OPSL 775

Laser edge detector

Features:
- Laser edge detector for counting in the overlap flow
- Counting rate > 1.5 million copies per hour
- Edge detection of individual sheets from 0.1mm thickness
- Detection range 5 … 150mm
- Adjustable pulse stretching
- Dynamic output pulse adaptation DPA
- Simple mounting

Accessories:
(available separately)
- Cables with M12 connector (K-D …)
- Mounting systems

Specifications:
- 12 - 30 V DC
- IEC 60947...
- IP 54

Dimensioned drawing

Electrical connection

Plug connection, 5-pin

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>br/BN</td>
</tr>
<tr>
<td>2</td>
<td>ns/WH</td>
</tr>
<tr>
<td>3</td>
<td>bl/BU</td>
</tr>
<tr>
<td>4</td>
<td>sw/BK</td>
</tr>
<tr>
<td>5</td>
<td>gr/GY</td>
</tr>
</tbody>
</table>

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Specifications

Optical data
- Measurement range 1) 5 … 150mm
- Edge height ≥ 0.1mm
- Focus range 100 ± 10mm for ≥ 0.1mm edge height
- Standard range 10 … 90mm/110 … 140mm for ≥ 0.3mm edge height
- Threshold 5 … 10mm/140 … 150mm for ≥ 0.4mm edge height
- Light source laser, pulsed
- Wavelength 670nm (visible red light)

Edge height
≥ 0.1mm

Focus range
100 ± 10mm

Threshold
5 … 10mm

Light source
laser, pulsed

Wavelength
670nm

Output power 2)
< 1 mW

Pulse duration 3)
8.3μs

Timing
- Counting rate 4) max. 500 copies
- Object speed max. 4m/s for 0.1mm edge height, max. 10m/s for ≥ 0.4mm edge height
- Object sequence distances (overlap flow) > 2mm
- Pulse width adjustment 1 … 1023ms, adjustable with 270° potentiometer
- Dynamic pulse adaptation 12.5 … 50%
- Delay before start-up ≤ 1.2s

Electrical data
- Operating voltage U_B 12 … 30VDC (incl. residual ripple)
- Residual ripple ≤ 15% of U_B
- Open-circuit current ≤ 100mA
- Switching output pin 4: PNP, activated when edge detected
- Signal voltage high/low ≥ (U_B-2V)/≤ 2V
- Output current max. 30mA
- Sensitivity adjustable, 270° potentiometer

Indicators
- Green LED POWER ready
- Yellow LED EDGE edge detected internally
- LED yellow STATUS off/flashing calibration process in progress/standby mode
- LED yellow DPA dynamic pulse adaptation activated

Mechanical data
- Housing aluminum
- Color black anodized
- Optics cover glass
- Fastening dovetail or 2 M6 screws in place of the profile strip
- Weight 690g
- Connection type 5-pin M12 connector

Environmental data
- Ambient temp. (operation/storage) -5°C … +55°C / -30°C … +70°C
- Protective circuit 1) 1, 2, 3
- VDE safety class III
- Protection class IP 54
- Laser class 2 (in accordance with EN 60825-1)
- Standards applied IEC 60947-5-2

1) For objects with a luminosity coefficient of 18 … 90%
2) Average value
3) Typical value
4) Dependent upon edge height, color and surface structure of the object to be detected.
5) 1=transient protection, 2=polarity reversal protection, 3= short-circuit protection for transistor output

Attention!
It is imperative that the safety notices in section 8 are observed

Order guide

<table>
<thead>
<tr>
<th>Designation</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser edge detector</td>
<td>OPSL 775/4-150-S12</td>
</tr>
</tbody>
</table>

Remarks

- Function characteristics:
The OPSL 775 edge detector is an optoelectronic sensor for the contactless detection of object edges.

- Approved purpose:
This product may only be used by qualified personnel and must only be used for the approved purpose. This sensor is not a safety sensor and is not to be used for the protection of persons.
1 General
The OPSL 775 edge detector is especially suited for the counting of products being transported in layers on conveyor belts or transport systems (overlap flow).

Attention!
It is imperative that the safety notices in section 8 are observed

It is possible with the OPSL 775 to detect edges being conveyed within a range of 5 to 150 mm, as measured from the underside of the device. The sensitivity range is dependent on the working distance. By focussing the laser beam to a distance of 100mm, detection of the smallest possible edge height of 0.1mm is only possible within the focus range of 100mm ± 10mm.

If an edge is detected using the respective settings, the device generates a pulse at the switching output (pin 4). The settings remain stored in such a way that they are protected against power interruption.

It is possible during the detection of edges that one and the same object is detected several times over. Commonly known as multiple pulses, these can occur with a single object when, for example, print copies are being conveyed with the open edge and not the "spine edge" leading. Likewise, interference caused by multiple pulses is to be anticipated for edges with discrepancies in lettering or color or differences in reflection, but also for the individual pages of a bound printed copy. By selecting an appropriate setting, these multiple pulses are selectively suppressed and the object can be correctly detected (see section 4).

2 Function buttons and indicators
Four LEDs serve as operational indicators and specify the current status of the device. Two potentiometers accessible from the outside, as well as two control buttons, have been provided for operation, for example for adjustment and calibration during installation.

Fig. 1: OPSL 775 - Device overview
2.1 Operation indicators

The operation indicators serve as a function check during operation, as well as for the calibration and adjustment process. The following information is displayed:

<table>
<thead>
<tr>
<th>Designation</th>
<th>Color of LED</th>
<th>Illuminated</th>
<th>Dark</th>
<th>Flashing</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER</td>
<td>Green</td>
<td>Device in operation</td>
<td>Device not in operation</td>
<td>–</td>
</tr>
<tr>
<td>EDGE</td>
<td>Yellow</td>
<td>Shows that an edge has been detected by the device. <strong>Caution!</strong> Does not correspond with the output pulse!</td>
<td>No edge detected</td>
<td>–</td>
</tr>
<tr>
<td>STATUS ¹)</td>
<td>Yellow</td>
<td>Output signal (pulse)</td>
<td>Calibration process in progress</td>
<td>Ready (standby)</td>
</tr>
<tr>
<td>DPA</td>
<td>Yellow</td>
<td>Dynamic pulse adaptation active</td>
<td>Fixed pulse active</td>
<td>–</td>
</tr>
</tbody>
</table>

¹) This indicator has three functions:
1. During installation, the device is calibrated to a specified working distance. The indicator is extinguished during the calibration process.
2. The indicator is active (illuminated) while an output pulse is being generated.
3. If no output pulse is generated within 1s, the device switches to standby mode. This is signalled by a flashing LED.

Table 1

2.2 Operational controls

Fig. 2: OPSL 775 - operational controls

**Potentiometer for output pulse width**

This potentiometer allows the output pulse width to be modified in stages, whereby turning to the left / right effects an increase / decrease of the output pulse width (left limit stop: Maximum pulse width = 1023ms or right limit stop: Minimum pulse width = 1ms). If the **dynamic pulse adaptation (DPA)** function is activated, the function of the potentiometer changes. See sections 4.3 and 4.5 for details regarding setting of the potentiometer.

**Sensitivity potentiometer (Sens)**

This potentiometer allows adjustment of detection sensitivity. To increase / reduce sensitivity, turn the potentiometer to the left or right accordingly. See section 4.3 for details.

**Control button for calibrating the working distance (CAL)**

Once mounted, the device must be calibrated to the specified maximum working distance. Push this button once to initiate the automatic calibration process. See section 4.1 for details.

**Control button for dynamic pulse adaptation (DPA)**

Pressing this button will activate / deactivate the dynamic pulse adaptation DPA (see section 4.4). The **DPA active** LED indicates that the DPA program is active when it remains illuminated.
3 Installation / alignment

3.1 General
In order that optimum functioning of the device can be guaranteed, the following points must be observed during installation:

1. The OPSL 775 must be installed in such a manner that vibrations are completely eliminated, otherwise there is a risk of counting errors occurring.
2. Observe the permissible ambient temperature!
3. Avoid direct sunlight on the cover glass.
4. As a safeguard against hazards to persons, the laser beam should not be pointed at reflective surfaces in the case of an uninterrupted overlap flow, as this may deflect the laser beam in an undefined direction (see section 8).

3.2 Mounting

Working distance and direction of overlap flow

Fig. 3: OPSL 775 - Working ranges
3.3 Direction of overlap flow and direction of overlap

The device will only be capable of counting the overlap flow correctly if it passes the laser beam going in the opposite direction (see fig. 4 left).

Notice!
The correct direction of overlap is stamped onto the front side of the device.

The OPSL 775 only counts those edges which are pointing in the conveying direction. Thus, in the case of an uninterrupted overlap flow, the last copy is counted only once as the "falling edge" is not detected.

3.4 Alignment

It should be ensured during installation of the device that the overlap flow passes parallel to the basic unit, or to its underside (see fig. 5 left).

Notice!
Rear edges are not counted!

Fig. 4: OPSL 775 - Overlap flow and direction of overlap

Fig. 5: OPSL 775 - Correct alignment
4 Commissioning

As it is relatively difficult to check the apparent optimum settings for influence or effectiveness with regard to the respective intended use, it is recommended that all setting procedures are performed with a defined reference sample. Furthermore, we recommend the utilization of an oscilloscope to facilitate convenient visualization of the progress of the "Edge detected" output signal (pin 4) in relation to the reference sample.

4.1 Calibrating the working distance

Following installation/mounting, the device must be calibrated to the specified working distance. The actual calibration is performed automatically. A sheet of white paper is used as a reference surface.

**The following steps are to be performed for calibration:**

1. Set the Sens potentiometer for sensitivity to the middle position.
2. Place a sheet of white paper flat underneath the device so that the laser beam is directed onto it.
3. Press the CAL calibration button briefly once (> 50ms).
   - The status display is extinguished momentarily for the duration of the calibration procedure.

Calibration is concluded and it should now be possible to count the edges in the overlap flow with a constant working distance. Under certain circumstances, the calibration procedure may have to be repeated. In the event that no edges can be detected, please refer to the procedure for setting the OPSL 775 in section 5.

4.2 General

There are three possibilities for optimum adaptation of the device for the specified counting tasks:

1. **Setting the sensitivity** allows detection or suppression of small or less distinct edges.
2. A program is available which can be selected to perform a **dynamic adaptation of the output pulse width** automatically in correlation with the sequential speed of the edges (recommended operating mode).
3. The device also offers the possibility of **setting the desired output pulse width manually**. This function is particularly suited for more difficult application conditions as a blockage time for the suppression of faulty pulses can be set simultaneously with a fixed output pulse width independent of the sequential speed of the edges.

4.3 Adjusting sensitivity (Sens potentiometer)

If the edges can not be detected correctly using the presetting specified in section 4.1, it is possible to increase the detection rate by adapting the sensitivity. Adjustment is performed using the Sens (sensitivity) potentiometer. Rotation to the left or right effects an increase/reduction of the sensitivity.

Medium sensitivity is wholly adequate for newspapers, magazines or similar objects. For extremely small edges or high sequential speeds of edges, detection accuracy can be improved by increasing the sensitivity. Structured edges can lead to counting errors. These counting errors can be avoided by reducing the sensitivity.

![Potentiometer position:](image)

**Fig. 6: OPSL 775 - Setting sensitivity**
4.4 Dynamic pulse adaptation (DPA program)

The dynamic pulse adaptation has already been activated at the factory and is signaled via the DPA LED. Actuate the DPA button for > 50ms in standby mode to deactivate the program; the DPA LED extinguishes. Pressing the button again will return you to your original position.

Dynamic pulse adaptation is only suitable for relatively regular edge distances (example: printing of newspapers). The program adapts the output pulse width permanently to the period directly following the object. The distance of the individual objects thus corresponds to 100%. An output pulse corresponding to 50%, 25% or 12.5% of the period following the object is generated in correlation with the setting of the pulse width (\(\mathcal{V}\)) potentiometer (see fig. 7).

**Attention!**

The output pulse width can only be set to one of three stages: Maximum – Intermediate position – Minimum.

If edges are recorded at extremely short distance and with high speed, it is possible that two edges are detected as a single pulse and thus only counted as a single edge. In this case, counting reliability can be enhanced by reducing the output pulse width. For blunt or rounded edges, counting accuracy is increased by extending the output pulse width.

**Notice!**

Since the minimum output width pulse is 1 ms, the output pulse width can not be reduced any further for the detection of edges with high speed, meaning the output width pulse is a constant 1 ms, regardless of the position of the potentiometer.

![Fig. 7: OPSL 775 - Effect of dynamic pulse adaptation](image)

<table>
<thead>
<tr>
<th>Position</th>
<th>Designation</th>
<th>Output pulse width (T) [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>max</td>
<td>50</td>
</tr>
<tr>
<td>Intermediate position</td>
<td>--</td>
<td>25</td>
</tr>
<tr>
<td>Minimum</td>
<td>min</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Table 2

4.5 Setting the output pulse width (\(\mathcal{V}\)) - Fixed pulse active (without DPA)

As already described in section 4.4, it is possible that counting can become impaired when edges are detected with very short distances from each other and with high speed. In this case, counting reliability can be improved by reducing the output pulse width. With blunt or rounded edges, counting accuracy is enhanced by extending the output pulse width. Output pulse width \(T\) can be set using the pulse width (\(\mathcal{V}\)) potentiometer. Rotating to the left or to the right effects an increase or reduction of the output signal pulse width.

**Attention!**

It must be ensured that the output pulse width is not greater than the period following the edge! We recommend using the dynamic pulse adaptation DPA wherever possible.

![Fig. 8: OPSL 775 - Output pulse with fixed pulse time](image)
Switching between range modes

If the entire adjustment range of 1 ... 1023 ms is not required, a maximum adjustment range can be defined by one of three different modes using an additional function (see table 3).

Table 3

<table>
<thead>
<tr>
<th>Range mode</th>
<th>Adjustment range [ms]</th>
<th>STATUS 1) LED</th>
<th>DPA active 1) LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 2)</td>
<td>1 ... 1023</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>1</td>
<td>1 ... 255</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>2</td>
<td>1 ... 63</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>3</td>
<td>1 ... 15</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

1) The LED indicator is only valid for the changeover procedure when changing the range mode!
2) Factory setting

The following procedure (fig. 9) must be initiated to set another range mode.

**Attention!**

If no button is actuated within 8s of calling up the function, the respective function is canceled and no change is initiated. The system is automatically restarted.

A customized resolution over 4 adjustment ranges is thus yielded.

Fig. 9: OPSL 775 - Procedure for switching over the range mode
5 Recommended procedure for setting the OPSL 775

Start

**Sens** potentiometer in intermediate position

Perform calibration

Edge detection possible?

---

**NO**

Repeat calibration with **Sens** potentiometer displaced from intermediate position

---

**YES**

Adjust **Sens** potentiometer to the left: +; right: –

Edge detection possible?

---

**NO**

---

**YES**

Counting result correct?

---

**NO**

---

**YES**

Adjust **pulse width** potentiometer to the left: +; right: –

Counting result correct?

---

**NO**

---

**YES**

Run through setting range completely?

---

**NO**

---

**YES**

Deactivate **DPA** and set pulse width manually

Run through setting range completely?

---

**NO**

---

**YES**

End

Fig. 10: OPSL 775 - Setting procedure
6 Diagnosis in the event of an error

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible cause</th>
<th>Remedial measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER LED does not light up green</td>
<td>No input voltage</td>
<td>Check voltage supply</td>
</tr>
<tr>
<td>No edge detection possible (EDGE LED not illuminated)</td>
<td>Working distance too great</td>
<td>Check working distance and adapt as necessary (section 3.2)</td>
</tr>
<tr>
<td></td>
<td>No calibration performed</td>
<td>Perform calibration procedure (section 4.1)</td>
</tr>
<tr>
<td></td>
<td>Sensitivity not ideal</td>
<td>Perform setting procedure (sections 4.3 or 5)</td>
</tr>
<tr>
<td></td>
<td>Direction of overlap flow/direction of movement incorrect</td>
<td>Check settings (section 3.3)</td>
</tr>
<tr>
<td></td>
<td>Object to be counted not suitable</td>
<td>Test with reference (section 3)</td>
</tr>
<tr>
<td></td>
<td>No laser beam (Caution! Refer to the safety notices in section 8!)</td>
<td>Notify the manufacturer</td>
</tr>
<tr>
<td>Edge counting faulty</td>
<td>Sensitivity/calibration not ideal, influence of ambient light</td>
<td>Readjust sensitivity (sections 4.3 or 5) / repeat calibration procedure (section 4.1)</td>
</tr>
<tr>
<td></td>
<td>Error due to multiple pulses</td>
<td>Check pulse width adjustment and readjust / run DPA program (recommended) as necessary</td>
</tr>
<tr>
<td></td>
<td>Objects to be counted not ideal</td>
<td>Test with reference</td>
</tr>
<tr>
<td></td>
<td>Sequential speed of edges outside of specification</td>
<td>Check period following object, perform a test at low speed</td>
</tr>
<tr>
<td>The output pulse width can only be adjusted in minimum range</td>
<td>Incorrect range mode set</td>
<td>Switch mode over to desired range (section 4.5)</td>
</tr>
<tr>
<td>No output pulse, although EDGE LED is detecting an edge</td>
<td>Contact problem</td>
<td>Check connection cable</td>
</tr>
</tbody>
</table>

Table 4

Notice!
Faulty results due to changes within the overlap flow with regard to color change, surface structure and edge shape of the objects to be counted or the distance of the objects from the detector may necessitate renewed calibration and resetting of the device to the new conditions, and do not necessarily relate directly to malfunctioning of the device.

7 Cleaning and storage

A damp cloth can be used for cleaning of the device housing.

Attention!
The optics cover (laser beam emission) on the underside of the device may only be cleaned with a non-scratch cloth specially designed for cleaning lenses (micro-fiber cloth)!

Store in a clean, temperature-regulated and dry place!
8 Safety notices

Beware of laser radiation!

The OPSL 775 edge detector operates with a class 2 red light laser in accordance with EN 60825-1.
The retina may sustain damage if the laser beam is observed for lengthy periods!
Never look directly into the laser beam! Never point the laser beam of the OPSL 775 at other people!
Beware of reflections of the laser beam from reflective surfaces during mounting and alignment of the
OPSL 775!

If any operating and adjustment devices other than those prescribed in the technical documentation are used,
or if other procedures are performed, or if the optical laser edge detector is used for any purpose other than
that for which it is intended, there is a high risk of dangerous exposure to radiation!

The utilization of optical instruments or devices together with the device increases the risk of damage to the
eyes!

Observe the valid legal and local laser protection requirements as stipulated within the most recent edition of
EN 60825-1.

Notice!

Affix the laser beam emission symbol included within delivery of the device to a point on the mounting location where
it can be clearly seen!

In the event of any doubt whatsoever, contact the respective person responsible for laser safety.