ML20
Markless Sensors

Running markless for stability and design freedom
The markless sensor provides benefits particularly in the field of roll-fed label machines. It is typically used for controlling the cutting process in order to separate labels without the use of print marks which take up a lot of space and are unaesthetic. Furthermore, the machine process is made more stable and waste caused by incorrect cuts is minimized.

The operation principle is based on a line camera that searches for contrast differences in the applicable print image without interruption (see picture). This allows an exact switching point to be determined even at high speeds.
This puts an end to games of hide-and-seek with marks on banderoles. The markless sensor gives the words “mark freedom” a whole new meaning. The need for drink banderoles and packaging to be provided with annoying marks for process control is now a thing of the past.

➤ Your benefits:
- The entire label can be used for advertising information.
- Erroneous switching caused by contrasts resembling a mark is prevented.

Previously used banderole with contrast mark

This label area has had to be designed in low-contrast until now in order to ensure that the sensor switches reliably and clearly. If there was a print resembling a mark, as shown here, a complex intervention in the machine controller was necessary in order to identify the correct mark.

New banderole without contrast mark and with complete design freedom for the entire area

Material savings allow costs to be reduced.
It is no longer necessary to cover the contrast mark by overlapping the material.
The flexibility of a camera transferred to the task of identifying marks results in a new innovative solution combined in the housing of the ML20. A line is used to ensure quick and accurate switching on recurring contrast patterns within a large field of view. In this way, SICK has managed again to combine experience and know-how in terms of proven technologies and presents a new sensor giving a direction to the market.

Markless sensor *)

- Speed of up to max. 7 m/s
- Simple teach-in procedure thanks to the autoselection of contrast areas in the entire image
- Accuracy of up to 0.6 mm

*) An encoder/motor feedback system is required for operation

Contrast sensor

- Extremely accurate (0.1 mm)
- Extremely fast (> 7 m/s)

Vision sensor

- User-adapted parameterization
- Shape detection

Print mark required

Consideration of the entire image

The task

Process control via contrast differences

The technology

Use of a camera element
Teach-in procedure and parameterization

Up to now users have been limited to the position and the type of contrast mark. The markless sensor provides complete freedom in terms of which contrast pattern need to be taught in. The teach-in of new formats is extremely simple. With the markless sensor, formats which have already been taught-in can be saved using the SOPAS software and Ethernet UDP and reloaded into the sensor for reuse. This significantly reduces system downtime caused by parameterization.

The red bars indicate the start and end points necessary for an ideal teach-in procedure. The teach-in procedure's start position is subsequently the position of the switching point. The red circles indicate potential reference areas which are searched for by the sensor for recognition purposes.

Configuration via the display and SOPAS

Intuitive operation via the display

The display makes it possible to teach-in a new format quickly and easily. Once the teach-in procedure is complete, a level of detection reliability is made visible in the display for a few seconds by means of a bar graph. When in operation, the sensor displays the process quality.

Configuration using SOPAS

All settings can be carried out on a PC using SICK’s communication software SOPAS. These include the following, for example:

- Displaying and changing the position of the switching point using an adjustable bar
- Saving and reusing formats which have already been taught-in
- Reading out all diagnosis data such as detection reliability etc.
Product description
The markless sensor is based on a pattern recognition principle. A taught-in image is used as a reference for the detection of a recurring contrast pattern. A stable switching signal is generated at high speed thanks to new technology without print marks. The markless sensor is ideal for applications in the packaging industry. User-friendly configuration is offered via the sensor’s control panel or by using SICK’s SOPAS software via Ethernet.

At a glance
- Tough metal housing
- Scanning speed of 7 m/s
- Monitor process quality via a control panel or SOPAS, via Ethernet
- Easy sensor teach-in and alignment
- Reproducibility of 0.6 mm (2 Sigma)
- Plug can be rotated 90°

Your benefits
- Reliable detection, even with complex images, reduces system downtime and waste
- Fewer machine builder restrictions mean more freedom when designing packaging
- Allows for more efficient utilization of space on the product instead of using unnecessary print marks and place markers
- Faster and easier format change by teaching of saved formats via Ethernet
- Monitor process and teach quality via a display or SOPAS, increasing reliability
- Fast and simple sensor alignment via a visible light spot and notches on the housing
- Easy sensor teach-in, directly via the control panel, external teach-in signal or using SOPAS via Ethernet

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➡️ www.mysick.com/en/ML20
## Detailed technical data

### Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (L x W x H)</td>
<td>46 mm x 46 mm x 77 mm</td>
</tr>
<tr>
<td>Sensing distance tolerance</td>
<td>± 2.5 mm</td>
</tr>
<tr>
<td>Light source 1)</td>
<td>LED, white</td>
</tr>
<tr>
<td>Wave length</td>
<td>400 nm ... 700 nm</td>
</tr>
<tr>
<td>Light spot size</td>
<td>60 mm x 3 mm</td>
</tr>
<tr>
<td>Adjustment</td>
<td>Start stop teach, trigger teach</td>
</tr>
<tr>
<td>Picture length (min.)</td>
<td>40 mm</td>
</tr>
<tr>
<td>Picture length (max.)</td>
<td>1,000 mm</td>
</tr>
<tr>
<td>Picture height (min.)</td>
<td>34 mm</td>
</tr>
<tr>
<td>Tolerance lateral movements</td>
<td>± 5 mm</td>
</tr>
</tbody>
</table>

1) Average service life of 100,000 h at $T_A = +25 \degree C$.

### Mechanics/electronics

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage $V_s$ 1)</td>
<td>DC 12 V ... 30 V</td>
</tr>
<tr>
<td>Ripple 2)</td>
<td>≤ 5 $V_{pp}$</td>
</tr>
<tr>
<td>Power consumption 3)</td>
<td>&lt; 6 W</td>
</tr>
<tr>
<td>Switching output</td>
<td>PNP: HIGH = $V_s$ - ≤ 2 V / LOW &lt; 0.5 V</td>
</tr>
<tr>
<td>Status output 4)</td>
<td>PNP: HIGH = $V_s$ - ≤ 2 V / LOW &lt; 0.5 V</td>
</tr>
<tr>
<td>Output current $I_{max.}$ 5)</td>
<td>&lt; 100 mA</td>
</tr>
<tr>
<td>Input, teach-in (ET)</td>
<td>PNP: Teach: U = 12 V ... &lt; U, Run: U &lt; 2 V</td>
</tr>
<tr>
<td>Input, blanking input (AT) 6)</td>
<td>PNP: blanked: U = 12 V ... &lt; U, free-running U &lt; 2 V</td>
</tr>
<tr>
<td>Initialization time</td>
<td>&lt; 10 s</td>
</tr>
<tr>
<td>Retention time (ET)</td>
<td>≥ 6 s, non-volatile memory</td>
</tr>
<tr>
<td>Connection type 7)</td>
<td>Ethernet connection M12, 4-pin; connector M12, 12-pin</td>
</tr>
<tr>
<td>Ambient light safety</td>
<td>30,000 lx</td>
</tr>
<tr>
<td>Protection class</td>
<td>III</td>
</tr>
<tr>
<td>Circuit protection</td>
<td>$V_s$ connections reverse-polarity protected, output Q short-circuit protected, interference suppression</td>
</tr>
<tr>
<td>Enclosure rating</td>
<td>IP 65</td>
</tr>
<tr>
<td>Weight</td>
<td>325 g</td>
</tr>
<tr>
<td>Housing material</td>
<td>Metal</td>
</tr>
<tr>
<td>Encoder resolution</td>
<td>100 µm ... 400 µm (in 1 µm)</td>
</tr>
<tr>
<td>Encoder input</td>
<td>Differential: 4.5 V - 5.5 V / TTL / RS-422, single ended: 12 V - 30 V / HTL / push-pull</td>
</tr>
</tbody>
</table>

1) Limit values: operation in short-circuit protected network max. 8 A.
2) May not exceed or fall short of $V_s$ tolerances.
3) Without load.
4) Detailed description of the status output in operating manual.
5) $I_{status} = Q + Q_{status}$
6) Fade-out of identical areas.
7) Use drilled and shielded cable.

### Ambient data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>Operation: –10 °C ... +55 °C</td>
</tr>
<tr>
<td></td>
<td>Storage: –20 °C ... +75 °C</td>
</tr>
<tr>
<td>Shock load</td>
<td>According to IEC 60068</td>
</tr>
</tbody>
</table>
### Ordering information

<table>
<thead>
<tr>
<th>Max. movement speed</th>
<th>Sensing distance</th>
<th>Repeatability ¹</th>
<th>Data interface</th>
<th>Switching output</th>
<th>Model name</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 m/s</td>
<td>20 mm</td>
<td>0.6 mm</td>
<td>Ethernet TCP/IP</td>
<td>PNP</td>
<td>ML20M-P1211</td>
<td>1044675</td>
</tr>
</tbody>
</table>

¹ Statistical error 2 σ.

### Dimensional drawing

![Dimensional drawing](image)

All dimensions in mm (inch)

1. Center of optical axis
2. Mounting hole, Ø 4.2 mm
3. Connector M12, 12-pin/Connector M12, 4-pin, rotatable up to 90° (Ethernet)
4. Display and function buttons
5. Function signal indicator (green) “on”
6. Function signal indicator (yellow) “Q”
7. Function signal indicator (green) “Link”
8. Function signal indicator (yellow) “Act”
**Connection type and diagram**

**Ethernet Connector**

**M12, 4-pin**

![Diagram of M12, 4-pin connector]

- **Connection diagram M12, 4-pin**
  - 1: Rx+
  - 2: Tx+
  - 3: Tx–
  - 4: Rx–

**Connector**

**M12, 12-pin**

![Diagram of M12, 12-pin connector]

- **Connection diagram M12, 12-pin**
  - 1: L+
  - 2: M
  - 3: NC
  - 4: Enc B
  - 5: AT
  - 6: Enc B
  - 7: Out
  - 8: ET
  - 9: NC
  - 10: Status
  - 11: Enc A
  - 12: Enc A
  - FE (shield)

**Recommended accessories**

**Plug connectors and cables**

<table>
<thead>
<tr>
<th>Description</th>
<th>Model name</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet cable, 4-pole, shielded, M12 plug, 4-pin (D-type encoded) / RJ-45 plug, 8-pin, 5 m</td>
<td>Connecting cable (plug-plug)</td>
<td>6034415</td>
</tr>
<tr>
<td>Data cable for Ethernet with 4-pin, M12 plug, angled, 8-pin RJ45 plug, 5 m</td>
<td>Connection cable (plug-plug)</td>
<td>6039488</td>
</tr>
<tr>
<td>Female connector, M12, 12-pin, straight, 5 m, PVC, shielded, drilled and twisted pair</td>
<td>DOL-1212-G05MAS02</td>
<td>6042754</td>
</tr>
<tr>
<td>Female connector, M12, 12-pin, angled, 5 m, PVC, shielded, drilled and twisted pair</td>
<td>DOL-1212-W05MAS02</td>
<td>6044109</td>
</tr>
<tr>
<td>Connection cable, M12, 12-pin, connector straight/socket straight, 5 m, shielded, drilled and twisted pair</td>
<td>DSL-1212-G05MAS02</td>
<td>6045234</td>
</tr>
</tbody>
</table>
## Terminal and alignment brackets

<table>
<thead>
<tr>
<th>Beschreibung</th>
<th>Typ</th>
<th>Artikelnr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate N04 for universal bar clamp, steel, zinc coated, incl. universal bar clamp and mounting material</td>
<td>BEF-KHS-N04</td>
<td>2051610</td>
</tr>
<tr>
<td>Mounting rod, straight, 200 mm, steel, zinc coated, without mounting material</td>
<td>BEF-MS12G-A</td>
<td>4056054</td>
</tr>
<tr>
<td>Mounting rod, L-shaped, 250 mm x 250 mm, steel, zinc coated, without mounting material</td>
<td>BEF-MS12L-B</td>
<td>4056053</td>
</tr>
</tbody>
</table>

**BEF-KHS-N04**

![BEF-KHS-N04 diagram](image1)

All dimensions in mm (inch)

**BEF-MS12G-A**

![BEF-MS12G-A diagram](image2)

All dimensions in mm (inch)

**BEF-MS12L-B**

![BEF-MS12L-B diagram](image3)

All dimensions in mm (inch)
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