MICRO-EPSILON

Instruction Manual

Endolight FOT Xenon

Xenon light source

MICRO-EPSILON Eltrotec GmbH
Heinkelstr. 2

73066 Uhingen / Germany

Phone +49 (0) 7161/98872-300
Fax +49 (0) 7161/98872-303
email eltrotec@micro-epsilon.de
www.micro-epsilon.com

CE

Certified according to DIN EN ISO 9001: 2008

Contents

1. Safety

The handling of the system assumes knowledge of the instruction manual.

1.1 Symbols Used

The following symbols are used in the instruction manual.

⚠ WARNING	Indicates a hazardous situation which, if not avoided, may result in death or serious injuries.
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injuries.
NOTICE	Indicates a situation which, if not avoided, may lead to property damage.
➡	Indicates a user action.
i	Indicates a user tip.

1.2 Warnings

⚠ WARNING

Do not operate the Endolight FOT Xenon light source without a xenon lamp. Disconnect the power supply before replacing the xenon lamp.

> Death by electric shock

> Danger of injury

⚠ CAUTION

Connect the power supply in accordance with the safety regulations for electrical equipment.

> Danger of injury

> Damage to or destruction of the light source

Do not look directly into the light source.

> Danger of injury, damage to the eyes or skin

Use the xenon lamp during operation only in the designated FOT Xenon light source.
> Fire hazard, risk of burns, damage to the eyes or skin

> Damage to property

Let the xenon lamp cool off for 10 to 15 minutes before replacing it.
> Risk of burns

NOTICE

The supply voltage must not exceed the specified limits.
> Damage to or destruction of the light source

Keep the light source away from liquids and splashes of water.
> Damage to or destruction of the light source

Install the xenon lamp correctly and ensure that the light source is connected properly.
> Short circuit

Please ensure sufficient ventilation to prevent overheating. Do not cover the light source.
> Damage to or destruction of the light source

The light source must not come into contact with solvent-based cleaning agents (neither lens nor cover).
> Damage to or destruction of the light source

Ensure a distance of about 2 m to computers or other magnetic-field-sensitive devices, or shield the light source separately.
> Electromagnetic interference (EMI)

1.3 Notes on CE Identification

The following applies for the Endolight FOT Xenon light source:

EMC regulation 2004/108/EC and

Low voltage Directive 2006/95/EC

Products which carry the CE mark satisfy the requirements of the EMC regulation 2004/108/EC ‘Electromagnetic Compatibility’ and the European standards (EN) listed therein. The EC declaration of conformity is kept available according to EC regulation, article 10 by the authorities responsible at

MICRO-EPSILON Eltrotec GmbH
Heinkelstraße 2
D-73066 Uhingen

The light source is designed for use in industry and satisfies the requirements of the standard
- DIN EN 61010-1: 2011-07

The system satisfies the requirements if they comply with the regulations described in the instruction manual for installation and operation.

1.4 Proper Use

- The Endolight FOT Xenon light source is used, using special fiber optic cables and systems for
  - Endoscopy
  - Microscopy
  - Image processing
  - Measurement
  - Industrial and technical lighting
  - Automatization
- The Endolight FOT Xenon light source is not suitable for medical purposes.
- The system may only be operated within the limits specified in the technical data, see Chap. 2.3.
- Use the Endolight FOT Xenon light source in such a way that in case of malfunctions or failure personnel or machinery are not endangered.
- Take additional precautions for safety and damage prevention for safety-related applications.

1.5 Proper Environment

- Operating temperature: 5 °C to 40 °C (+41 °F to +104 °F)
- Storage temperature: 10 °C to 30 °C (+50 °F to +86 °F)
- Humidity: 15 to 95 %
- Ambient pressure: Atmospheric pressure (700 hpa up to 1060 hpa)

2. Functional Principle, Technical Data

2.1 Short Description

The Endolight FOT Xenon light source provides high-quality intense white light with a color temperature of 5000 k, which is similar to daylight. The light source has a very high color rendering index. It is an ideal solution for applications requiring intense white light, such as

- Lighting for endoscopes
- UV/NDT inspections
- Fluorescence
- Microscopes
- Video and optical lighting systems

2.2 Advanced Features

- Internal thermal shutdown
- Double insulated
- Low electrical noise
- Convection cooling
- ACMI Fiber adapter
- Full-off light attenuation through mechanical iris control
- UV/IR filter included
- Shock resistant
- Constant light output

2.3 Technical Data

Model		Endolight FOT Xenon
Output		24 W
Light output		590 lm with glass fiber optic cable with a 4 mm fiber cross section
Fiber diameter		max. 5 mm
Average operating life		~ 500 h
Weight	Light source	0.5 kg
	Power supply unit	0.5 kg
Voltage supply		100 - 240 V, 50 - 60 Hz
Input voltage		12 VDC
Output		12 V / 3.4 A
Light source		Xenon
Color temperature xenon lamp		5000 K
Xenon lamp		24 Watt
Operating life xenon lamp		approximately 500 hours
Light intensity		Manually adjustable
Fiber optic cable connection		ACMI
Dimensions		137 x 90 x 68 mm
Operating temperature		5 °C to 40 °C (+41 °F to +104 °F)
Storage temperature		10 °C to 30 °C (+50 °F to +86 °F)
Low Voltage Directive		DIN EN 61010-1: 2011-07
Shock resistant		With precisely aligned electrodes instead of a tungsten filament [1]

1) This design improves resistance to shocks and vibrations – ideal lighting for harsh environments.

3. Delivery

3.1 Unpacking

- FOT Xenon light source
- Power supply unit
- Power supply cable
- Xenon lamp

Suitable fiber optic cables are listed in Optional Accessories, see Chap. 7.

Fiber optic cables with synthetic fibers are suitable to only a limited extent.

Check for completeness and shipping damage immediately after unpacking.

In case of damage or missing parts, please contact the manufacturer or supplier immediately.

3.2 Storage

- Storage temperature: 10 °C to 30 °C (+50 °F to +86 °F)
- Humidity: 15 to 95 %

4. Assembly

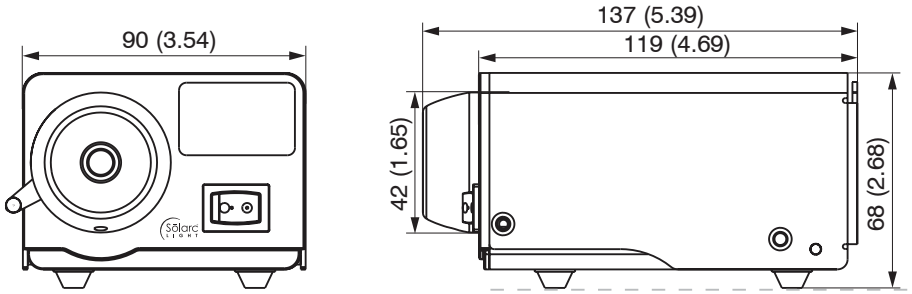

Fig. 1 Endolight FOT Xenon light source – dimensional drawing

5. Operation

5.1 Installation

⚠ CAUTION

Operate the Endolight FOT Xenon light source only when the cover is closed. Position the device horizontally. The xenon lamp particles can reach temperatures of up to 1000 °C (1832 °F).

Risk of fire, burns, property damage

Please ensure that the light source is placed onto its feet and is positioned horizontally; otherwise thermal changes may occur, reducing the operating life of the xenon lamp.

The xenon lamp is filled with hot vapor and is subject to gravity, which has a horizontal pull.

The xenon lamp ignites with a series of short (> 1 microsecond) high-voltage pulses of up to 10 kV. This sounds like a series of mouse clicks. An ionized arc is created between the electrodes.

5.2 Commissioning

➡ Insert the plug of the power cable into the power supply unit, see Fig. 2.

Fig. 2 Power supply unit and power cable

➡ Insert the plug of the power supply unit, into the supply voltage connection, see Fig. 4.

Fig. 3 Power supply unit plug

Fig. 4 Light source rear view

⚠ CAUTION

Do not look directly into the light source and avoid direct contact with the light source. Risk of injuries; damage to the eyes or skin

➡ Now connect the power supply to a grounded AC outlet.

The power switch should be in the 0 position, see Fig. 5

➡ Turn the intensity control for your Endolight FOT Xenon light source to minimum, see Fig. 5.

Fig. 5 Light source front view

➡ Insert the fiber optic cable into the lamp connection, see Fig. 6, see Fig. 7, and connect the other end with an endoscope, see Fig. 8 or a fiber optic illumination unit.

Fig. 6 Connecting the fiber optic cable *to the light source – not yet connected*

Fig. 7 Connecting the fiber optic cable *to the light source – connected*

Fig. 8 Connecting the fiber optic cable to an endoscope

NOTICE

Do not turn the Endolight FOT Xenon light source on and off in rapid succession. This shortens the life span of the xenon lamp considerably.

- Set the power switch to `I`, see Fig. 5.
- Use the intensity control of your Endolight FOT Xenon light source to adjust the light intensity, see Fig. 5.
- Switch off the light source when it is not needed by pushing the power switch back into the 0 position.

i Let the xenon lamp cool off for 10 to 15 minutes after each use.
Do not start the Endolight FOT Xenon light source straight after switching it off. This will reduce the life of the lamp significantly.

If you cannot start the lamp:

- Switch off the supply voltage and wait 10 to 14 seconds before turning the light source back on, see Chap. 6.3.

5.3 Xenon Lamp

5.3.1 Replacing a Lamp

- Switch off the Endolight FOT Xenon light source by pushing the power switch into the 0 position, see Fig. 5. Disconnect the power cord from the wall socket and remove the power supply unit plug from the rear of the light source.
- Remove the 5 screws from the FOT Endolight Xenon light source with a 2 screwdriver, see Fig. 9.

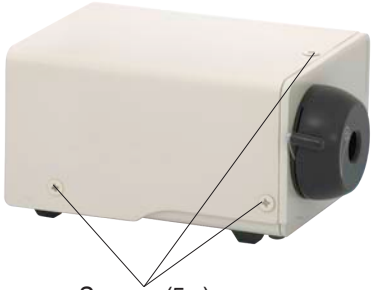

Fig. 9 Side view with screws

- Open the housing cover upwards to have access to the xenon lamp, see Fig. 10.

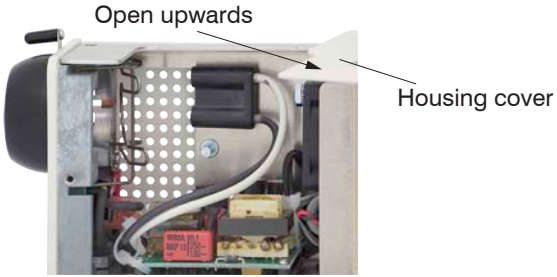

Fig. 10 Opening the cover

⚠ CAUTION

Ensure that you follow the instructions for proper disposal, see Chap. 10., if the xenon lamp is broken. Risk of poisoning, respiratory distress

⚠ CAUTION

Remove the xenon lamp only after it has cooled off completely. Risk of burns

Ensure that you dispose of the xenon lamp correctly, if it is broken, see Chap. 10.

- When the xenon lamp has cooled down (10 to 15 minutes after the last operation), pull the clamping bracket upwards over the lamp spring holder, see Fig. 11.
- Now hold the lamp base and simultaneously press down the lamp spring holder, see Fig. 12.

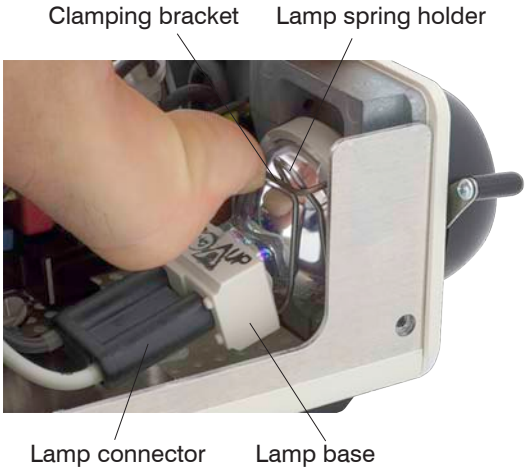

Fig. 11 Pull up the clamping bracket

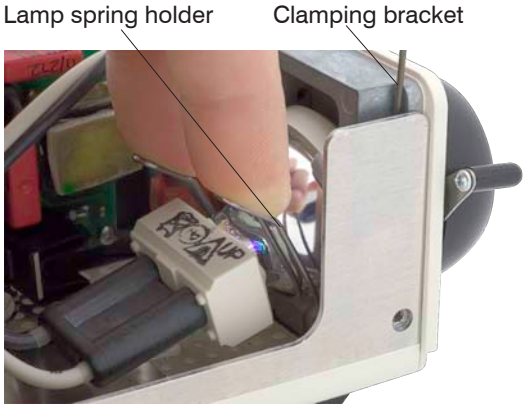

Fig. 12 Press down the lamp spring holder

- At the same time, hold the xenon lamp at its base and gently pull it out (upwards).
- Disconnect the lamp connector from the xenon lamp, see Fig. 13, and remove the xenon lamp.

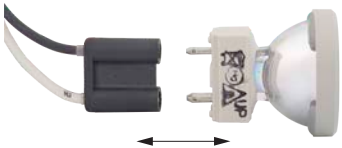

Fig. 13 Disconnect the lamp connector from the xenon lamp

NOTICE

Do not touch the xenon lamp. Only touch the lamp socket.

Skin oils from fingerprints or other impurities on the xenon lamp will decrease lamp performance or cause premature failure of the xenon lamp.

- Dispose of the xenon lamp, see Chap. 10.
- Hold the new xenon lamp [1] at its socket, and insert it into the lamp connector (polarity protection).

i Make sure that “UP” is facing upwards when you insert the xenon lamp into the socket.

- Press the lamp socket with the xenon lamp downwards. The xenon lamp is now inside the lamp spring holder.

Note the clicking sound. The guide pin is now positioned at the bottom of the xenon lamp and engaged in the lamp holder slot, see Fig. 15.

- Push the clamping bracket back over the lamp spring holder.
- Remove any fingerprints and lint using a clean cotton swab and alcohol.
- Tighten the 5 screws to close the cover.
- Reconnect the power supply.

1) Use only original xenon lamps from MICRO-EPSILON Eltrotec, which are available as accessories, see Chap. 7.

Fig. 14 Xenon lamp with guide pin

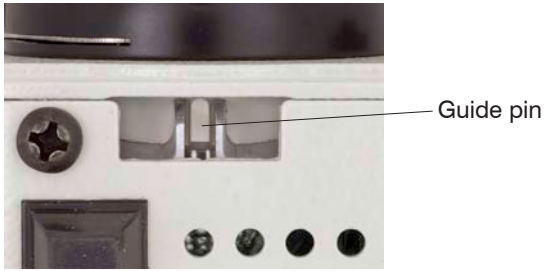

Fig. 15 Lamp slot, view from below

5.3.2 Light Output Stability

Fluctuations in the light output of up to 5 % and occasional gas flares or bright flashes of red or pink light are normal.

Xenon lamps contain small amounts of metals. These metals are present both in liquid and in solid form and may show as dark-reddish or reddish-brown spots or as a film on the inner surface when the xenon lamp is cold. These phenomena are normal and do not affect the operation of the xenon lamp. They disappear once the xenon lamp has been put into operation.

The discharge between the two closely positioned electrodes, which are sealed in a quartz glass envelope, generates light through an electric arc. During operation small amounts of metals are heated to a liquid state, producing the vapor required for the desired light color.

Light generated in such a way is very intense.

Appropriate precautions in relation to light intensity and heat must be taken:

- The Endolight Xenon light source operates at very high temperatures and under extremely high pressure. Particles can reach up to 1000 °C (1832 °F) and can cause burns, fire or damage to property. Proper installation, cooling and ventilation is required to ensure reliable operation.

⚠ CAUTION

Operate the Endolight FOT Xenon light source only when the cover is on. Position the device horizontally. The xenon lamp particles can reach temperatures of up to 1000 °C (1832 °F). Risk of fire, burns, property damage

⚠ CAUTION

Do not look directly into the light source and avoid direct contact with the light source. Risk of injuries; damage to the eyes or skin

NOTICE

Do not touch the xenon lamp. Only touch the lamp socket.

Skin oils from fingerprints or other impurities on the xenon lamp will decrease lamp performance or cause premature failure of the xenon lamp.

- Operate the xenon lamp only in its closed light source housing.
- The UV light from the xenon lamp can cause serious eye damage and skin irritation.
- Always let the xenon lamp cool off for 10 to 15 minutes before replacing it.
- Handle the xenon lamp with caution.
- Do not touch the xenon lamp. Only touch the lamp socket. Skin oils, fingerprints or other impurities on the xenon lamp will decrease the performance or cause premature failure of the xenon lamp.
- Switching the FOT Xenon light source on and off in rapid succession will shorten its life span.
- Xenon lamps are highly efficient and sensitive to changes in temperature and external influences. Variations in performance and color may occur.
- After switching the xenon lamp off it should be left to cool for 10 to 15 minutes before turning it back on to ensure a trouble-free startup. If you do not observe this waiting period, the xenon lamp may not ignite because the pressure within the chamber is too high and no arc between the electrodes can be generated.
- The more stable the mains voltage, the longer the service life of the xenon lamp and the better the quality of the emitted light.
- Avoid any damage and mechanical disruptions when installing, assembling or replacing the xenon lamp.
- The maximum operating temperature must not be exceeded and good ventilation must be provided at all times.
- The high quality of the light output is typically retained during the lifetime of the lamp at 75 % or more of its original value.
- Xenon lamps use high-voltage short-term pulses to initiate operation.
- This model is a DC (direct current) xenon lamp. Ensure proper electrical wiring to prevent damage to the xenon lamp.
- It takes about 24 seconds to achieve full light output. After the ignition process, the mixture of metals, halogens and rare earth elements must first heat up to melt the solid components and let them evaporate. During the warm-up phase instabilities may occur, such as a flickering or blinking of the lamp.

Because a variety of factors influence the service life of the xenon lamp, the stated life span is only an average value.

The xenon lamp is considered defective if it does not start or if the light yield has fallen to half its original value. The operating life of the xenon lamp depends on how often it is started. If the xenon lamp is switched on and off frequently in rapid succession, the service life is reduced by approximately 50 %.

If the xenon lamp is operated in a continuous mode, its service life improves by up to 30 %.

The following illustrations show the state of the spectral distribution and light intensity of a new xenon lamp, see Fig. 16, and after 650 hours, see Fig. 17. The performance of the xenon lamp barely changes during its life cycle.

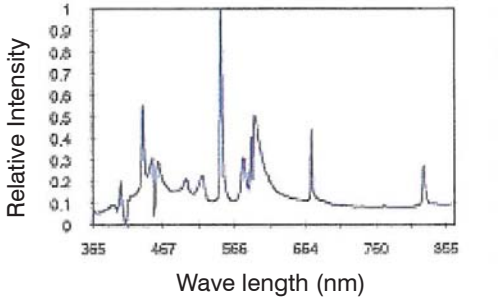

Fig. 16 Spectral output at 0 operating hours

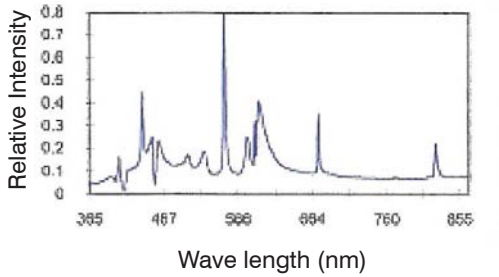

Fig. 17 Spectral output at 650 operating hours

⚠ CAUTION

Do not look directly into the light source and avoid direct contact with the light source. Risk of injuries; damage to the eyes or skin

6. Instruction for Operation

6.1 Additional Safety Measures

The xenon lamp produces light across the entire visible spectrum (UV-IR) as well as ultraviolet light. Never look directly into the light of a xenon lamp. Operate the xenon lamp only when the light source housing is closed.

> Can irritate the eyes or cause severe damage to the retina.

i Please wear appropriate protective glasses!

6.2 Cleaning

NOTICE

Do not immerse the device in water.

Do not connect the device/power supply cable if it is damp. The light source may get damaged or destroyed

6.2.1 Housing and Power Supply Unit

- Turn off the Endolight FOT Xenon light source and disconnect the power cord from the wall socket and from the rear of the light source.
- Wipe the exterior surfaces using a damp cloth with mild soapy water.
- Wipe the power cord using a damp cloth with mild soapy water.

6.2.2 Xenon Lamp and Quartz Glass

- Remove any fingerprints using a cotton swab or isopropyl alcohol (rubbing alcohol).
- Remove any lint from the xenon lamp.

6.3 Troubleshooting

There are only few possible causes for a defective xenon lamp, which are all due to extreme thermal and mechanical conditions within the xenon lamp.

1. The xenon lamp breaks.

One typical failure cause is the xenon lamp breaking (sometimes with an audible pop).

➪ Replace the xenon lamp, see Chap. 5.3.1.

⚠ CAUTION

Please ensure that you follow the safety and disposal instructions, see Chap. 10.
> Risk of poisoning, respiratory distress, health hazard

2. The xenon lamp does not ignite.

➪ Switch off the power supply and wait 10 to 15 seconds before turning the device back on.

➪ Check the voltage supply and the connections between power supply unit and light source / power supply unit and power supply.

➪ Check that the xenon lamp is positioned correctly.

➪ Try again to switch on the light source.

NOTICE

Do not turn the Endolight FOT Xenon light source on and off in rapid succession. This shortens the life of the xenon lamp considerably.

ℹ Do not start the Endolight FOT Xenon light source straight after it was switched off as it may not ignite. Let the xenon lamp cool off for 10 to 15 minutes before starting it again.

7. Accessories

Endolight xenon replacement lamp Order no. 21320903

Fiber optic cable EL 1/4 1800 MEP/S with universal adapter Order no. 20711767

Liquid fiber optic cable EFL 1/4 1800 MEP/S with universal adapter Order no. 20711803

Other fiber optic cables and fiber optic lighting units are available on request.

8. Warranty

All components of the device have been checked and tested for perfect function in the factory. In the unlikely event that errors should occur despite our thorough quality control, this should be reported immediately to MICRO-EPSILON Eltrotec.

The warranty period lasts 12 months following the day of shipment. Defective parts, except wear parts, will be repaired or replaced free of charge within this period if you return the device free of cost to MICRO-EPSILON Eltrotec. This warranty does not apply to damage resulting from abuse of the equipment and devices, from forceful handling or installation of the devices or from repair or modifications performed by third parties.

No other claims, except as warranted, are accepted. The terms of the purchasing contract apply in full. MICRO-EPSILON Eltrotec will specifically not be responsible for eventual consequential damages. MICRO-EPSILON Eltrotec always strives to supply the customers with the finest and most advanced equipment. Development and refinement is therefore performed continuously and the right to design changes without prior notice is accordingly reserved. For translations in other languages, the data and statements in the German language operation manual are to be taken as authoritative.

9. Service, Repair

In the event of a defect on the Endolight FOT Xenon light source or on power supply cable please send us the effected parts for repair or exchange. In the case of faults the cause of which is not clearly identifiable, the whole measuring system must be sent back to:

MICRO-EPSILON Eltrotec GmbH
Heinkelstraße 2
73066 Uhingen / Germany
Tel: +49 / 7161 / 98872-300
Fax: +49 / 7161 / 98872-303

eltrotec@micro-epsilon.de
www.micro-epsilon.com

10. Decommissioning, Disposal

The light source is manufactured in accordance with RoHS Directive 2011/65/EU.

The xenon lamp consists largely of quartz glass and it contains a small amount of mercury and inert gas. Argon and xenon are used as filling gases. In addition, small quantities of other materials are used, but they do not play a significant role. The electrodes are made of tungsten. They are coated with nickel and molybdenum and fused into the quartz glass.

Disposal must be carried out according to the following steps and in line with local regulation guidelines for the disposal of hazardous waste:

- Remove the xenon lamp only after it has cooled off completely (10 to 15 minutes).
- Remove the broken xenon lamp from the lamp socket.
- Remove any remaining mercury using adhesive tape, paper or a syringe.
- Place any material that was in contact with mercury into an airtight non-metallic container, and dispose of it in line with official regulations.
- Ensure that these steps are carried out with adequate ventilation, and wear protective goggles and protective clothing.

Mercury may leak when the xenon lamp breaks.

⚠ CAUTION

Risk of poisoning, respiratory distress, health hazard

Do not breathe in any mercury vapor.

Mercury vapor is toxic and can damage your lungs and nervous system. If mercury leaks out, air the room thoroughly (for approximately 30 minutes, depending on room size and conditions). A high concentration of vapors may cause short-term symptoms such as pneumonia, chest pain, shortness of breath, coughing, gingivitis, salivation and stomatitis. When the substance comes into contact with the skin and/or eyes it can cause redness and irritation.

Inhalation of quartz may lead to shortness of breath and coughing.

Inhalation of tungsten dust may cause irritation of eyes, nose and throat. The essential trace element molybdenum is no longer processed correctly which can lead to disorders of the stomach/intestinal tract.

- Clean the affected areas with a mild soap or detergent and water, and prevent any further contact. Consult a doctor if necessary.

MICRO-EPSILON

MICRO-EPSILON Eltrotec GmbH
Heinkelstr. 2 · D-73066 Uhingen, Germany
Phone +49 (0) 7161 / 98872-300 · Fax +49 (0) 7161 / 98872-303
eltrotec@micro-epsilon.de · www.micro-epsilon.de

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