LumaSense™ TECHNOLOGIES

IGA 740

IMPAC-Pyrometer

Operation Manual · Betriebsanleitung

Proven Quality

Contents

1 Basic Information

1.1 Notes for the User Manual

This user manual describes the structure of the IMPAC 740 infrared pyrometer for non-contact temperature measurement and gives the operators all the necessary information related to installation, operation, de-installation along with information related to maintenance and repairs of the pyrometer. When malfunctions occur, the user manual provides suggestions for their potential causes and their repair.

This user manual is intended for qualified service and maintenance personnel with appropriate technical expertise including a basic knowledge of temperature measuring technology.

Before you use the pyrometer for temperature measurement, you must have read and understood these operating instructions! Keep the manual so that it is available at all times.

Take into account all the requirements given in this user manual. This is a precondition for:

- The correct and professional use of the pyrometer
- Proper maintenance, cleaning and care of the pyrometer
- Prevention of risks and strict observance of the essential technical safety regulations

1.2 Document Structure and Symbols

Operating instructions to be performed in sequence are numbered in chronological order. They are grouped together in operational units and accompanied by the corresponding results.

Listings without a sequential order are presented as bullet points and items in sub-lists are preceded by dashes.

Safety precautions are shown with pictograms and key words. They provide information about the type, source and consequences of the hazard, and safety precautions. The meanings of the pictograms and key words are explained in Safety (section 2) at page 3.

1.3 Purpose

The IMPAC 740 pyrometer is particularly intended for the non-contact measurement of surface temperatures on metal, ceramic, plastics and is specially designed for industrial applications as well as applications in the area of research and development.

The IMPAC 740 also enables you to solve high speed applications in laser areas by using laser rejection filters and challenging temperature measurement on silicon or tungsten.

1.4 Intended Use

The IMPAC 740 pyrometer is to be used exclusively for the non-contact measurement of surface temperatures of the materials specified in Purpose (section 1.3) at page 1. Any applications beyond that area are not allowed! Any damage resulting from this is the sole responsibility of the operator.

Proper use of the device also includes:

- The observance of the requirements of these operating instructions for transport and storage, assembly, operation and care of the pyrometer
- The observance of the power requirements specified in Technical Data (section 4) at page 7 and the operating and environmental conditions
- The compliance with the legal accident prevention and environmental regulations

Among applications/conditions for which the pyrometer is not intended for use are in particular:

- The use of the pyrometer within medical areas
- The use of the pyrometer in the food industry
- The use of the pyrometer in areas where there is danger of explosion
- The use of the pyrometer outside of the operating and environmental conditions specified in Technical Data (section 4) at page 7

1.5 Warranty and Liability

LumaSense Technologies GmbH offers a 2 year warranty for the device starting from the date of invoice. The warranty covers manufacturing defects. Then the device will be repaired free of charge, however freight charges are the responsibility of the respective sender.

LumaSense Technologies GmbH reserves the right to exchange the equipment or parts of the instrument instead of a repair. After a repair, LumaSense Technologies GmbH offers a warranty of 12 months on all repaired and/or exchanged instrument components.

Deviations from the proper use described in this user manual will result in restricted warranty and liability or the loss in case of damage. Damage to wearing parts (e.g. fuses) is excluded from the guarantee.

Warranty and liability claims for personal injuries and/or material damage are excluded if this or these result from one or more of the following causes:

- Improper use of the device
- Inappropriate operation and servicing of the device
- Unauthorized modifications to the device without prior consultation with LumaSense Technologies GmbH
- Rough, mechanical actions or deliberate destruction of the device
- Connection error (overvoltage)
- Frost damage by not observing the permitted environmental conditions and/or by inappropriate storage
- Malfunctions that are caused by non-conformance to this user manual

2 Safety

2.1 Symbols and Key Words Used

The following symbols and key words are used in the user manual to indicate hazards and instructions. Safety precautions always appear before an action.

DANGER:
Indicates a potentially dangerous situation. Failure to abide may result in light or minor injury and damage.

CAUTION:
Indicates a potentially damaging situation. Failure to abide may result in damage to the product or to anything near the product.

IMPORTANT:
Indicates useful tips and other specifically useful information that allow any dangerous or damaging situations to be avoided.

REFERENCE TO ENVIRONMENTAL PROTECTION:
Important instructions for protecting the environment.

2.2 General Safety Notes

The IMPAC 740 pyrometer has been built in accordance with the currently valid standards of the technology and the recognized safety regulations and ensures the highest safety level.

The fundamental safety and occupational safety requirements of applicable laws, standards, and guidelines have been taken into account in the pyrometer design. The safety of the pyrometer is confirmed by the declaration of conformity and the CE mark.

All information related to safety is with reference to the regulations of the European Union currently in force. In other countries, applicable laws, national directives and safety regulations have to be met.

Apart from the safety instructions given in these operating instructions, you should also take into account the generally valid regulations for accident prevention and environmental protection as well as the regulations of the respective professional associations and strictly comply with them.

Note the general safety instructions:

- Commissioning of the pyrometer may only be carried out by persons qualified to do so, taking the safety instructions into account.
- Pay attention to the installation site requirements and notes for commissioning.
- Only use the original cables provided as accessories for the connection of the pyrometer. Other cables, especially cables manufactured by yourself, are not permitted.
- Lay all cables and cooling water pipes in such a way that they are not exposed to any tension and are not clamped or squashed.
- Before start-up, carry out a visual inspection for damage to the components of the pyrometer(housing, optics, cable and pipes). Never operate the pyrometer with damaged components.

3 Scope of Delivery / Accessories

3.1 Scope of Delivery

The scope of delivery of the pyrometer includes:

- High speed infrared pyrometer IMPAC IGA 740
- Vario optics (optional macro optics)
- Retaining pin ∅ 14.9 mm, length 100 mm
- Water cooling connection
- Inspection sheet
- User manual

IMPORTANT:
The connecting cable is not included in scope of delivery. Please order it according to the length required.

3.2 Device models

Art.-No.	Description	Configuration	Measuring range
47401-01010	IGA 740	Pilot light, vario optic, current output 0 . . . 20 mA	300 . . . 1,400
47401-01110		Pilot light, macro optic, current output 0 . . . 20 mA	
47401-01210		Through lens sighting, vario optic, current output 0 . . . 20 mA	
47401-01310		Through lens sighting, macro optic, current output 0 . . . 20 mA	
47401-01020		Pilot light, vario optic, current output 4 . . . 20 mA	
47401-01120		Pilot light, macro optic, current output 4 . . . 20 mA	
47401-01220		Through lens sighting, vario optic, current output 4 . . . 20 mA	
47401-01320		Through lens sighting, macro optic, current output 4 . . . 20 mA	
47401-02010	IGA 740	Pilot light, vario optic, current output 0 . . . 20 mA	500 . . . 2,500
47401-02110		Pilot light, macro optic, current output 0 . . . 20 mA	
47401-02210		Through lens sighting, vario optic, current output 0 . . . 20 mA	
47401-02310		Through lens sighting, macro optic, current output 0 . . . 20 mA	
47401-02020		Pilot light, vario optic, current output 4 . . . 20 mA	
47401-02120		Pilot light, macro optic, current output 4 . . . 20 mA	
47401-02220		Through lens sighting, vario optic, current output 4 . . . 20 mA	
47401-02320		Through lens sighting, macro optic, current output 4 . . . 20 mA	
47402-01010	IGA 740	Pilot light, vario optic, current output 0 . . . 20 mA	160 . . . 1,000
47402-01110		Pilot light, macro optic, current output 0 . . . 20 mA	
47402-01210		Through lens sighting, vario optic, current output 0 . . . 20 mA	
47402-01310		Through lens sighting, macro optic, current output 0 . . . 20 mA	
47402-01020		Pilot light, vario optic, current output 4 . . . 20 mA	
47402-01120		Pilot light, macro optic, current output 4 . . . 20 mA	
47402-01220		Through lens sighting, vario optic, current output 4 . . . 20 mA	
47402-01320		Through lens sighting, macro optic, current output 4 . . . 20 mA	

Art.-No.	Description	Configuration	Measuring range
47402-02010	IGA 740	Pilot light, vario optic, current output 0 . . . 20 mA	300 . . . 2,300
47402-02110		Pilot light, macro optic, current output 0 . . . 20 mA	
47402-02210		Through lens sighting, vario optic, current output 0 . . . 20 mA	
47402-02310		Through lens sighting, macro optic, current output 0 . . . 20 mA	
47402-02020		Pilot light, vario optic, current output 4 . . . 20 mA	
47402-02120		Pilot light, macro optic, current output 4 . . . 20 mA	
47402-02220		Through lens sighting, vario optic, current output 4 . . . 20 mA	
47402-02320		Through lens sighting, macro optic, current output 4 . . . 20 mA	

3.3 Accessories

Connecting cable

Art.-No.	Description
30007-50040	Connecting cable, connector, straight, 5-pol., 4.0 m
30007-50075	Connecting cable, connector, straight, 5-pol., 7.5 m
30007-50100	Connecting cable, connector, straight, 5-pol., 10.0 m
30007-50150	Connecting cable, connector, straight, 5-pol., 15.0 m
30007-50200	Connecting cable, connector, straight, 5-pol., 20.0 m
30007-50900	Extension connecting cable, connector, straight, 5-pol., per meter
30007-51040	Connecting cable, connector, straight, 5-pol., jack 5-pol., 4.0 m
30007-51075	Connecting cable, connector, straight, 5-pol., jack 5-pol., 7.5 m
30007-51100	Connecting cable, connector, straight, 5-pol., jack 5-pol., 10.0 m
30007-51150	Connecting cable, connector, straight, 5-pol., jack 5-pol., 15.0 m
30007-51200	Connecting cable, connector, straight, 5-pol., jack 5-pol., 20.0 m

BNC-connecting cable

Art.-No.	Description
30007-91040	BNC-connecting cable, 4.0 m
30007-91075	BNC-connecting cable, 7.5 m
30007-91100	BNC-connecting cable, 10.0 m
30007-91150	BNC-connecting cable, 15.0 m
30007-91200	BNC-connecting cable, 20.0 m

Power supply

Art.-No.	Description
3 852 540	Power supply NG 0D, 85 . . . 265 V AC, 24 V DC, 600 mA
3 852 550	Power supply NG 2D, with 2 limit contacts, 85 . . . 265 V AC, 24 V DC, 600 mA
3 852 190	Power supply NG, 230 V AC, 24 V AC, 750 mA

Device mounting

Art.-No.	Description
30002-10010	Ball and socket mounting screw mounted
30002-10020	Ball and socket mounting clamp mounted

Scanner and Maximum value storage

Art.-No.	Description
30002-30020	Optical scanner SC 1 for series 730/740 with screwed flange

Accessories for optics

Art.-No.	Description
30002-20010	Vario optic
30002-20030	Vario optic with air purge unit
30002-20020	Macro optic
30002-20040	Vario optic with protective glass
30003-03410	Laser rejection filter 1064 nm

Order information

Please send your orders for accessories to the following address. When ordering, please quote the type, the name of the accessory part, and the quantity.

Service address

LumaSense Technologies GmbH
Kleyerstr. 90
D-60326 Frankfurt/Main
Germany

Phone: +49 (0)69 / 9 73 73 - 0
Fax: +49 (0)69 / 9 73 73 - 167
E-Mail: impac@lumasenseinc.com
Internet: www.lumasenseinc.com

4 Technical Data

Measurement range in °C/ Spectral range in μm:	300 . . . 1,400 °C 1.58 . . . 1.80 μm (MB 14) 500 . . . 2,500 °C 1.58 . . . 1.80 μm (MB 25) 160 . . . 1,000 °C 1.58 . . . 2.20 μm (MB 10) 300 . . . 2,300 °C 2.00 . . . 2.20 μm (MB 23)
Measurement outlet analog:	0 . . . 20 mA or 4 . . . 20 mA (select at order), maximum burden 500 Ω 0 . . . 10 V via BNC
Accuracy:	0.75 % of measured value (at 25 °C , ε=1)
Reproducibility:	< 0.3 % of measured value (at 25 °C , ε=1)
Response time t_{95}:	6 μs via voltage output 9 μs via current output
Emissivity (ε):	adjustable from 0.1 . . . 1
Vario optic (standard):	for measuring distances and measuring fields refer to table next below
Macro optic (optional):	measuring distance: 288 mm (MB 14 and MB 25) 290 mm (MB 10 and MB 23) measuring field: ∅ 0.7 mm (MB 14 and MB 25) ∅ 1.0 mm (MB 10 and MB 23) distance from basic instrument front edge
Sighting mechanism:	LED pilot light or optional through lens sighting (optional)
Operating temperature:	0 . . . +40 °C 0 . . . +80 °C with water cooling
Storage temperature:	-20 . . . +70 °C
Power supply:	24 V DC, 0.2 A or 24 V AC, 0.2 A
Degree of protection :	IP 54 according to DIN 40 050
Cooling:	connection: 2 tube screw connector 0.25" flow rate: at least 1 l/min pressure: maximum 6 bar coolant temperature: 10 . . . 35 °C
Test base:	EN 55 011 : 1998, limit class A
CE marking:	according to EU regulations
Weight:	about 1.2 kg
Dimensions:	Pyrometer (LxWxH) mm 170 (basic instrument) x 70 x 70 Length with maximum extension of optics: 320 mm

Vario optic:

d[a] in mm	450	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,500	3,000
M[b] in mm	2.5	4.0	6.0	8.0	10.5	11.5	13.0	14.0	15.0	20.0	28.0

[a] Distance from optics front edge
[b] Measuring field diameter

5 Technical Description

5.1 System Design / Principle of Operation

Figure 1 shows the basic structure of the pyrometer. The basic parts of a pyrometer are the lens, aperture, filter detector, and the signal processing unit. The infrared radiation coming in from the object to be measured is gathered by the lens. The aperture blocks unwanted rays at the edges. The filter permits only the desired spectral range to enter. The rays then pass through to the detector which transforms the infrared radiation into electric signals. These signals are then linearised in the signal processing unit and changed into a standard output signal which can then be read in the display, and be used for process control.

The operating elements as well as the connections/interfaces are located at the back of the pyrometer (see Operating and display elements (section 5.3) at page 10).

The coolant connections are located under the instrument.

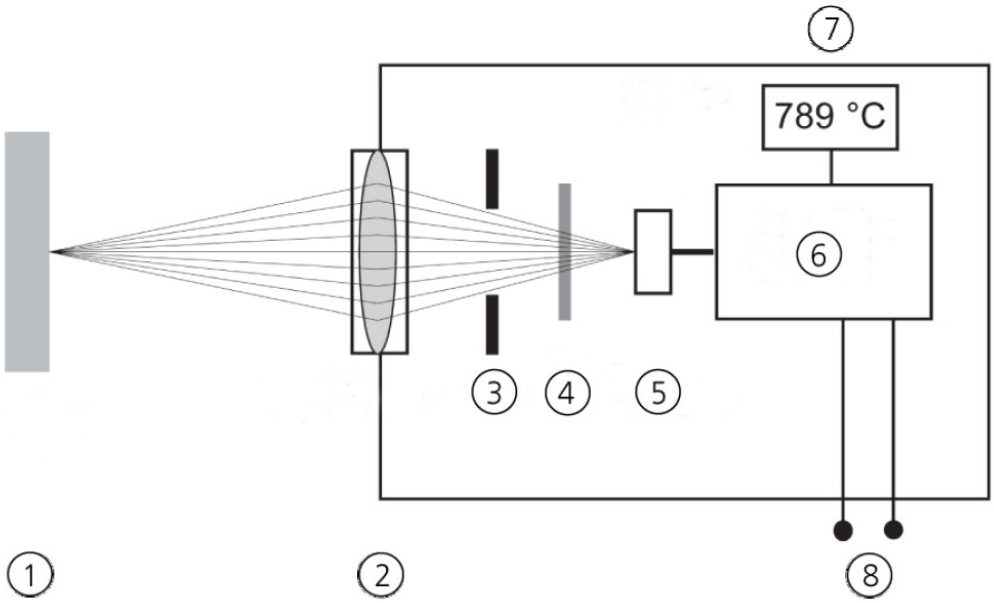

Figure 1: Structure of the pyrometer

1. Object
2. Lens
3. Aperture
4. Filter
5. Detector
6. Signal processing unit
7. Display
8. Connections

5.2 Optics

Depending on the application (measuring distance, measuring field diameter, etc.), the pyrometer is equipped with a vario-optic or a macro-optic.

5.2.1 Vario optics

The Vario optic can be adjusted to the required measuring distance and allows small measuring fields for various distances to the object being measured. The object being measured can be at an arbitrary distance, but must be at least as large as the measuring field at that distance (see Setting the vario optic (section 7.1) at page 15).

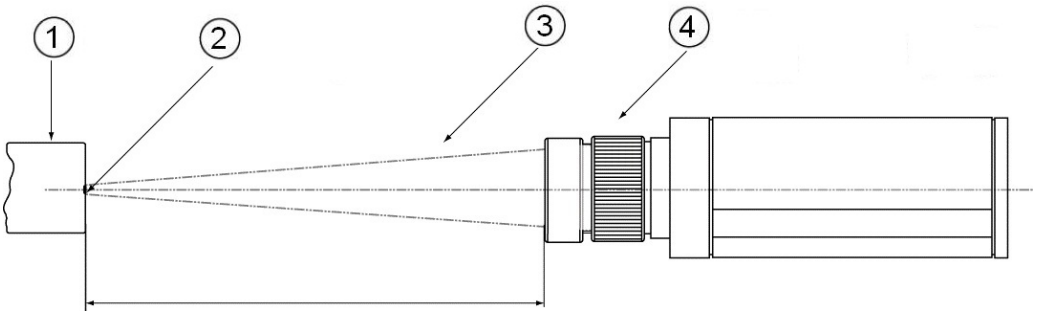

Figure 2: Vario optics

1. Object to be measured
2. Measuring field
3. Optical ray from vario tube
4. Ring nut

5.2.2 Macro optics

The macro-optics is a fixed optics for very small measuring fields, i.e. a certain measuring field diameter is given for a certain measuring distance.

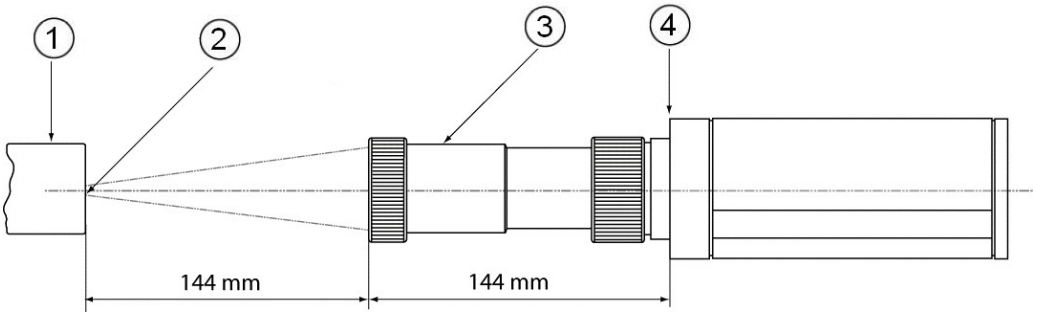

Figure 3: Macro optics measuring set-up (MB 14 and MB 25)

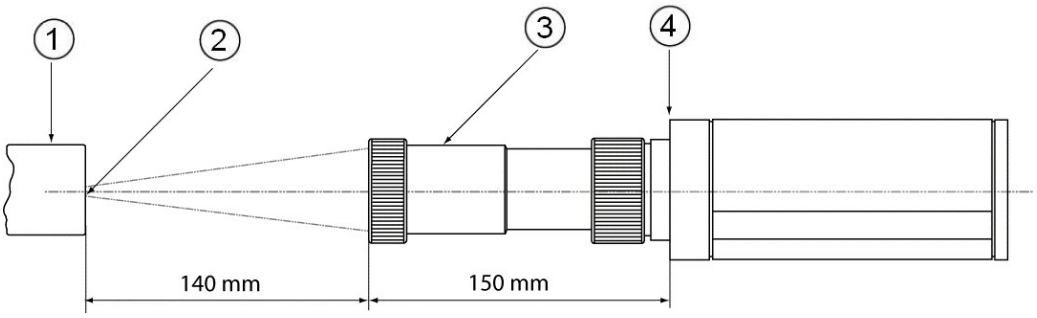

Figure 4: Macro optics measuring set-up (MB 10 and MB 23)

1. Object to be measured
2. Measuring field ∅ = 0.7 mm (MB 14 and MB 25), ∅ = 1.0 mm (MB 10 and MB 23)
3. Macro tube
4. Pyrometer front edge

IMPORTANT:
The macro tube cannot be adjusted. The distances mentioned must be respected absolutely in order to ensure the small measuring field.

5.3 Operating and display elements

The controls and indicators are located on the rear side of the device. For the meaning of individual elements refer to legend Figure 5, for operation of the pyrometer see Operation of the pyrometer (section 7) at page 15.

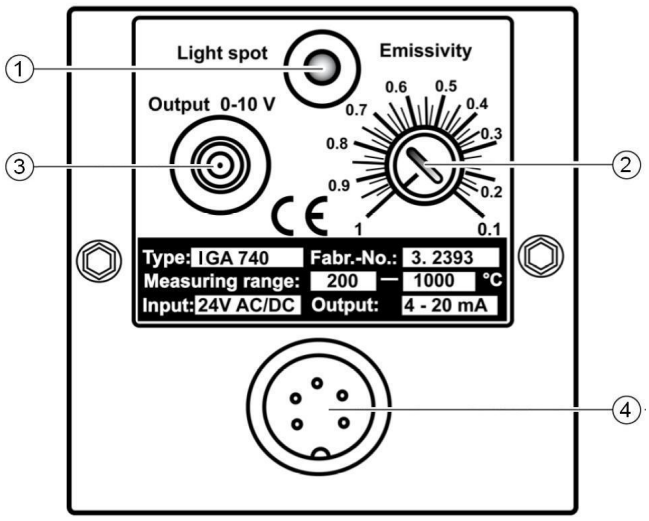

Figure 5: Operating and display elements

Operating and display element	Meaning
1 Push button for pilot light	switch on/ off the pilot light
2 Potentiometer [emissivity]	adjustment of emissivity from 0.1 . . . 1
3 BNC Output	BNC output 0 . . . 10 V for connection to storage oscilloscope
4 5-pin plug connection	Power supply connection and output

5.4 Connection for 5-pole connecting cable

The 5-pole plug to connect the instrument is at the rear side of the unit (see Figure 5). The contacts of the 5-pole plug are arranged as follows:

Plug pin	Meaning
1	+24 V Supply voltage (DC or AC)
2	0 V Supply voltage (DC or AC)
3	Ground output
4	Analog output 0 / 4 . . . 20 mA
5	PE

5.5 Cooling connection

At ambient temperatures of more than 40°C the pyrometer must be operated with the associated cooling! The two connections for the connection of a cooling circuit are located under the instrument (see Figure 6).

The following should be taken into account when connecting a cooling circuit:

- Flow rate at least 1 l/min
- Pressure maximum 6 bar
- Coolant temperature 10 °C to 35 °C

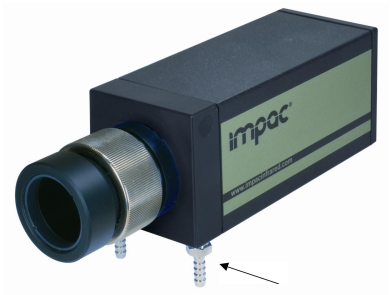

Figure 6: Cooling water connections (tube screw connector 0.25")

Cold tap water is usually sufficient for cooling. It should not be so strongly cooled that condensation develops on the instrument. Take into account the environmental conditions (air temperature and humidity) with respect to the cooling.

5.6 Mounting

There is a retaining pin (scope of delivery) through which the pyrometer can be fixed using various brackets.

We recommend fixing the pyrometer using the retaining pin or the optional available ball and socket mounting support with clamp or thread. This mounting plate ensures secure assembly of the pyrometer (for order data see Accessories (section 3.3) at page 5).

6 Starting Up

6.1 Installation Site Requirements

CAUTION:
Measurement errors and damage to the pyrometer through

- Ambient temperatures too high
- Strong contamination of the optics due to dust, smoke, steam or other causes like air pollution
- Electromagnetic interference sources

You must take into account the following climatic conditions and the requirements of the place of use of the pyrometer!

6.1.1 Climatic conditions

The following requirements must be fulfilled with respect to the climatic conditions at the place of use of the pyrometer:

- Temperature range 0 °C to +40 °C (up to +80°C with connected cooling)
- Maximum air humidity: 60 % at room temperature
- Atmosphere free of dust, corrosive vapours, and fume gases

6.1.2 Requirements at the place of use

Take into account the following requirements at the place of use of the pyrometer:

- Take care with the choice of the place of use and take into account the ergonomic and the legal guidelines for industrial safety in order to ensure safe operation of the pyrometer.
- Set up the pyrometer on a firm, stable base. The base must be free from concussion and vibration.
  Note:
  We recommend using the rail mounting plate available as an accessory for the attachment of the pyrometer as well as a clamping attachment (see Accessories (section 3.3) at page 5).
- Do not expose the system to direct sunlight or radiation from heating (e.g. radiators).
- Do not set the pyrometer near strong electromagnetic fields or near electromagnetic interference sources.
- Make sure that the pilot light falls unhindered on the object being measured and that there is nothing in the path of the rays.

6.2 Installation

6.2.1 Fix and connect the pyrometer

DANGER:
There is danger of injury and possible equipment damage by connection of cables under power!
Never connect cables under power! Make sure that the voltage supply is switched off before connection of the cables to the pyrometer!

IMPORTANT:
Operation of the pyrometer about ambient temperatures of more than 40°C is **only permitted with water cooling!** Connect the pyrometer to a suitable cooling circuit with ordinary tap water! The use of coolants is permitted only with the agreement of the manufacturer!
The temperature of the cooling water must lie between 10 °C and 35 °C. Condensation build-up due to the low temperature of the cooling water is to be avoided.

Install the pyrometer as follows:

1. Mount the pyrometer with the help of the retaining pin and taking into account the conditions specified in Installation Site Requirements (section 6.1) at page 12 for the intended place of use.
   Note:
   Do not exceed the 12 mm screw-in depth from the pyrometer.

2. Connect, if necessary (only in case of ambient temperatures more than 40°C) the water cooling.

3. Connect the colored wires of the 5-pole connecting cable (position B, Figure 7) to appropriate connections of a switchboard. For wire configuration please see legend to Figure 7.

4. Connect the 5-pole connecting cable to the pyrometer at the back of the instrument (position A, Figure 7) and to the power supply.

5. Double check stable set up of the pyrometer.

✓ **The pyrometer is ready for use and can be switched on.**

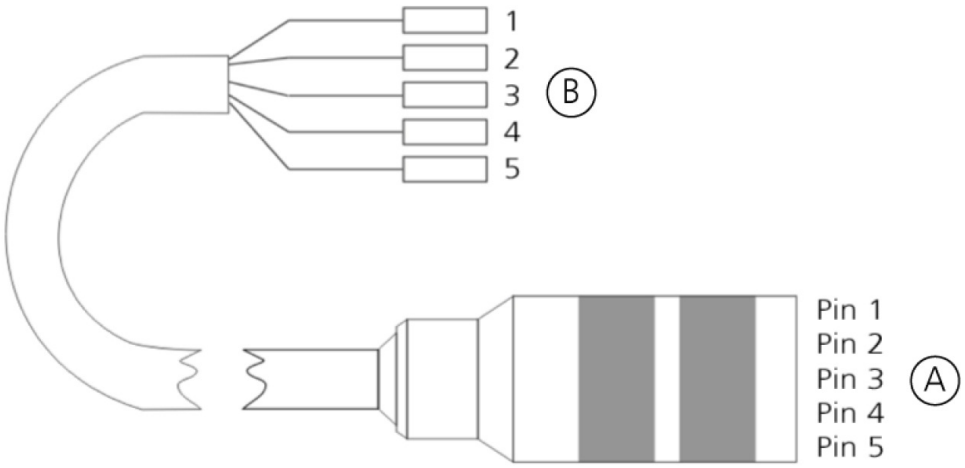

Figure 7: Pyrometer wire connection with configuration

Connector A	Meaning
Pin 1	Supply voltage +24 V (DC or AC)
Pin 2	Supply voltage 0 V (DC or AC)
Pin 3	Ground output
Pin 4	Analogue output 0 / 4 . . . 20 mA
Pin 5	PE

Connector B	Meaning
1 - white	Supply voltage +24 V (DC or AC)
2 - brown	Supply voltage 0 V (DC or AC)
3 - green	Ground output
4 - yellow	Analogue output 0 / 4 . . . 20 mA
5 - green-yellow	PE

6.2.2 Align pyrometer

The pyrometer is equipped with an LED pilot light for accurate alignment of the sensor with the object to be measured. Align the pyrometer with the object to be measured as follows:

1. Switch on the supply voltage to the pyrometer.
2. Allow a starting time of approx. 5 minutes for thermo-stabilization. Than the pyrometer has stabilized and is ready to work with the given accuracy.
3. Switch on the pilot light by pressing the push button at the rear side. Make sure that there is nothing in the path of rays.
   Note:
   In order to avoid measuring errors, the area of the pilot light must not be larger than the object to be measured.
4. If you have a pyrometer with vario optic, adjust the necessary measuring distance (see Setting the vario optic (section 7.1) at page 15).
   Note:
   The macro-optics cannot be adjusted.

✓ **The pyrometer is thus aligned and ready for temperature measurement.**

7 Operation of the pyrometer

7.1 Setting the vario optic

Adjust the necessary measuring distance with the help of the vario optic as follows:

1. If necessary switch on the pilot light by pressing the push button at the rear side.
2. Loosen the ring nut by turning it in a counter-clockwise direction.
3. Move the vario optic forwards and/or backwards, in order to adjust the pyrometer to the required measuring distance.
   Note:
   The size of the pilot light is identical to the size of the measuring field. The measuring field may not be larger than the object to be measured at the adjusted distance!
4. After adjusting the measuring distance, lock the annular nut by turning it in a clockwise direction

✓ **The vario optic is thus adjusted to the required measuring distance.**

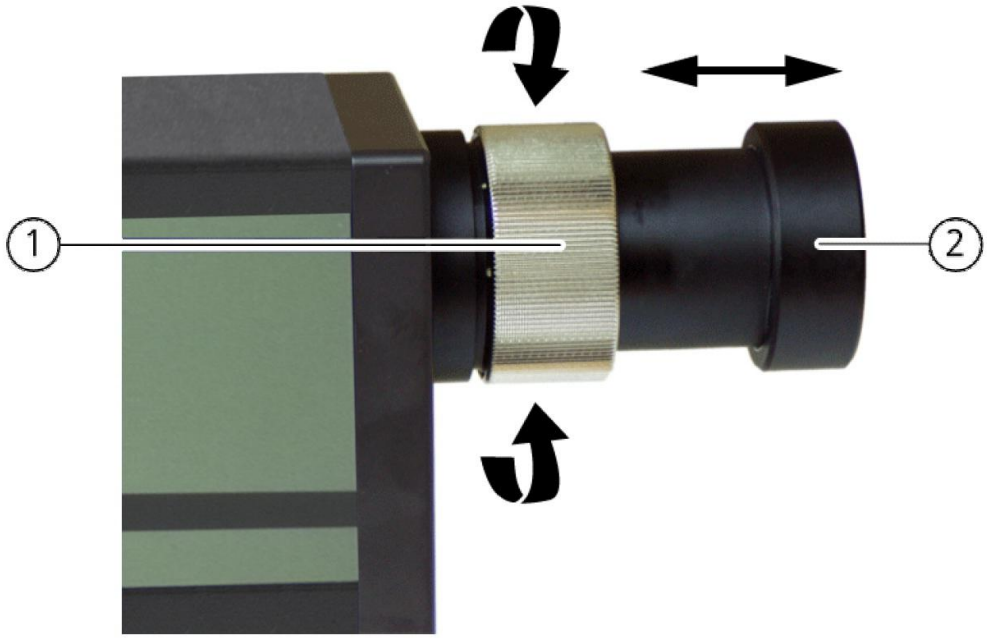

Figure 8: Setting the vario optic

1. Ring nut
2. Optic

d[a] in mm	450	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,500	3,000
M[b] in mm	2.5	4.0	6.0	8.0	10.5	11.5	13.0	14.0	15.0	20.0	28.0

[a] Distance from optics front edge
[b] Measuring field diameter

7.2 Adjusting the emissivity

The emissivity is the relationship between infrared energy radiated from an object and the radiation energy of a perfect emitter (black emitter) at the same temperature and the same spectral range.

The emissivity is material-dependent and of a considerable size in order to be able to determine the temperature of an object accurately without contact. The emissivity of the object being measured must therefore be known and be adjusted at the pyrometer.

Typical emissivities for various materials are available on our homepage at www.lumasenseinc.com or in relevant literature.

The instrument is calibrated at black body radiation (ε = 1,00). Real objects have an emissivity less than ε = 1.00. This difference can be adjusted with changing the emissivity value from the pyrometer.

How to find out correct emissivity:

1. First measure the real temperature of measuring object with a contact thermometer e.g. thermocouple or resistance probes. The “black” temperature (spectral temperature) measured with a pyrometer adjusted to emissivity = 1.0 usually gives a measuring value differing to real temperature because of the real emissivity of < 1.0. The value given by the instrument usually will be less than the real temperature. The emission ratio of most materials depends on temperature as well as wave length being measured.
2. You can get a correlation of the temperature scales, if you adjust the pyrometer at the exact temperature with the help of the emissivity value.

✓ **After adjusting the emissivity factor through a correlation measurement you can now measure temperatures for the calibrated temperature range at an accuracy mentioned in the technical data.**

IMPORTANT:
Please pay attention if you take over table values of emissivity to give the value of emissivity factor at a certain wave length. Adjusting emissivity following table values is not as exactly as adjusting following a comparing measurement.

Changing emissivity

With the help of a suitable screw driver and without any violence you can adjust emissivity at the rear side of the pyrometer stepless between 0.1 and 1.

7.3 Use of the pilot light

With the help of the pilot light the measurement point can easily determined.

For devices with a spectral range of 0.85 . . . 1.05 μm, the pilot light has to switched off during the measurement, as this may falsify the measurement result.

8 Troubleshooting

DANGER:
There is a danger of injury and possible equipment damage through incorrect power supply!
Let problems relating to an incorrect power supply be eliminated by an electrical specialist! Do not carry out arbitrary work on the electrical components of the pyrometer!

Only eliminate such problems yourself when their causes obviously relate to incorrect power supply, undercooling or contamination of the lens.

Do not undertake any interventions into the pyrometer. If problems arise which do not relate to the causes mentioned above, inform the service staff of the LumaSense Technologies GmbH.(for contact data see Service address (section 3.3) at page 6)

Fault	Cause	Solution
Pyrometer does not provide any measured values	Power supply faulty or interrupted	• Check the power supply • Check plugs and connections • Inspect cable
If the pyrometer supplies inaccurate measured values or measured values which lie outside the range to be expected	dirty optics or condensation on the lens	Clean optics (see Cleaning the Optics (section 10.2) at page 19)
	Cooling too strong/ weak or air humidity too high	Check cooling (see Cooling connection (section 5.5) at page 11)

9 Transport and Storage

9.1 Transport of the Pyrometer

CAUTION:
Environmental factors, impacts and the formation of water condensation may damage some components!
When transporting the pyrometer, take suitable measures to protect all components from environmental factors, impacts and the formation of water condensation! Temporary storage of the pyrometer in the open air is not permitted!

Look at Taking out of service (section 11.1) at page 20 how to dismantle the pyrometer.

It is advisable to use the original packaging for the shipping of the pyrometer. If the original packaging is no longer available, the pyrometer should be shipped in a cardboard box with shock-absorbing PE material.

When transporting the pyrometer observe the following instructions:

- Take great care when transporting the pyrometer to avoid damage through the effect of force, or careless loading or unloading.
- Avoid jerks, vibrations and the formation of condensed water due to severe temperature deviations while transporting.
- In the case of overseas shipping, a suitable desiccator (e.g. silica gel) should be inserted and the pyrometer should be sealed together with the desiccator in a protective plastic sheet.
- If the pyrometer is not immediately installed after delivery and put into operation, then it should be carefully stored in a location protected against dust and humidity (Storage of the Pyrometer (section 9.2) at page 18).

✓ **The pyrometer is thus ready to be shipped.**

9.2 Storage of the Pyrometer

CAUTION:
Environmental factors, impacts and the formation of water condensation may damage some components!
Store the pyrometer only in dry areas without large variations in temperature! The atmosphere should be free of dust and corrosive vapors!

CAUTION:
There is a danger of destruction by using freezing cooling water with a storage temperature <0 °C!
Before storage of the pyrometer if applicable remove any remaining cooling water from the cooling ducts of the equipment! Storage of the pyrometer with coolant remaining in the cooling ducts is not permitted!

Store the pyrometer appropriately in the original packaging. Put a suitable desiccant inside the packing (e.g. silica-gel) to prevent damage by moisture. Protect the pyrometer against dust through suitable measures.

The following climatic conditions are required in the storage room of the pyrometer:

- Temperature range -20 °C . . . +70 °C
- Maximum air humidity to 70 %
- Atmosphere free of dust and corrosive vapors

10 Maintenance and Care

10.1 General information

CAUTION:
Humidity can lead to the destruction of the electrical and electronic components!
Do not use any liquids for cleaning the pyrometer or cleaning the immediate of the pyrometer!

IMPORTANT:
The servicing period depends particularly on the operating and environmental conditions and is therefore to be specified by the operator!

The pyrometer is largely maintenance-free. Its function depends, however considerably on the condition of the optics. The optics must therefore be checked and if necessary cleaned at regular intervals according to the operating and environmental conditions (see Cleaning the Optics (section 10.2) at page 19). This is necessary in particular if the measured temperature levels do not lie in the expected range.

In the case of excessive contamination or scratches of the optics, please contact the technical customer service (contact address see Service address (section 3.3) at page 6).

Check the cables and the housing at regular intervals for damage and a firm seating.

10.2 Cleaning the Optics

Clean the lens with a soft cloth or cotton pad and with white spirits. The optics is thus cleaned and the pyrometer is again ready for use.

11 Taking out of service, Disposal

11.1 Taking out of service

DANGER:
Removing electrically live cables risks injury and damage to equipment.
Never remove electrically live connecting cables. Before removing a cable, ensure that the power supply has been switched off.

Take the pyrometer out of operation as follows:

1. Switch off the power supply to the pyrometer
2. Remove the cables at the rear side of the pyrometer.
3. If applicable switch off the cooling water supply.
4. If applicable remove the connections of the cooling system and empty the remaining cooling water from the cooling ducts of the pyrometer.
5. Dismantle the pyrometer from the mounting plate.
6. If necessary bring the optics in and tighten the annular nut.

✓ **The pyrometer is thus out of operation.**

11.2 Disposal

For disposal, you can return the pyrometer to LumaSense Technologies GmbH (for address see Service address (section 3.3) at page 6). For this you should pack the pyrometer appropriately in the original packaging or use a cardboard carton with shock absorbing PE material.

REFERENCE TO ENVIRONMENTAL PROTECTION:
Do not dispose of the pyrometer with domestic refuse!