



# **Operating Manual DLS**

Digital Line Sensor for Web Guiding

Firmware Version 1.10 05/2009 ff

This operation manual is also available in German.  
Please contact your local representative.

Diese Bedienungsanleitung ist auch in Deutsch erhältlich.  
Bitte kontaktieren Sie Ihren nächstgelegenen FMS Vertreter.

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# 1 Functional Description DLS

DLS is a self calibrating digital line and edge sensor for web guiding applications. The sensor recognizes different lines and can be setup to follow either the middle of a line or either edge of the line.

The sensor works with a LED CCD with different colours for best illumination and maximum contrast on the material. The sensor is able to choose the best illumination based on integrated software.

The sensor can be set up to search for lines and for edges automatically. The parameters for optimal contrast, control mode, line parameters, etc will be stored after a calibrations process and are the reference for the following production. The parameters are stored in non-volatile memory. This lets the sensor distinguish between the guiding line and similar patterns, printed characters or marks.

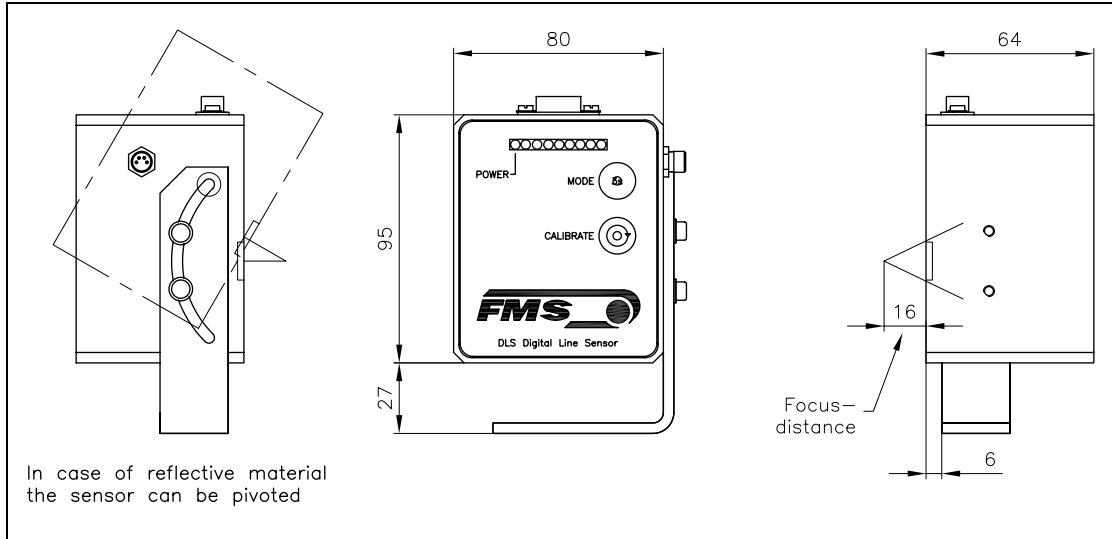
The display shows the position of the line as a moving point according to its position within the detection range of the sensor. An edge is being displayed as a moving bar from either side (depending on contrast polarity).

The sensor can be positioned with a light spot and the focussing aid. The line position can be optimised and made visible on the LED display with aid of an electronic focus mode.

The DLS sensor can handle intermittent lines and also lines that are being touched or crossed by a pattern. When the line disappears, e.g. in case of an intermittent line pattern, the web guide will be frozen at the actual position until the line pattern is again recognized by the sensor. This safety measure is very helpful since it guarantees continuity of production without machine stops or loss of material. The described frame blocking feature is only accessible in combination with FMS web guide controllers.

## 2 Dimensions

Dimensions: 95x80x64 mm



**Fig.1: Dimensions**

dls00007

## 3 Scope of Delivery

- Sensor DLS
- Focusing aid (spacer for focus distance)

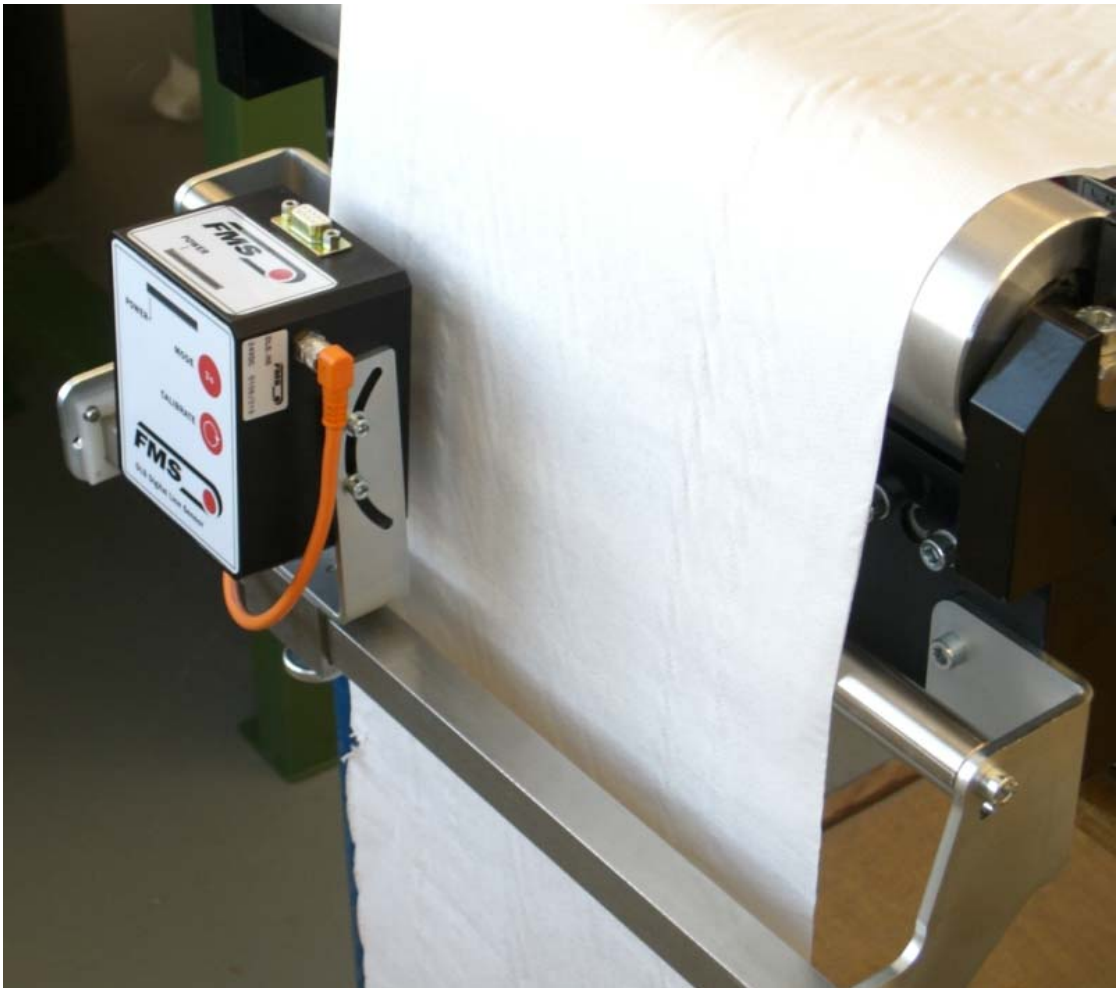
**Not in the scope of delivery are:**

- Connection cable (length according to customer specification).
- Mounting bracket (BKS.W.V.A.20x20.DLS)
- Sensor adjustment / mounting (BKS.W.DLS.020.2.XXX.YYY)  
Length of guiding rod depends from the webMASTER type.

## 4 Installation

### 4.1 Mounting the Sensor

The sensor requires a 20\*20mm fixation bar that has to be installed according to the picture (Fig.2). The sensor itself is fixed by two M4 screw on fixation bracket which is attached to the fixation bar.



**Fig. 2: Mounting of sensor on square bar, view of tilting device**

dls00005

The 2 screws on the side of the sensor allow tilting the sensor around the focus point. This can be required with reflective material (Fig.2)

**The DLS must be installed in a fixed 16mm distance to the web** (focus pointer is provided). Ideally an idler roller with small wrap angle or a bar is used to stabilize the web after the exit roller of the web guide (Fig.3).

**The focus pointer gives the exact position against the web. It has to be removed after the mechanical installation.**



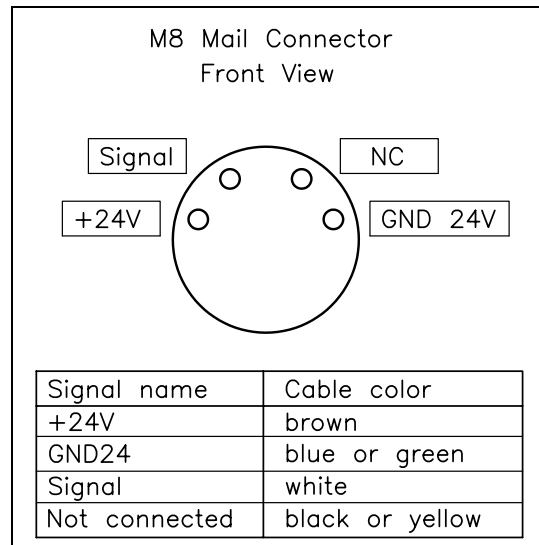
**Fig.3: Focus pointer and web stabilization bar**

dls00003

## 4.2 Wiring

### Electrical connections:

If the sensor is used with a built-in web guide controller in the steering frame FMS-webMASTER 020, the sensor is connected with a cable 4x0.14mm<sup>2</sup> of the respective length. Fig. 5 shows the sensor connector in front view with its pin assignment. The table lists the wire colour corresponding to the signal names.



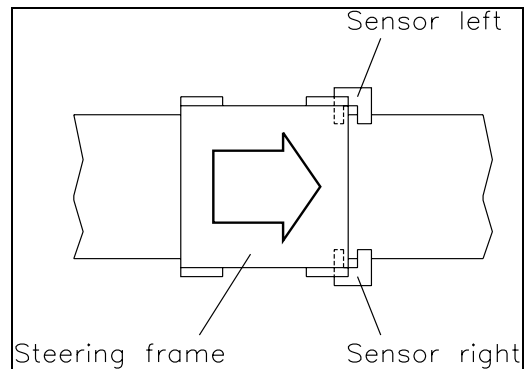
**Fig. 5: Sensor Connector** DLS00008e

## 4.3 Right or Left Hand Position of the Sensor

### Definition of Left and Right

Left and right are always seen in direction of the running web (Fig. 6).

1. The line guide sensor DLS will only work when it is connected on the right hand running position and the sensor switch on the electronic panel is set to right.
2. If a left hand ultrasonic sensor US01B is replaced by a DLS then the sensor switch on the electronic panel has to be moved to the right hand position and returned if the ultrasonic sensor is replaced.
3. If a right hand ultrasonic sensor is in use then no action is required, the DLS can replace the US01B with no need to change the switch position.



**Fig. 6: Left and right** K100007e



### Caution

In special frames of the type BKS020.xxx.480.75.D.582339 (ABG) the sensor switch is inside the frame. In order to change the switch position the front panel has to be removed. The switch is located on the post attached to the main board. The web guide manual specifies this. Should the switch be in the incorrect position when using any sensor the guide will drive over to one side and remain there, being unable to detect any edge or line.

# 5 Operating

## 5.1 Mode of Operation

By pressing the Mode key for 3 sec. the operator can activate the control mode menu. The operator can choose between 5 operating modes. The mode will switch to the next on every short pressure on the mode key and also indicate the chosen mode in the display: If there is no pressure on the mode key for 3 second the sensor go back in standard operation mode by keeping the last chosen mode. If the operator changed a mode then the sensor will flash all LED signalling that a new calibration is necessary.

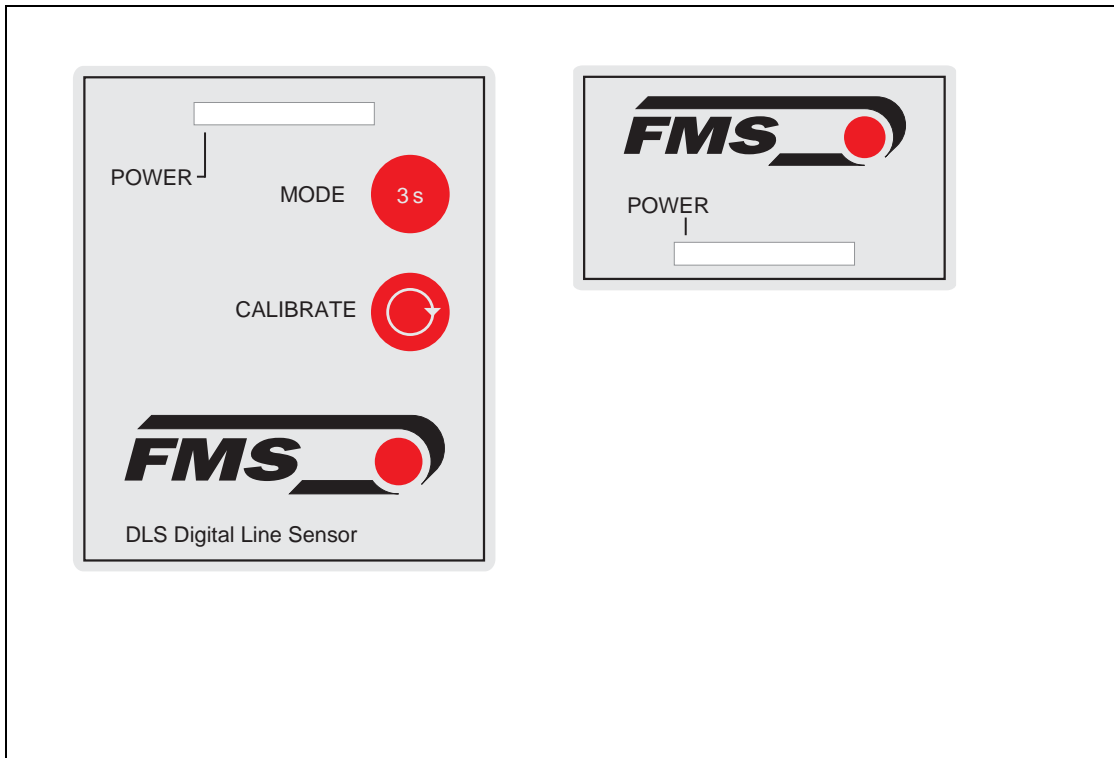


Fig. 7: Front panel

DLS0006e

Mode	Display
Line mode: centre of line*	○○○○●●○○○
Line mode: left edge of line*	○○○○●●○○○
Line mode: right edge of line*	○○●○○●○○○
Edge mode (edge detection only)	○●●●●○○○○
Automatic mode. Line (priority) or edge, automatic detection by sensor	○●●●○○●●●

\*right and left are defined as seen from the material and looking onto the sensor display.



## 5.2 Calibration for Optimal Illumination

By pressing key *CALIBRATE* for 2s the sensor starts a calibration process. The sensor is searching for lines or edges according to the mode that has been set. This only takes fractions of a second (the illumination flashes) and afterwards the configuration is stored in the non-volatile memory and the display shows a growing bar according to the contrast found for approx. 0.5s. Afterwards the sensor switches back to normal operation. If the calibration process is not successful it can be because:

- The contrast is insufficient.
- The line or edge is not positioned in the field of view of the sensor. The sensor should be moved horizontally until the line or edge comes into the field of view.
- The focus is not optimal. Adjust the distance between sensor and material.

Unsuccessful calibration is signalled by the sensor by a flashing all LED (see below).

## 5.3 Adjustment of Focus Distance

The focus distance is an important parameter for the proper function of the sensor. Two methods are provided to set up the right focus distance.

- Set up the focus distance by using the provided focusing aid (chapter 4.1).
- Visualisation of the focus on the LED display

A short press on the key *MODE* will activate the focus visualisation mode. The LED row shows the focus value. After 15 second (or a second short press on the mode key) the sensor will go back into normal operation mode.

The focus is visualised by the LED. A bad focus will show no LED lit. A good focus will have all LED lit. By moving carefully the sensor forth and back it is possible to adjust for optimal focus.

Focus	Display
<b>Bad</b>	●○○○○○○○○●
<b>Middle</b>	●●●○○●●●
<b>good</b>	●●●●○●●●●

## 5.4 Error Signal

A calibration error is signalled by alternating blinking of all LED. Note that after a mode change it is always necessary to redo a calibration.

Error signal:

○●○●○●○●○ alternate with ●○●○●○●○●

## 5.5 Normal Operation

**In normal operation the display shows the position of the line or the edge. The first LED is always lit to show power on.**

**If the line or edge is missing only the power LED is on. As soon as the line or edge is present again the LEDs show the position again.**



### Note

In web guiding systems all equipped with FMS components and DLS sensors it may happen that the web guide controller blocks the steering frame. This protective function is activated when the line is interrupted and impossible to detect it anymore. The LED above the Automatic key of the web guide will start blinking and indicate to operator that the line quality is bad.

The described frame blocking feature is only accessible in combination with FMS web guide controllers.

Examples of line/edge indication:

Description	Display
Line in centre of sensor	●○○○●○○○○
Line close to right end of sensor	●○○○○○○●○
Edge clear/dark in centre of sensor	●○○○○●●●●
Edge dark/clear close to right end of sensor	●●●●●●●○

The display can be viewed from top or frontal.

## 5.6 Holographic Lines/Edges

Holographic patterns can be followed after a calibration. The sensor automatically switches on the best light sources. However, the nature of holograms is such that it they can be seen only under a certain angle. Therefore it can be necessary to turn the sensor by 180 degrees (such that the top display is bottom now) to achieve visibility of holograms. Visibility of normal printed lines is not affected by turning the sensor.

## 6 Technical Data

	<b>DLS</b>
Sensing width	8mm
Resolution	6/100mm
Measuring rate	2ms
Output signal 0...10V	0V when the line or edge fully right 10V when the line or edge fully left
Power supply	24VDC (18...36VDC)
Temperature range	0 ... 50°C
Protection class	IP 20



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