OPSL 775

Laser edge detector

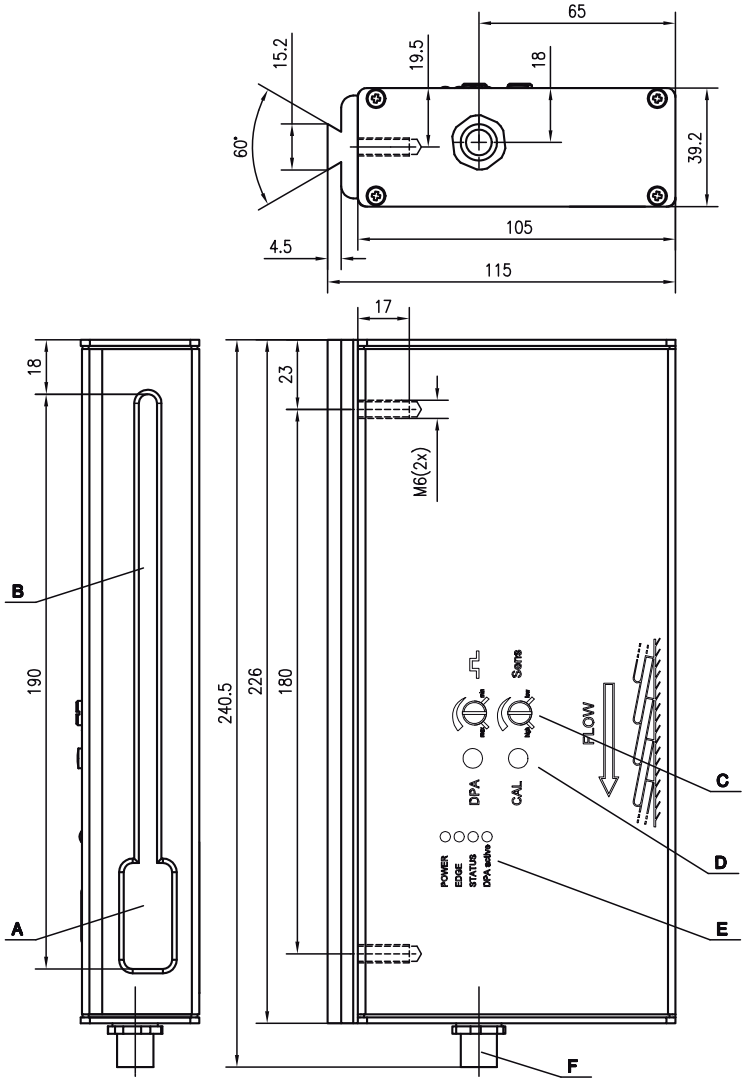
en 02-2011/06 50103772

5 … 150 mm

12 - 30 V DC

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

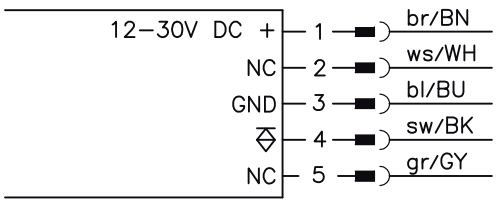
Dimensioned drawing



A Transmitter
B Receiver
C Potentiometer
D Control buttons
E Indicator diodes
F M12 connector, 5-pin

Electrical connection

Plug connection, 5-pin



Accessories:

(available separately)

- Cables with M12 connector (K-D …)
- Mounting systems

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)
Output power [2]	< 1mW
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	…/4…	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
Yellow LED STATUS	output pulse edge
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 [5]	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.
The maximum value for 500 copies applies for an edge height of > 0.4mm only.
5) 1=transient protection, 2=polarity reversal protection, 3= short-circuit protection for transistor output

Attention!

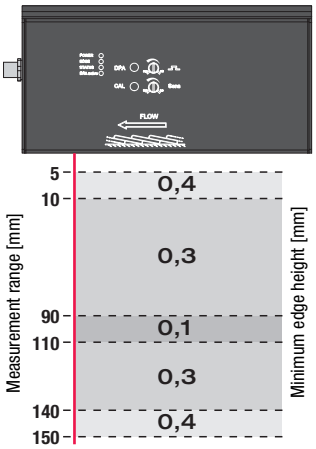
It is imperative that the safety notices in section 8 are observed

Order guide

	Designation	Part No.
Laser edge detector	OPSL 775/4-150-S12	50115063

Tables

Diagrams



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.

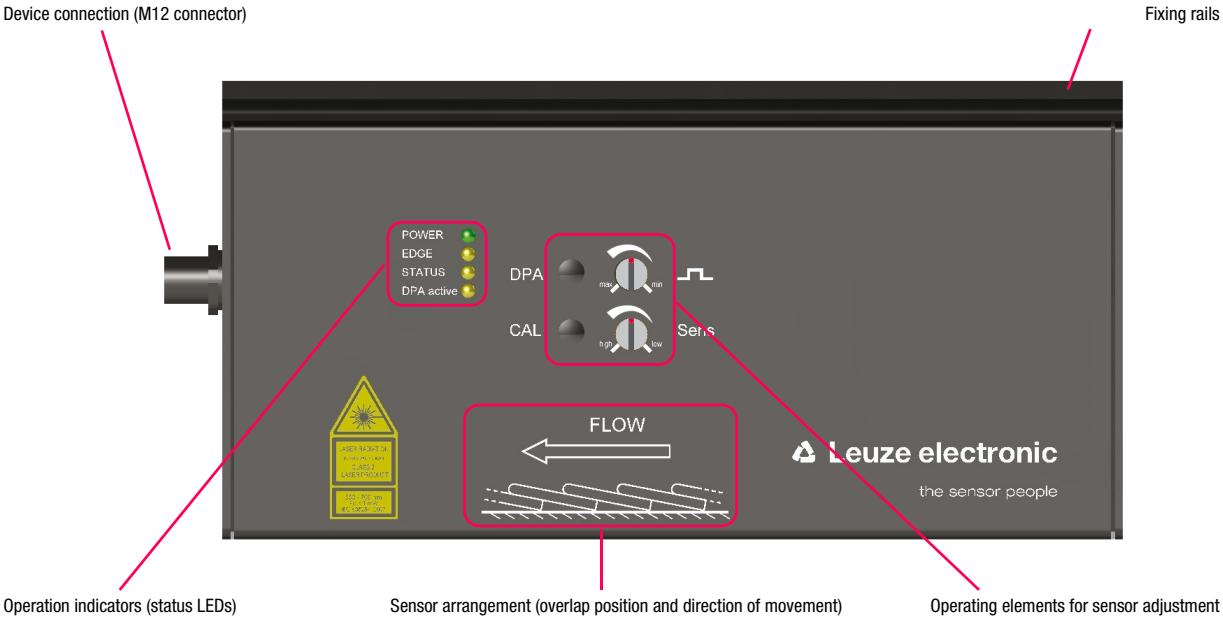


Fig. 1: OPSL 775 - Device overview

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:

Designation	Color of LED	Illuminated	Dark	Flashing
POWER	Green	Device in operation	Device not in operation	–
EDGE	Yellow	Shows that an edge has been detected by the device. **Caution!** Does not correspond with the output pulse!	No edge detected	–
STATUS [1)]	Yellow	Output signal (pulse)	Calibration process in progress	Ready (standby)
DPA	Yellow	Dynamic pulse adaptation active	Fixed pulse active	–

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 signaled by a flashing LED.

Table 1

2.2 Operational controls

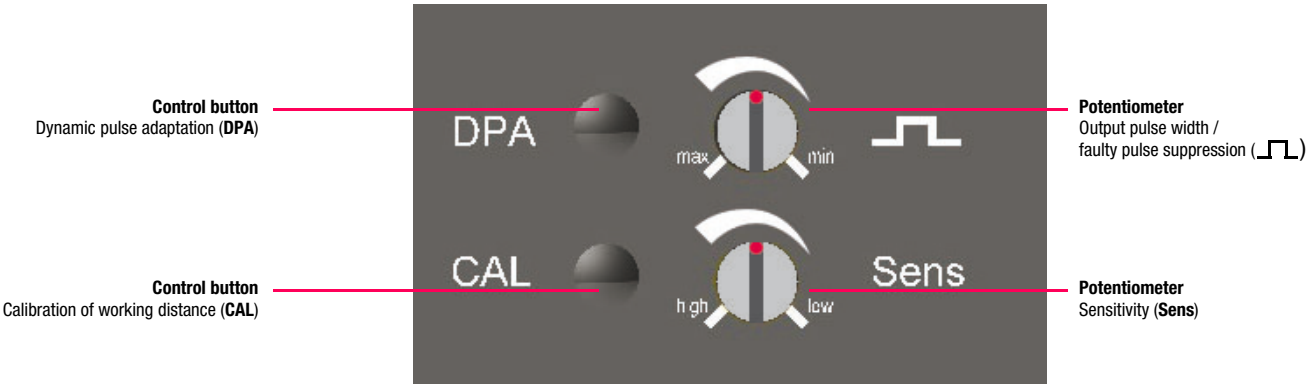


Fig. 2: OPSL 775 - operational controls

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

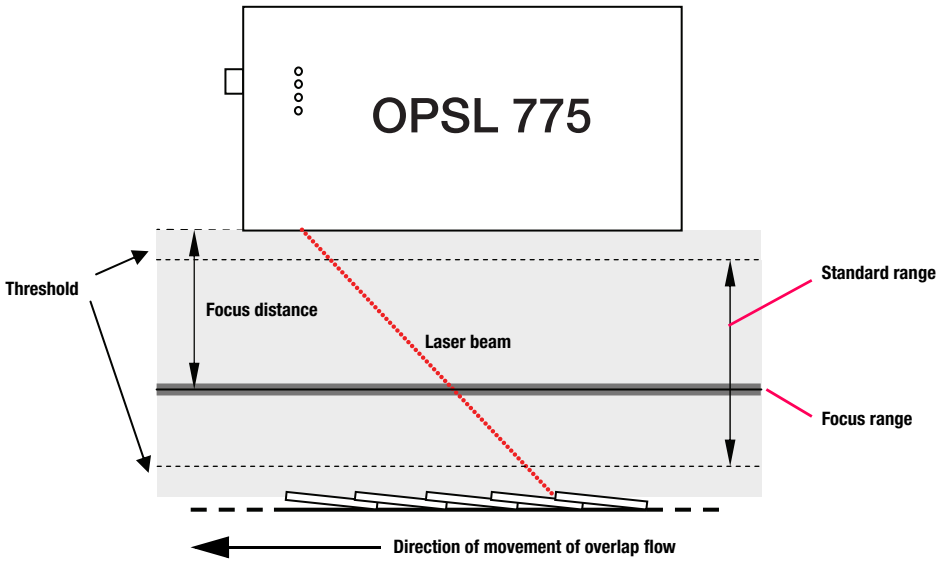


Fig. 3: OPSL 775 - Working ranges

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.

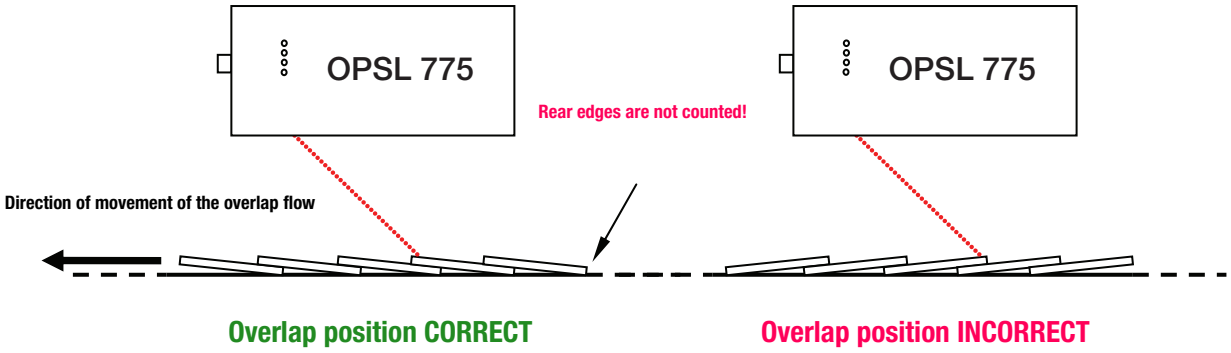


Fig. 4: OPSL 775 - Overlap flow and direction of overlap

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).

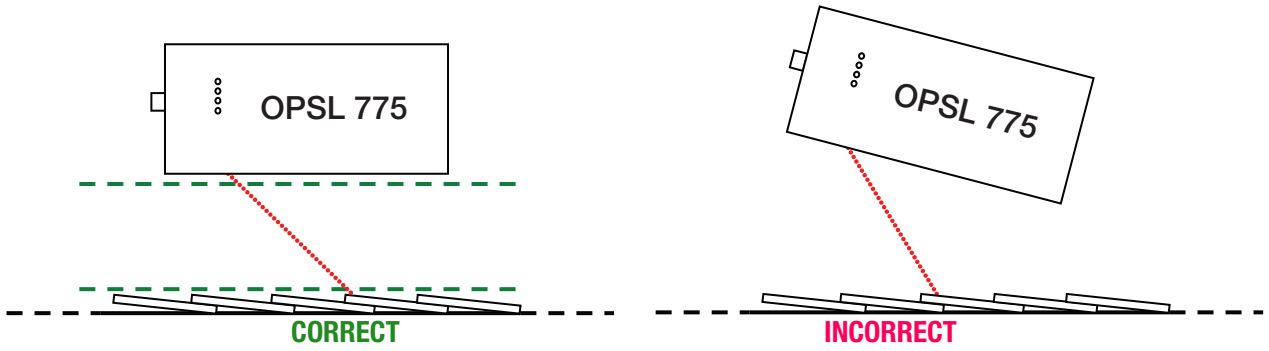


Fig. 5: OPSL 775 - Correct alignment

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 (> 50 ms).
   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

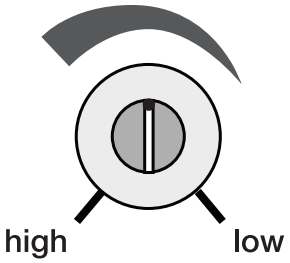
There are three possibilities for optimum adaptation of the device for the specified counting tasks:

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:

High: High sensitivity
Medium: Medium sensitivity
Low: Low sensitivity

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

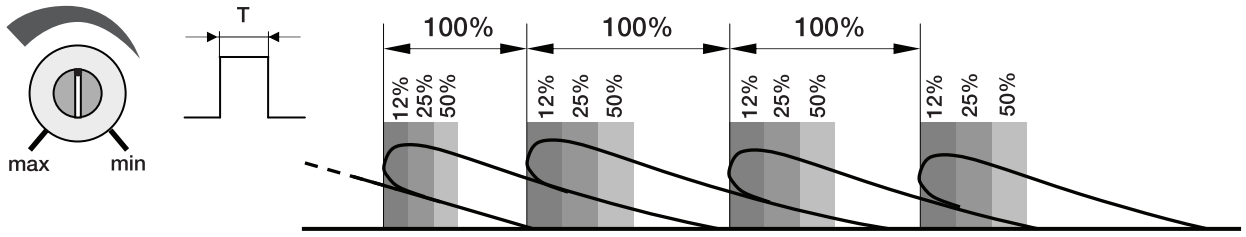


Fig. 7: OPSL 775 - Effect of dynamic pulse adaptation

Position	Designation	Output pulse width T [%]
Maximum	max	50
Intermediate position	--	25
Minimum	min	12.5

Table 2

4.5 Setting the output pulse width (⎍) - 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** (⎍) 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.

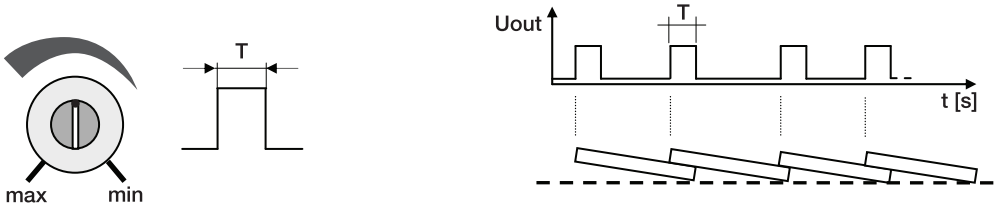


Fig. 8: OPSL 775 - Output pulse with fixed pulse time

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).

Range mode	Adjustment range [ms]	STATUS 1) LED	DPA active 1) LED
0 2)	1 … 1023	○	○
1	1 … 255	○	●
2	1 … 63	●	○
3	1 … 15	●	●

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

Table 3

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

Attention!

If no button is actuated within 8 s 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.

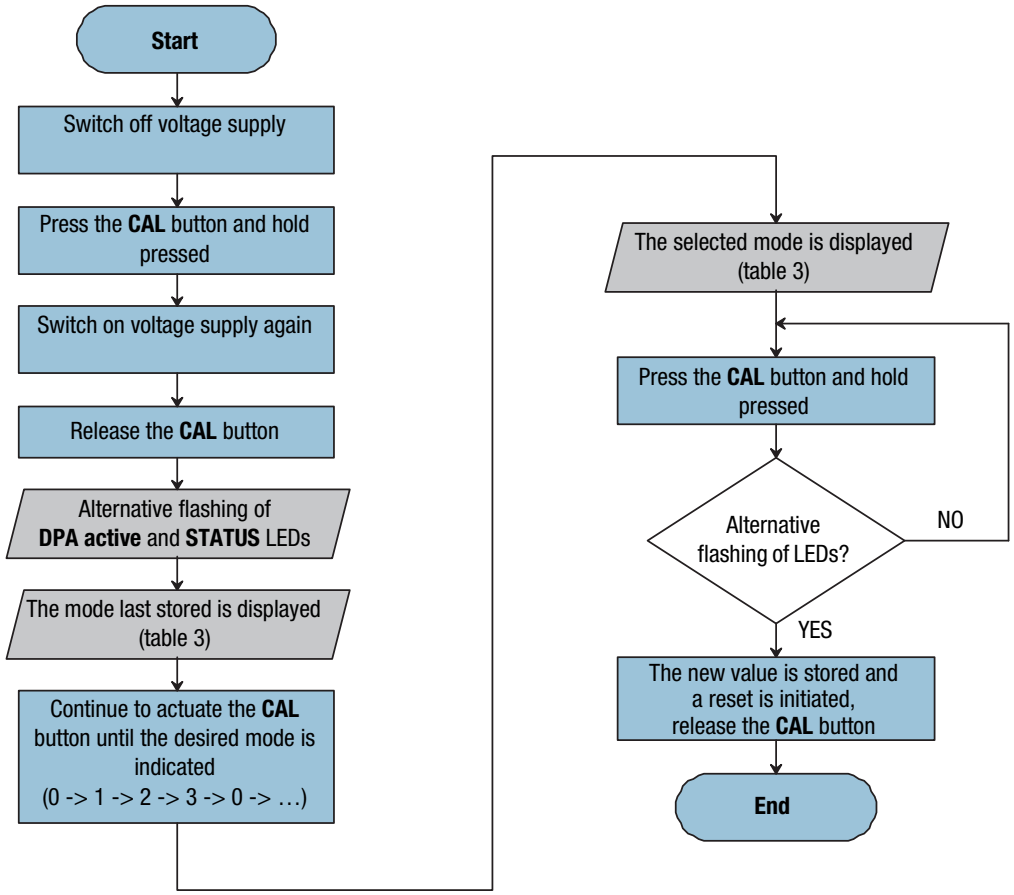


Fig. 9: OPSL 775 - Procedure for switching over the range mode

5 Recommended procedure for setting the OPSL 775

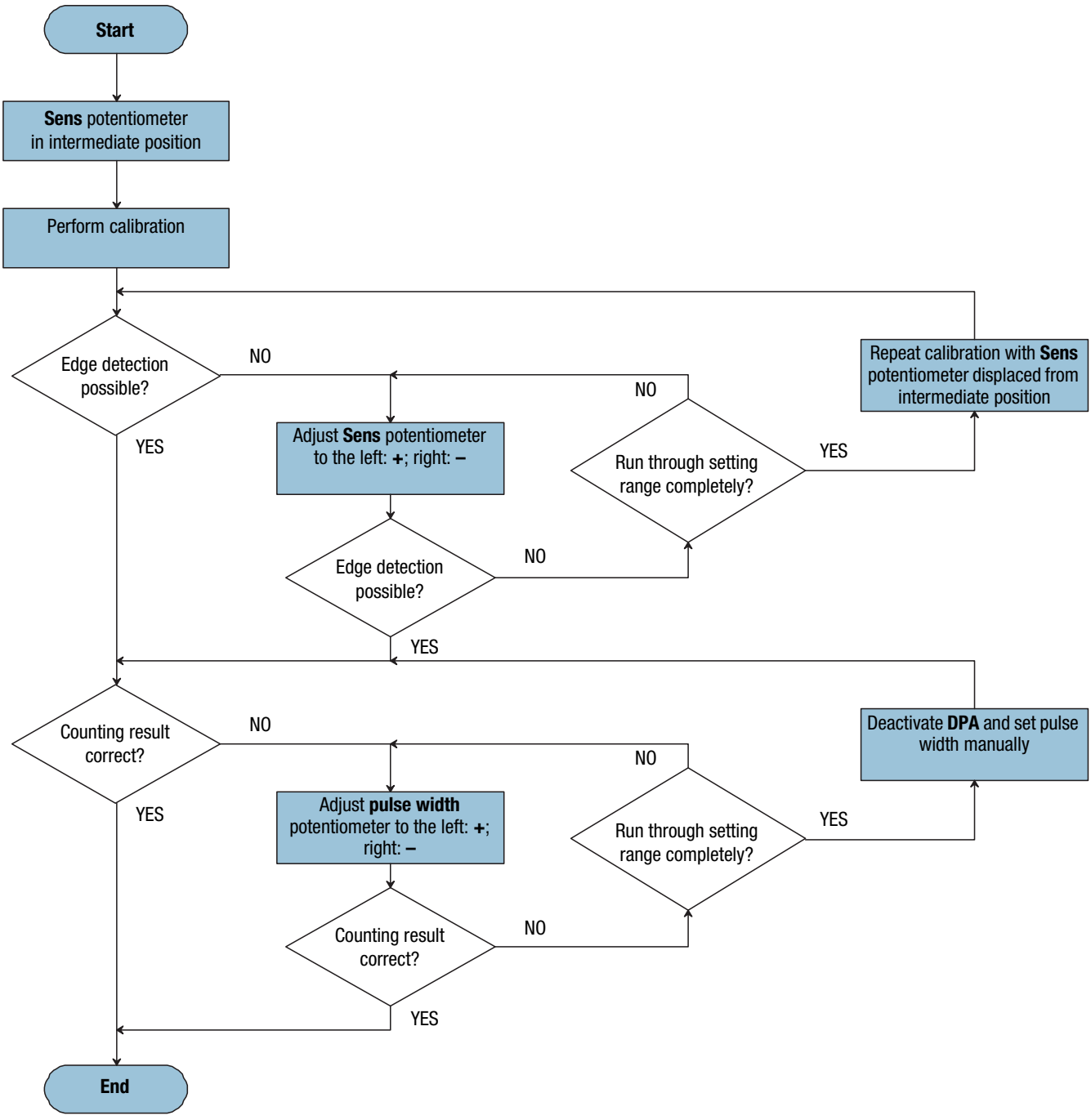


Fig. 10: OPSL 775 - Setting procedure

6 Diagnosis in the event of an error

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

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.