



FIFE DSE-15

Operating Instructions



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1 INTRODUCTION

About these operating instructions

These Operating Instructions describe the installation, operation, commissioning, and maintenance of the DSE-15 sensor and provide important instructions for proper use.

The operating instructions must be carefully stored and must always be available at or near the customer's system during the service life of the sensor.

Translation of the original Operating Instructions:

These Operating Instructions are a translation. The original Operating Instructions were composed in German.

Target groups

These Operating Instructions are directed to both the *system construction master* as well as the *operator* who uses the sensor in production line.



Read operating instructions

The Operating Instructions must be read and used by *all persons* who have the responsibility of installing, commissioning, operating and maintaining the sensor.

Proper usage

The digital reflected light sensor DSE-15 is used for non-contact measurement of the lateral offset of a material web being guided in a customer system. The sensor is suitable for

- Web edge guiding and
- Web center guiding for dual application.

The sensor can be used to control opaque, transparent or reflective materials.

The sensor must only be used in accordance with its intended purpose and in a technically flawless conditions.

The sensor must not be changed or opened.

Improper usage

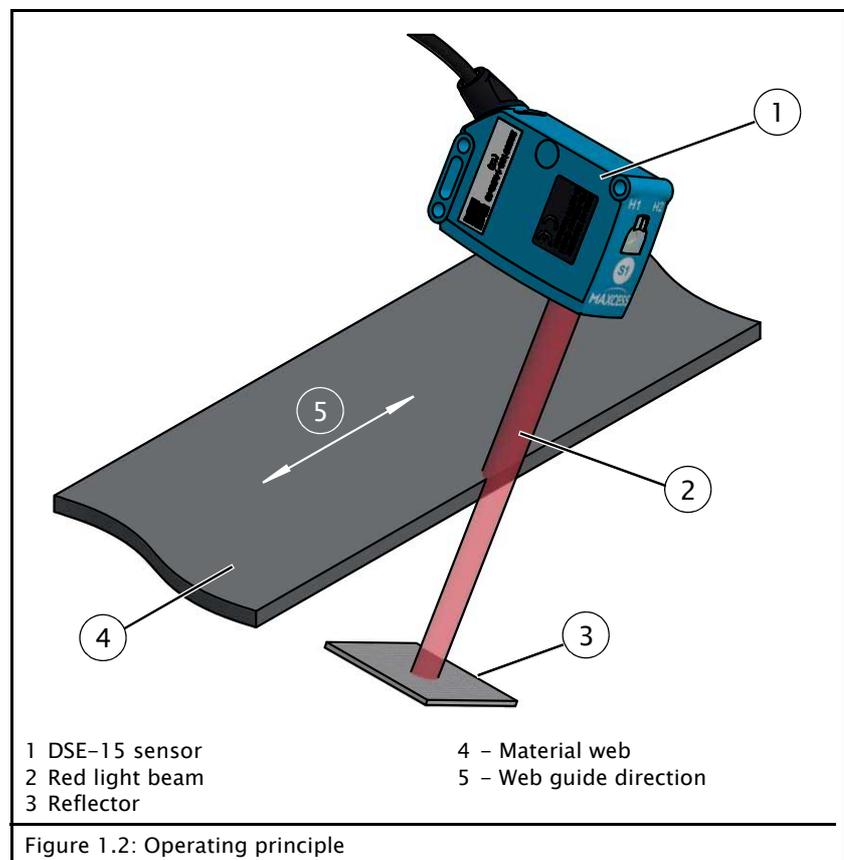
- Operation outside of the technical specifications is not permitted.
- Operation in areas where there is a danger of explosions is prohibited.
- The sensor may not be used as a support, handle or step.
- Any use other than the designated use is not permitted.

Operating principle



The DSE-15 sensor uses pulsing, visible red light for coaxially transmitted and received light beams. This makes the sensor insensitive to ambient light and reflections.

The light source generates a red light. Depending on the amount of the sensor field of view covered by the material web, a portion of the light strikes the reflector installed under the material web. Reflected light is received by the sensor and the ambient light is filtered out. Based on this the receiver generates the output signal from which the precise position of the web edge is determined.



It is possible to operate the sensor with either a supply voltage of 12V or 24V. The output signal would automatically be switched over in that case.

- Power supply voltage 12V:
The sensor provides an output signal in the range from 0 to 10mA. Thus the sensor can be connected to all Fife web guide controllers.
- Power supply voltage 24V:
The sensor provides an output signal in the range from 4 to 20mA. This can be used to establish a wire-break-proof connection to external devices.

An integrated LED display shows information about operation states directly on the sensor, for example whether supply voltage is applied, the cover of the red light beam and error messages.

Option

A digital production data acquisition to Fife D-MAXE controller extends the range of applications for the sensor inside the digital network environment. Additional sensor data can be provided to other hardware equipment if the Fife D-MAXE is linked appropriately to the network.

2 SAFETY INSTRUCTIONS

Important information

To ensure safe and problem-free operation of the DSE-15 sensor it must be

- properly shipped and stored,
- properly mounted and placed in operation,
- properly used and carefully maintained.

Proper operation and careful maintenance will ensure a long service life for the sensor.

Please note the following:

- The content of these operating instructions
- Any safety instructions that are printed on the unit
- The requirements of the machine manufacturer
- Applicable national, state and local requirements for accident prevention and environmental protection

Information about safety instructions

The safety instructions and symbols described in this section are used in these Operating instructions. They are used to avoid possible dangers for users and to prevent material damage.



SIGNAL WORD

Source of danger and its results.

⇒ Avoiding dangers

Signal words

The signal word **DANGER** indicates an immediate danger of serious injury or death.

The signal word **WARNING** indicates a possible danger which could lead to serious injury or death.

The signal word **CAUTION** refers to a possible danger which could lead to slight to moderate injury.

The signal word **ATTENTION** refers to a possible danger which could lead to material damage.

Symbols



Reference to general hazards that may result in bodily injuries



Refers to danger of injury caused by crushing



Refers to danger of injury caused by cutting



Refers to general hazards that will result in damage to the device or system



Qualified electrician
The electrical components may only be connected and disconnected by a qualified electrician!



Read operating instructions
Follow these operating instructions for proper and safe use.
Keep for future use.

Additional markings

- Bulleted list
- Instructions
 1. Instructions which must be processed in the specified order
 2. End of the instructions
- Reference or cross-reference



Note:
Reference to important information.

Personnel requirements

The tasks listed in these operating instructions may only be carried out by appropriately qualified personnel commissioned by the operator. The responsibilities of the personnel for the work on the system must be clearly defined by the operator.

Transport, assembly, maintenance, troubleshooting, disassembly:

- Specialized staff
 - Mechatronics engineer, industrial mechanic, etc.

Electrical connection or disconnection:

- Specialized staff
 - Only by a qualified electrician

Control during operation:

- Specialized staff
 - Machine and system operators, etc.
- Personnel or trainees trained and supervised by the system operator

Repair:

- Specialized staff
 - Service technician of Fife-Tidland GmbH

Qualified electrician



A qualified electrician is a person whose specialist training, knowledge and experience, as well as knowledge of the relevant standards, enable him to assess and perform the work assigned to him and to recognize and avoid possible hazards.

The electrician is specially trained for the field in which he or she works and is familiar with the relevant standards and regulations.

Preventing hazards

- No changes may be made to the sensor.
- The parameters specified in Section *Technical Data* must be observed.
- Only accessories and replacement parts that have been approved by Fife Tidland may be used.
- The sensor may not be used as a support, handle or step. There is a danger that the sensor will become damaged (breaking off/snapping), resulting in personal injury.

Residual risks

Installing the product in a machine/system makes it possible to form clamping, squeezing and cutting points.

Despite a safe design and supplementary protective measures, residual risks may remain for the machine/system in which the product is installed. These risks must be recorded in a risk assessment by the machine/system builder and taken into consideration in the operating instructions.

3 INSTALLATION

Transport and storage

- The sensor and/or the unit on which the sensor is mounted must be secured against slipping during transport
- The sensor must be stored in a cool, clean, and dry place.
→ *Ambient conditions, page 9-1*
- The sensor must not be stored in the vicinity of powerful magnetic fields. The electronic components of the sensor may be damaged.

Included with delivery

- Reflected light sensor DSE-15
The model designation and part number are on the nameplate on the housing.
- Mounting bracket and fastening material
- Reflector
- Operating instructions

Mounting

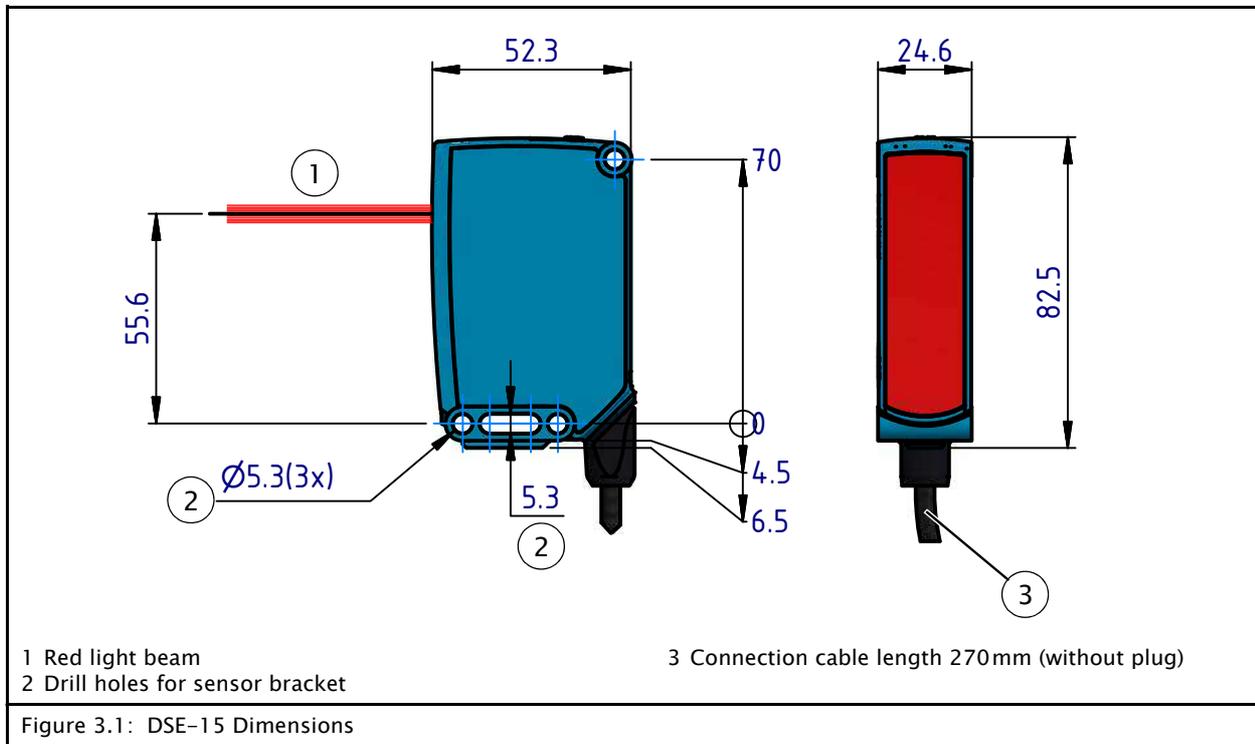


WARNING

- ⇒ If a sensor is damaged, it must not be installed or placed in operation.
 - ⇒ All assembly tasks on the sensor must only be performed when there is no electrical power in the system.
 - ⇒ Assembly tasks and mechanical settings must only be performed when the machine has been stopped and secured from being turned on again.
-

Mounting location

- Protection Class: IP65
- Operating temperature: 5°C ... 60°C
- Relative humidity: max. 90%, non-condensing
- Operating altitude above sea level: maximum 3000m
- Protected from vibrations
- Do not place close to strong magnetic fields:
The electronic components may be damaged.
- Do not place close to strong electrostatic fields:
The electronic components may be damaged.
- Not in places where there is a risk of explosions.

Dimensions**Mechanical fastening**

Drill holes are available on the housing for fastening the sensor in place. A large variety of assembly options are possible in connection with the various sensor mountings.

**Note:**

Faults such as tilting or a loosely attached sensor can lead to imprecise guiding of the material web.

Procedure

1. Assemble the mounting bracket on the sensor using the fastening material included with delivery

ATTENTION

⇒ Tighten the M5 fastening screws to a max. torque of 1,3Nm.

→ [figure 3.2](#)

2. Fasten the sensor onto the sensor bracket

→ Sensor bracket Type MO [figure 3.3](#)

→ Sensor bracket Type MB [figure 3.4](#)

→ Special sensor brackets available on request

3. Slide the mounted unit onto the square bar and fasten it with the star grip

4. Set up distance between reflector and sensor

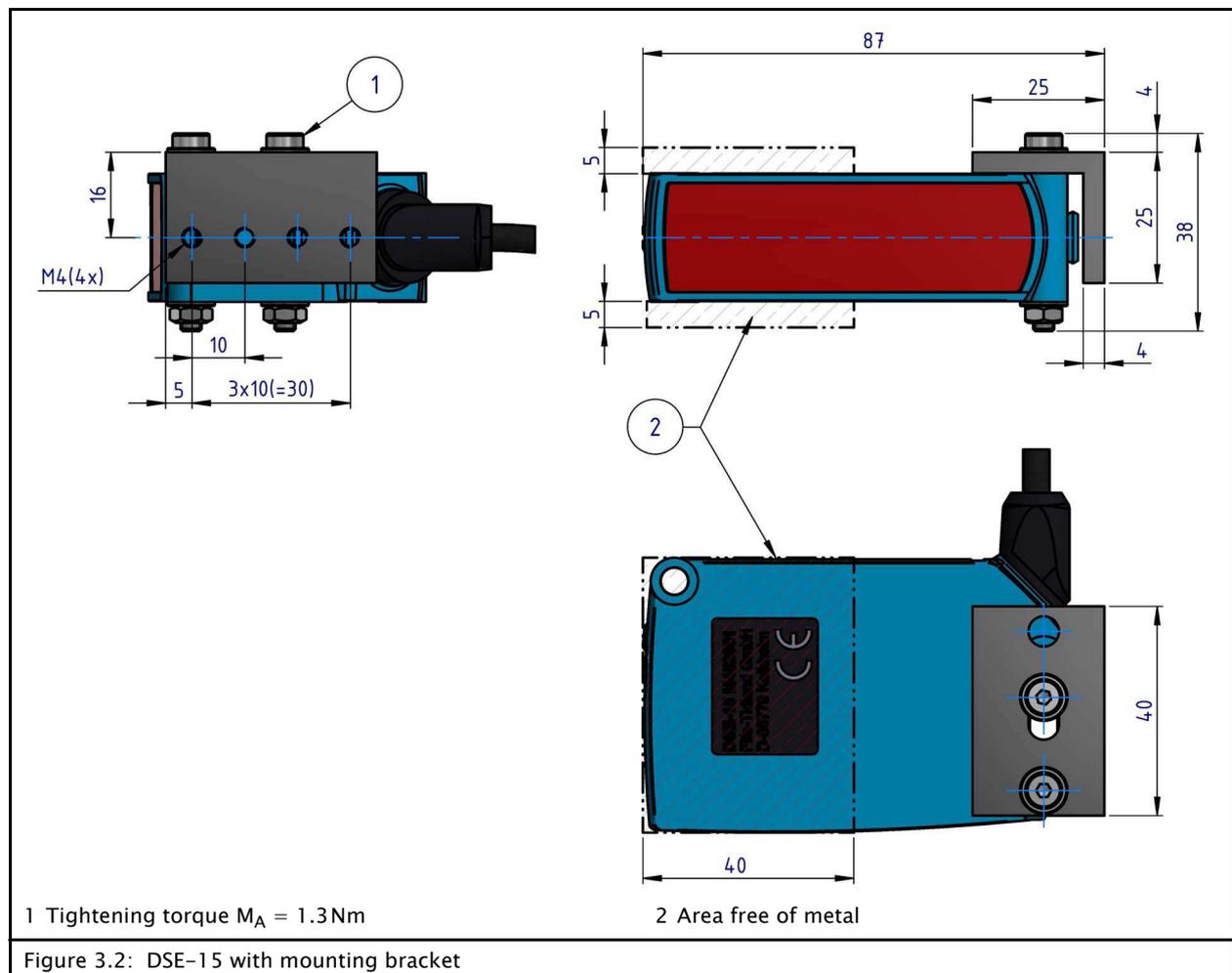
→ [page 3-5](#)

5. Set up arrangement of reflector and sensor

→ [page 3-6](#)

6. Electrical connection

→ [page 3-8](#)



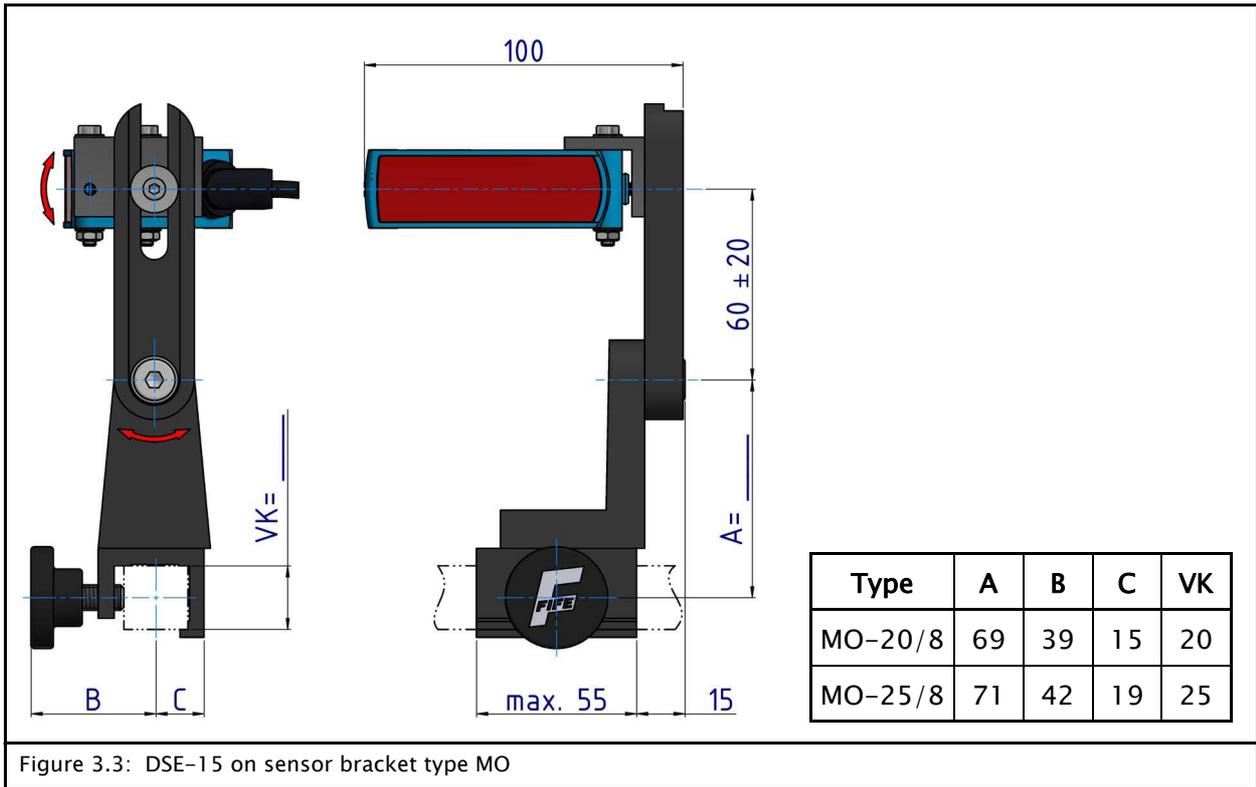


Figure 3.3: DSE-15 on sensor bracket type MO

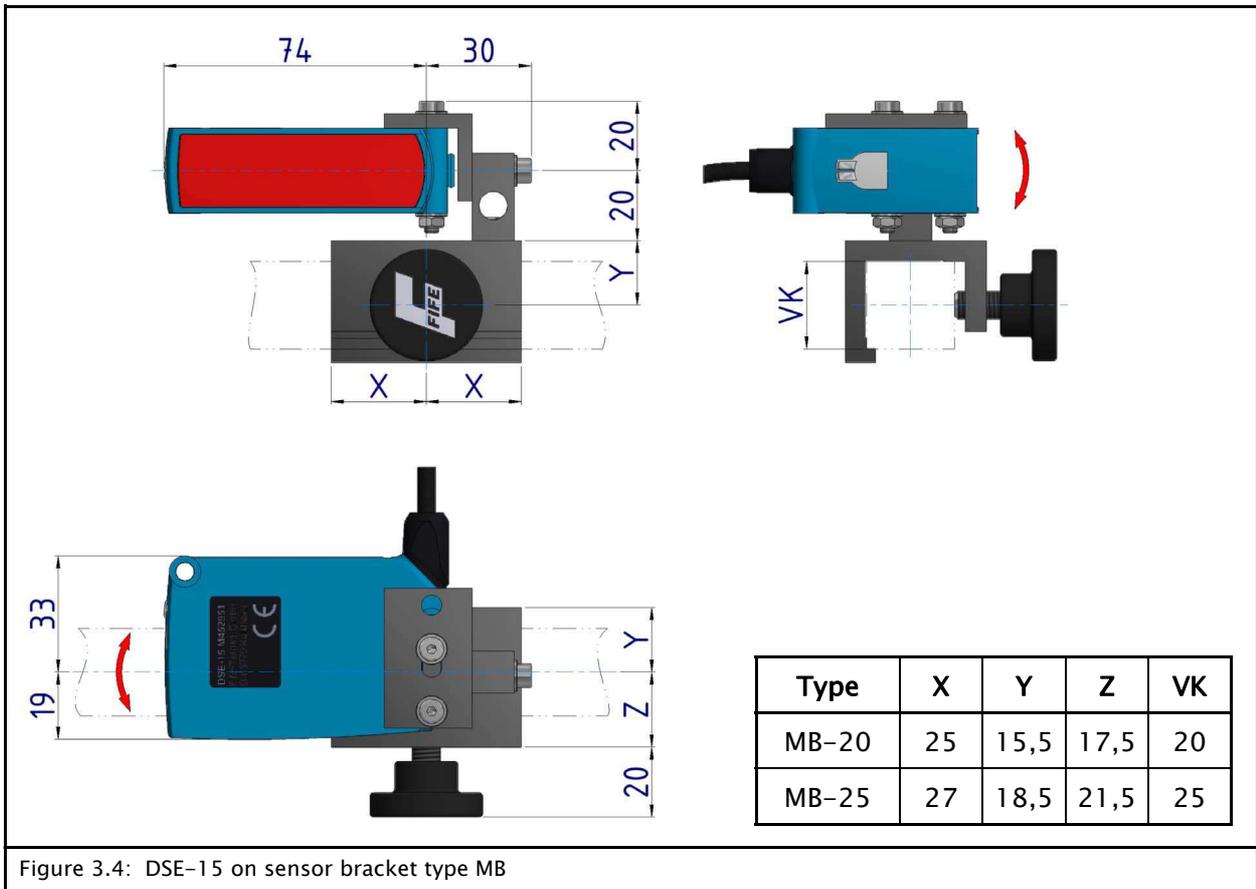


Figure 3.4: DSE-15 on sensor bracket type MB

Distance between reflector and sensor

The web is located between the sensor and reflector.

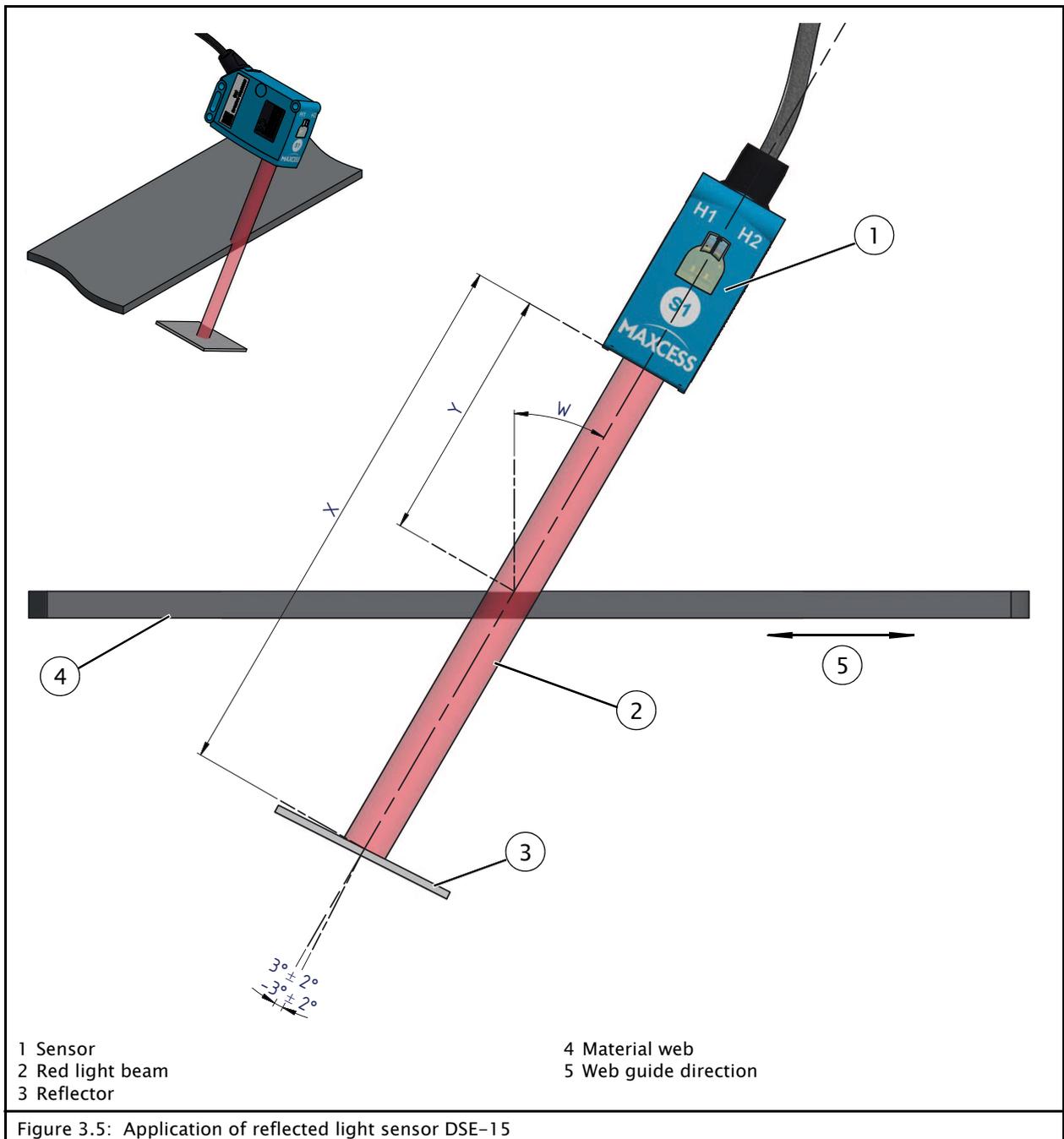


ATTENTION

The sensor could become unusable.

Depending on the material of the controlled web, it is possible a grinding of the material web or a plane change could strike and damage the sensor or reflector.

⇒ Make certain there is sufficient distance between the web and sensor.



The reflector of the sensor must be inclined at an angle of $+ (3^\circ \pm 2^\circ)$ or $- (3^\circ \pm 2^\circ)$. This will prevent undesirable reflected light from striking the sensor

If the material is recorded with a glossy or matte surface, the red light beam should strike the web level at a certain angle.

→ table and [figure 3.5](#)

Material	W
reflective	5° – 45°
matte	0° – 45°

A minimum distance must be maintained for reflectors with a rough structure.

→ table and [figure 3.5](#)

Material	X	Y
opaque	up to 1000mm	10 – 90% of X
transparent	150 – 1000mm	max. $\frac{3}{4}X$

Alignment of reflector and sensor

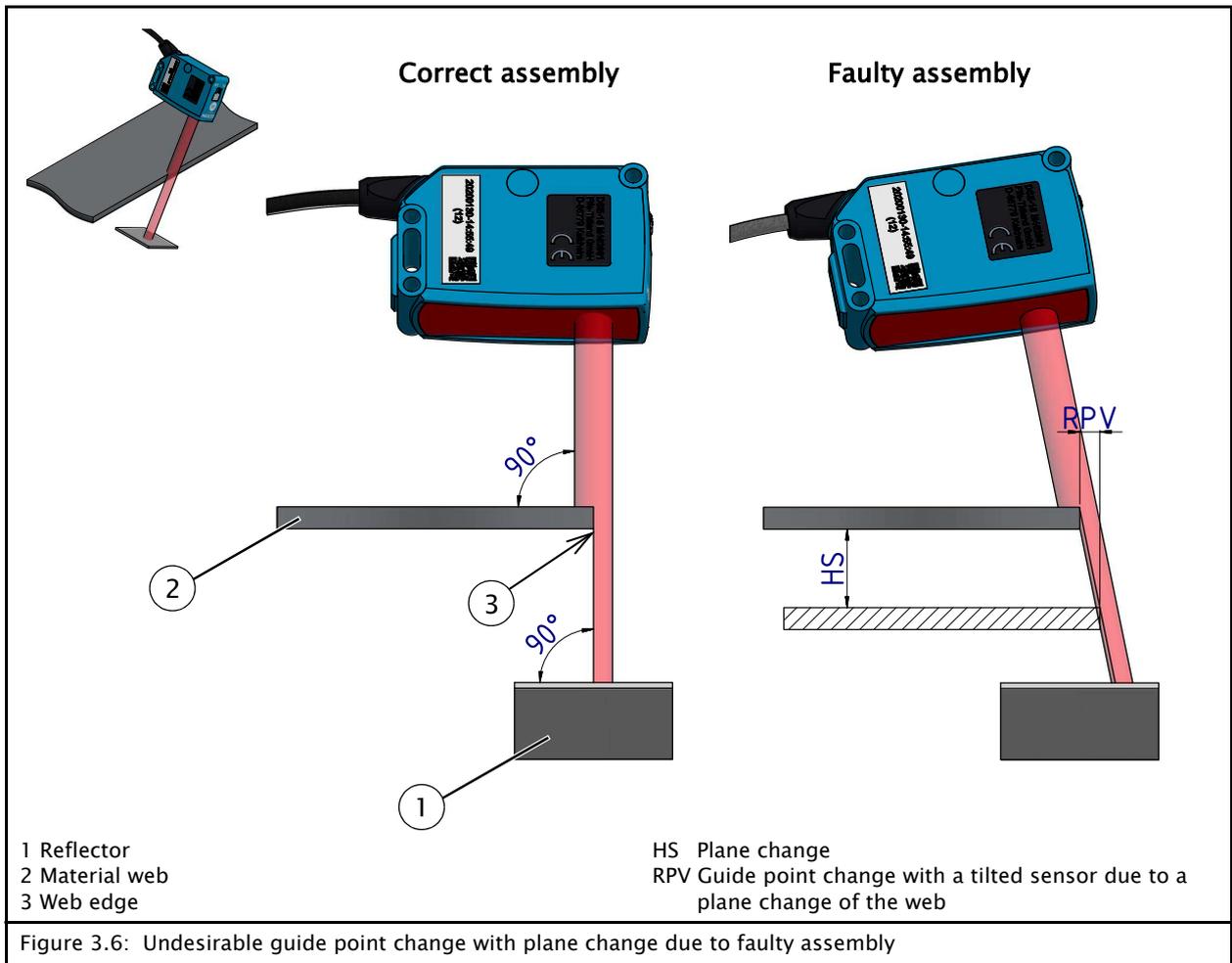
To prevent an undesirable change in the web position and guide point when the web plane changes, the sensor must be mounted at an angle of 90° to the web surface.

→ [figure 3.6](#)



Note:

If a positioner is used to move the sensor, the red light beam must strike the reflector along the entire path the sensor moves without faults.



Electrical connection



ATTENTION

The sensor could be damaged.

- ⇒ The safe function of the sensor and the system is only guaranteed if it is properly installed.
 - ⇒ Electrical connections should always be made or disconnected on the sensor while there is no electrical power in the system.
 - ⇒ When attaching the connector with the jack on the sensor, pay close attention to the guide and groove! The connector and jack must not be connected with incorrect orientation or by force, as this will destroy the sensor.
 - ⇒ Electrical lines must not be subjected to any mechanical loads.
-

- The sensor must be connected to the web guide controller according to the system diagram in the system documentation.



Note:

Normally the sensor must be connected to the web guide controller with a cable on the corresponding sensor input. In some cases two sensors can be connected to a sensor input on the web guide controller via a Y cable or an external distributor box.



only for sensor cables with open wire ends

Personnel: Qualified electrician

⇒ The sensor may only be connected electrically by a qualified electrician.

- The power supply voltage must be externally fused.
→ *Power supply, page 9-2*
- The external 12V/24V DC voltage must be generated and supplied in accordance with the criteria for protective extra-low voltage (PELV).
- The negative potential must be connected to ground.
- The sensor housing must be grounded via the cable screen.

→ see also the drawing for the sensor cable in the system documentation

4 CONTROL ELEMENTS



The DSE-15 sensor has the following control and display elements:

LED H1:

- not assigned

LED H2

- not assigned in its regular operation state
- lit when sensor setup is started

LED display (marked)

- Shows whether the red light beam is covered by the material web when the sensor is working in the regular operation state
 - [LEDs in normal operation, page 6-1](#)
- Indicates that the sensor has been set up to the reflector when the two outer LEDs alternate flashing with the inner LED
 - [Setting up the sensor and reflector, page 5-1](#)
- Indicates an error when all the LEDs flash simultaneously
 - [Troubleshooting, page 8-1](#)

S1 key

- Start the sensor setup

The S1 key is a capacitive touchpad. Make certain there are no metallic objects on or in the immediate vicinity of the key.

→ [figure 3.2](#)

5 COMMISSIONING



WARNING

Unexpected movements of the machine may lead to injuries or death.

- ⇒ The sensor must not be placed in operation unless it has been securely mounted.
- ⇒ Commissioning must only be performed while the machine is stopped and protected against being turned on again.
- ⇒ Make certain there is no one in the hazardous area of the drives.

Setting up the sensor and reflector

Precondition:

- There must not be any material between the sensor and reflector.
- The protector of the sensor and the reflector must be clean.

Setup

1. Switch the web guide controller to "Manual" operation mode
2. Align the light beam of the sensor to the reflector

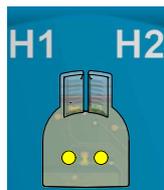
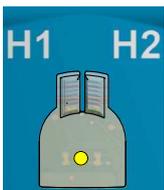


3. Place a finger on the S1 key
 - Check: The green LED H2 is lit



Note:

If LED H2 is not lit, increase the coverage of your finger on the S1 key, for example by using your thumb.



4. Do not remove your finger from the S1 key until the LED display matches the adjacent bit pattern, alternating with it
 - Check: The green LED H2 goes out

The sensor performs the setup for the reflector automatically.

5. The sensor is now ready for operation.

Calibrating the sensor inputs of the web guide controller

All settings required for operating the sensor are performed with the web guide controller.

→ Information on this topic is available in the Operating Instructions for the web guide controller.

Before the sensor is used for working with transparent material, the sensor must always be calibrated to the contrast with the web guide controller.

6 OPERATION



WARNING

Danger of injury by crushing

⇒ Do not place your hands on or near moving parts (rollers, material web, etc.) during operation.



Danger of injury due to cutting on the edge of the material web

⇒ Do not place your hands on the edge of the (moving) material web during operation.



ATTENTION

The sensor could become unusable during the operation by damages.

⇒ Depending on the material of the controlled web, it is possible a grinding of the material web or a plane change could strike and damage the sensor or reflector.

Make certain there is sufficient distance between the web and sensor.

Operation

No tasks or settings are required on the sensor during operation.

For transparent material, the sensor inputs on the web guide controller must be calibrated to the contrast.

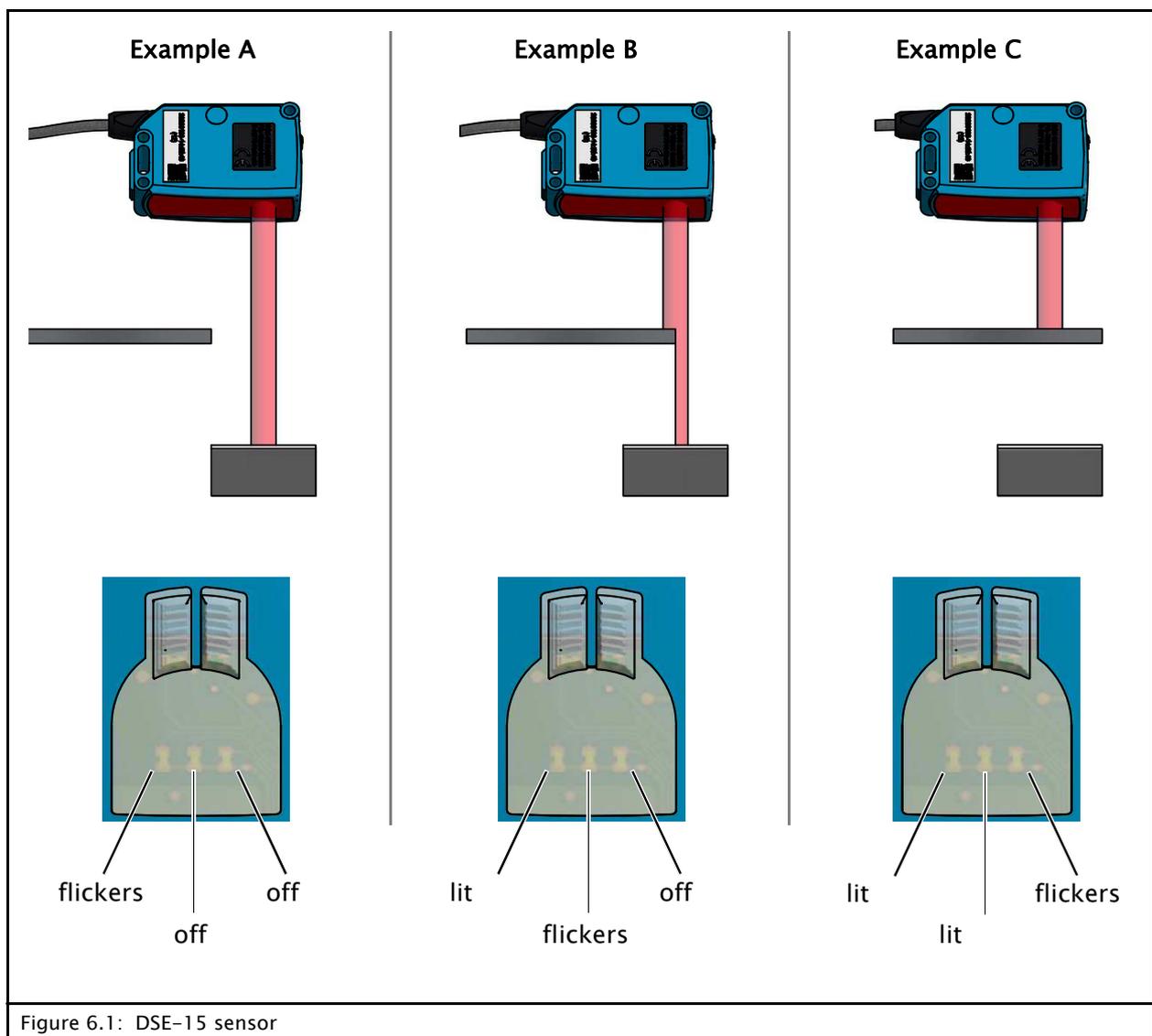
LEDs in normal operation

LEDs H1 and H2

In normal operation the two LEDs H1 and H2 are turned off.

LED display

- Field of view completely uncovered:
The left LED flickers, the two LEDs to the right of it are off.
→ Example A
- Field of view partially covered by the material:
The left LED is lit, the middle LED flickers and the right LED is off.
→ Example B
- Field of view completely covered by the material:
The two left LEDs are lit while the right LED flickers.
→ Example C



7 MAINTENANCE



WARNING:

Danger of injury by crushing.

⇒ Maintenance work must only be performed on the sensor when the power is turned off and the machine is stopped and protected against being turned on again.

Maintenance

Cleaning

Clean ambient dust and dirt from the protector and reflector at regular intervals using a neutral cleaning agent and a soft cloth. Keep chemical resistances in mind when choosing the cleaning agent.

→ [Materials used, page 9-1](#)

Setting up the sensor again

If the protector or reflector begins to show signs of wear, the accuracy of the sensor can be improved by adjusting the brightness values of the sensor to the changed conditions by setting up the sensor again.

→ [Setting up the sensor and reflector, page 5-1](#)

Maintenance

No additional maintenance tasks are required for the sensor.

Decommissioning



1. Turn off the electrical power to the system
2. Disconnect the signal cable from the sensor.

only for sensor cables with open wire ends

Personnel: Qualified electrician

⇒ The sensor may only be disconnected electrically by a qualified electrician.

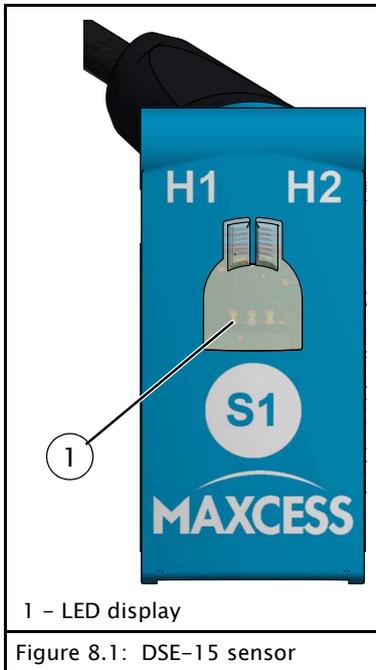
3. Unscrew the sensor from its bracket.
4. Store the sensor in a cool, clean and dry place.
→ [Ambient conditions, page 9-1](#)

OR

Dispose of the sensor according to your national requirements.

8 TROUBLESHOOTING

LED display



The sensor displays information about the operation state when the LEDs are lit or flashing. The information is divided into groups as follows:

Normal operation:

The output signal of the sensor is displayed. The LEDs flicker/ light up depending on the position of the material web within the sensor field of view.

Error message:

Error n = 1 .. 3:

The output signal of the sensor (10s long) and the flashing pattern of an error are displayed alternately. An error is displayed until it has been corrected. It is still possible to use the sensor.

Error n = 4 .. 5:

Only the blinking pattern of an error is displayed. The sensor is no longer supplying a valid output signal. An error is displayed until it has been corrected.

Error n = 6 .. 7:

Only the blinking pattern of an error is displayed. The sensor is no longer supplying a valid output signal.

Fault

In the event of an error, the LEDs flash with a certain pattern: flash n times for 0.5s on – 0.5s off, followed by 1s pause. The number of flashing pulses between two pauses encodes the error number "n".

"n"	Fault	Remedy
1	Undervoltage	Check power supply voltage
2	Overvoltage	
3	Overtemperature	The error is set at 70°C and canceled at 60°C.
4	Adjustment error - measurement signal too low	Set up the sensor (again), Check the mechanical arrangement of the sensor and reflector. Is there not enough reflected light present? → <i>Setting up the sensor and reflector, page-5-1</i>
5	Adjustment error - measurement signal too high	Set up the sensor (again), Check the mechanical arrangement of the sensor and reflector. Is there too much reflected light present? → <i>Setting up the sensor and reflector, page-5-1</i>
6	Internal setup error	The error cannot be corrected by the customer. Service required or the sensor must be sent to Fife-Tidland GmbH.
7	General hardware error	

9 TECHNICAL DATA

General information

Dimensions

→ [figure 3.1, page 3-2](#)

Weight

100g (with cable and plug)

Protection class

IP 65

Ambient conditions

Ambient temperature: 5°C ... 60°C

Relative humidity: up to 90%, non-condensing

Operating altitude max. 3000m above sea level

Materials used

Housing: Plastic, VISTAL®

Protector: PMMA (polymethylmethacrylate), glued

A data sheet can be requested on this material (EK0471).

Properties

Light source

LED

visible red light

Wavelength

$\lambda = 632 \text{ nm} \pm 6 \text{ nm}$

$\Delta\lambda = 20 \text{ nm}$

Sensor field of view

10mm

Linearity

5% max. error

in the proportional band of 6mm

Web plane change

1% max. error

Temperature error

2% (at 10°C .. 50°C)

Electrical connection

Power supply

10V ... 28V

(PELV, negative potential connected to ground)

Overcurrent protection device slow-blow max. 2A)

Power consumption

<600mW

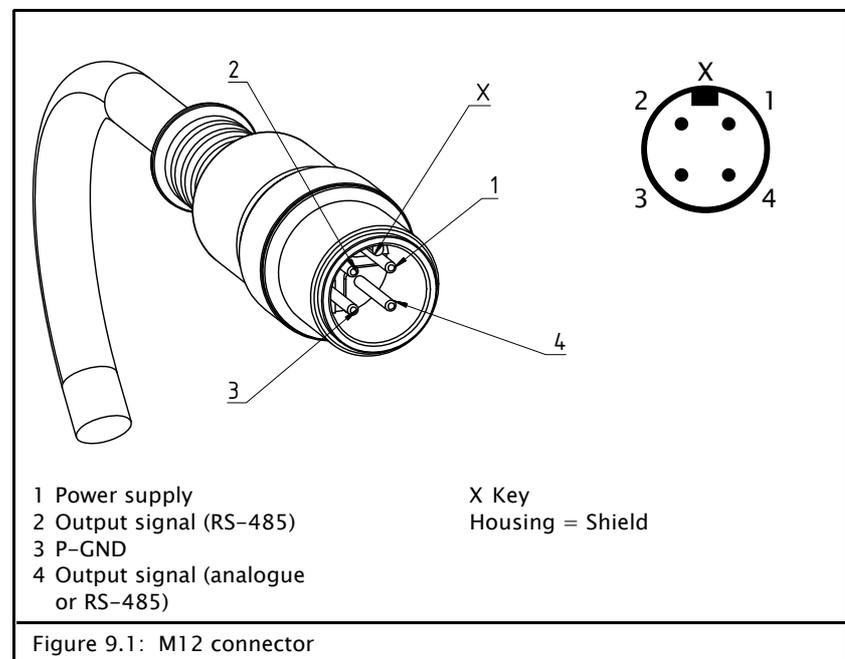
Output signal

0 - 10mA to $\leq 400\Omega$ at 12V (10...15V) Power supply

4 - 20mA to $\leq 200\Omega$ at 24V (20...28V) Power supply

Digital data exchange via RS-485 when connected to selected FIFE web guide controllers (e.g. D-MAXE)

Pin assignment



Standards

The DSE-15 sensor was constructed in accordance with the standards and regulations of the European Union. A Declaration of Conformity is available.