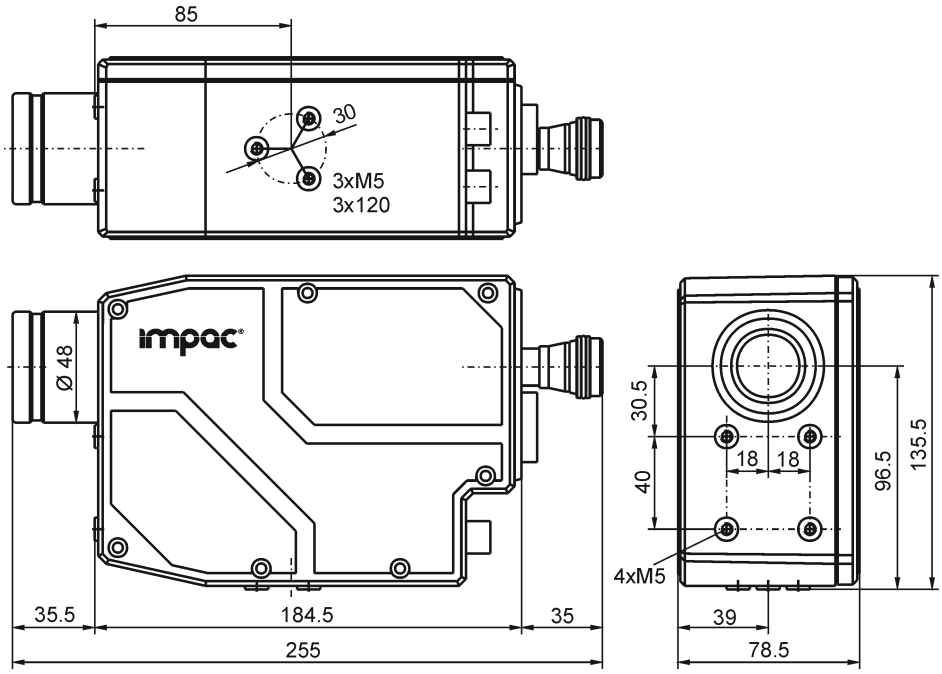
The signal is analysed via the pyrometer's analog output (0/4 ... 20 mA) and / or the serial interface (RS232 or RS485).
The scanning frequency is permanently set to 12,5 Hz. The attachment is powerd by 24 V AC, 50 Hz.

The pyrometer has to be adjusted to the fastest exposure time due to the mirror rotation, to keep the smallest spot size. The high mirror rotation speed of the mirror produces spot sizes in form of a line. For the different temperatur ranges (MB) the following spot sizes are achieved:

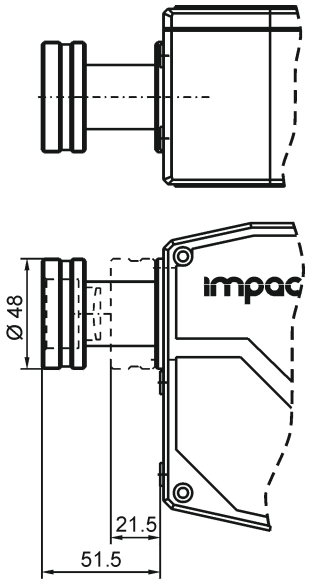
IS 12		MB 14		MB 16; 18; 20L	MB 25; 35L
IGA 12		MB 10	MB 13; MB 14L	MB 18	MB23
Fixed optics	**Measuring distance**	**Spot size [mm]**			
2	54 mm	2.1 x 0.7	2.0 x 0.6	1.8 x 0.4	1.6 x 0.2
3	144 mm	4.8 x 1.0	4.6 x 0.8	4.3 x 0.5	4.1 x 0.3
4	554 mm	16.8 x 2.3	16.5 x 2.0	15.7 x 1.2	15.2 x 0.7
5	1194 mm	36.8 x 5.5	35.1 x 3.8	34.1 x 2.8	32.7 x 1.4
6	5494 mm	162.9 x 19.0	158.9 x 15	155.9 x 12.0	150.3 x 6.4
Scanning angle:		63°	68°	72°	73°

Dimensions

Types with fixed optics:



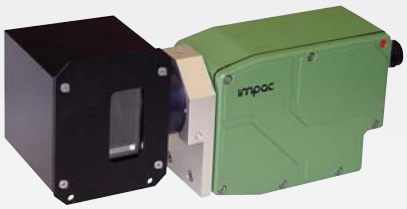
Types with focusable optics:
optics inserted / pulled out



Overview Accessories

Mechanical accessories:

Cooling jacket



Rotary mirror attachment
ROT 10

Ball and socket mounting, steel

Cooling plate

Ball and socket mounting

air purge unit

Electrical accessories:

NG DC

LED digital display

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