HEXAGON

Operating Instructions

Laser Scanner

LS-R-4.8

Manual Version V01.00-REV01.00
Release Date 2021-03-19

Table of Contents

1 Description

1.1 General

1.1.1 Preface

The safety instructions in this manual have to be strictly observed to guarantee a safe and reliable function of the touch probe and to avoid personal and material damage. The meaning of the symbols related to the safety instructions is described in the table below:

⚠ **CAUTION**	CAUTION indicates a hazardous situation that, if not avoided, could result in injury.
NOTICE	NOTICE indicates important information that, if not observed, could lead to property damage/malfunctions.
INFORMATION	INFORMATION indicates important information or helpful advices for the work with the described device.

1.1.2 Safety Instructions

⚠ **CAUTION**
Risk of injury! At high spindle rotation speeds, there is a danger that the device will come out of the spindle, or that parts of the device will be ejected. • Make sure that the laser scanner is only used with no spindle rotation speed

⚠ **CAUTION**
Risk of injury due to hot device surface! Especially with high ambient temperatures, the device can get hot during operation. • If the laser scanner has been in operation, it must only be handled with protective gloves.

⚠ CAUTION

Risk of eye injuries due to laser radiation!

The LS-R-4.8 laser scanner is a laser class 2 product according to EN/IEC 60825-1:2014. To avoid eye injuries, the following instructions must be followed:

- Do not look directly into the laser beam.
- Do not point the laser beam at people.
- When the laser scanner is not in use, protect it against unauthorised access.
- Switch off the system before cleaning or maintenance work.

Fig. 1 Hazard labels on the laser scanner housing

NOTICE

Risk of damage to the equipment!

Rotating the spindle at high speed can damage the laser scanner.

- Make sure that the laser scanner is only used with no spindle rotation speed.

NOTICE

Risk of damage to the equipment!

When the battery compartment is open, there is a risk that dirt and moisture can penetrate the sensor. The specified protection class (IP68) only applies when the battery compartment is closed.

- Make sure that the laser scanner is only used with no spindle rotation speed.

NOTICE

Risk of material damage!

- The laser scanner is not monitored for collisions. All travel paths must be programmed so that no collisions can occur.

NOTICE

Risk of material damage caused by third-party parts!

- Only use the original spare parts listed in these operating instructions to perform maintenance and repairs.

NOTICE

Possible damage to the laser scanner

Deposits on the optical windows have a significant effect on the measuring accuracy of the laser scanner.

- Avoid drips or heat damage to prevent a decrease in accuracy or sensitivity.
- Do not touch the optical windows on the laser scanner.
- Do not use solvents to clean the housing of the laser scanner.
- Store only within the specified storage temperature range, see chapter 1.5.1.
- Avoid the formation of condensation on the optical elements, e.g. by quickly changing the temperature.

INFORMATION

The information given in this manual can be changed by the manufacturer at any time. Thus the user is responsible to regularly inquire about updated information.

1.1.3 Validity

These operating instructions are valid for the hardware available at the date of creation of these operating instructions. The manufacturer reserves the right to make technical modifications.

1.2 Purpose

The LS-R-4.8 laser scanner is used for measuring and detecting various workpiece geometries (e.g. arches, surfaces, corners, edges, areas, slots, grooves, curves, cut-outs, polygons, shanks and spherical surfaces). It is also suitable for measuring complex geometries, like three-dimensional surfaces and for measurements involving pivot axes. The measured workpieces can consist of a variety of different materials (e.g. processed, semi-finished, punched, forged, cast material, as well as dark materials such as rubber and carbon fibre).
Radio-wave transmission ensures that the measuring signals from the laser scanner can be transmitted to the receiver over large distances.
The measuring results are evaluated using the program **HxGN NC Measure**.

1.3 Declarations and Approvals

1.3.1 Europe and UK (EU an UKCA Declarations of Conformity)

The EU and UKCA Declarations of Conformity can be found at the end of these operating instructions.
If required, a copy of the signed original declarations of conformity may be requested from the address given on the back cover.

1.3.2 USA (FCC Declaration)

This device complies with Part 15 of the FCC. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

This device has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the device is operated in a commercial environment. This device generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

In order to comply with FCC and IC RF Exposure requirements, the device must be installed and operated such that a minimum separation distance of 20 cm is maintained between the device and all persons during normal operation.

Changes or modifications not expressly approved by m&h Inprocess Messtechnik GmbH may void the FCC/RSS authorization to operate this equipment.

FCC ID: MFFLSR48

1.3.3 Canada (IC /RSS Declaration)

English:

This device complies with Industry Canada licence-exempt RSS standard(s).
Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

Français:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.
L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC: 5782A-LSR48

1.3.4 China

This device has an RTA certificate (**R**adio Transmission Equipment **T**ype **A**pproval Certificate) issued by the SRRC (**S**tate **R**adio **R**egulatory **C**ommittee) for use in China.

CMIIT ID: 2016DJ1391

1.3.5 Japan

This device has a certificate issued by the Japanese MIC (**M**inistry of **I**nternal Affairs and **C**ommunications) for use in Japan. This certification complies with the Japanese Radio Law:

R 202-LSI069

1.4 System Components

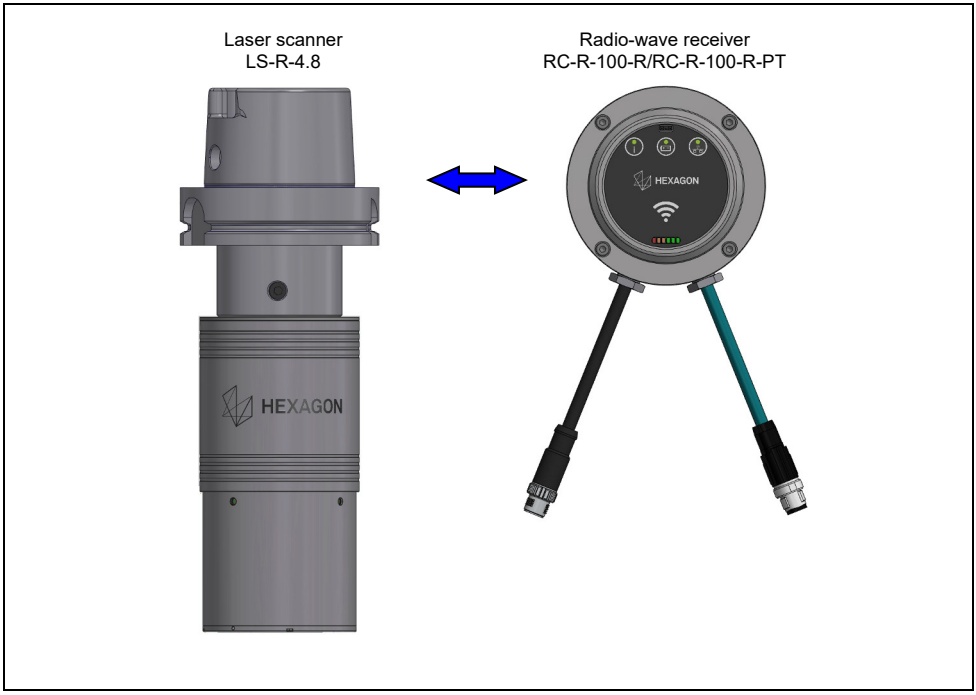


Fig. 2 System Components

1.5 Technical Data

1.5.1 Laser scanner technical data

Transmission frequency		2400-2483.5 MHz (2.4 GHz) 5.18-5.24 GHz (WLAN 5GHz) (20 MHz channels 36, 40, 44, 48)
Transmission/reception range		Up to 15 m
Laser class		2 (EN / IEC 60825-1:2014)
Laser manufacturer		OSRAM Opto Semiconductors GmbH
Laser type		PL450B (laser diode)
Emitted wavelength (blue)		450 nm
Maximum average radiation power		1 mW
Beam spread		24° (visual) 17,2° (measuring range)
Laser type		CW Laser (Continuous Wave)
Working distance and depth (Z) (outer housing edge to average working distance)		115 ±40 mm
Line width		27,1 mm (minimum working distance) 39,2 mm (average working distance) 51,3 mm (maximum working distance)
Zoom mode 1	Frame rate	42 Hz
	Raw points per line (µm)	841
	Raw point spacing (µm)	32 (minimum working distance) 47 (average working distance) 61 (maximum working distance)
Zoom mode 2	Frame rate	80 Hz
	Raw points per line (µm)	421
	Raw point spacing (µm)	65 (minimum working distance) 93 (average working distance) 122 (maximum working distance)
Zoom mode 3	Frame rate	144 Hz
	Raw points per line (µm)	211
	Raw point spacing (µm)	129 (minimum working distance) 187 (average working distance) 244 (maximum working distance)
Data rate		30.000 to 36.000 Pt/sec
Sensor's insensitivity to extraneous light		5,000 lx (diffused, indirect artificial light)
Operating temperature		5 to 40 °C (41 to 104 °F)
Temperature range for specified accuracy		15 to 40 °C (59 to 104 °F)
Storage temperature		-25 to +70 °C
Ambient humidity		90 % non-condensing
Weight		1900 g (without batteries)
Power supply		4x 3.7 V battery, 26650, Li-ion, 5000 mAh
Battery lifetime (continuous measurement)		10 h
System booting time		5 s
Protection against dust and water		IP68 (IEC 60529)

1.5.2 Calibration sphere technical data

Material	Epoxy resin
Coating thickness	30 to 50 µm
Diameter	25,4XX mm (1")
Colour	White (Munsell N9.4)
Gloss (60°)	3 ±2.5

1.6 Dimensions

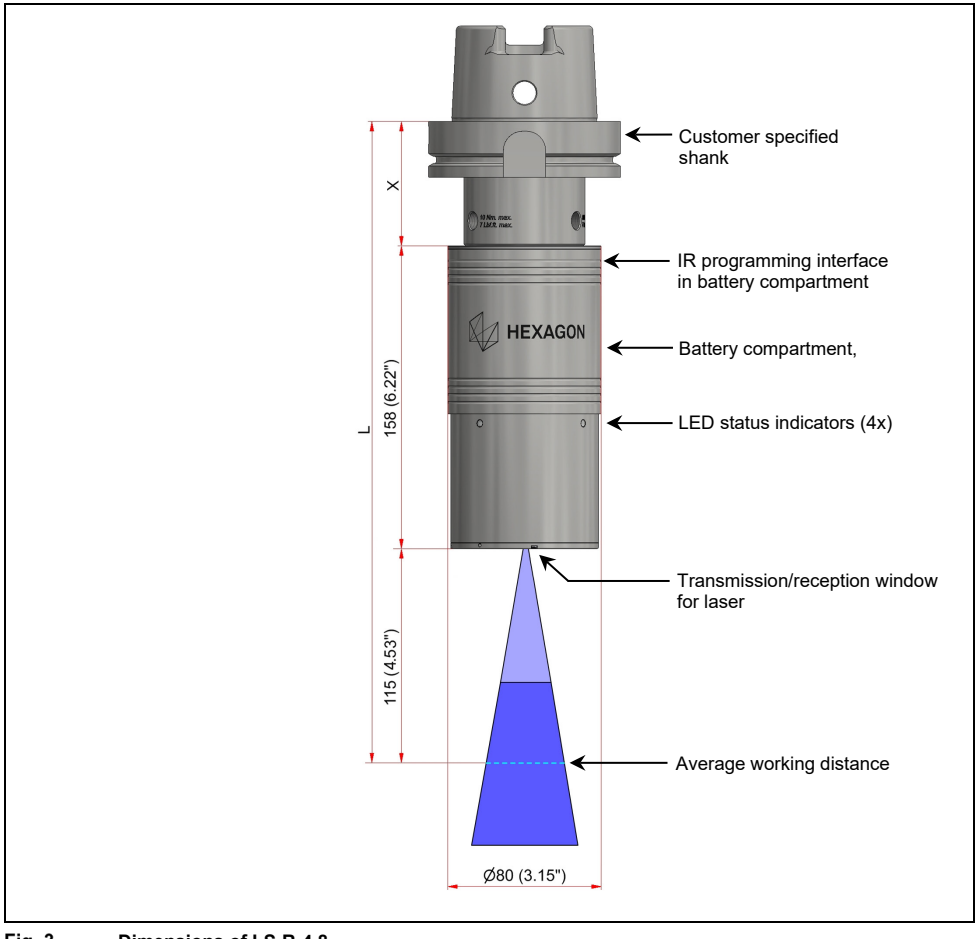


Fig. 3 Dimensions of LS-R-4.8

INFORMATION
The dimension X for the length of the shank, required to calculate the total length L of the laser scanner system, can be found in the accessories catalogue. The total length L is the sum of the laser scanner length and the dimension X.

1.7 Markings

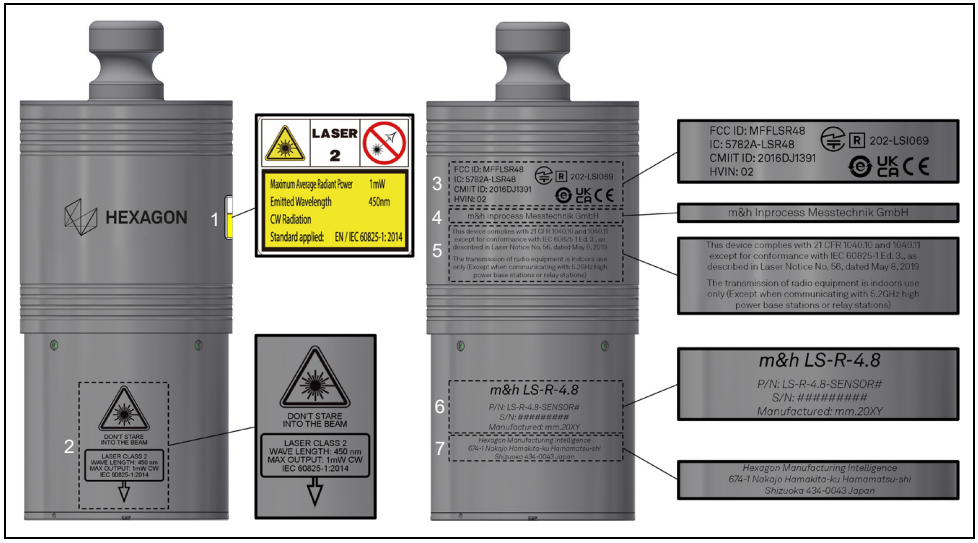
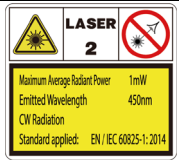
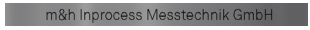
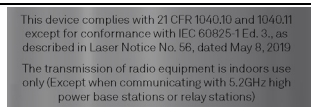
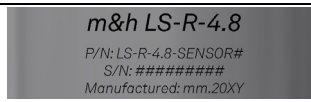
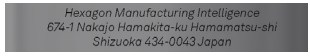


Fig. 4 Markings

Position	Labeling	Description
1		Laser warning, complete
2		Laser warning with information on the laser class and position indicator for the laser transmission window (refer to chapter 2.4.1)
3		Approval numbers for national and European radio approvals and conformity labels
4		Registered applicant for radio licenses
5		Compliance information for FDA Laser Regulations (21CFR 1040.10 and 1040.11) and radio declaration for indoor use
6		Devive information: • Product name • Part numberr • Serial number • Manufacturing date
7		Manufacturer address

1.8 Function parameters

1.8.1 Measuring Range

The following illustration shows the recommended average working distance and the permissible working range between the minimum and maximum possible working distance:

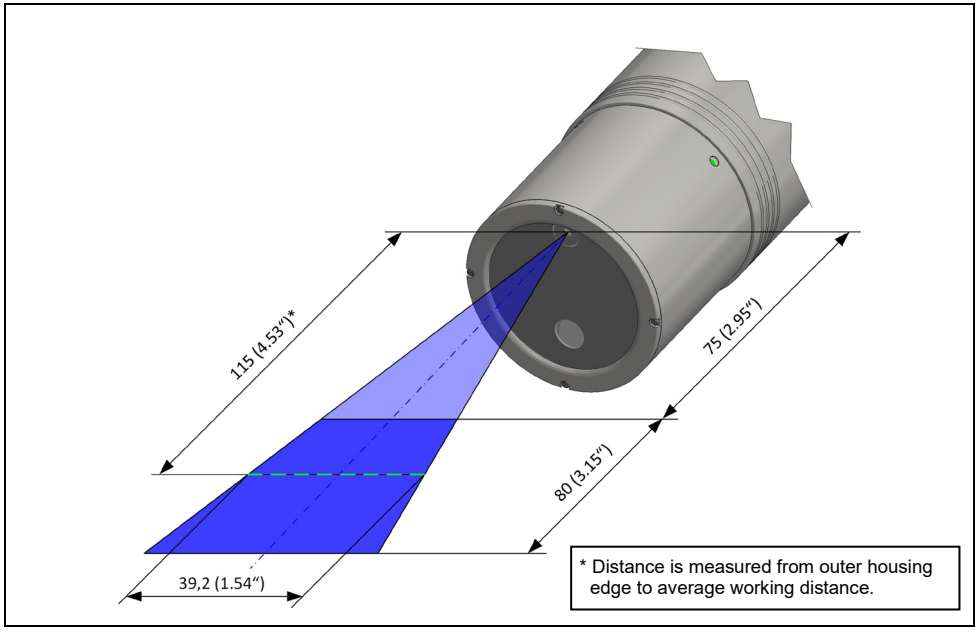


Fig. 5 Measuring Range

1.8.2 Sensitivity and gain factor (Laser Sensor Gain)

The gain factor set depends on the workpiece to be measured (material, surface condition). This setting increases the sensitivity of the laser scanner during data acquisition. Depending on the measuring result, it may be useful to adjust the gain factor in the measuring software.

INFORMATION
The gain factor setting significantly affects the quality of the recorded measuring data. If data quality is poor, adjusting the gain factor can improve data quality. The following gain factor settings are recommendations and can be adapted to individual ambient/material conditions.

Gain factor	White	Grey/Bright steel	Carbon
5	-	-	X
4	-	X	X
3	X	X	-
2	X	X	-
1	X	-	-

INFORMATION
If the acquisition of measuring data is difficult when scanning dark, shiny or transparent surfaces, the gain factor should be set to one of the settings **"4"** or **"5"**. However, this setting, and the resulting higher sensitivity of the laser scanner, increases the probability of recording low quality data. In order to automatically filter out this data from the measurement, the quality filter can also be activated.

1.8.3 Quality filter

The quality filter is used to filter out low quality measuring points from the measurement.
The following quality filters are used here:

- Error data filter for 3D data
- Angle filter
- Outlier filter
- Edge filter

INFORMATION
If the acquisition of measuring data is still difficult when scanning dark, shiny or transparent surfaces, despite setting the gain factor to **"4"** or **"5"**, the quality filter should be deactivated. However, this setting reduces both the measuring accuracy of the system and the data quality.

1.9 Transmission and Reception Area

INFORMATION
The transmission/reception ranges shown below only apply under optimum operating conditions. For a secure signal transmission, laser scanner and receiver must be located in the transmission area of the other device. The range for a secure signal transmission is up to 15 m.

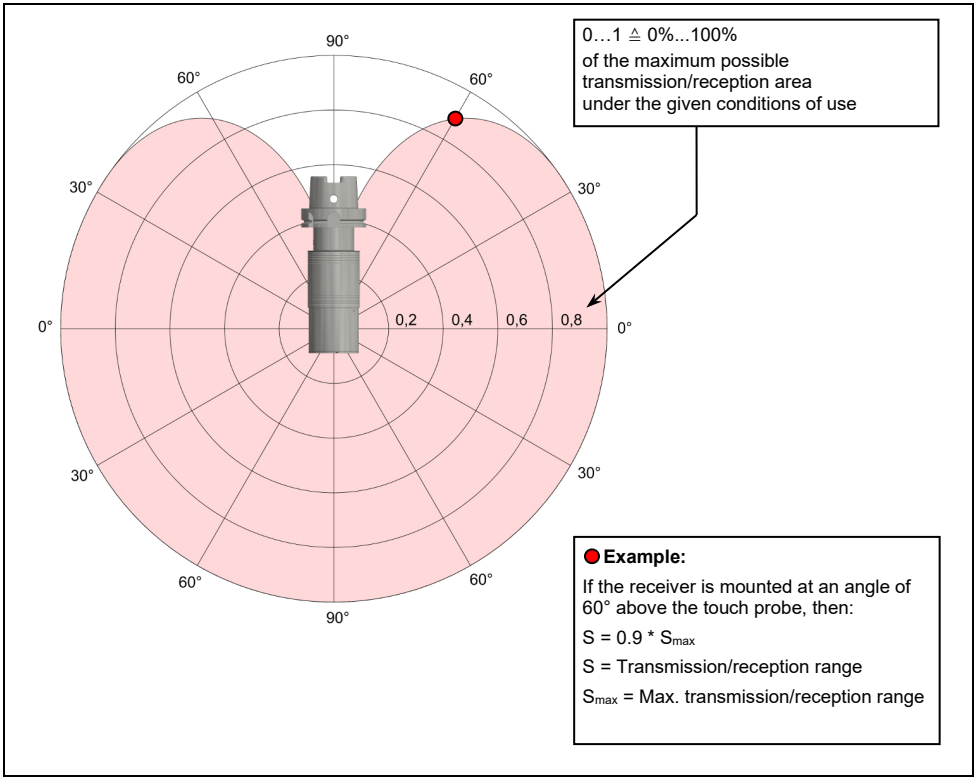


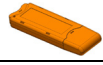
Fig. 6 Transmission and reception area (emission/reception behaviour of antenna)

1.10 Delivery Contents, Accessories and Spares

1.10.1 Delivery Contents

Order Number	Description
LS-R-4.8-SENSOR#	**Laser scanner LS-R-4.8**
	4x batteries, type IMR26650 (6401)
	USB stick with operating Instructions (LS-USB-KEY-OI)
	Transport case (LS-R-4.8-CASE)

1.10.2 Accessories, General

Order Number	Description	Illustration
03939542	M8 calibration sphere V2 - Standard	
QUAL-SPHERE-HOLDER	Calibration sphere holder	
6402	Battery charger	
6409	Programming clip	
6259	IR-RAW stick	
LS-R-TB	Tool box, consisting of: 4x batteries, type IMR26650 (6401) 4x cleaning cloths (4297) 1x battery charger (6402) 1x programming clip (6409) 1x IR-RAW stick (6259) 1x Cylindrical pin 1.5x16 (6412) 1x USB 2.0 Extension 1.8 m 1x Storage box (6410) 1x USB Charger with quick charge 3.0 (H00028517)	

1.10.3 Shanks

In conjunction with laser scanner LS-R-4.8, only shanks for a shaft diameter of 28 mm can be used. It is recommended to use a shank with indexing. An overview of available shanks for the laser scanner can be found in the accessories catalogue.

INFORMATION
If a shank is used without indexing, a calibration must first be performed to determine the exact alignment of the system in the spindle before using the laser scanner.

1.10.4 Spares

Order Number	Description	Illustration
0506	Clamping screw	

2 Operation

2.1 Tools, Measurement and Test Equipment

Order Number	Description	Illustration
3489	Hexagon key AF4 mm	
4297	Optics cleaning cloth	
LS-R-TB#	Tool box, consisting of: 4x batteries, type IMR26650 (6401) 4x cleaning cloths (4297) 1x battery charger (6402) 1x programming clip (6409) 1x IR-RAW stick (6259) 1x Cylindrical pin 1.5x16 (6412) 1x USB 2.0 Extension 1.8 m 1x Storage box (6410) 1x USB Charger with quick charge 3.0 (H00028517)	

2.2 Consumables for maintenance

In addition to the supplied tools, measuring and test equipment, the following auxiliary equipment and consumables can be used for cleaning. These are not part of the delivery contents and must be purchased separately if necessary.

Activity		Auxiliary equipment/Consumables
Dry cleaning	Optical windows	Clean, soft, lint-free micro-fibre cloth
	Calibration sphere	Clean, lint-free gloves
		Clean, soft, lint-free micro-fibre cloth
Wet cleaning	Optical windows	Clean, soft, lint-free micro-fibre cloth
		Camera lens cleaner or isopropyl alcohol

2.3 Commissioning and Setup of the Scanner

2.3.1 Mounting/dismounting the shank

1. Dismounting the shank:
   1.1 Remove clamping screws from the shank.
   1.2 Remove shank.
2. Mounting the shank:
   2.1 Slide the shank onto the laser scanner.
   2.2 Insert the clamping screws and tighten to the torque specified in Fig. 7.
3. Calibrate the laser scanner.

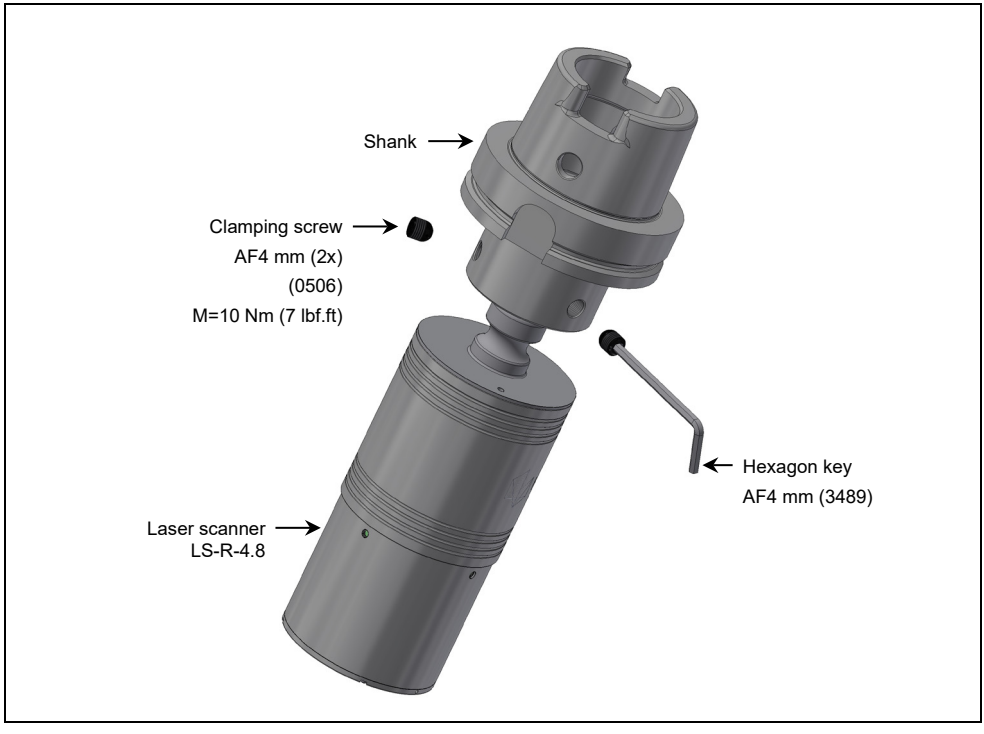


Fig. 7 Mounting/dismounting the shank

2.3.2 Inserting/Replacing the Battery

NOTICE

Risk of damage to the equipment!

- Clean and dry the laser scanner well before opening!
- Do NOT use compressed air to clean the laser scanner!
- Replace/recharge empty batteries immediately!

1. Carefully slide the battery compartment sleeve down (1./Fig. 8).

NOTICE

Risk of damage to the equipment!

The laser scanner LS-R-4.8 is protected against wrong polarity (short circuit protection). It is nevertheless necessary to pay attention to the polarity when inserting a new battery, because the device will not work with wrong polarity! The correct polarity is shown on the battery compartment by the corresponding symbols (+/-).

2. Take the used battery out of the battery compartment and insert a new battery (2./Fig. 8).

NOTICE

Risk of damage to the equipment!

- When closing the battery compartment, ensure that both O-rings are properly seated!

3. Carefully slide the battery compartment sleeve upwards as far as it will go (3./Fig. 8).

INFORMATION

After replacing the battery, the time for starting the laser scanner (reboot) is approx. 5 s!

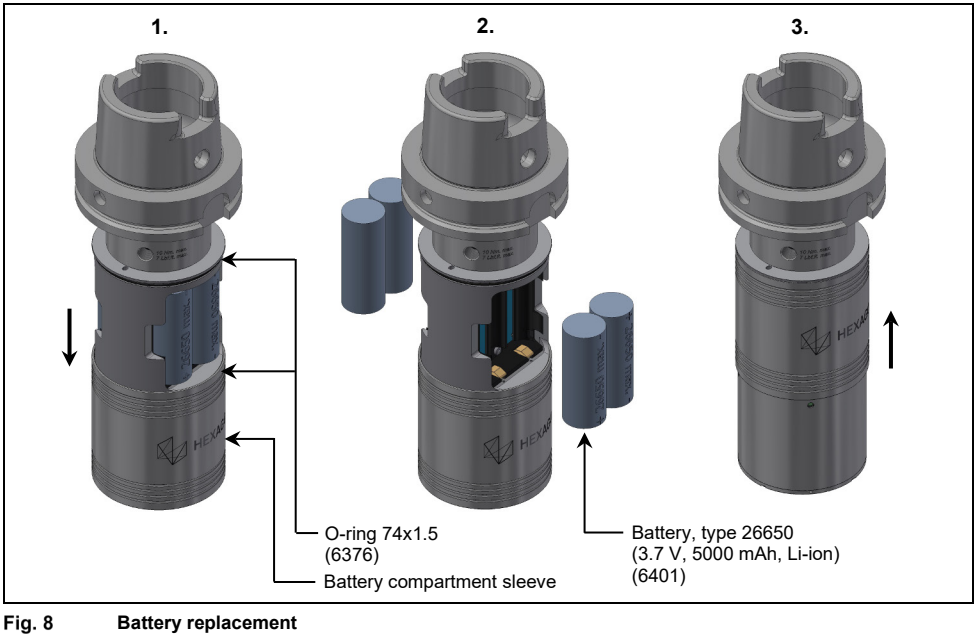


Fig. 8 Battery replacement

2.3.3 Pairing the scanner with a receiver

INFORMATION
In order to pair the laser scanner with a radio-wave receiver type RC-R-100, **the radio-wave receiver must be in pairing mode** (see operating instructions RC-R-100). The required pairing information is entered in the associated PC software and then transmitted with the programming clip to the infrared interface of the LS-R-4.8 laser scanner. Afterwards, the pairing process is started.

1. Remove the cover cap from the IR stick which is inserted in the programming clip.
2. Connect the USB port of the IR stick to the PC using the associated USB cable.
3. Start the pairing program.

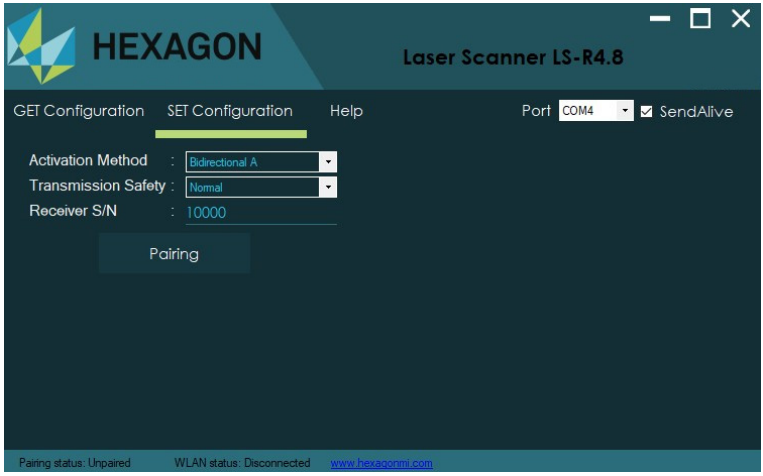


Fig. 9 Pairing software

4. In the **"SET Configuration"** area, enter the pairing information (activation code, transmission security and serial number of the radio-wave receiver to be paired).
5. Slide the battery compartment sleeve downwards.
6. Insert batteries as described in chapter 2.3.2.

INFORMATION
After inserting the final battery, the laser scanner will be in pairing mode for approx. 5 s. During this time, the programming clip must be mounted and pairing must be started in the pairing software. The necessary preparations and settings in the pairing software must therefore be carried out before inserting the batteries.

7. Mount the programming clip on the laser scanner so that the infrared interface on the programming clip is aligned with the infrared interface inside the battery compartment of the LS-R-4.8 laser scanner.
8. Push the battery compartment sleeve up until it closes on the programming clip.

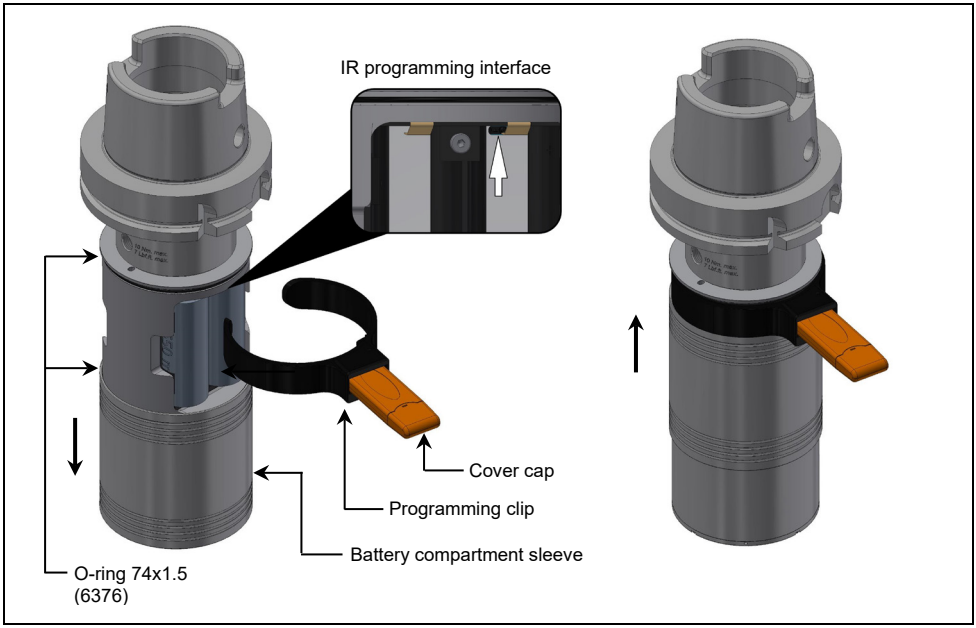


Fig. 10 Mounting the programming clip

9. Use the **[Pairing]** button in the pairing software to start pairing (more details on how to use the pairing software can be found in the software user manual).

INFORMATION
After successful pairing, the WLAN connection is set up to transfer the scan data. This process is automatic and requires no further action by the user.

10. After successful pairing, disconnect the USB cable from the IR stick.
11. Attach the cover cap on the IR stick.
12. Slide the battery compartment sleeve downwards and remove the programming clip from the laser scanner.
13. Carefully slide the battery compartment sleeve upwards as far as it will go.

NOTICE
Risk of damage to the equipment! • When closing the battery compartment, ensure that both O-rings are properly seated!

2.3.4 Warming up the laser scanner

INFORMATION
The system accuracy is considered stable after 60 minutes of use (“warm-up” time). The scanner maximum location error is 30 µm after stabilization. The scanner actual location error is written in the "Inspection Report" delivered with the Scanner. For reference, the subsequent table shows sample data of the difference in accuracy between the actual used time and the stabilized accuracy, at an environment temperature of 23°C. The system (machine with laser scanner) actual accuracy is evaluated on the machine during installation.

Time [min]	Offset Error [mm]	Depth Error [mm]
0	0,024	0,004
1	0,012	0,010
3	0,011	0,010
5	0,009	0,005
15	0,006	0,001
30	0,004	0,003
60	0,000	0,000

2.4 Aligning the scanner for measuring

NOTICE

Risk of incorrect measuring data!

The sensor's insensitivity to extraneous light is 5000 lx. This permits measuring under diffused, artificial light. If the sensor is pointed directly at an artificial light source during operation or exposed to direct sunlight, the direct incidence of light can lead to the recording of incorrect measuring data.

- Do not point the sensor directly at light sources during operation.
- Dim or shade the direct light source if the sensor needs to be aligned directly with the light source.

2.4.1 Marking of the transmission window on the scanner housing

For correct alignment of the laser scanner for measuring, the scanner housing is marked on one side with an arrow directly below the laser warning symbol (see Fig. 11). The laser transmission aperture (transmission window) is located on this side.

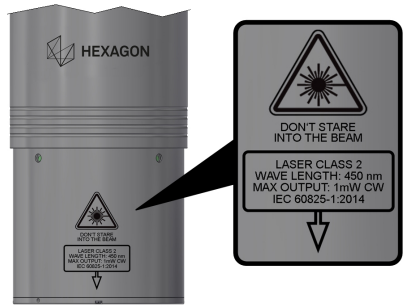


Fig. 11 Marking of the laser transmission window

2.4.2 Measuring edges and special characteristics

INFORMATION
For the exact measuring of edges and special characteristics, the sensor must be aligned across the areas to be measured. If the sensor is aligned parallel to such workpiece geometries, there is a risk of inaccurate measurements.

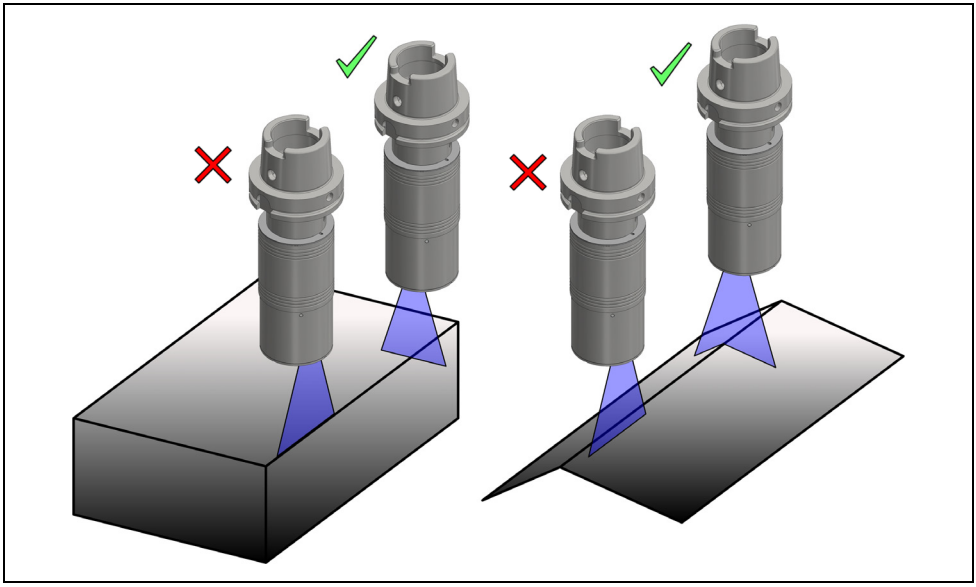


Fig. 12 Measuring edges and special characteristics

2.4.3 Interrupting the beam path

INFORMATION
Depending on the profile of the object to be measured, the beam may be blocked and the beam path may be interrupted, for example, due to object edges (see Fig. 13). • For optimal measuring results, always align the sensor with the profile to avoid interruptions to the beam path as far as possible.

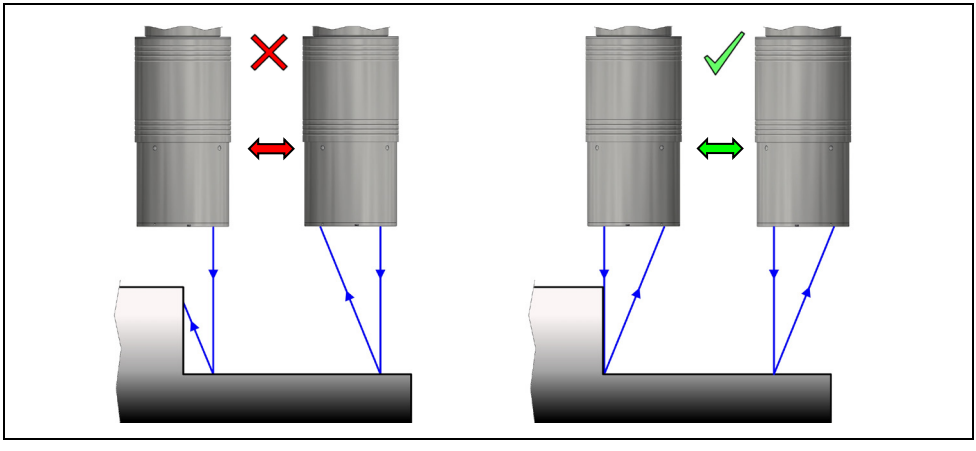


Fig. 13 Interrupting the beam reflection

2.4.4 Direct reflections

INFORMATION
Depending on the profile and surface condition of the workpiece to be measured, especially in the case of shiny or polished surfaces, the laser beam can be reflected so that it directly hits the transmission window of the laser scanner. This may overload the laser scanner occasionally. • To avoid direct reflections, align the sensor according to Fig. 14 .

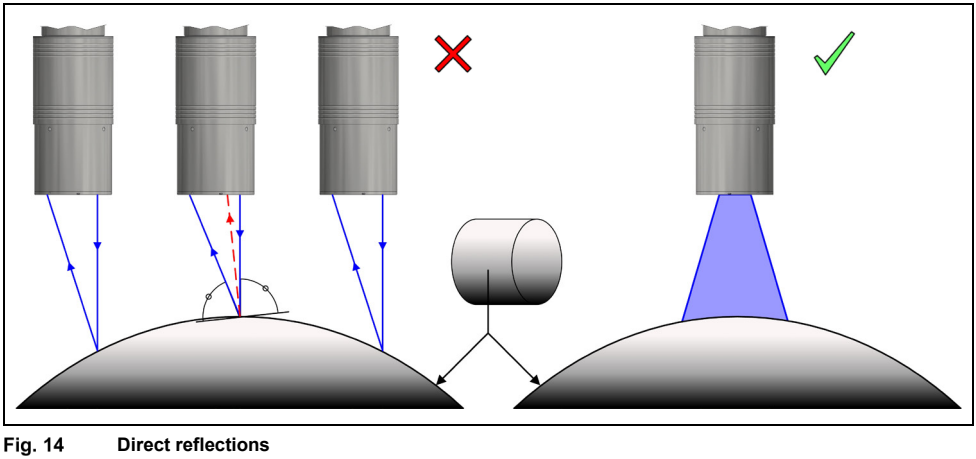


Fig. 14 Direct reflections

2.4.5 Secondary reflections

INFORMATION
Depending on the profile and surface condition of the workpiece to be measured, especially in the case of shiny or convex surfaces, secondary reflections can occur. This may mean that the measuring results are falsified. • To avoid secondary reflections, align the sensor according to Fig. 15 .

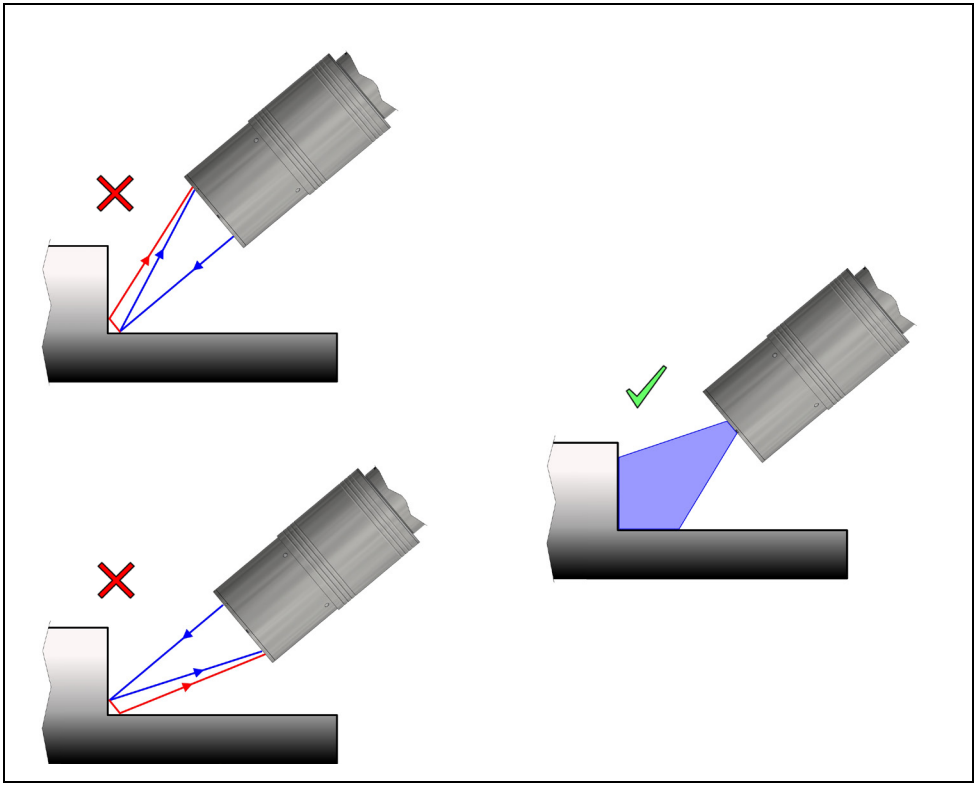


Fig. 15 Secondary reflections

2.5 Optical Status Display

The table below gives an overview of the blinking patterns of the LEDs (Fig. 16) and their meaning.

LEDs permanently blue (approx. 5 s)	Laser scanner starts after inserting batteries
LEDs blinking green	Laser scanner is transmitting signals
LEDs blinking green/red	LOW BATTERY
LEDs blinking orange	Trigger (synchronisation signal)
LEDs permanently red	Error

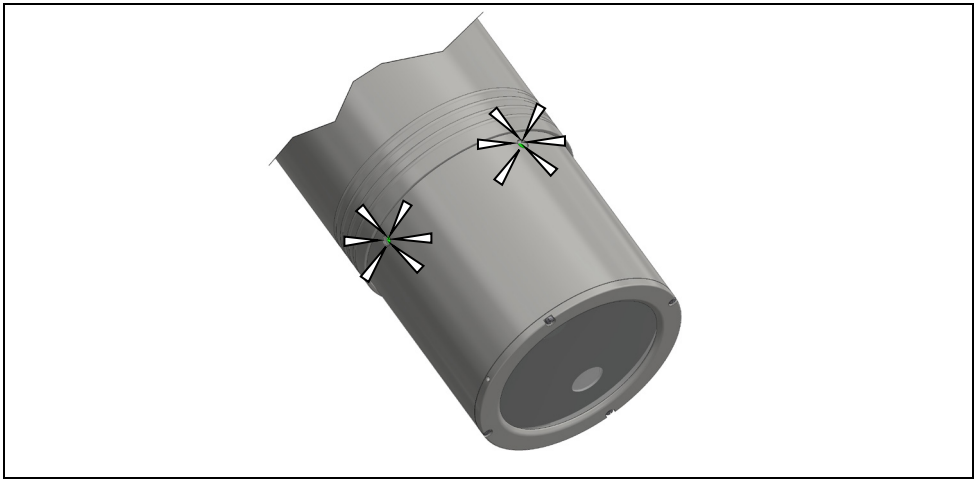


Fig. 16 Optical Status Display

2.6 Troubleshooting

INFORMATION
In addition to the information in this chapter, further troubleshooting options and frequently asked questions about the operation of the laser scanner can be found at www.HxGN.biz/FAQ-Laserscanning.

2.6.1 Problems with data quality

Error	Possible cause	Solution
Local noisy data in the point cloud.	Dust or dirt on the workpiece amplifies the laser signal.	Clean the workpiece.
	Local modification of the surface properties of the workpiece.	-
Noisy zone in the point cloud in a certain part of the laser beam.	Highly reflective surface of the workpiece causes direct reflection back to the sensor.	Change workpiece alignment.
	Finger prints or dirt on the sensor windows.	Clean the optical windows (see chapter 2.7.1).
The sensitivity has decreased or the recommended gain factor settings (see chapter 1.8.2) do not allow the laser scanner to record measuring data.	Finger prints or dirt on the optical windows of the laser scanner.	Clean the optical windows (see chapter 2.7.1).
	The laser scanner is faulty.	Contact the service department at m&h Inprocess Messtechnik GmbH.

2.6.2 Error during operation

Error	Possible cause	Solution
Laser beam is emitted, but data cannot be recorded.	The workpiece is outside the measuring range.	Adjust the measuring distance and depth and check with a bright workpiece.
	The surface cannot be measured.	Increase the sensitivity of the laser scanner by setting the gain factor correctly (see chapter 1.8.2).
	The laser scanner is faulty.	Contact the service department at m&h Inprocess Messtechnik GmbH.
	Scanning speed is too high.	Switch off the quality filter in NC Measure (see chapter 1.8.3).

2.7 Maintenance and Cleaning

2.7.1 Cleaning the optical windows of the laser scanner

NOTICE

Risk of measuring errors!

Damage to the optical windows affects the measuring accuracy of the laser scanner.

- Contact the service department at m&h Inprocess Messtechnik GmbH.

NOTICE

Risk of measuring errors!

Grease and dirt deposits on the optical windows reduces the measuring accuracy of the sensor.

- Do not touch the optical windows of the sensor with bare hands or contaminate it otherwise.
- Remove contamination from the optical windows before measuring.
- Do not use aggressive cleaning agents, as they may damage the optical windows.

1. Wipe the optical windows with a clean, soft, lint-free micro-fibre cloth or with the supplied optics cleaning cloth (4297).
2. If the contamination cannot be removed with the cloth, gently wipe the windows with a camera lens cleaner or isopropyl alcohol.
3. If the contamination cannot be removed even with a camera lens cleaner or isopropyl alcohol, contact the service department at m&h Inprocess Messtechnik GmbH.

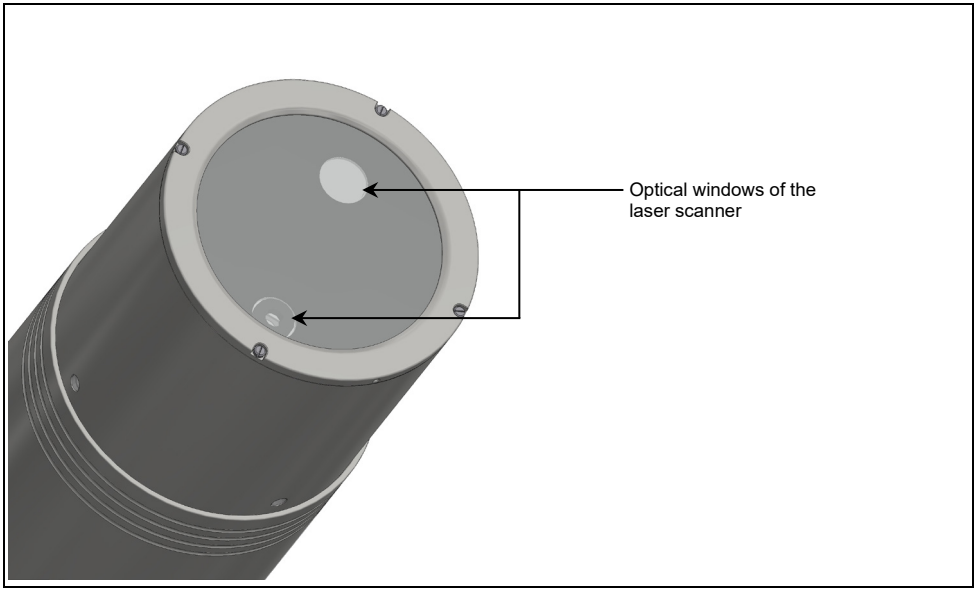


Fig. 17 Cleaning the optical windows of the laser scanner

2.7.2 Cleaning the calibration sphere

NOTICE

Risk of incorrect calibration data caused by contamination

Contamination on the calibration sphere may reduce the data quality.

- Do not touch the calibration sphere.
- If contamination is present, clean the calibration sphere before calibration.
- Do not use solvents or cleaners; they may damage the calibration sphere.

NOTICE

Possible damage to the calibration sphere when cleaning

The calibration sphere may be damaged if it comes into contact with other objects, e.g. when placed on a table. Vigorous rubbing when cleaning may damage the surface, which will affect the data quality.

- Avoid contact with other objects.
- Hold the calibration sphere only by the shaft when cleaning.
- Only rub gently when cleaning.

Removing minor contaminants

1. Hold the calibration sphere by the shaft with one hand.
2. Carefully wipe the calibration sphere using only light pressure with a clean, soft, lint-free micro-fibre cloth.

Fig. 18 Dry cleaning the calibration sphere with a micro-fibre cloth

Removing grease deposits

NOTICE
Possible damage to the calibration sphere when cleaning The use of solvents or cleaners is **not** recommended, as they may damage the calibration sphere. Light grease deposits can be removed with extreme care using a clean, soft, lint-free micro-fibre cloth and isopropyl alcohol. However, any such cleaning is performed entirely at own risk.

1. Moisten a micro-fibre cloth with isopropyl alcohol.
2. Hold the calibration sphere by the shaft with one hand.
3. Wipe the calibration sphere extremely carefully with the moistened cloth using only light pressure.
4. Carefully dry the calibration sphere using a dry micro fibre cloth.

Fig. 19 Wet cleaning the calibration sphere with isopropyl alcohol

2.7.3 Inspection

A manufacturer inspection is recommended once a year. For further information, contact the service department at m&h Inprocess Messtechnik GmbH.

EU Declaration of Conformity

This declaration of conformity is issued under the sole responsibility of m&h Inprocess Messtechnik GmbH.

Manufacturer/ Representative:	**m&h Inprocess Messtechnik GmbH** Am Langholz 11 88289 Waldburg Germany
Product name:	**Radio-wave Laser Scanner**
Model / Type:	**LS-R-4.8**

The product mentioned above meets the requirements of the following relevant directives / standards:

Directive / Standard	Issue	Title / Section
2011/65/EU	2011	Restriction of the use of certain hazardous substances in electrical and electronic equipment
2014/53/EU	2014	Making radio equipment available on the market
2014/30/EU	2014	Electromagnetic compatibility
2006/25/EG	2006	Minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation)
EN 61326-1	2013	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1
EN 61326-2-2	2013	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-2
EN 55011	2016	Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement
ETSI EN 300328	2019	Wideband transmission systems - Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques
ETSI EN 301489-1	2020	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services - Part 1
ETSI EN 301489-3	2019	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services - Part 3
ETSI EN 301489-17	2017	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services - Part 17
EN ISO 12100	2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60825-1	2014	Safety of laser products - Part 1: Equipment classification and requirements
EN 62368-1	2014	Audio/video, information and communication technology equipment - Part 1: Safety requirements

CE

Waldburg, 28.05.2021

Place, Date

Wolfgang Madlener, General Manager