

OPTIMESS®

Laser Distance Sensor Type M Analog-Output



Operating Manual

Version 2.3, May 2009

Contents

1. Safety

- 1.1 Laser safety
- 1.2 Electrical safety
- 1.3 Intended environment
- 1.4 Intended use

2. Delivery

- 2.1 Scope of delivery
- 2.2 Storage

3. Principle of Operation

4. Assembly and Connection

- 4.1 Attaching the sensor
- 4.2 Connecting the sensor
- 4.3 Status output INVALID
- 4.4 LASER ON / OFF function
- 4.5 Display of the sensor operating conditions (LED)

5. Starting Operation

6. General Information

- 6.1 Errors due to colour differences
- 6.2 Errors due to temperature differences
- 6.3 Errors due to tilting
- 6.4 Errors due to shadowing of the measuring spot

7. Technical Data

8. Warranty

1. Safety

1.1 Laser safety

The sensors of the OPTIMESS M series operate with semiconductor lasers in the visible or near infrared range and belong to the laser classes 2, 3R or 3B.

Never look directly into the laser beam.

When operating the sensors, observe the respective national regulations on radiation safety concerning laser equipment.

Laser operation must be signalled by an optical or acoustic warning.

The sensors must only be opened by authorized personnel!

For repairs, send the sensors to the manufacturer or a competent service centre only.

1.2 Electrical safety

The sensors of the OPTIMESS M series meet the requirements of EU directive 89/336/EEC “Electromagnetic compatibility” and the harmonizing European norms listed there.

If installed and operated correctly, the sensors comply with the norms

EN 50 081-1 (interference emission)
EN 50 082-2 (interference resistance)

1.3 Intended environment

Operating temperature:	-20°C ... +50°C
Storage temperature:	-30°C ... +70°C
Air humidity:	5 ... 95% not condensing
Air pressure:	Atmospheric pressure
Type of protection:	IP 65

1.4 Intended use

The sensors of the OPTIMESS M series are designed for use in the industrial sector and on vehicles.

Their range of application comprises:

- Distance measurement
- Thickness measurement
- Profile measurement
- Dimensional control

The sensor must only be operated under the conditions specified in the technical data (Chapter 7).

Ensure that nobody is endangered and that machines are not damaged in the event of sensor malfunction or failure. If necessary, take additional safety and damage prevention measures.

2. Delivery

2.1 Scope of delivery

- 1 Sensor OPTIMESS M
- 1 Operating manual
- 1 Calibration protocol

The sensor cable must be ordered separately.

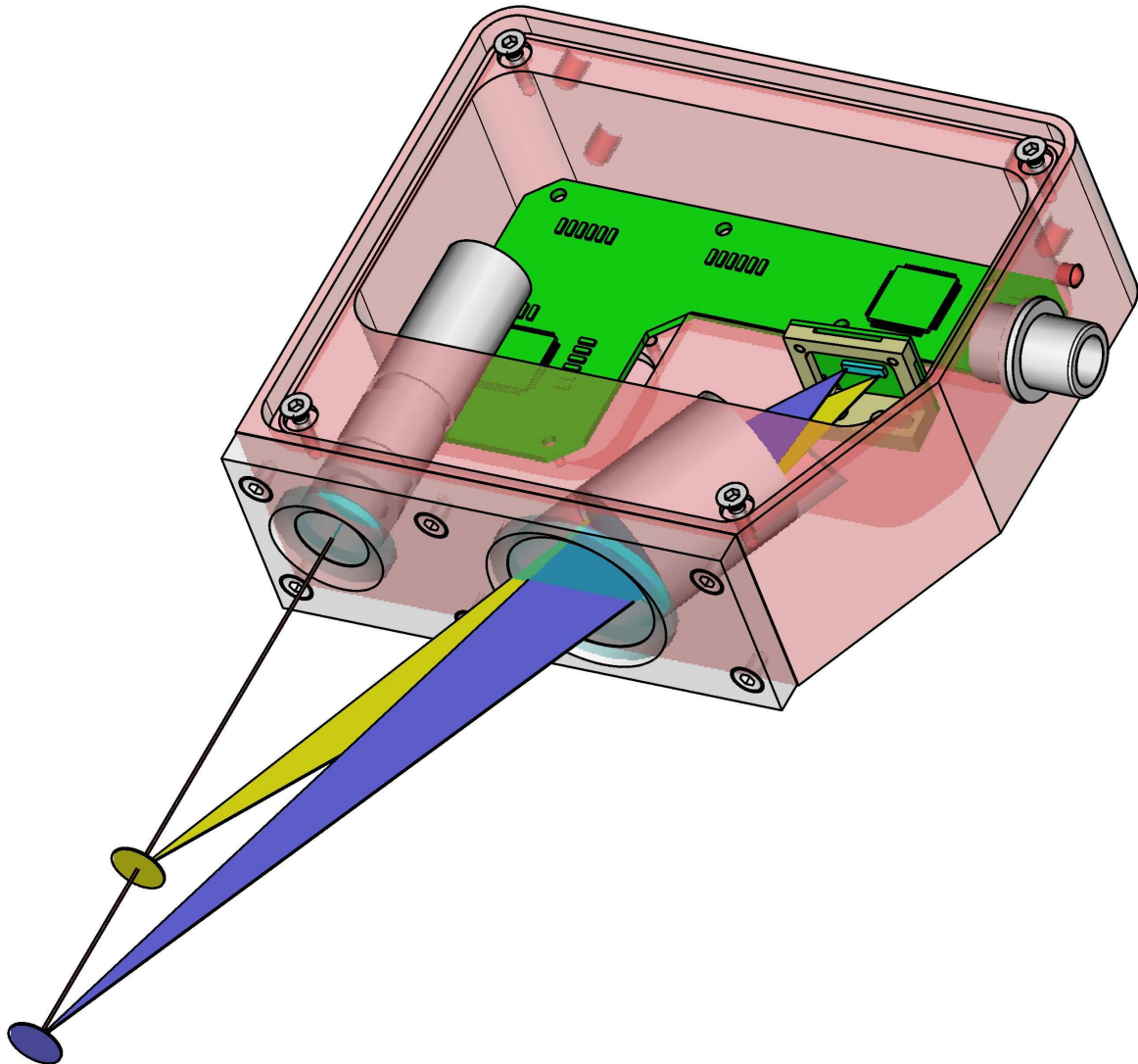
2.2 Storage

Storage temperature: – 30 to + 70° C

Air humidity: max. 95% (not condensing)

3. Principle of Operation

The sensors of the OPTIMESS M series operate according to the principle of triangulation. The laser spot which is emitted by a laser diode of the optical system is projected under an angle onto a CMOS linear image sensor by the receiving optics. The integrated electronics in the sensor process the optical distance data and display it in the form of an analog value. The standard output voltage is negative when the distance to the object is greatest.



The laser intensity is regulated and thus compensates reflection differences over a large area of the measured surface. The ambient light is largely cancelled out due to the specific evaluation process undergone by the modulated laser light.

If the measuring process is obstructed (too little reflected light, interrupted light path or defective sensor), the switching output INVALID will be activated. The measuring value is kept at the level of the last valid value.

An LED at the connector socket signals that the sensor is operating (see 4.5).

4. Assembly and Connection

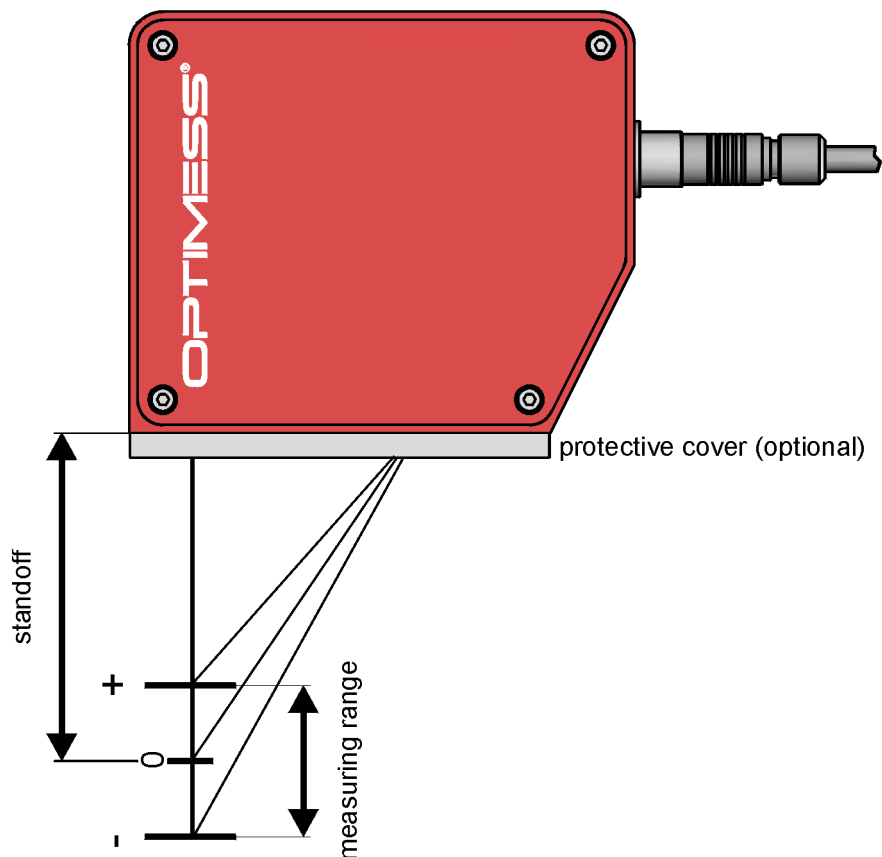
4.1 Attaching the sensor

The sensor is attached with 4 screws of thread size M5.

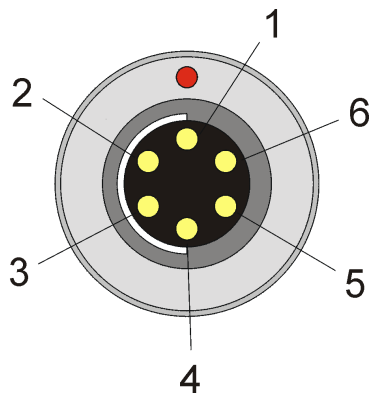
When using the sensor in systems or machines with potential differences, we recommend attaching the sensor as a self-contained unit or using a power supply with galvanic isolation from the supply and signal cables.

Ensure that the distance to the object is correct (see Chapter 7 Technical Data). The standoff is always defined as from the housing's front edge without protective cover.

In order to avoid measuring uncertainties, direct the laser beam as horizontally to the object as possible.



4.2 Connecting the sensor



View on socket

Connector	Cable	Function Analog
Pin 1	red	12...30V
Pin 2	blue	N.C.
Pin 3	yellow	GND
Pin 4	green	INVALID
Pin 5	transparent	OUTPUT
Pin 6	black	LASER ON / OFF
Screen	blank wire	Screen

The OPTIMESS M sensor is equipped with a 6-pin socket of the type Fischer DBEE103 A056. See table for the socket assignment.

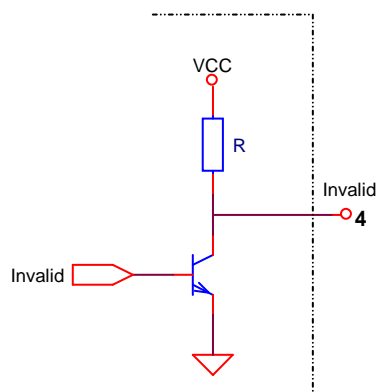
For voltage supply, use a low-noise voltage source.
Supply voltage: 12 ... 30V 150mA max.

The cable is shielded, and the shield is connected with the socket housing.
Connecting the shield with the PE conductor must be done by the operator.

In order to minimize interference voltage at the analog output, we recommend closing off the cable end of the signal output or the signal processing input with a capacitor of 10...47 nF against signal GND.

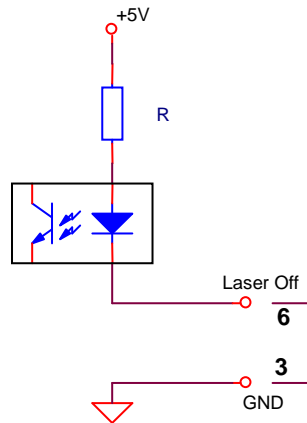
4.3 Status output INVALID (only analog output type)

The status output INVALID is activated when invalid measurements. The NPN - Transistor switches the exit against GND. This means that light is reflected either too weak or the measuring spot is covered by an object. Also a damage of the laser is indicated thereby.



4.4 LASER ON / OFF function

The laser can be switched off by connecting the laser control input (pin 6) with GND (pin 3). The sensor will be operative 20 ms after the laser is switched on again.



4.5 Display of the sensor operating conditions (LED)

Following operating conditions are indicated by the LED close to the connector:

LED red:	INVALID = not enough reflected light
LED yellow:	OVERRANGE = Target out of measuring range
LED green:	Measuring signal O.K.

5. Starting Operation

After having checked the sensor for proper assembly and connection, switch on the power supply. The LED above the socket must light up.

Achieving thermal sensor stability requires a warm-up time of approx. 2 min. After the warm-up time the sensor will be ready for operation immediately upon switching the laser on with the LASER ON/OFF function.

If your object reflects well (bright surface) and is within the measuring range, there will be a stable voltage at the signal output which correlates with the distance. The INVALID signal must be inactive and the green LED must light up.

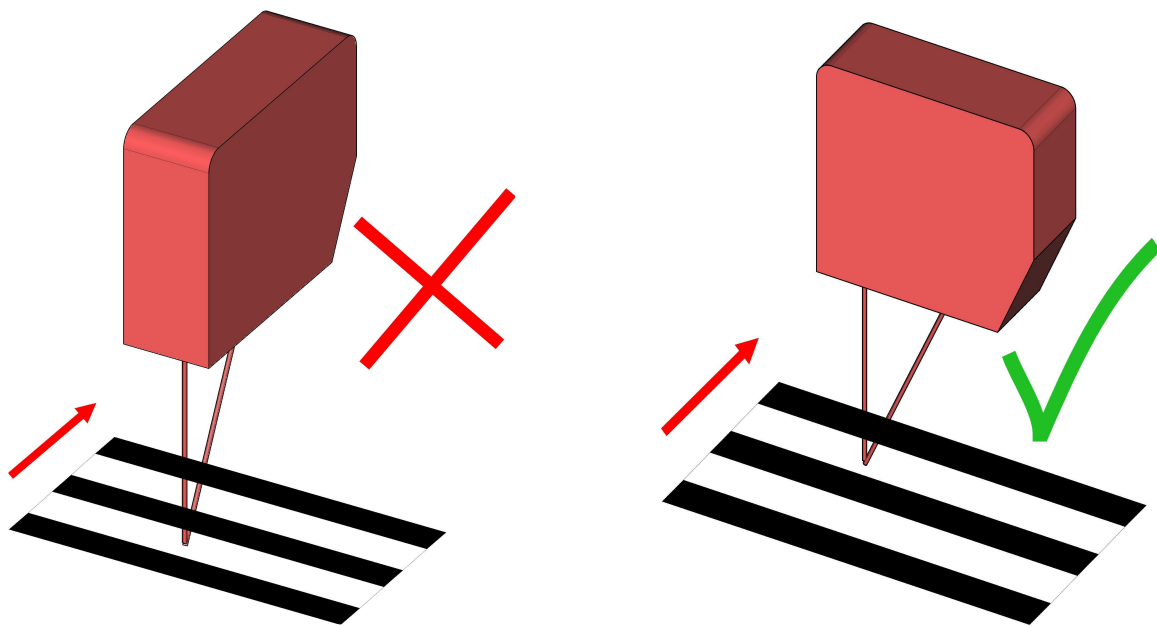
If the measuring beam is interrupted or the laser is switched off via the pin 6 control lead, the signal output will save the last measuring value, and the INVALID signal will become active (GND Level).

6. General Information

6.1 Errors due to colour differences

Colour differences on the measured objects hardly affect the measuring result because of the laser's intensity regulation. A change in the penetration depth of the laser beam, e.g. with only slightly pigmented plastics, may cause measuring errors.

In the case of colour gradients the sensor should be aligned in such a way that the transmitter – receiver line is as parallel as possible to the colour edge.



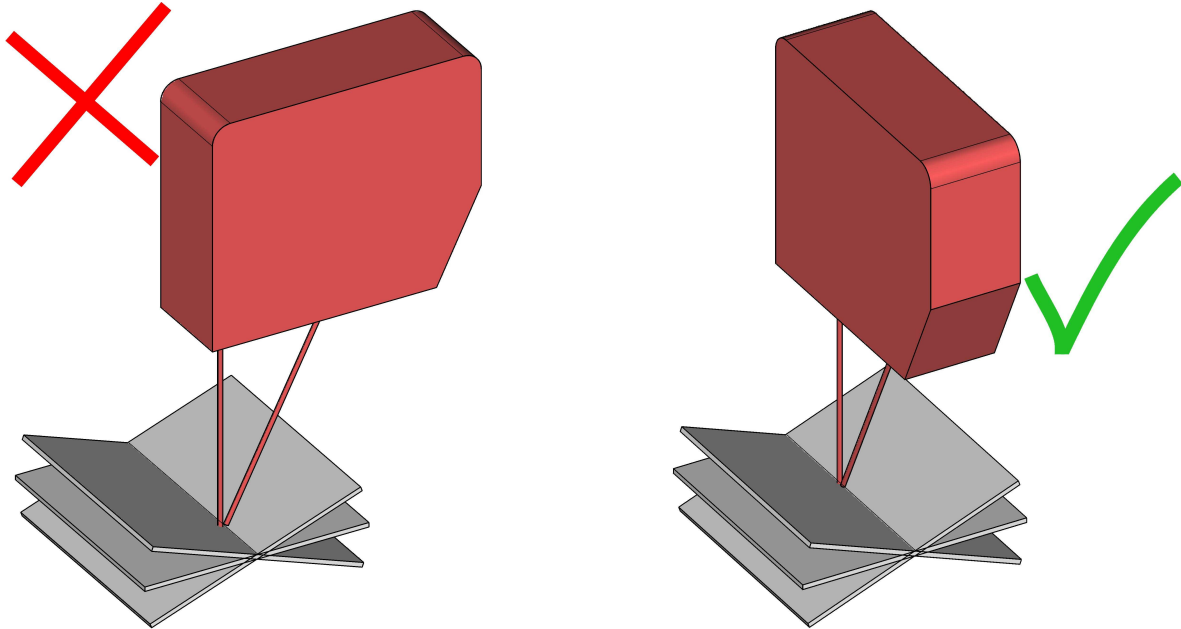
6.2 Errors due to temperature differences

You will need to allow for a warm-up time of approx. 10 min. prior to measuring for the sensor to achieve thermal stability. Note that within small measuring ranges, temperature fluctuations may also affect the sensor retaining unit.

After the warm-up time, the sensor will be ready for operation immediately upon switching the laser on with the LASER ON/OFF function (see 4.4).

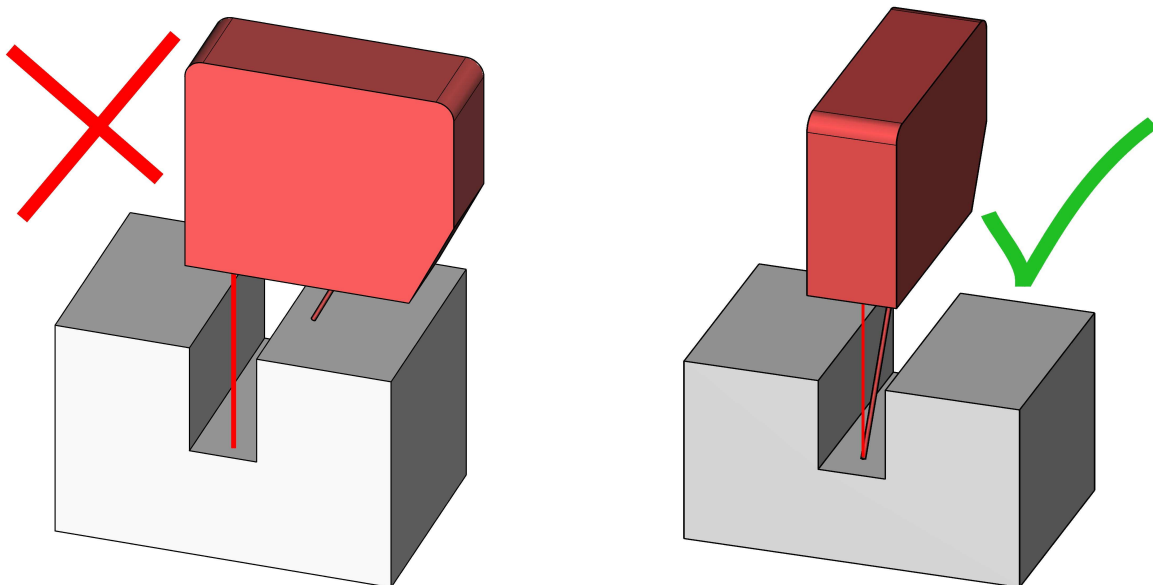
6.3 Errors due to tilts

Align the sensor in such a way that the largest tilts are at right angles to the sensor. The influence of tilts on the measuring result strongly depends on the degree of surface reflection.



6.4 Errors due to shadowing of the measuring spot

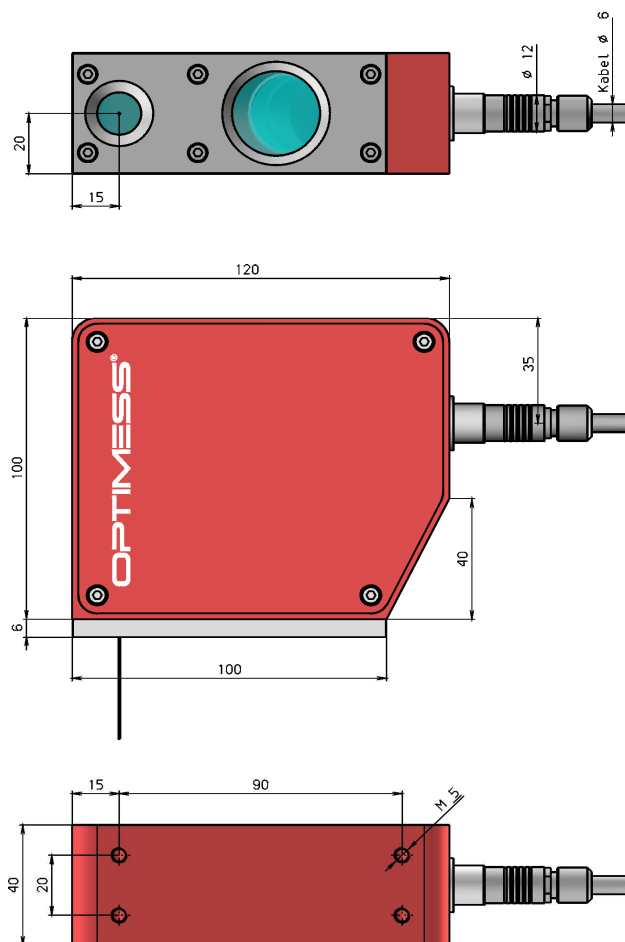
When measuring across grooves or edges, align the sensor in such a way that the measuring spot is not shadowed by the edge.



7. Technical Data

Type *	OMS 8008	OMS 8020	OMS 8040	OMS 8080	OMS 8120	OMS 8200
Measuring range [mm] *	8	20	40	80	120	200
Standoff [mm] *	50	100	150	200	300	400
Resolution [mm] *	0.002	0.005	0.01	0.02	0.03	0.05
Linearity *	$\leq \pm 0.06\%$ of measuring range					
Reproducibility	$\leq \pm 0.03\%$ of measuring range					
Limiting frequency *	20 kHz max.					
Filter type *	Digital averaging					
Measuring frequency *	20 kHz max.					
Light source	Laser diode					
Spot size [mm]	0.05	0.1	0.15	0.2	0.3	0.4
Wavelength *	650 - 790nm					
Laser class *	2 / 3R / 3B					
Photo detector	CMOS Linear image sensor					
Power supply	$\pm 15V / 120mA$, $\pm 5\%$ or $10 - 30V / 120mA$ (only unipolar output and CAN Bus)					
Output signal *	$\pm 5V / \pm 10V / 0...5V / 0...10V / 0...20mA / 4...20mA / CAN Bus$					
Temperature range	$-20^{\circ}C$ to $50^{\circ}C$ not condensing					
Dimensions	120 x 100 x 40mm					
Weight	820g					
Protection class	IP 65					

* Specifications may vary and are stated on the specification sheet provided with each sensor



8. Warranty

This sensor was subjected to constant in-process quality controls. Only top quality components were used.

However, should malfunctions still occur during operation, please immediately notify your competent service centre or ELAG Elektronik AG directly.

There is a one year's warranty on the sensor. Within this period of time it is repaired free of charge if sent to ELAG Elektronik AG or a competent service centre at the owner's expense.

Damage due to improper handling or forceful action and damage caused by repairs or modifications made by third parties are not covered by the warranty.

Only ELAG Elektronik AG is competent to carry out repairs.

No further claims can be made.

ELAG Elektronik AG is not liable for consequential damage.

ELAG Elektronik AG reserves the right to carry out constructional changes.



ELAG Elektronik AG | Stegackerstrasse 14 | CH-8409 Winterthur
Tel +41 52 235 15 50 | Fax +41 52 235 15 59 | info@elag.com | www.elag.com