Optical Distance Sensors
ODSL 8 / ODSL 30 / ODS 96

Technical description / Software description

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Product names are used without warranty of unrestricted applicability.
Changes reflecting technical improvements may be made

1 General Information

1.1 Explanation of symbols

The symbols used in this technical description are explained below.

Attention

Pay attention to passages marked with this symbol. Failure to heed this information may lead to injuries to personnel or damage to the equipment.

Attention Laser Radiation

This symbol warns of possible danger through hazardous laser radiation.

Notice

This symbol indicates text passages containing important information.

1.2 Important Terms

Triangulation

Distance measuring procedure, which determines the distance of an object by the incidence angle of the light reflected from the object.

Absolute measurement accuracy

Shows the possible divergence of the measurement value from the anticipated value through changes in the environmental conditions during the measuring process. Higher accuracy is given at constant environmental conditions.

Repeatability

Measuring distance change with repeated measurement at the same output signal (observe the same peripheral conditions as with resolution).

Resolution

The smallest possible distance change of the measured object, which causes a definite change in the output signal. Resolution is higher in the short range than in the distant range. Small objects can be recognised better in the short range.

Reference measurement

Device function of the ODSL 30… for the compensation of a possible temperature drift. A reference measurement should be carried out before each exact measurement. The reference measurement is activated via a separate device input and is automatically carried out once after the device is switched on.

Diffuse reflection

Return and/or degree of reflection of the radiated light.

Integration time

The integration time of the ODS is comparable to the exposure time in a camera. It is automatically adjusted to the intensity of the reflected light and thus depends on the reflectance factor of the measured object. It is inversely proportional to the measurement frequency.

Measurement frequency

The measurement frequency represents the number of measurements per second. When adjusting the integration time to the reflectivity independency, the measurement frequency changes corresponding to the reflectivity value.

Response time

The time period required by the ODS to obtain stable measurements after change of the reflectivity behaviour.

Delay before start-up

The delay before start-up indicates the point in time when the first valid measurement can be obtained after switching on.

Light switching / Dark switching

Indicates the behaviour of the switching output when an object is inside the taught/ parametered switching distance. At light switching, the switching output is active (high), at dark switching inactive.

Insensitivity towards extraneous light

Indicates the insensitivity of the measurement result towards extraneous light. The ODS is reliably measuring even with extraneous light intensity of 5 kLux. Typical light intensity in a work place is only 1 kLux.

1.3 Declaration of Conformity

The optical distance sensors of the series ODSL 8, ODSL 30 and ODS 96 have been manufactured observing current European standards and guidelines.

Notice

The corresponding declaration of conformity can be requested from the manufacturer.

The manufacturer of the product, Leuze electronic GmbH + Co KG in D-73277 Owen/Teck, possesses a certified quality assurance system in accordance with ISO 9001.

CE

2 Safety Notices

2.1 Safety Standards

The optical distance sensors of the series ODSL 8, ODSL 30 and ODS 96 have been developed, manufactured and tested, observing current safety standards. They correspond to the state of the art.

2.2 Intended Use

Attention

The protection of personnel and the device cannot be guaranteed if the device is operated in a manner not corresponding to its intended use.

Optical distance sensors of the series ODS are intelligent, adjustable sensors with CCD element for distance measuring.

In particular, unauthorised use includes:

- rooms with explosive atmospheres (zones 0, 1, 20, 21).
- operation for medical purposes

Notice

For Ex zones 2 and 22, a device of the device category 3 or ignition protection type nA may be used (ask us).

Areas of application

The optical distance sensors of the series ODS have been designed for the following areas of application:

- Distance measurement
- Contour determination
- Stack positioning
- Filling level measurement
- Packet conveying machines and many more

2.3 Working Safely

Attention Laser Radiation!

The optical distance sensors ODSL 8, ODSL 30 and ODS 96 operate with a red light laser of class 2 acc. to EN 60825-1 (2001/11). If you look into the beam path over a longer time period, the retina of your eye may be damaged!

Never look directly into the beam path!

Do not point the laser beam of the ODS(L) at persons!

When mounting and aligning the ODS(L), take care to avoid reflections of the laser beam off reflective surfaces!

The use of operating and adjusting devices other than those specified in this technical description, carrying out of differing procedures, or improper use of the optical laser distance sensor may lead to dangerous exposure to radiation!

The use of optical instruments or devices in combination with the device increases the danger of eye damage!

Adhere to the applicable legal and local regulations regarding protection from laser beams acc. to EN 60825-1 in its latest version.

The ODSL 8 uses a laser diode with low power in the visible red light range with an emitted wavelength of about 650 nm. The ODSL 30 uses a laser diode with low power in the visible red light range with an emitted wavelength of about 655 nm. The ODS 96 uses a laser diode with low power in the visible red light range with an emitted wavelength of about 670 nm.

The glass optics cover is the only opening through which the laser radiation can escape from the device. The housing of the ODS(L) is sealed and has no parts that need to be adjusted or maintained by the user. The device must not be tampered with and must not be changed in any way! The destruction of the seal voids the warranty!

Notice!

It is important that you attach the sticky labels supplied to the device (notice signs and laser emission symbol)! If the signs would be covered due to the installation situation of the ODS(L), attach them close to the ODS(L) such that reading the notices cannot lead to looking into the laser beam!

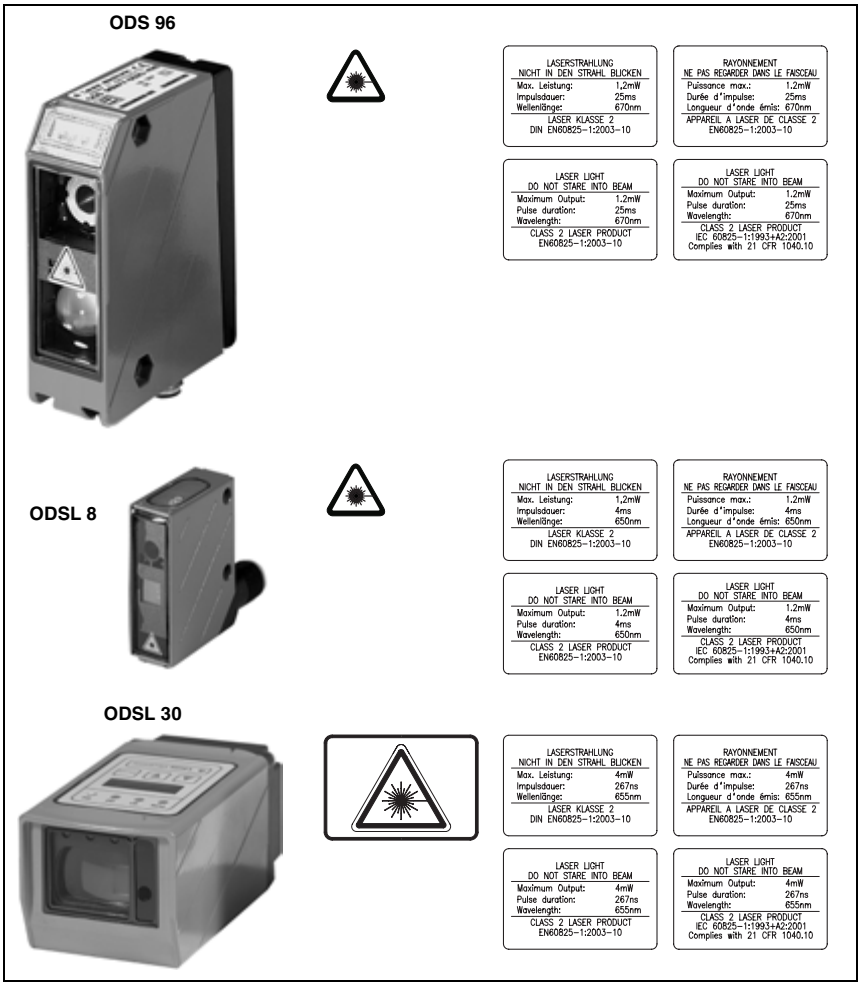


Figure 2.1: Stick-on label with warning notices

Attention

Access and changes to the device, except where expressly described in this operating manual, are not authorised.

2.3.1 ODSL 8 Laser Safety Notices for the United States and Canada

The optical distance sensors ODSL 8 fulfil the requirements of the safety standard IEC 60825-1:1993+A2:2001 for a class 2 product. They also fulfil the regulations in accordance with U.S. 21 CFR 1040.10 and 1040.11 for a Class II product with the exception of the deviations described in the document "Laser Notice No. 50", dated July 26th, 2001.

Radiated power

The ODSL 8 uses a laser diode with low power in the visible light range. The emitted wavelength is 650nm. The peak output power of the laser beam is 1.2mW. The radiated power observed at a distance of 20cm through an aperture of 7mm and averaged over a period of 1000s is less than 1mW acc. to the CDRH Class II specification.

Adjustment and maintenance

Do not attempt to carry out modifications or otherwise interfere with the device. The optical distance sensors contain no parts that need to be adjusted or maintained by the user.

The glass optics cover is the only opening through which the laser radiation can escape from the device.

Warning

The use of operating and adjusting devices other than those specified in this technical description, carrying out of differing procedures, or improper use of the optical laser distance sensor may lead to dangerous exposure to radiation!

The use of optical instruments or devices in combination with the device increases the danger of eye damage!

2.3.2 ODS 96 Laser Safety Notices for the United States and Canada

The optical distance sensors ODS 96 fulfil the requirements of the safety standard IEC 60825-1:1993+A2:2001 for a class 2 product. They also fulfil the regulations in accordance with U.S. 21 CFR 1040.10 and 1040.11 for a Class II product with the exception of the deviations described in the document "Laser Notice No. 50", dated July 26th, 2001.

Radiated power

The ODS 96 uses a laser diode with low power in the visible light range. The emitted wavelength is 670nm. The peak output power of the laser beam is 1.2mW. The radiated power observed at a distance of 20cm through an aperture of 7mm and averaged over a period of 1000s is less than 1mW acc. to the CDRH Class II specification.

Adjustment and maintenance

Do not attempt to carry out modifications or otherwise interfere with the device. The optical distance sensors contain no parts that need to be adjusted or maintained by the user.

The glass optics cover is the only opening through which the laser radiation can escape from the device.

Warning

The use of operating and adjusting devices other than those specified in this technical description, carrying out of differing procedures, or improper use of the optical laser distance sensor may lead to dangerous exposure to radiation!

The use of optical instruments or devices in combination with the device increases the danger of eye damage!

2.4 Organisational measures

Documentation

All entries in this operating manual must be heeded, in particular those in section 2.
Carefully store this technical description. It should be accessible at all times.

Safety regulations

Observe the locally applicable legal regulations and the rules of the employer's liability insurance association.

Qualified personnel

Mounting, commissioning and maintenance of the device must only be carried out by qualified personnel.
Electrical work must be carried out by a certified electrician.

Repair

Repairs must only be carried out by the manufacturer or an authorised representative.

3 Description ODSL 8

3.1 General description

The ODSL 8 is a distance measuring device with a large area of application. The equipment is available as laser version with analogue or digital outputs. The distance measuring device works on the triangulation principle and uses a CCD line for evaluating the measurement signal.

An integrated microcontroller in connection with the programming device UPG 5 enables parameter programming via an optional programming software. Even without software, the switching point of the switching output can easily be set via a teach input on all variants.

Through automatic adjustment of the integration time (exposure time) to the intensity of the objects' reflected light, a high degree of independence from the reflectivity properties of the measured object is achieved. In case of low reflectivity (dark objects) a lower measurement frequency results.

Accessories

To expand the functionality of the ODSL 8, a programming software is available.

With regard to their dimensions, the ODSL 8 distance sensors are identical with the sensors of the series 8 of Leuze electronic. Particularly, the mounting accessories of the series 8 can be used for the ODSL 8. Details can be found in section 4.

3.2 Typical Areas of Application for the ODSL 8

3.2.1 Continuous Distance Measurement

All ODSL 8 variants with analogue or digital output can be used for continuous distance measuring. In order to use all features of the ODSL 8, use of the programming software is recommended.

Depending on position or settings of the ODS, various applications are possible:

- Measuring the thickness of planks with two opposing sensors and a differential of the two measured values.
- Stack/Object height measuring.
  Even with difficult surfaces, the stack/ object height of moving objects can be measured. Averaging is recommended here.
- Contour determination through controlled passing movement of an object through the beam of the ODSL 8.
- Volume measuring by taking measurements on two levels during the concurrent movement of the object.
- Determination of the diameter, e.g., on paper rolls.

In case of ODSL 8 variants with analogue outputs, it is recommended to limit the working range of the analogue output to the required distance range. The analogue output will then be activated within the distance range from 1 … 10V or 4 … 20mA. Distances outside this range will automatically have an output voltage of < 1V, 4mA or > 10V, 20mA.

3.2.2 Positioning Tasks

For simple positioning tasks, all ODSL 8 variants with analogue output and two teachable switching outputs are suitable.

The ODSL 8 is mounted in a way to enable positioning in the direction of the measuring beam.

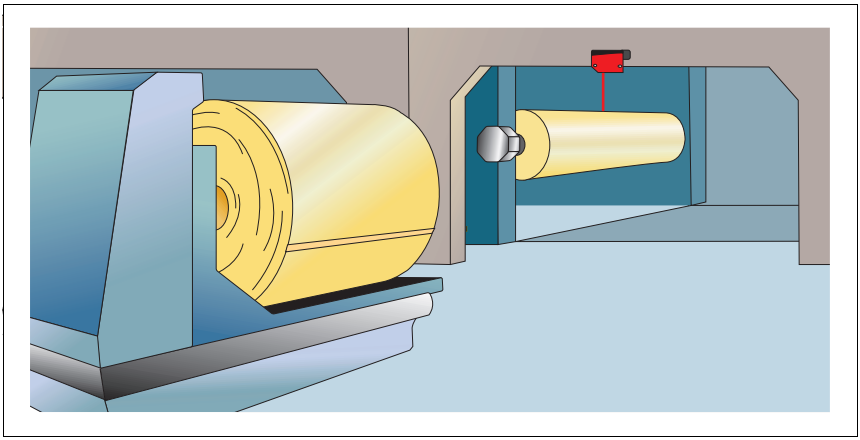


Figure 3.1: Application example "measurement of the roll diameter"

3.2.3 Filling Level Control for Bulk Goods

For the filling level control in connection with control of material flow, all ODSL 8 variants with one switching output are suitable. However, the programming software is required to adjust the hysteresis.

The ODSL 8 is mounted ensuring that its measuring beam meets the surface of the bulk good vertically. Using the software, the function of Q1 is set to "light switching" and the minimal filling level entered as lower limit. The upper limit is set to the maximum distance (400mm). The distance between minimum and maximum filling level is entered as hysteresis.

Material flow is switched on/off by the ODSL 8 as soon as the filling level falls below the lower limit or reaches the maximum.

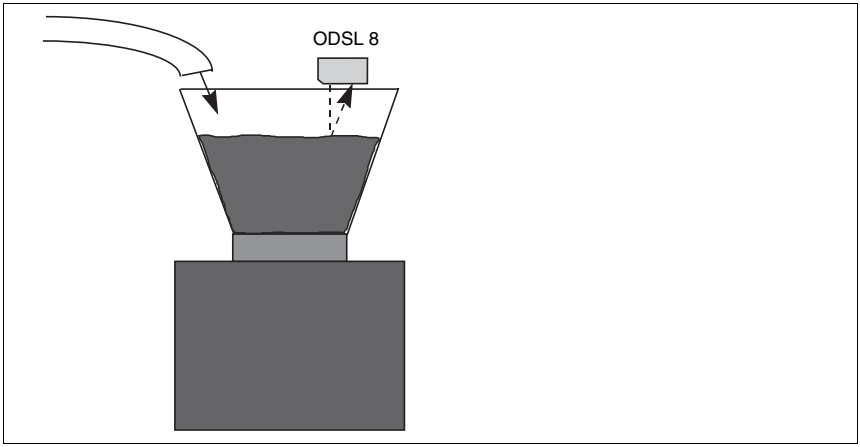


Figure 3.2: Application example "Filling Level Control"

Notice

For mounting instructions please refer to section 9.2.

3.3 ODSL 8 Variants

Variants

The ODSL 8 is available in four variants:

- as a **laser distance sensor** with **analogue output** (voltage or current)
  - measurement range between 25 … 45 mm, resolution 0.01 mm
  - measurement range between 20 … 400 mm, resolution 0.1 mm
- as a **laser distance sensor** with **digital output** (RS 232 or RS 485)
  - measurement range between 25 … 45 mm, resolution 0.01 mm
  - measurement range between 20 … 400 mm, resolution 0.1 mm

3.3.1 ODSL 8 with analogue output

Analogue output ODSL 8

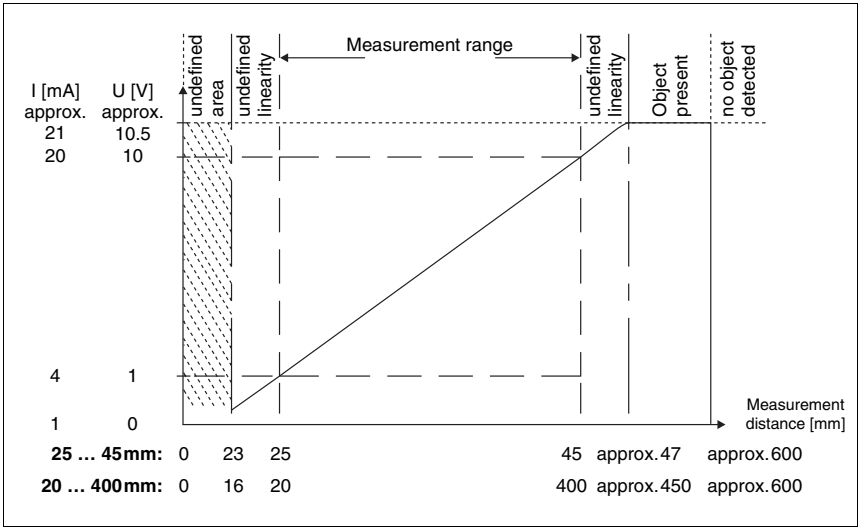


Figure 3.3: Behaviour of the analogue output ODSL 8

Behaviour of the output, ODSL 8

The ODSL 8 has an analogue output with linear behaviour inside the respective measurement range. The user can choose between current output (4 … 20 mA) and voltage output (1 … 10 V). Above and below the linear range, linearity is lost however, the output values signify an upper deviation (> 20 mA respectively > 10 V) or a lower deviation (< 4 mA respectively < 1 V) of the measurement range.

In addition, the ODSL 8 with analogue output also has two switching outputs. The position within the measuring range, at which the switching outputs are active can be set as needed via a teach-in lead.

Using the optional programming software, the declivity of the output characteristic curve can be changed (steep progression with concurrent reduction of the measurement range). Furthermore, the switching behaviour of the switching outputs can be individually set.

3.3.2 ODSL 8 with serial output

Serial output

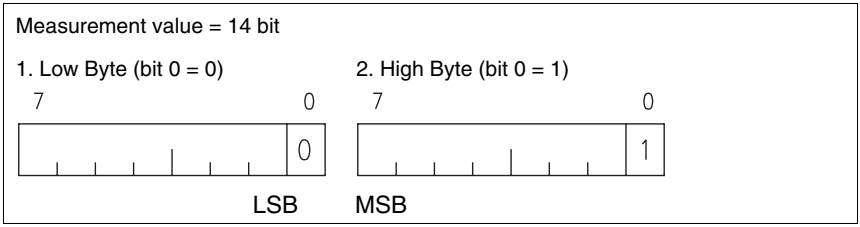


Figure 3.4: Serial output ODSL 8

The serial output of the ODSL 8 delivers a continuous data stream. The measurement value is transmitted with two byte. The LSB signifies the High- and the Low-Byte, to ensure recognition of definite coherence. For transmission, no telegram frame, but only the normal serial protocol is used. The transmission protocol consists of 8 databits, 1 startbit, 1 stopbit, no parity. The ODSL 8 has a digital output which is realised either through the RS 232 or the RS 485 interface. The transmission rate is 9600 baud at the RS 232 interface and 9600 baud without termination at the RS 485 interface.

A "C" program example demonstrates how bytes are read and processed for further usage:

Program example in "C"

```
//Start of the program for measurement value generation----------------------
    Rxbyte = inportb(RXB(COM2.port_adr));       //Read transmitted byte
    if (flag==0)                                //First byte has to be a
                                                //Low-Byte
    {
        if ((Rxbyte & 0x01) == 0)               //Test on Low-Byte
            {
            value = (Rxbyte & 0xFE) >> 1;       //Insert measurement value
                                                //point-aligned
            flag = 1;                           //Next received
                                                //byte has to be a
                                                //High-Byte
            }
    }
    else
    {
        if ((Rxbyte & 0x01) == 1) //Test on High-Byte
            {
            value|=((Rxbyte&0xFE) << 6);        //Insert point-aligned in
                                                //measurement value
            flag = 0;                           //14 bit measurement value
                                                //is generated
            measurement value = value;          //Save measurement value
            }
    }
// End of program of measurement value generation-------------------------
```

The ODSL 8 with digital output has one switching output. Its behaviour can be taught or set via the programming software, as described in section 9.3.

3.3.3 ODSL 8 with two switching outputs

Switching outputs ODSL 8/V…

The two switching outputs of the ODSL 8/V… are working independently from each other. Via the optional programming software, the switching ranges of the two outputs can be defined freely within the measurement range.

A common teach line is available for both switching outputs, meaning the switching outputs are taught alternatingly. The presently taught output is displayed through the simultaneous or alternating flashing of the LEDs (see section 9.3).

Generally, teaching always takes place towards the middle of the switching range (see remarks on page 82 and page 83).

4 Technical Data ODSL 8

4.1 Optical data

	ODSL 8/…-45-S12	ODSL 8/…-400-S12
Optical data		
Measurement range [1]	25 … 45mm	20 … 400mm
Resolution	≤ 0.01mm	≤ 0.1mm
Light source	laser (modulated light)	
Wavelength	650nm (visible red light)	
Light-spot diameter	divergent, 1x6mm at a distance of 400m	
Error limits [2]		
Absolute measurement accuracy [1]	± 0.5% of measurement value	± 1% up to 200mm ± 2% 200 … 400mm
Repeatability [3]	± 0.1% of measurement value	± 0.25% up to 200mm ± 1% 200 … 400mm
Linearity	0.5% at 90% white	
Timing		
Measurement frequency	200Hz (5ms measurement time)	
Response time	≤ 20ms	
Delay before start-up	≤ 300ms	

1) Reflectance factor 6% … 90%, over the whole temperature range, measured object ≥ 50 x 50mm²
2) After an operating time of 10min., the device has reached the operating temperature required for an optimal measurement.
3) Same object, measured object ≥ 50 x 50mm²

4.2 LED indicators

LED	ODSL 8	
	teach in on GND	**teach in on + U_B**
green permanent light	ready	
green flashing	error	Teach-in procedure[1]
green off	no voltage	
yellow permanent light	object within teach-in measurement distance (switching output 1 only)	
yellow flashing		Teach-in procedure[1]
yellow off	object outside teach-in measurement distance	

1) The teach-in process is described in detail in section 9.3

Notice

For the ODSL 8/V… (2 switching outputs), the continuous light of the yellow LED shows merely whether there is an object in the first measurement distance taught (switching output 1). The state of the second switching output is not displayed.

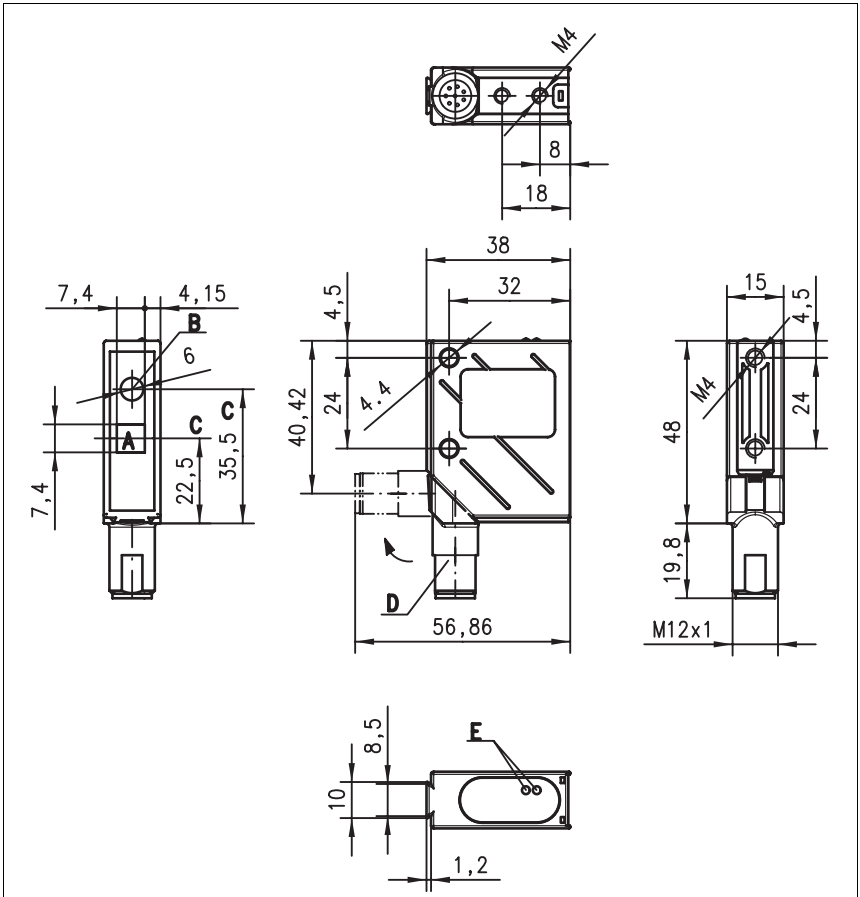
4.3 Electrical Data, Installation Data

	ODSL 8/V…	ODSL 8/D…
Electrical data		
Operating voltage U_B	18 … 30 VDC (incl. residual ripple)	10 … 30 VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B	
Bias current	≤ 50 mA	
Switching outputs [1]	2 PNP transistor outputs, high active	1 PNP transistor output, high active
Signal voltage high/low	≥ (U_B - 2V) / ≤ 2V	
Analogue output [2]	R_L ≥ 2 kOhm: voltage 1 … 10 V R_L ≤ 500 Ohm: current 4 … 20 mA	
Output current	max. 100 mA per transistor output	
Digital output RS 232		9600 Baud
Digital output RS 485		9600 Baud, no termination
Transmission protocol		2 byte transmission, constant data flow
Mechanical data		
Housing	metal	
Optics cover	glass	
Weight	70 g	
Connection type	M12 connector, 8-pin, turning	
Environmental data		
Ambient temp. (operation/storage)	-20 … +50 °C / -40 … +70 °C	
Extraneous light limit	≤ 10 kLux	
Protective circuit [3]	2, 3	
VDE safety class [4]	II, all-insulated	
Protection class	IP 67	
Standards applied	IEC 60947-5-2	

1) Inversion possible through programming software
2) Analogue voltage output is calibrated
3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
4) Rating voltage 250 VAC

4.4 Dimensioned and Connection Drawings

All ODSL 8 variants



A Transmitter
B Receiver
C Optical axis
D 90° turning connector
E LED yellow, green

Figure 4.1: Dimensioned drawing ODSL 8 variants

ODSL 8/V… (analogue output)

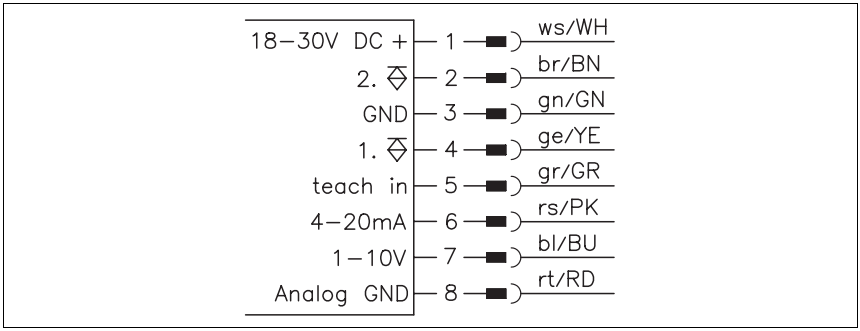


Figure 4.2: Electrical Connection ODSL 8 analogue

ODSL 8/D… (digital output)

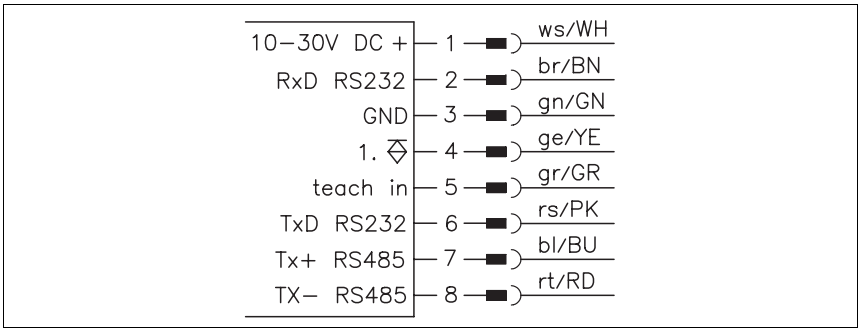


Figure 4.3: Electrical Connection ODSL 8 digital

4.5 Accessories

The following accessories are available for the ODSL 8:

Designation	Order No.	Short description
UPG 5	50039627	Programming adaptor for ODSL 8
ODS96-PS	50082006	Programming software
KB-448-2000-8A	50032411	Connection lead (M12, axial, 2m)
KB-448-5000-8A	50033061	Connection lead (M12, axial, 5m)
BT 8…, UMS 8…		Mounting systems of Series 8

5 Description ODSL 30

5.1 General description

The ODSL 30 is a laser distance measuring device with a large area of application. The equipment is available in different versions with analogue outputs, digital outputs, or switching outputs. The distance measurement uses the phase measurement principle. The measurement range lies between 0.2 … 30m.

Integrated in the device are a keypad and a two-line LCD display which can be used to program the ODSL 30. During measurement operation, the display shows the current measurement value. The switching point of the switching outputs can easily be set via a teach input on all variants.

Remarks

Moving objects into the measurement beam from the side may lead to incorrect measurement values.

In the case of highly reflective objects, incorrect measurements may take place if the distance exceeds 150m.

By carrying out the integrated reference measurement function before a measurement, the sensor's accuracy can be improved. To achieve this, the active input (Pin 2) can be configured via the menu to act either as an activation input with referencing, or as a pure referencing input. While the referencing function is carried out (duration about 0.3s), no measurement can be taken.

If the device is used in areas subject to electrostatic charges, it is recommended to connect the housing of the ODSL 30 to a common potential.

Accessories

The ODSL 30 ships with a mounting device for easy mounting and alignment (further accessories see chapter 6.5).

5.2 Typical Areas of Application for the ODSL 30

5.2.1 Continuous Distance Measurement

All ODSL 30 variants with analogue/digital or switching output can be used for continuous distance measuring. The menu-guided parameterisation via key pad and LC display on the device without additional software permits the adaptation to a large number of applications.

Depending on position or settings of the ODS, various applications are possible:

- Stack/Object height measuring. Even with difficult surfaces, the stack/ object height of moving objects can be measured.
- Contour determination through controlled passing movement of an object through the beam of the ODSL 30.
- Volume measuring by taking measurements on two levels during the concurrent movement of the object.
- Determination of the diameter, e.g., on paper rolls.
- Positioning of sidetracking skates, etc.
- Measuring the thickness of planks with two opposing sensors and a differential of the two measured values.

5.2.2 Positioning Tasks

The ODSL 30 variants with analogue output and/or up to three teachable switching outputs are ideally suited for basic positioning tasks, such as the height/level adjustment of elevating platforms and rising floors.

The ODSL 30 is mounted in a way to enable positioning in the direction of the measuring beam.

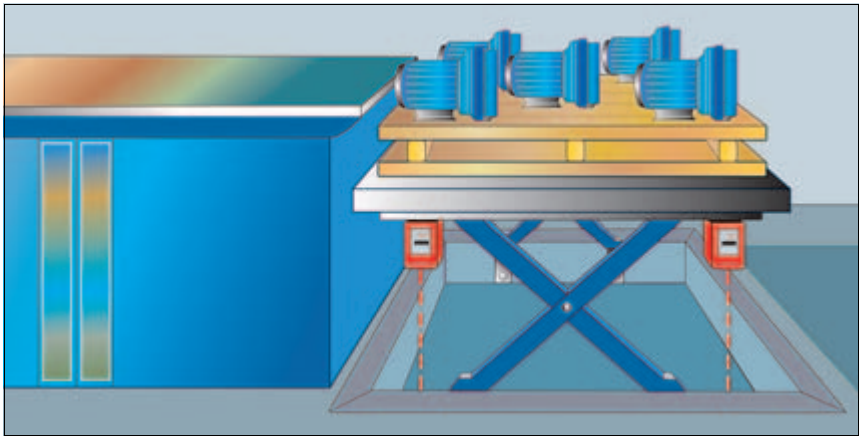


Figure 5.1: Application example Positioning of Elevating Platforms

5.2.3 Collision prevention

The ODSL 30 is ideally suited to be used as collision prevention device:

- Distance regulation via the analogue output of the ODSL 30
- Collision prevention via the switching outputs of the ODSL 30

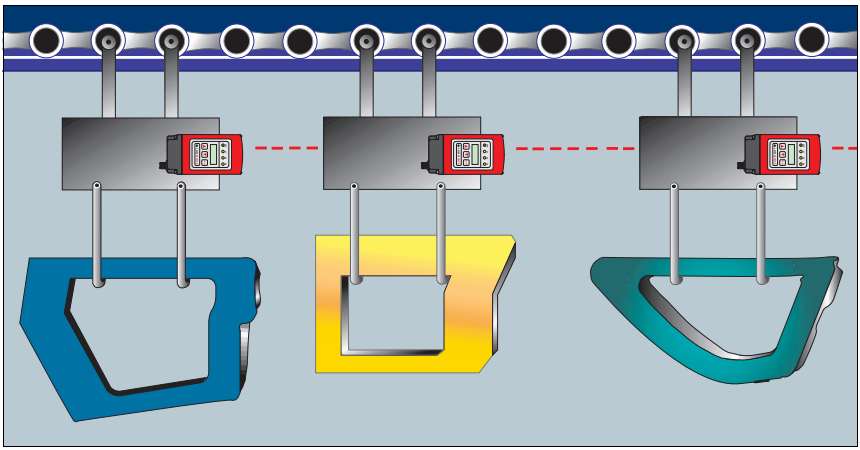


Figure 5.2: Application example "Collision Prevention"

5.3 Mounting

The ODSL 30 ships with the mounting device BT 30 that permits the easy mounting and alignment of the ODSL 30.

Figure 5.3: ODSL 30 with BT 30

Dimensioned drawing BT 30

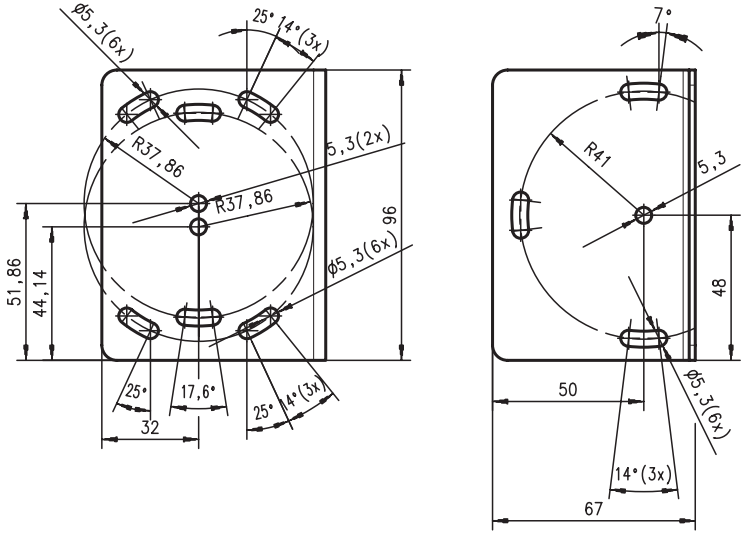


Figure 5.4: Dimensioned drawing BT 30

Notice

With the help of the two aiming notches on the upper side of the device, you can carry out a coarse alignment of the ODSL 30 even before commissioning.

5.4 ODSL 30 Variants

Variants

The ODSL 30 is available in four variants:

- as a **laser distance sensor** with **2 analogue outputs 1 … 10V and 4 … 20mA** and **1 universally configurable switching output** measurement range between 0.2 … 30m
- as a **laser distance sensor** with **3 universally configurable switching outputs** measurement range between 0.2 … 30m
- as a **laser distance sensor** with **serial interface RS 232** and **2 universally configurable switching outputs**, measurement range between 0.2 … 30m
- as a **laser distance sensor** with **serial interface RS 485/RS 422** and **2 universally configurable switching outputs**, measurement range between 0.2 … 30m

5.4.1 ODSL 30/V… with Analogue Output

Analogue Output ODSL 30/V…

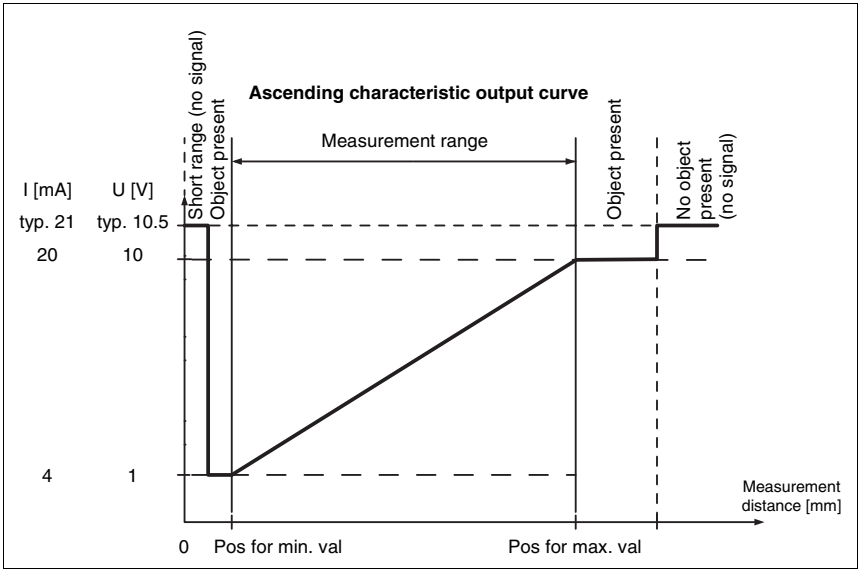


Figure 5.5: Characteristic output curve ODSL 30/V… with positive gradient

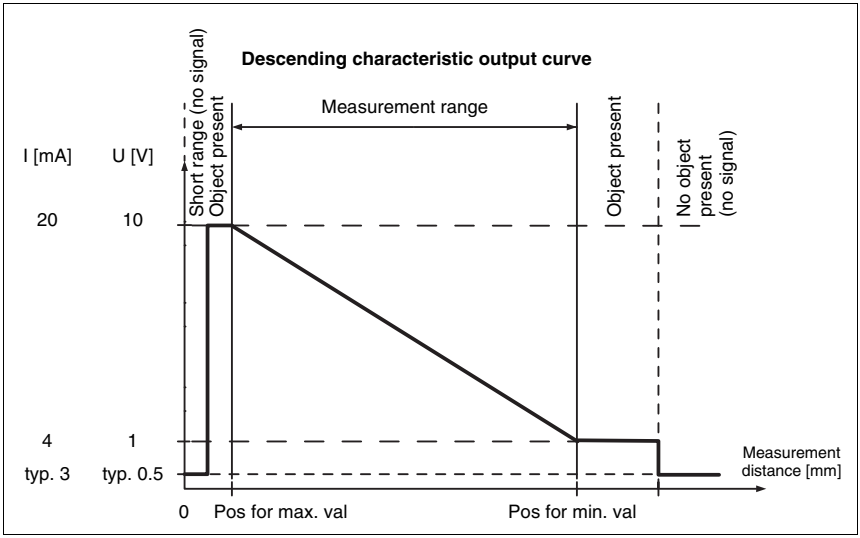


Figure 5.6: Characteristic output curve ODSL 30/V… with negative gradient

Behaviour of the analogue outputs of the ODSL 30/V…

The ODSL 30/V… has an analogue output with linear behaviour. A current output (4 … 20mA) and a voltage output (1 … 10V) are available to the user. The analogue output can be adjusted within the measurement range by configuration via the key pad and LCD display (adaptation of the characteristic output curve). The parameter Cal. Ana. Output determines whether the calibration is to be carried out for the current or voltage output. The characteristic output curve can be configured with a positive or negative gradient. For this purpose, the two distance values Pos for min. val and Pos for max. val for the minimum and maximum analogue output value are set accordingly in the range between 200mm and 30000mm (see figure 5.5 and figure 5.6).

Object distance	Current output [1]		Voltage output [2]	
	with positive gradient	with negative gradient	with positive gradient	with negative gradient
no object or object too close or too far away (no signal)	> 20.5mA (typ. 21mA)	< 3.5mA (typ. 3mA)	> 10.25V (typ. 10.5V)	< 0.75V (typ. 0.5V)
= distance for minimum analogue value	4mA	20mA	1V	10V
= distance for maximum analogue value	20mA	4mA	10V	1V
< distance for minimum analogue value	4mA	20mA	1V	10V
> distance for maximum analogue value	20mA	4mA	10V	1V

1) The typical values only apply if the current output is calibrated.
2) The typical values only apply if the voltage output is calibrated.

Behaviour of the switching output of the ODSL 30/V…

Additionally, a switching output is available with the ODSL 30/V… with analogue output. The position within the measuring range at which the switching output becomes active can be set arbitrarily via a teach line or via parameterisation. In addition to the switching point, it is also possible to set the switching hysteresis, the switching behaviour (light/dark switching), and the type of the switching output (PNP high active or NPN low active or PNP/NPN push-pull).

Generally, teaching always takes place towards the switching point (see figure 5.7 on page 30).

Object distance	Light switching output Q1	Dark switching output Q1
No object (no signal)	off	on
< 200mm[1]	on	off
< teach value	on	off
> teach value	off	on

1) Only if a received signal is available that can still be evaluated, otherwise same as "no object"

5.4.2 ODSL 30/24… with three switching outputs

Switching outputs ODSL 30/24…

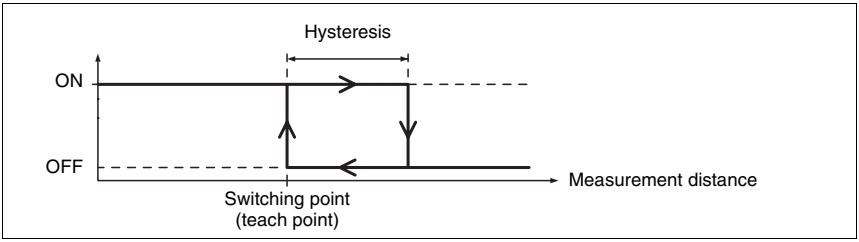


Figure 5.7: Behaviour of the switching outputs ODSL 30/24…
(switching behaviour: light switching)

Behaviour of the switching outputs of the ODSL 30/24…

The ODSL 30/24… has three independent switching outputs. The position within the measuring range at which the switching outputs become active can be set arbitrarily via a teach line or via parameterisation. In addition to the switching points, it is also possible to configure the switching hysteresis, the switching behaviour (light/dark switching), and the type of the switching output (PNP high active or NPN low active or PNP/NPN push-pull).

Generally, teaching always takes place towards the switching point (see remarks on page 82 and page 83).

Object distance	Light switching			Dark switching		
	output Q1	output Q2	output Q3	output Q1	output Q2	output Q3
No object (no signal)	off	off	off	on	on	on
< 200 mm[1)]	on	on	on	off	off	off
< teach value	on	on	on	off	off	off
> teach value	off	off	off	on	on	on

1) Only if a received signal is available that can still be evaluated, otherwise same as "no object"

5.4.3 ODSL 30/D… with Serial Output

The ODSL 30/D… has 2 digital switching outputs and one serial interface which is implemented either as an RS 232 interface or as an RS 485/RS 422 interface. The transmission rate can be set to between 600 and 115200 baud.

The serial transmission is carried out with 1 start bit, 8 data bits and 1 or 2 stop bits without parity.

For the transmission of the measurement values, 4 different transmission modes may be configured (see figure 5.8):

- **ASCII measurement value** (7 bytes, measurement range 0 … 30 m, resolution 1 mm) [1)]
- **14 bit measurement value** (2 bytes, measurement range 0 … 15 m, resolution 1 mm) [1)]
- **16 bit measurement value** (3 bytes, measurement range 0 … 30 m, resolution 1 mm) [1)]
- **Remote Control Operation** [2)]

1) Continuous measured value output in a 100 ms grid. For the ODSL 30/D 485…, the transfer is carried out in RS 422 mode, i.e., with permanent transmission on the Tx+ and Tx- lines.

2) For the ODSL 30/D 485…, the transfer is carried out in RS 485 mode, i.e., the Tx+ and Tx- lines are switched to receive. This permits several ODSL 30/D 485… to be connected onto a single bus. In this case, the device addresses of the individual devices must differ from each other.
The ODSL 30/D 232… can also be operated via remote control, however, only as a point-to-point-connection between the ODSL 30 and the controller.

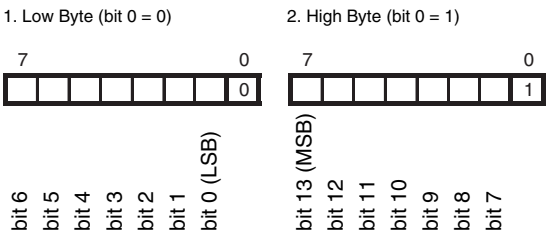
Measurement value ASCII transmission

Transmission format: **MMMMM<CR>**

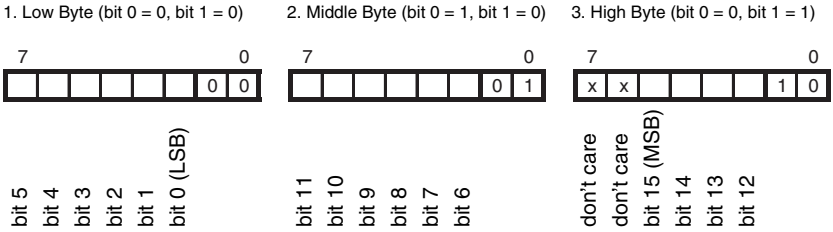
MMMMM = 5-digit measurement value

<CR> = ASCII character "Carriage Return" (x0D)

Measurement value = 14 bits (measurement range 0 … 15m, resolution 1mm)



Measurement value = 16 bits (measurement range 0 … 30m, resolution 1mm)



Remote Control

ASCII transfer of the measurement value on request
4 digits (4 bytes) **or 5 digits** (5 bytes).

Figure 5.8: Serial transmission formats ODSL 30/D…

Measurement value output for various transmission types

Object distance	Measurement value output for protocol				
	ASCII	**14 bit**	**16 bit**	**Remote 4 bytes**	**Remote 5 bytes**
No object (no signal)	65535	16383	65535	9999	65535
< 200 mm[1)]	distance value	distance value	distance value	distance value	distance value
200 mm … 9900 mm	distance value	distance value	distance value	distance value	distance value
9901 mm … 16000 mm	distance value	distance value	distance value	9901	distance value
16001 mm … 65000 mm	distance value	16001	distance value	9901	distance value
> 65000 mm	65001	16001	65001	9901	65001
Device error	0	0	0	0	0

1) Only if a received signal is available that can still be evaluated, otherwise same as "no object"

Commands for remote control operation

For remote control operation (parameter `Remote Control`), a device address between 0 … 14 can be set. In this operating mode, the ODSL 30/D… reacts only to commands from the controller. The following control commands are available:

Query of 4-digit measurement value (ODS 96 compatible, bus operation for ODSL 30/D 485…):

	Byte No.									Response time
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
Command	Sensor address 0x00 through 0x0E	–	–	–	–	–	–	–	–	
Sensor Response	"*" (0x2A)	ASCII address tens	ASCII address ones	ASCII-distance measurement value thousands	ASCII-distance measurement value hundreds	ASCII-distance measurement value tens	ASCII-distance measurement value ones	"#" (0x23)	–	max. 120 ms

Query of 5-digit measurement value (bus operation for ODSL 30/D 485…):

	Byte No.									Response time
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
Command	"*" (0x2A)	ASCII address "0…9", "A…D"	"M" (0x4D)	"#" (0x23)	–	–	–	–	–	
Sensor Response	"*" (0x2A)	ASCII address "0…9", "A…D"	ASCII-distance measurement value ten thousands	ASCII-distance measurement value thousands	ASCII-distance measurement value hundreds	ASCII-distance measurement value tens	ASCII-distance measurement value ones	Status	"#" (0x23)	max. 120 ms

Activation of referencing (bus operation for ODSL 30/D 485…):

	Byte No.									Response time
	0	1	2	3	4	5	6	7	8	
Command	"*" (0x2A)	ASCII address "0…9", "A…D"	"R" (0x52)	"#" (0x23)	–	–	–	–	–	
Sensor Response	"*" (0x2A)	ASCII address "0…9", "A…D"	Status	"#" (0x23)	–	–	–	–	–	max. 120ms

Sensor activation[1] (bus operation for ODSL 30/D 485…):

	Byte No.									Response time
	0	1	2	3	4	5	6	7	8	
Command	"*" (0x2A)	ASCII address "0…9", "A…D"	"A" (0x41)	"#" (0x23)	–	–	–	–	–	
Sensor Response	"*" (0x2A)	ASCII address "0…9", "A…D"	Status	"#" (0x23)	–	–	–	–	–	max. 120ms

Deactivating the sensor[1] (bus operation for the ODSL 30/D 485…):

	Byte No.									Response time
	0	1	2	3	4	5	6	7	8	
Command	"*" (0x2A)	ASCII address "0…9", "A…D"	"D" (0x44)	"#" (0x23)	–	–	–	–	–	
Sensor Response	"*" (0x2A)	ASCII address "0…9", "A…D"	Status	"#" (0x23)	–	–	–	–	–	max. 120ms

Status byte (bitwise processing):

Bit number	Value	Meaning
7 (MSB)	0x80	always = 0 (reserved)
6	0x40	1 = other error, 0 = OK
5	0x20	always = 1, if the status is 0x20, the sensor functions flawlessly
4	0x10	always = 0 (reserved)
3	0x08	always = 0 (reserved)
2	0x04	1 = sensor deactivated, 0 = sensor activated
1	0x02	1 = no signal or signal too low, 0 = signal OK
0 (LSB)	0x01	1 = Laser defective, 0 = Laser OK

1) The sensor is activated by default and in this case cannot be deactivated via the control command. The control command is only effective if the input activ/ref is configured as an activation and referencing input. In this case, the following applies: The sensor is activated if the input activ/ref is at active level **or** if the sensor is activated via control command. The sensor is deactivated if the input activ/ref is not at active level **and** the sensor is deactivated via control command.

Behaviour of the switching outputs of the ODSL 30/D…

In addition, the ODSL 30/D… with serial output also has two switching outputs. The position within the measuring range at which the switching outputs become active can be set arbitrarily via a teach line or via parameterisation. In addition to the switching points, it is also possible to configure the switching hysteresis, the switching behaviour (light/dark switching), and the type of the switching output (PNP high active or NPN low active or PNP/NPN push-pull).

Generally, teaching always takes place towards the switching point (see figure 5.7 on page 30).

Object distance	Light switching		Dark switching	
	output Q1	output Q2	output Q1	output Q2
No object (no signal)	off	off	on	on
< 200 mm[1)]	on	on	off	off
< teach value	on	on	off	off
> teach value	off	off	on	on

1) Only if a received signal is available that can still be evaluated, otherwise same as "no object"

Notes regarding the termination of the data lines of the ODSL 30/D 485…

The ODSL 30/D 485… features a combined transmitter and receiver component that can transmit serial data according to the RS 485 and RS 422 standard (see TIA/EIA-485-A or DIN66259, Part 3).

These standards define some basic rules that should be followed in order to achieve the most reliable data transmission:

- The data lines A and B (which correspond to the ODSL 30 pins Tx+ and Tx-) are connected to an intrinsic impedance of $Z_0 \approx 120\Omega$ via a 2-wire twisted pair cable.
- The end of the data line (and the beginning in case of RS 485) is terminated using a 120Ω resistor. The ODSL 30/D 485… does not have an internal bus termination.
- The RS 485 bus participants are wired in an in-line bus topology, i.e., the data line is fed from one bus participant to the next. Cable stubs are to be avoided or to be kept as short as possible.
- The RS 485 specification assumes an inactive potential difference of $U_{AB} \geq 200\,mV$ between the data cables. A bus termination in the form of a voltage divider should be implemented in order to maintain this level. Usually, it is connected to the RS 485 coupling module of the PLC.

The RS 485 specification permits transmission rates in the megabit range for up to 32 participants. The ODSL 30/D 485… is designed for a data transmission rate of typically 9600 Baud (600 … 115200 Baud may be configured). In practice, this means that the strict requirements regarding the bus termination and the cabling are "softened" for a few bus participants.

However, it is important to maintain the bus idle levels ($U_{AB} \geq 200$ mV). If the PLC coupling module does not include a bus termination with voltage divider, the following circuit may be used.

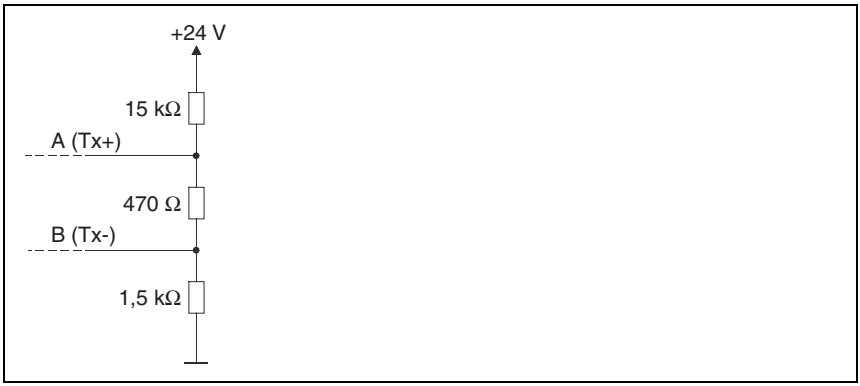


Figure 5.9: Voltage divider for the RS 485 bus termination

The RS 422 connection does not require a bus termination for cable lengths up to about 20 m and data transmission rates less than 9600 Baud.

Further information:

- RS 422: Electrical Specification acc. to DIN 66259, Part 3
- ISO 8482: Abstract
  Specifies the physical medium characteristics for twisted pair multipoint interconnections in either 2-wire or 4-wire network topology, a binary and bi-directional signal transfer, the electrical and mechanical design of the endpoint system branch cables and the common trunk cable which may be up to 1200 m in length, the component measurements of the integrated type generators and receivers within the endpoint system, the applicable data signalling rate up to 12.5 Mbit/s.

5.5 Operation and parameterisation of the ODSL 30

Indicator and operating elements

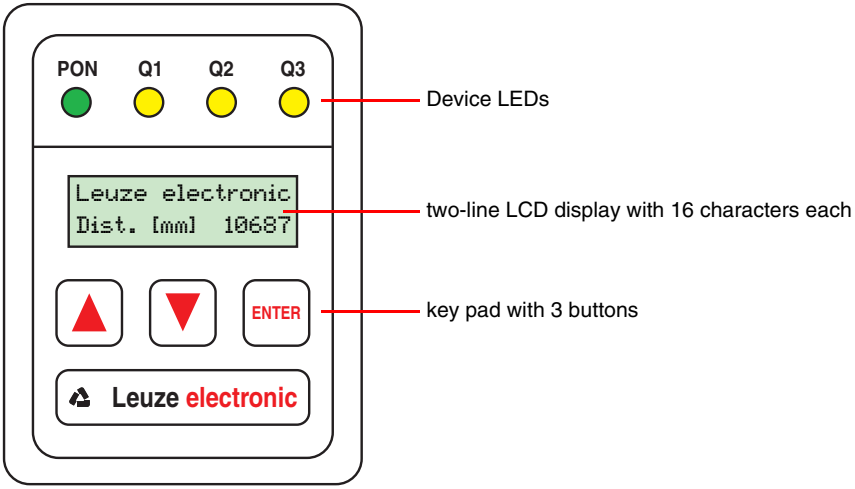


Figure 5.10: Indicator and operating elements ODSL 30

LED indicators ODSL 30

LED	Colour	Display when	
		teach-in deactivated	teach-in activated
PON	green permanent light	ready	
	green off	no voltage	
Q1, Q2, Q3	yellow permanent light	object inside teach-in measurement distance	
	yellow flashing		Teach-in procedure[1)]
	yellow off	object outside teach-in measurement distance or no signal present	

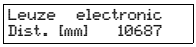
1) The teach-in process is described in detail in section 9.3

Notice

The 3 yellow LEDs Q1, Q2 and Q3 for the status display of the up to 3 switching outputs are additionally located in the optical window of the ODSL 30. Only the LEDs for those switching outputs that are actually available in the respective device version have a function.

Switching on

After power-on and error-free initialisation of the device, the green LED **PON** lights up continuously, the ODSL 30 is measurement mode. The display lighting remains switched off.



In measurement mode, the LCD display shows the current measurement value in millimetres. If no object is detected or if the signal is too weak, the notice NO SIGNAL appears on the display.

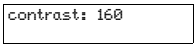
Notice

After an operating time of 30 min., the device has reached the operating temperature required for an optimal measurement and should be referenced then.

The measurement values can be viewed via the ODS programming software. The programming terminal UPG 5 is required for this purpose. While the device is switched on, the left arrow key (up arrow) on the key pad must be pressed simultaneously.
(see chapter 10.1.2 "Connection of the ODSL 30 to a PC").

Adjustment of the display contrast

While switching the device on, press both arrow keys of the ODSL 30 simultaneously.

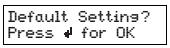


After releasing the keys, you can decrease or increase the contrast of the LCD display with the arrow keys (value range 0 … 255). By pressing ENTER, the adjusted contrast value is applied and you get to the configuration menu of the ODSL 30.

Reset to factory settings

By pressing ENTER while switching the device on, you can reset the configuration of the ODSL 30 to the state upon delivery.

A safety prompt appears.



By pressing ENTER again, all parameters are reset to factory settings. All settings made previously are permanently lost. By pressing an arrow key, the ODSL 30 returns to measurement operation without resetting the parameters.

Parameterisation / navigation in the menu

By pressing an arbitrary key, the LCD display illumination is switched on, and the configuration menu of the ODSL 30 appears.

- ***You can scroll through the menu items using the arrow keys.***
- ***You can select the individual menu items by pressing ENTER.***
- ***If a value or parameter can be changed, a cursor flashes. You can change this value or parameter by using the arrow keys. You apply the setting by pressing ENTER.***
- ***Via the menu item "Return", you return to the parent level in the menu structure.***
- ***Via the menu item "Exit from Menu", you return to the measurement mode.***

Notice

Values that can be toggled or edited are shown in red (PDF file) or grey (b/w print of the manual) in the menu structure.

If no key is pressed for 60s in the configuration menu, the device automatically returns to the measurement mode.

*The device can be protected against unauthorised parameterisation change by activating the password query. The **password** is always set to "**165**".*

5.5.1 Parameterisation / menu structure ODSL 30/V… (analogue)

Level 1	Level 2	Level 3	Level 4	Explanation / Notes	Default
Input Menu	Inp. teach Q1/Q2 Teach Out Q1/Q2	Inp. teach Q1/Q2 Teach Out Q1/Q2		Teach input is activated	X
		Inp. teach Q1/Q2 Input disabled		Teach input is deactivated	
	Input activ/ref Referencing	Input activ/ref Referencing		Input is referencing input	X
		Input activ/ref Activation + Ref		Input is activation and referencing input	
		Input activ/ref Input disabled		Input activ is deactivated	
	Input Polarity active HIGH +24V	Input Polarity active HIGH +24V		All inputs are active high	X
		Input Polarity active LOW 0V		All inputs are active low	
	Return			Return to level 1	
Output Q Menu	Q1 Function sel.	Q1 Switch Point Value: 001000	Q1 Switch Point act Value: 01000	Switching point of output Q1 in millimetres	1000
		Q1 Hysteresis Value: 000020	Q1 Hysteresis act Value: 00020	Switching hysteresis of output Q1 in millimetres	20
		Q1 light/dark light switching	Q1 light/dark light switching	Q1 is active if an object is present in the switching range	X
			Q1 light/dark dark switching	Q1 is active if no object is present in the switching range	
		Q1 Driver PNP high active	Q1 Driver PNP high active	Q1 is high-side output (PNP)	X
			Q1 Driver NPN low active	Q1 is low-side output (NPN)	
			Q1 Driver PNP/NPN pushpull	Q1 is push-pull output	
		Return		Return to level 2	
	Return			Return to level 1	
Analogue Out Menu	Cal. Ana. Output Current 4-20mA	Cal. Ana. Output Current 4-20mA		Current output calibrated, Voltage output uncalibrated	X
		Cal. Ana. Output Voltage 1-10V		Voltage output calibrated, Current output uncalibrated	
	Pos for max. val Value: 005000	Pos for max. val act Value: 05000		Distance [mm], at which the max. analogue value is output	5000
	Pos for min. val Value: 000200	Pos for min. val act Value: 00200		Distance [mm], at which the min. analogue value is output	200
	Return			Return to level 1	

Level 1	Level 2	Level 3	Level 4	Explanation / Notes	Default
Service Menu	Password check inactive	Password check inactive		Password for menu access not active	X
		Password Check activated		Password for menu access active, password: 165 (can not be changed)	
	ODSL 30 Serial No Val: 99999			Display of serial number, no changes possible	
	Software YYMMDD Val: 31024			Display of software version, no changes possible	
	Parameter YYMMDD Val: 31024			Display of parameter version, no changes possible	
	Interface-Type Analog Interface			Display of the interface type, no changes possible	
	Return			Return to level 1	
Exit from Menu				Return to measurement mode	

5.5.2 Parameterisation / menu structure ODSL 30/24/V… (3 switching outputs)

Level 1	Level 2	Level 3	Level 4	Explanation / Notes	Default
Input Menu	Inp. teach Q1/Q2 Teach Out Q1/Q2	Inp. teach Q1/Q2 Teach Out Q1/Q2		Teach input is activated	X
		Inp. teach Q1/Q2 Input disabled		Teach input is deactivated	
	Input activ/ref Referencing	Input activ/ref Referencing		Input is referencing input	X
		Input activ/ref Activation + Ref		Input is activation and referencing input	
		Input activ/ref Input disabled		Input activ is deactivated	
	Inp. teach Q3 Teach output Q3	Inp. teach Q3 Teach Output Q3		Teach input is activated	X
		Inp. teach Q3 Input disabled		Teach input is deactivated	
	Input Polarity active HIGH +24V	Input Polarity active HIGH +24V		All inputs are active high	X
		Input Polarity active LOW 0V		All inputs are active low	
	Return			Return to level 1	
Output Q Menu	Q1 Function sel.	Q1 Switch Point Value: 001000	Q1 Switch Point act Value: 01000	Switching point of output Q1 in millimetres	1000
		Q1 Hysteresis Value: 000020	Q1 Hysteresis act Value: 00020	Switching hysteresis of output Q1 in millimetres	20
		Q1 light/dark light switching	Q1 light/dark light switching	Q1 is active if an object is present in the switching range	X
			Q1 light/dark dark switching	Q1 is active if no object is present in the switching range	
		Q1 Driver PNP high active	Q1 Driver PNP high active	Q1 is high-side output (PNP)	X
			Q1 Driver NPN low active	Q1 is low-side output (NPN)	
			Q1 Driver PNP/NPN pushpull	Q1 is push-pull output	
		Return		Return to level 2	
	Q2 Function sel.	Q2 Switch Point Value: 001000	Q2 Switch Point act Value: 01000	Switching point of output Q2 in millimetres	1500
		Q2 Hysteresis Value: 000020	Q2 Hysteresis act Value: 00020	Switching hysteresis of output Q2 in millimetres	20
		Q2 light/dark light switching	Q2 light/dark light switching	Q2 is active if an object is present in the switching range	X
			Q2 light/dark dark switching	Q2 is active if no object is present in the switching range	
		Q2 Driver PNP high active	Q2 Driver PNP high active	Q2 is high-side output (PNP)	X
			Q2 Driver NPN low active	Q2 is low-side output (NPN)	
			Q2 Driver PNP/NPN pushpull	Q2 is push-pull output	
		Return		Return to level 2	

Level 1	Level 2	Level 3	Level 4	Explanation / Notes	Default
	Q3 Function sel.	Q3 Switch Point Value: 001000	Q3 Switch Point act Value: 01000	Switching point of output Q3 in millimetres	2000
		Q3 Hysteresis Value: 000020	Q3 Hysteresis act Value: 00020	Switching hysteresis of output Q3 in millimetres	20
		Q3 light/dark light switching	Q3 light/dark light switching	Q3 is active if an object is present in the switching range	X
			Q3 light/dark dark switching	Q3 is active if no object is present in the switching range	
		Q3 Driver PNP high active	Q3 Driver PNP high active	Q3 is high-side output (PNP)	X
			Q3 Driver NPN low active	Q3 is low-side output (NPN)	
			Q3 Driver PNP/NPN pushpull	Q3 is push-pull output	
		Return		Return to level 2	
	Return			Return to level 1	
Service Menu	Password Check inactive	Password Check inactive		Password for menu access not active	X
		Password Check activated		Password for menu access active, password: 165 (can not be changed)	
	ODSL 30 Serial No Val: 99999			Display of serial number, no changes possible	
	Software VYMMDD Val: 31024			Display of software version, no changes possible	
	Parameter VYMMDD Val: 31024			Display of parameter version, no changes possible	
	Interface-Type 3 Outp. Q1-Q2-Q3			Display of the interface type, no changes possible	
	Return			Return to level 1	
Exit from Menu				Return to measurement mode	

5.5.3 Parameterisation / menu structure ODSL 30/D 232… (digital RS 232)

Level 1	Level 2	Level 3	Level 4	Explanation / Notes	Default
Input Menu	Inp. teach Q1/Q2 Teach Out Q1/Q2	Inp. teach Q1/Q2 Teach Out Q1/Q2		Teach input is activated	X
		Inp. teach Q1/Q2 Input disabled		Teach input is deactivated	
	Input activ/ref Referencing	Input activ/ref Referencing		Input is referencing input	X
		Input activ/ref Activation + Ref		Input is activation and referencing input	
		Input activ/ref Input disabled		Input activ is deactivated	
	Input Polarity active HIGH +24V	Input Polarity active HIGH +24V		All inputs are active high	X
		Input Polarity active LOW 0V		All inputs are active low	
	Return			Return to level 1	
Output Q Menu	Q1 Function sel.	Q1 Switch Point Value: 001000	Q1 Switch Point act Value: 01000	Switching point of output Q1 in millimetres	1000
		Q1 Hysteresis Value: 000020	Q1 Hysteresis act Value: 00020	Switching hysteresis of output Q1 in millimetres	20
		Q1 light/dark light switching	Q1 light/dark light switching	Q1 is active if an object is present in the switching range	X
			Q1 light/dark dark switching	Q1 is active if no object is present in the switching range	
		Q1 Driver PNP high active	Q1 Driver PNP high active	Q1 is high-side output (PNP)	X
			Q1 Driver NPN low active	Q1 is low-side output (NPN)	
			Q1 Driver PNP/NPN pushpull	Q1 is push-pull output	
		Return		Return to level 2	
	Q2 Function sel.	Q2 Switch Point Value: 001000	Q2 Switch Point act Value: 01000	Switching point of output Q2 in millimetres	1500
		Q2 Hysteresis Value: 000020	Q2 Hysteresis act Value: 00020	Switching hysteresis of output Q2 in millimetres	20
		Q2 light/dark light switching	Q2 light/dark light switching	Q2 is active if an object is present in the switching range	X
			Q2 light/dark dark switching	Q2 is active if no object is present in the switching range	
		Q2 Driver PNP high active	Q2 Driver PNP high active	Q2 is high-side output (PNP)	X
			Q2 Driver NPN low active	Q2 is low-side output (NPN)	
			Q2 Driver PNP/NPN pushpull	Q2 is push-pull output	
		Return		Return to level 2	
	Return			Return to level 1	

Level 1	Level 2	Level 3	Level 4	Explanation / Notes	Default
Serial COM Menu	COM Function sel ASCII Distance	COM Function sel ASCII Distance		Serial transmission, measurement output in ASCII	X
		COM Function sel Distance 14 bit		Serial transmission, 14 bit measurement value, 15m measurement range	
		COM Function sel Distance 16 bit		Serial transmission, 16 bit measurement value, 30m measurement range	
		COM Function sel Remote Control		Remote control activated, RS 232 no bus operation	
		COM Function sel switched OFF		Serial data transmission deactivated	
	Node Address Value: 000	Node Address act Value: 000		Node address 0 … 14	0
	Baudrate COM Baudrate 9600	Baudrate COM Baudrate 9600		Baud rate 9600 bit/s	X
		Baudrate COM Baudrate 19200		Baud rate 19200 bit/s	
		Baudrate COM Baudrate 28800		Baud rate 28800 bit/s	
		Baudrate COM Baudrate 38400		Baud rate 38400 bit/s	
		Baudrate COM Baudrate 57600		Baud rate 57600 bit/s	
		Baudrate COM Baudrate 115200		Baud rate 115200 bit/s	
		Baudrate COM Baudrate 600		Baud rate 600 bit/s	
		Baudrate COM Baudrate 1200		Baud rate 1200 bit/s	
		Baudrate COM Baudrate 2400		Baud rate 2400 bit/s	
		Baudrate COM Baudrate 4800		Baud rate 4800 bit/s	
	Stopbits COM 1	Stopbits COM 1		Number of stop bits: 1	X
		Stopbits COM 2		Number of stop bits: 2	
	Return			Return to level 1	
Service Menu	Password Check inactive	Password Check inactive		Password for menu access not active	X
		Password Check activated		Password for menu access active, password: 165 (can not be changed)	
	ODSL 30 Serial No Val: 99999			Display of serial number, no changes possible	
	Software YYMMDD Val: 31024			Display of software version, no changes possible	
	Parameter YYMMDD Val: 31024			Display of parameter version, no changes possible	
	Interface-Type RS232 Interface			Display of the interface type, no changes possible	
	Return			Return to level 1	
Exit from Menu				Return to measurement mode	

5.5.4 Parameterisation / menu structure ODSL 30/D 485… (digital RS 485)

Level 1	Level 2	Level 3	Level 4	Explanation / Notes	Default
Input Menu	Inp. teach Q1/Q2 Teach Out Q1/Q2	Inp. teach Q1/Q2 Teach Out Q1/Q2		Teach input is activated	X
		Inp. teach Q1/Q2 Input disabled		Teach input is deactivated	
	Input activ/ref Referencing	Input activ/ref Referencing		Input is referencing input	X
		Input activ/ref Activation + Ref		Input is activation and referencing input	
		Input activ/ref Input disabled		Input activ is deactivated	
	Input Polarity active HIGH +24V	Input Polarity active HIGH +24V		All inputs are active high	X
		Input Polarity active LOW 0V		All inputs are active low	
	Return			Return to level 1	
Output Q Menu	Q1 Function sel.	Q1 Switch Point Value: 001000	Q1 Switch Point act Value: 01000	Switching point of output Q1 in millimetres	1000
		Q1 Hysteresis Value: 000020	Q1 Hysteresis act Value: 00020	Switching hysteresis of output Q1 in millimetres	20
		Q1 light/dark light switching	Q1 light/dark light switching	Q1 is active if an object is present in the switching range	X
			Q1 light/dark dark switching	Q1 is active if no object is present in the switching range	
		Q1 Driver PNP high active	Q1 Driver PNP high active	Q1 is high-side output (PNP)	X
			Q1 Driver NPN low active	Q1 is low-side output (NPN)	
			Q1 Driver PNP/NPN pushpull	Q1 is push-pull output	
		Return		Return to level 2	
	Q2 Function sel.	Q2 Switch Point Value: 001000	Q2 Switch Point act Value: 01000	Switching point of output Q2 in millimetres	1500
		Q2 Hysteresis Value: 000020	Q2 Hysteresis act Value: 00020	Switching hysteresis of output Q2 in millimetres	20
		Q2 light/dark light switching	Q2 light/dark light switching	Q2 is active if an object is present in the switching range	X
			Q2 light/dark dark switching	Q2 is active if no object is present in the switching range	
		Q2 Driver PNP high active	Q2 Driver PNP high active	Q2 is high-side output (PNP)	X
			Q2 Driver NPN low active	Q2 is low-side output (NPN)	
			Q2 Driver PNP/NPN pushpull	Q2 is push-pull output	
		Return		Return to level 2	
	Return			Return to level 1	

Level 1	Level 2	Level 3	Level 4	Explanation / Notes	Default
Serial COM Menu	COM Function sel ASCII Distance	COM Function sel ASCII Distance		Serial transmission, measurement output in ASCII	X
		COM Function sel Distance 14 bit		Serial transmission, 14 bit measurement value, 15m measurement range	
		COM Function sel Distance 16 bit		Serial transmission, 16 bit measurement value, 30m measurement range	
		COM Function sel Remote Control		Remote control activated via bus commands	
		COM Function sel switched OFF		Serial data transmission deactivated	
	Node Address Value: 000	Node Address act Value: 000		Node address 0 … 14	0
	Baudrate COM Baudrate 9600	Baudrate COM Baudrate 9600		Baud rate 9600 bit/s	X
		Baudrate COM Baudrate 19200		Baud rate 19200 bit/s	
		Baudrate COM Baudrate 28800		Baud rate 28800 bit/s	
		Baudrate COM Baudrate 38400		Baud rate 38400 bit/s	
		Baudrate COM Baudrate 57600		Baud rate 57600 bit/s	
		Baudrate COM Baudrate 115200		Baud rate 115200 bit/s	
		Baudrate COM Baudrate 600		Baud rate 600 bit/s	
		Baudrate COM Baudrate 1200		Baud rate 1200 bit/s	
		Baudrate COM Baudrate 2400		Baud rate 2400 bit/s	
		Baudrate COM Baudrate 4800		Baud rate 4800 bit/s	
	Stopbits COM 1	Stopbits COM 1		Number of stop bits: 1	X
		Stopbits COM 2		Number of stop bits: 2	
	Return			Return to level 1	
Service Menu	Password Check inactive	Password Check inactive		Password for menu access not active	X
		Password Check activated		Password for menu access active, password: 165 (can not be changed)	
	ODSL 30 Serial No Val: 99999			Display of serial number, no changes possible	
	Software YYMMDD Val: 31024			Display of software version, no changes possible	
	Parameter YYMMDD Val: 31024			Display of parameter version, no changes possible	
	Interface-Type RS 485 Interface			Display of the interface type, no changes possible	
	Return			Return to level 1	
Exit from Menu				Return to measurement mode	

5.5.5 Operating example

The following values are to be configured for an ODSL 30/V… :

- calibrated current output 4 … 20mA, characteristic curve with positive gradient and measurement range 500 … 3500mm.
- switching point for output Q1 at 3150mm.

The device is set to factory settings and is in measurement mode.

Configuring the calibrated current output

Action	Display	Explanation / Notes
Press an arbitrary key ▲, ▼, or ENTER.	Input Menu	You get to the configuration menu for the ODSL 30…
Press the keys ▲ and ▼ to change to the menu item "Analog Out Menu".	Analogue Out Menu	Menu item for the configuration of the analogue output.
Select menu item with the ENTER key.	Cal Ana. Output Current 4-20mA	Current output 4 … 20mA is already set as the calibrated output.
Press the keys ▲ and ▼ to change to the menu item "Pos for min. val".	Pos for min. val Value: 000200	This menu item sets the distance value for the minimum analogue value.
Press the ENTER key to edit the value.	Pos for min. val act Value: 00200	Ready for editing.
Press the ▲ and ▼ keys to change the present value to "500".	Pos for min. val new Value->00500	New value has been edited.
Apply the new value by pressing the ENTER key.	to store press ↵ new Val.: 00500	Applying.
Save the new value by pressing the ENTER key.	Pos for min. val Value: 000500	Saving.
Press the keys ▲ and ▼ to change to the menu item "Pos for max. val".	Pos for max. val Value: 005000	This menu item sets the distance value for the maximum analogue value.
Press the ENTER key to edit the value.	Pos for max. val act Value: 05000	Ready for editing.
Press the ▲ and ▼ keys to change the present value to "3500".	Pos for max. val new Value->03500	New value has been edited.
Apply the new value by pressing the ENTER key.	to store press ↵ new Val.: 03500	Applying.
Save the new value by pressing the ENTER key.	Pos for max. val Value: 003500	Saving.
Change to the menu item "Return" by pressing the ▲ and ▼ keys.	Return	This menu item leads to the parent level.
Select menu item with the ENTER key.	Analogue Out Menu	Menu level 1.

Action	Display	Explanation / Notes
Press the keys ▲ and ▼ to change to the menu item "Exit from Menu".	Exit from Menu	This menu item exits the configuration menu.
Select menu item with the ENTER key.	Leuze electronic Dist. [mm] 10687	The device has returned to measurement mode

Configuring the switching point Q1

Action	Display	Explanation / Notes
Press an arbitrary key ▲, ▼, or ENTER.	Input Menu	You get to the configuration menu for the ODSL 30…
Press the keys ▲ and ▼ to change to the menu item "Output Q Menu".	Output Q Menu	This menu item configures the switching outputs.
Select menu item with the ENTER key.	Q1 Function sel.	Menu item for the configuration of the switching output Q1.
Select menu item with the ENTER key.	Q1 Switch Point Value: 001000	This menu item configures the switching point for output Q1.
Press the ENTER key to edit the value.	Q1 Switch Point act Value: 01000	Ready for editing.
Press the ▲ and ▼ keys to change the present value to "3150".	Q1 Switch Point new Value->03150	New value has been edited.
Apply the new value by pressing the ENTER key.	to store press ↵ new Val.: 03150	Applying.
Save the new value by pressing the ENTER key.	Q1 Switch Point Value: 003150	Saving.
Change to the menu item "Return" by pressing the ▲ and ▼ keys.	Return	This menu item leads to the parent level.
Select menu item with the ENTER key.	Output Q Menu	Menu level 1.
Press the keys ▲ and ▼ to change to the menu item "Exit from Menu".	Exit from Menu	This menu item exits the configuration menu.
Select menu item with the ENTER key.	Leuze electronic Dist. [mm] 10687	The device has returned to measurement mode

6 Technical Data ODSL 30

6.1 Optical data

	ODSL 30
Optical data	
Measurement range [1]	0.2 … 30m
Resolution	1mm
Light source	laser (modulated light)
Wavelength	655 nm (visible red light)
Light-spot diameter	divergent, Ø6mm at a distance of 10m
Minimum object size	50x50mm² at a distance of 10m (6 … 90% diffuse reflection)
Error limits [2]	
Absolute measurement accuracy [1]	± 5mm (6 … 90% diffuse reflection), ± 2mm (90% diffuse reflection) after referencing
Repeatability [3]	± 2mm (6 … 90% diffuse reflection)
Temperature drift	typ. 0.5mm/K (without referencing)
Timing	
Measurement time	100ms (90% diffuse reflection)
Delay before start-up	≤1s

1) ODSL 30/D… and ODSL 30/24… only:
Luminosity coefficient 6 … 90%, over the entire temperature range, measured object ≥ 50 x 50mm²
2) After an operating time of 10min., the device has reached the operating temperature required for an optimal measurement.
3) Same object, measured object ≥ 50 x 50mm²

6.2 Electrical Data, Installation Data

6.2.1 ODSL 30/V-30M-S12

	ODSL 30/V-30M-S12
Electrical data	
Operating voltage U_B	18 … 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Power consumption	≤ 4 W
Switching output 1)	1 PNP transistor output, HIGH active (default), NPN transistor or push-pull through parameterisation
Signal voltage high/low	≥ (U_B-2V)/≤ 2V
Output current	max. 100mA per transistor output
Analogue output	1 voltage output 1 … 10V (R_L ≥ 2kOhm) 1 current output 2) 4 … 20mA (R_L ≤ 500Ohm)
Deviation of the characteristic curve 3)	**Measurement range up to 2.5m**: ± 2% **without** referencing, ± 1% **with** referencing **Measurement range 2.5m to 5m**: ± 1.5% **without** referencing, ± 1% **with** referencing **Measurement range 5m to 30m**: ± 1% **without** referencing, ± 1% **with** referencing
Repeatability 4)	± 0.5% of measurement value

1) LC display and key pad at the device for parameterisation
2) The current output is calibrated
3) Reflectance factor 6% … 90%, over the whole temperature range, measured object ≥ 50 x 50mm²
4) Same object, measured object ≥ 50 x 50mm²

6.2.2 ODSL 30/24-30M-S12

	ODSL 30/24-30M-S12
Electrical data	
Operating voltage U_B	10 … 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Power consumption	≤ 4W
Switching outputs 1)	3 PNP transistor outputs, HIGH active (default), NPN transistor or push-pull through parameterisation
Signal voltage high/low	≥ (U_B-2V)/≤ 2V
Output current	max. 100mA per transistor output

1) LC display and key pad at the device for parameterisation

6.2.3 ODSL 30/D 232-30M-S12

	ODSL 30/D 232-30M-S12
Electrical data	
Operating voltage U_B	10 … 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Power consumption	≤ 4W
Switching outputs 1)	2 PNP transistor outputs, HIGH active (default), NPN transistor or push-pull through parameterisation
Signal voltage high/low	≥ (U_B-2V)/≤ 2V
Output current	max. 100mA per transistor output
Serial interface	RS 232, 9600 Baud (default), baud rate adjustable
Transmission protocol	constant data flow for Addr. = 0, bus commands at Addr. ≠ 0, 16 bit measurement value, 3 byte transmission (configurable) 14 bit measurement value, 2 byte transmission (configurable) ASCII transmission 5 bytes + CR (default setting)

1) LC display and key pad at the device for parameterisation

6.2.4 ODSL 30/D 485-30M-S12

	ODSL 30/D 485-30M-S12
Electrical data	
Operating voltage U_B	10 … 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Power consumption	≤ 4W
Switching outputs 1)	2 PNP transistor outputs, HIGH active (default), NPN transistor or push-pull through parameterisation
Signal voltage high/low	≥ (U_B-2V)/≤ 2V
Output current	max. 100mA per transistor output
Serial interface	RS 485, 9600 Baud (default), no termination, baud rate adjustable
Transmission protocol	constant data flow for Addr. = 0, bus commands at Addr. ≠ 0, 16 bit measurement value, 3 byte transmission (configurable) 14 bit measurement value, 2 byte transmission (configurable) ASCII transmission 5 bytes + CR (default setting)

1) LC display and key pad at the device for parameterisation

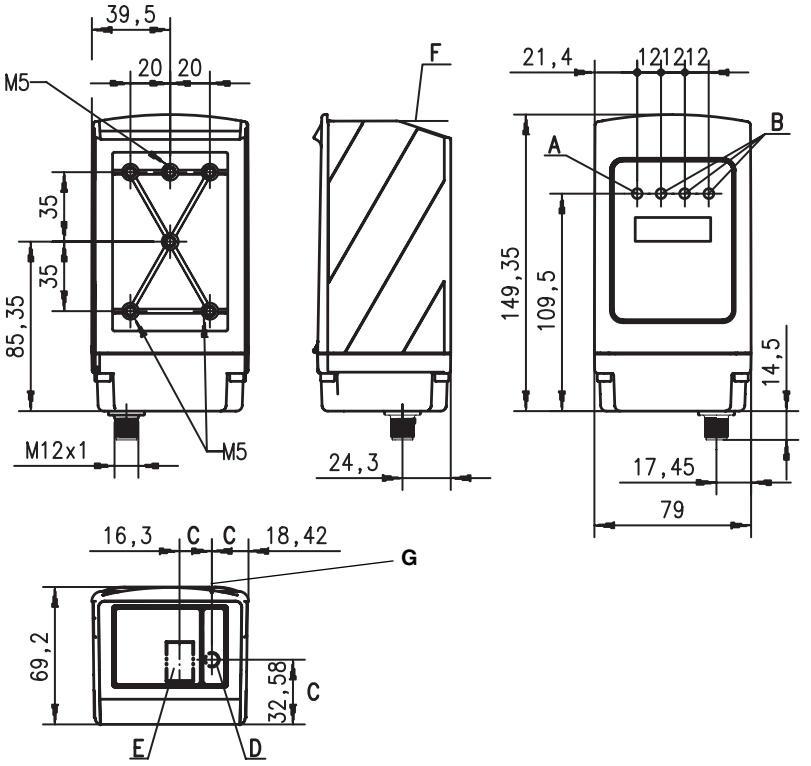
6.3 Mechanical Data, Environmental Data

	ODSL 30
Mechanical data	
Housing	metal
Optics cover	glass
Weight	650 g
Connection type	M12 connector, 8-pin
Environmental data	
Ambient temp. (operation/storage)	0 … +45 °C / -40 … +70 °C
Extraneous light limit	≤ 5 kLux
Protective circuit [1]	2, 3
VDE safety class [2]	II, all-insulated
Protection class	IP 65
Standards applied	IEC 60947-5-2

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs
2) Rating voltage 250 VAC

6.4 Dimensioned and Connection Drawings

All ODSL 30 variants



A 1 Indicator diode green/ready
B 3 Indicator diodes yellow/switching outputs Q1, Q2, Q3
C Optical axes
D Transmitter
E Receiver
F Reference edge for the measurement (distance zero point)
G Sight for coarse alignment

Figure 6.1: Dimensioned drawing ODSL 30 variants

ODSL 30/V… (analogue output)

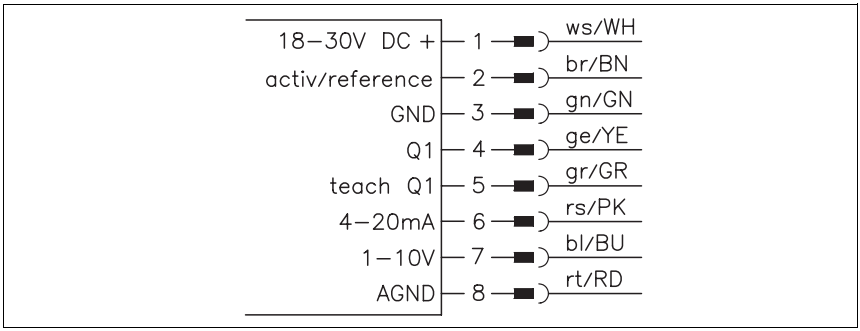


Figure 6.2: Electrical Connection ODSL 30/V…

ODSL 30/24… (3 switching outputs)

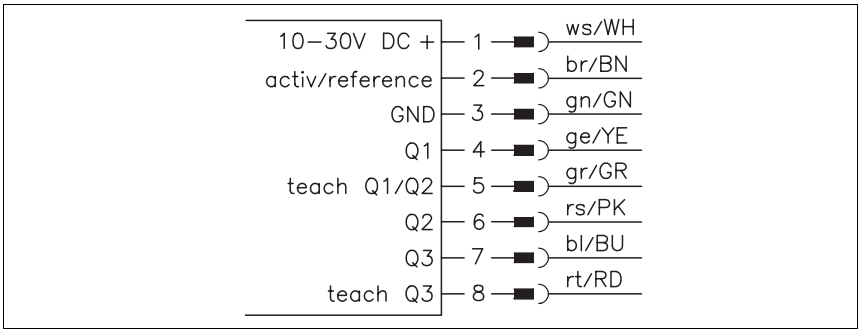


Figure 6.3: Electrical Connection ODSL 30/24…

ODSL 30/D 232… (digital output RS 232)

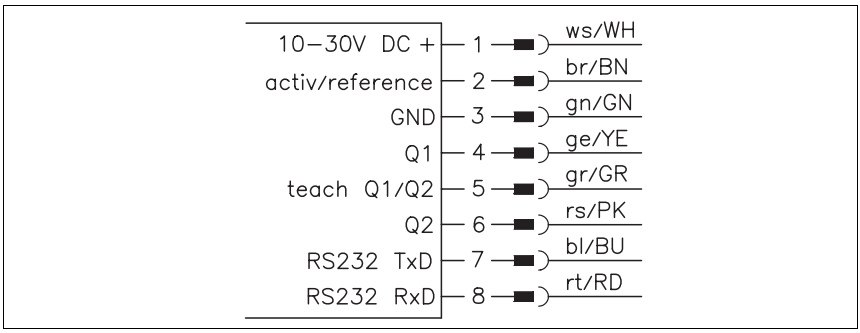


Figure 6.4: Electrical Connection ODSL 30/D 232…

ODSL 30/D 485… (digital output RS 485)

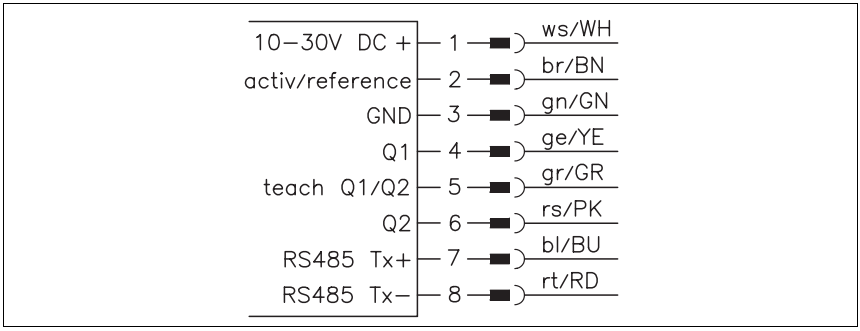


Figure 6.5: Electrical Connection ODSL 30/D 485…

6.5 Accessories

The following accessories are available for the ODSL 30:

Designation	Order No.	Short description
BT 30	50040352	Mounting device (part of the delivery contents)
KB-448-2000-8A	50032411	Connection lead (M12, axial, 2m)
KB-448-5000-8A	50033061	Connection lead (M12, axial, 5m)
UPG 5[1)]	50039627	Programming adaptor for ODSL 8/ODSL30/ ODS 96
ODS [2)]	50082006	Programming software

1) Required for the visualisation of the measurement values via the ODS programming software.
2) With the ODSL 30…, this can only be used exclusively for the visualisation of measurement values on the PC; configuration is not possible!

7 Description ODS 96

7.1 General description

The ODS 96 is a distance measuring device with a large area of application. The equipment is available as LED or laser version with analogue or digital outputs. The distance measuring device works on the triangulation principle and uses a CCD line for evaluating the measurement signal.

An integrated microcontroller enables parameter programming via an optional programming software. Except for the RS 485 interface, the switching points of the switching outputs of all other variants can be set without software via a teach-in input.

Through automatic adjustment of the integration time (exposure time) to the intensity of the objects' reflected light, a high degree of independence from the reflectivity properties of the measured object is achieved. In case of low reflectivity (dark objects) a lower measurement frequency results.

Accessories

To expand the functionality of the ODS 96, a programming software is available.

With regard to their dimensions, the ODS 96 distance sensors are identical with the sensors of the series 96 of Leuze electronic. Particularly, the mounting accessories of the series 96 can be used for the ODS 96. Details can be found in section 8.

7.2 Typical Areas of Application for the ODS 96

7.2.1 Continuous Distance Measurement

All ODS 96 variants with analogue or digital output can be used for continuous distance measuring. In order to use all features of the ODS 96, use of the programming software is recommended.

Depending on position or settings of the ODS, various applications are possible:

- Measuring the thickness of planks with two opposing sensors and a differential of the two measured values.
- Stack/Object height measuring
  Even with difficult surfaces, the stack/ object height of moving objects can be measured.
- Contour determination through controlled passing movement of an object through the beam of the ODS 96.
- Volume measuring by taking measurements on two levels during the concurrent movement of the object.
- Collision prevention at telpher lines.
- Positioning of vehicles.

In case of ODS 96 variants with analogue outputs, it is recommended to limit the working range of the analogue output to the required distance range. The analogue output will then be activated within the distance range from 1 … 10V or 4 … 20mA. Distances outside this range will automatically have an output voltage of < 1V, 4mA or > 10V, 20mA.

7.2.2 Positioning Tasks

For simple positioning tasks, all ODS 96 M/S variants with two teachable switching outputs are suitable.

The ODS 96 is mounted in a way to enable positioning in the direction of the measuring beam. Both switching outputs are taught to the required position. In case the distance is smaller than the taught position, switching output 1 is active and switches the positioning motor to enlarge the distance. In case the distance is bigger than the taught position, switching output 2 is active and switches the positioning motor to reduce the distance.

Using this method, positioning tasks can be performed without difficulties.

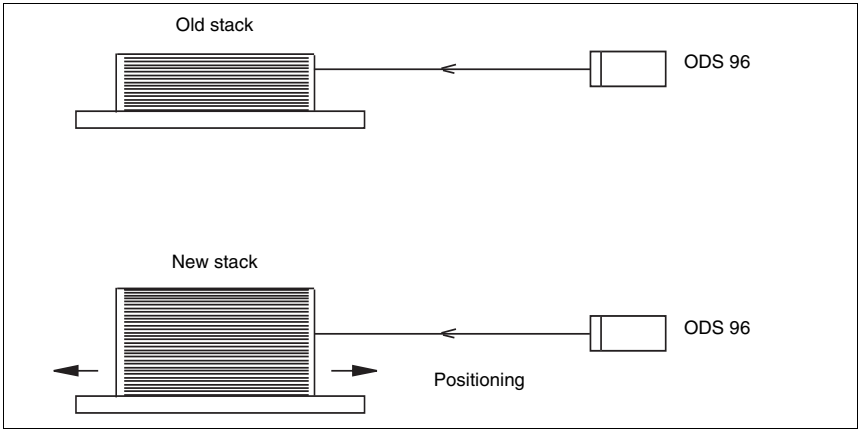


Figure 7.1: Application example "Positioning Tasks"

Notice

For mounting instructions please refer to section 9.2.

7.3 ODS 96 Variants

Variants

Two different base variants of the ODS 96 are available:

- as **infrared distance sensor**
  measurement ranges:100 … 600mm
  120 … 1400mm
- as **laser distance sensor** with visible red light
  measurement ranges:50 … 2000mm
  200 … 2000mm
  200 … 5000mm

7.3.1 ODS 96 M/V with Analogue Output

Analogue output of the infrared device variant

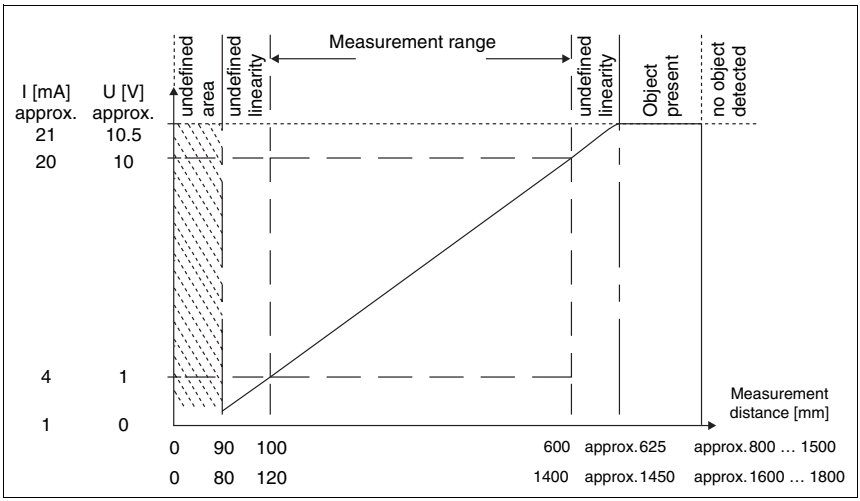


Figure 7.2: Behaviour of the analogue output, ODS 96 M/V (infrared light)

Analogue output of the laser device

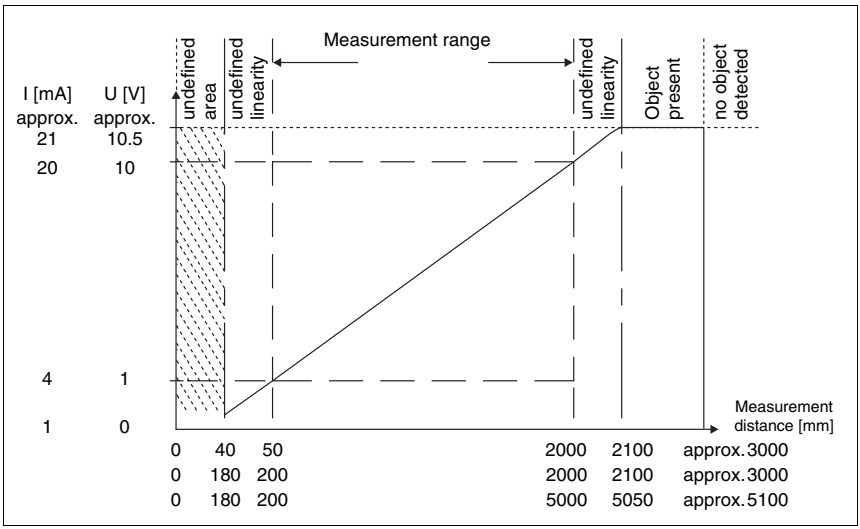


Figure 7.3: Behaviour of the analogue output, ODS 96 M/V (Laser)

Behaviour of the output, ODS 96 M/V

The ODS 96 M/V has an analogue output with linear behaviour inside the respective measurement range. The user can choose between current output (4 … 20mA) and voltage output (1 … 10V). Above and below the linear range, linearity is lost however, the output values signify an upper deviation (> 20mA respectively > 10V) or a lower deviation (< 4mA respectively < 1V) of the measurement range.

Additionally, a switching output is available with the ODS 96 M/V. The position within the measuring range, at which the switching output is active can be set as needed via a teach-in lead. The width of the active range is ±2mm (LED) respectively ±10mm (laser).

Using the optional programming software, the declivity of the output characteristic curve can be changed (steep progression with concurrent reduction of the measurement range). Furthermore, the switching behaviour of the additional switching output can be individually set.

7.3.2 ODS 96 M/D with Serial Output

Serial output of the infrared and laser device variants

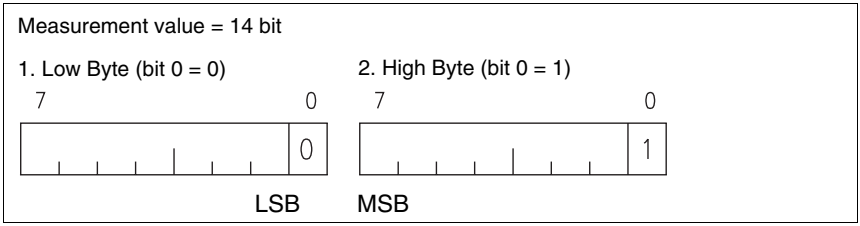


Figure 7.4: Serial output, ODS 96 M/D

Serial output of the ODS 96 M/D

The serial output of the ODS 96 M/D delivers a continuous data stream. The measurement value is transmitted with two byte. The LSB signifies the High- and the Low-Byte, to ensure recognition of definite coherence. For transmission, no telegram frame, but only the normal serial protocol is used. The transmission protocol consists of 8 databits, 1 startbit, 1 stopbit, no parity. The ODS 96 M/D has a digital output which is realised either through the RS 232 or the RS 485 interface. The transmission rate is 9600 baud at the RS 232 interface and 9600 baud without termination at the RS 485 interface.

A "C" program example demonstrates how bytes are read and processed for further usage:

Program example in "C"

```
//Start of the program for measurement value generation----------------------
    Rxbyte = inportb(RXB(COM2.port_adr));       //Read transmitted byte
    if (flag==0)                                //First byte has to be a
                                                //Low-Byte
    {
        if ((Rxbyte & 0x01) == 0)               //Test on Low-Byte
            {
            value = (Rxbyte & 0xFE) >> 1;       //Insert measurement value
                                                //point-aligned
            flag = 1;                           //Next received
                                                //byte has to be a
                                                //High-Byte
            }
    }
    else
    {
        if ((Rxbyte & 0x01) == 1) //Test on High-Byte
            {
            value|=((Rxbyte&0xFE) << 6);        //Insert point-aligned in
                                                //measurement value
            flag = 0;                           //14 bit measurement value
                                                //is generated
            measurement value = value;          //Save measurement value
            }
    }
// End of program of measurement value generation-------------------------
```

The behaviour of the switching output of the ODS 96 M/D can be set as described with the ODS 96 M/V. However, the ODS 96 M/D variant with RS 485 interface does not offer a teach input.

7.3.3 ODS 96 M/S with two Switching Outputs

Switching outputs of the infrared and laser device variants

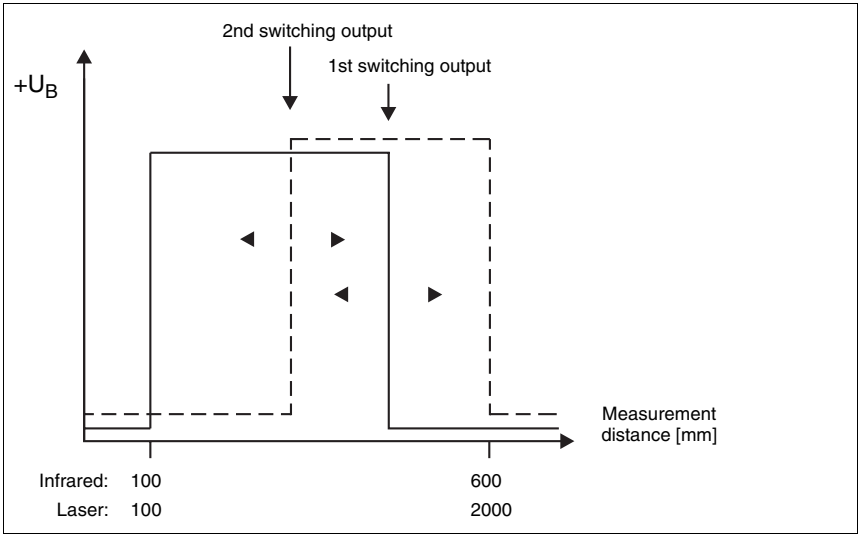


Figure 7.5: Behaviour of the switching outputs, ODS 96 M/S

ODS 96 M/S with two switching outputs

The two switching outputs of the ODS 96 M/S are working independently from each other. Through the teach input, the second signal edge can be taught at output 1, the first signal edge is situated at the beginning of the measurement range. The first signal edge can be taught at output 2, the second signal edge is situated at the end of the measurement range.

A common teach line is available for both switching outputs, meaning the switching outputs are taught alternatingly. The presently taught output is displayed through the simultaneous or alternating flashing of the LEDs (see section 9.3).

The outputs can be adjusted independently of each other by using the optional programming software.

8 Technical Data ODS 96

8.1 Optical data

	ODS 96 M/V, M/D, M/S	ODS 96 M/V, M/D, M/S Laser
Optical data		
Measurement ranges [1]	100 … 600mm 120 … 1400mm	50 … 2000mm 200 … 2000mm 200 … 5000mm
Resolution	≤ 0.5mm	≤ 5mm up to 2000mm ≤ 10mm up to 3000mm ≤ 30mm up to 5000mm
Light source	LED (modulated light)	laser (modulated light)
Wavelength	880nm (infrared)	670nm (visible red light)
Light-spot diameter	approx. 10mm (over whole measurement range)	divergent min. 3 x 12mm^2 in 2000mm distance
Error limits [2]		
Absolute measurement accuracy [1]	± 2 %	± 2% up to 2000mm ± 2.5% at 3000mm ± 5% at 5000mm
Repeatability [3]	± 0.5 %	± 1% up to 2000mm ± 2% at 3000mm ± 3% at 5000mm
b/w detection thresholds (6%/90%)	≤ 1%	≤ 1% ≤ 2% at 3000mm
Timing		
Switching frequency	20 … 100Hz	10 … 100Hz
Response time	≤ 100 ms	≤ 100 ms
Delay before start-up	≤ 300ms	≤ 300ms

1) Luminosity coefficient 6% … 90%, over the whole temperature range, measured object ≥ 50 x 50mm^2
2) After an operating time of 10min., the device has reached the operating temperature required for an optimal measurement.
3) Same object, measured object ≥ 50 x 50mm^2

8.2 LED indicators

LED	ODS 96 M/V, M/V Laser; ODS 96 M/D, M/D Laser		ODS 96 M/S, M/S Laser	
	teach in on GND	teach in on + U_B	teach in on GND	teach in on + U_B
green permanent light	ready		ready	
green flashing	error	Teach-in procedure[1)]	error	Teach-in procedure [1)]
green off	no voltage		no voltage	
yellow permanent light	object inside teach-in measurement distance		object inside measurement range	
yellow flashing		Teach-in procedure[1)]	object outside measurement range	Teach-in procedure[1)]
yellow off	object outside teach-in measurement distance		no object detected	

1) The teach-in process is described in detail in section 9.3

8.3 Electrical Data, Installation Data

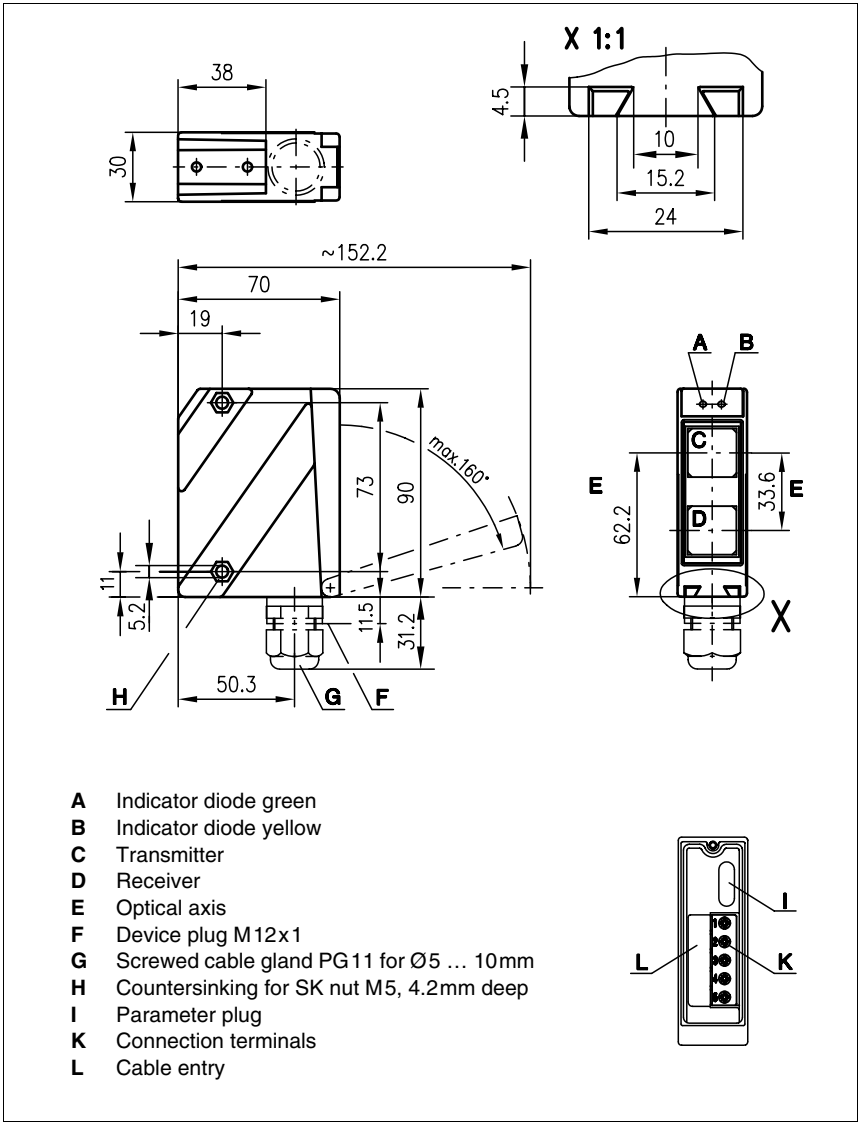
	M/V; M/V Laser	M/D; M/D Laser	M/S; M/S Laser
Electrical data			
Operating voltage U_B	18 … 30VDC (incl. residual ripple)	10 … 30VDC (incl. residual ripple)	
Residual ripple	≤ 15% of U_B		
Bias current	≤ 150mA		
Switching outputs [1)]	1 PNP transistor output, high active		2 PNP transistor outputs, high active
Signal voltage high/low	≥ (U_B - 2V) / ≤ 2V		
Analogue output	R_L ≥ 2kOhm: voltage 1 … 10V R_L ≤ 500Ohm: current 4 … 20mA		
Output current			max. 100mA per transistor output
Digital output RS 232		9600 Baud	
Digital output RS 485		9600 Baud, no termination	
Transmission protocol		2 Byte transm., constant data stream	

	M/V; M/V Laser	M/D; M/D Laser	M/S; M/S Laser
Mechanical data			
Housing	diecast zinc		
Optics cover	glass		
Weight	380g		
Connection type	terminals or M12 connectors		
Environmental data			
Ambient temp. (operation/storage)	-20 … +50°C / -30 … +70°C		
Extraneous light limit	≤ 5 kLux		
Protective circuit 2)	1,2,3		
VDE safety class 3)	II, all-insulated		
Protection class	IP 67		
Standards applied	IEC 60947-5-2		

1) Inversion possible through programming software
2) 1=transient protection, 2=polarity reversal protection, 3=short-circuit protection for all outputs
3) Rating voltage 250 VAC

8.4 Dimensioned and Connection Drawings

All ODS 96 variants



A Indicator diode green
B Indicator diode yellow
C Transmitter
D Receiver
E Optical axis
F Device plug M12x1
G Screwed cable gland PG11 for Ø5 … 10mm
H Countersinking for SK nut M5, 4.2mm deep
I Parameter plug
K Connection terminals
L Cable entry

Figure 8.1: Dimensioned drawing ODS 96 devices

ODS 96 M/V

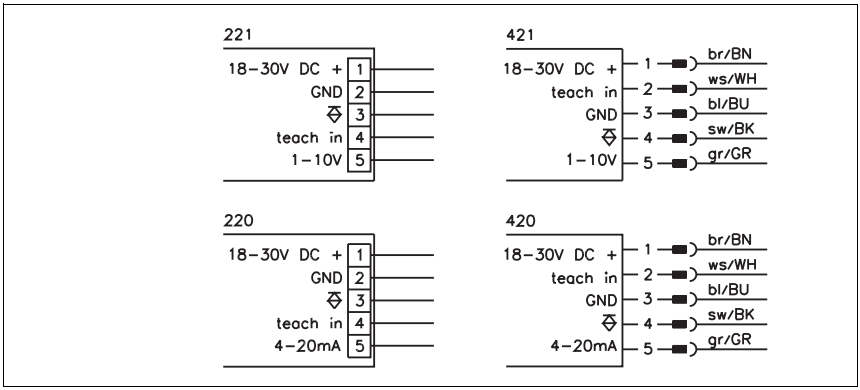


Figure 8.2: Electrical connection, ODS 96 M/V

ODS 96 M/D

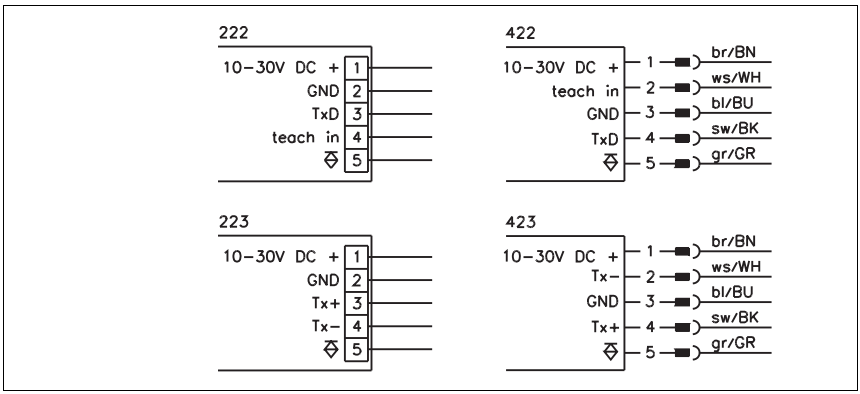


Figure 8.3: Electrical connection, ODS 96 M/V

ODS 96 M/S

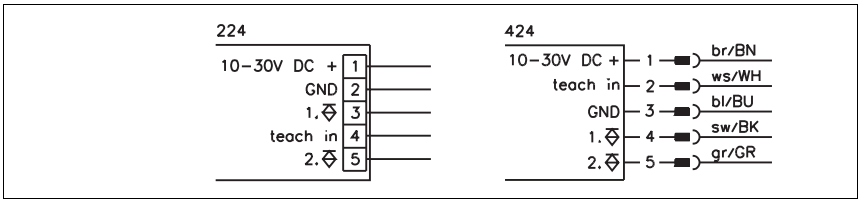


Figure 8.4: Electrical connection, ODS 96 M/V

8.5 Accessories

The following accessories are available for the ODS 96:

Designation	Order No.	Short description
KB-ODS96-1500	50082007	Programming cable 1.5m
KB-ODS96-6000	50061428	Programming cable 6m
ODS96-PS	50082006	Programming software
KB-095-5000-5	50020500	Connection lead (M12, angled, 5m)
KB-095-5000-5A	50020499	Connection lead (M12, axial, 5m)
BT 96	50025570	Mounting device
UMS 96	50026204	Universal mounting system

9 Installation

9.1 Storage, Transportation

Unpacking

- *Check the packaging for any damage. If damage is found, notify the post office or shipping agent as well as the supplier.*
- *Check the delivery contents using your order and the delivery papers:*
  - delivered quantity
  - device variant and model as indicated on the nameplate
  - accessories
  - operating manual
- *Save the original packaging for later storage or shipping.*

If you have any questions concerning your shipment, please contact your supplier or your local Leuze electronic sales office.

- *Observe the local regulations regarding disposal of packaging material.*

9.2 Mounting

Mounting systems are available which have to be ordered separately at Leuze electronic. The order number can be found in section 4.5, section 6.5 or section 8.5. Apart from this, the drilled-through holes and threaded holes are suitable for the individual mounting of the ODS, depending on the area in which it is to be used.

Notice

The mounting device BT 30 is already included in the delivery package of the ODSL 30.

Mounting

To avoid errors while the object enters the measurement beam, correct movement direction of the objects has to be observed. The following graphics show instructions on the installation of the optical distance sensors:

Preferred movement of the objects

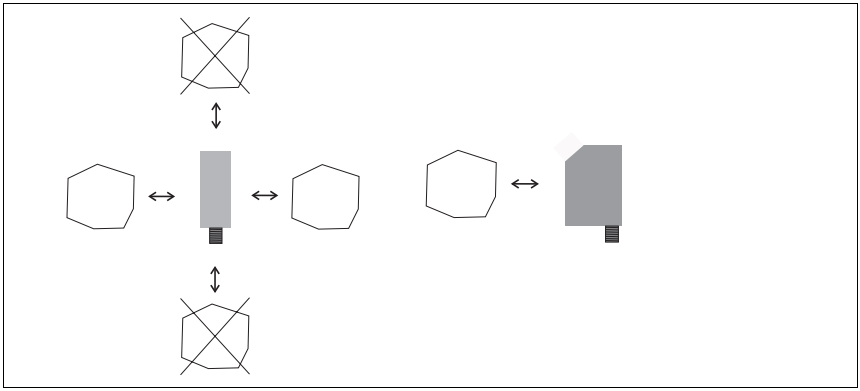


Figure 9.1: Preferred movement of the objects

Preferred mounting in connection to objects with structured surface

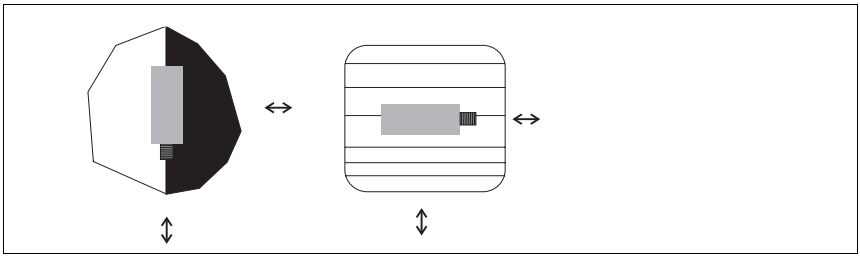


Figure 9.2: Preferred mounting in connection to objects with structured surface

View through a chase

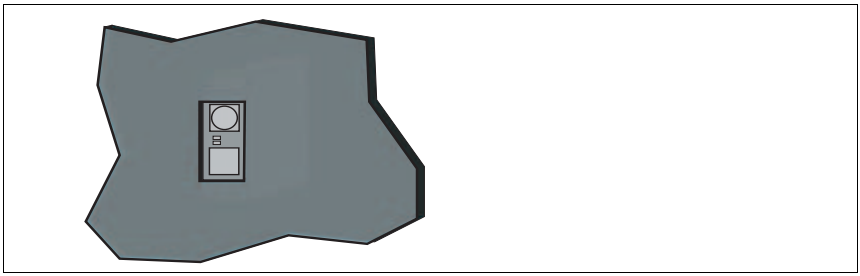


Figure 9.3: View through a chase

If the ODS has to be installed behind a cover, the chase has to have at least the size of the optical glass cover. Otherwise, a correct measurement is not possible or can not be guaranteed.

Alignment to measurement objects with reflecting surfaces

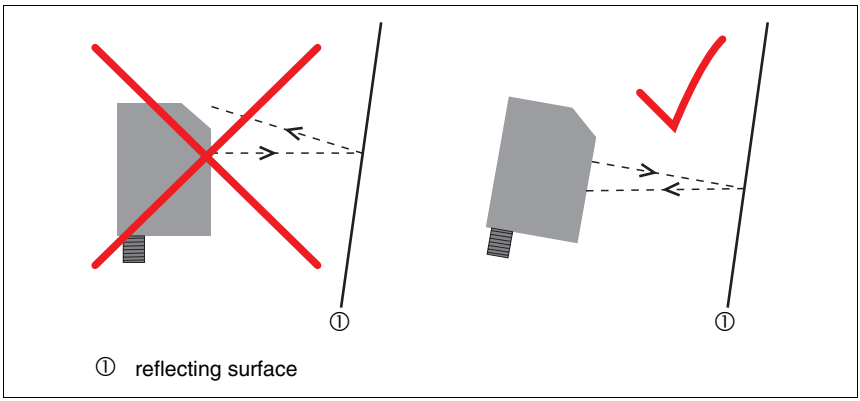


Figure 9.4: Alignment to measurement objects with reflecting surfaces

If the measurement object to be detected has a reflecting surface, a measurement may not be possible depending on the angle in which the light is reflected by the measurement object's surface. Adjust the angle between the sensor and the measurement object such that the sensor can reliably detect the measurement object.

9.3 Teach-in

Notice

The teach-in procedure can be extended and facilitated through the optional programming software.

Switching points can also be set through teach-in without using the software. For teach-in, there are differences among the various device variants:

Teach procedure for ODSL 8/D, ODS 96 M/V, ODS 96 M/D (1 switching output)

↳ *Position the measured object at the desired distance. Connect the teach input for ≥ 2 sec. to $+U_B$. After that, connect the teach input to GND. The switching output is taught.*

The taught switching point represents the middle of the switching range of the output.

These default values are preset:

- Function characteristics of the switching output: "light switching"
- Switching range: ± 2mm with infrared devices and ± 10mm with laser devices
- Hysteresis: 1mm with infrared devices and 5mm with laser devices

These values can only be changed by using the programming software.

Teach procedure for ODSL 8/V, ODS 96 M/S (2 switching outputs)

↳ *Position the measured object at the first desired distance. Connect the teach input for ≥ 2 sec to $+U_B$. The LEDs are flashing simultaneously. Reconnect the teach input to GND. The first switching output is taught.*

↳ *Now, position the measured object at the second desired distance. Connect the teach input for ≥ 2 sec to $+U_B$. The LEDs are flashing alternatingly. Reconnect the teach input to GND. The second switching output is taught. In non-operational mode, the teach input is connected to GND.*

Teach procedure for ODSL 30/V… (1 switching output)

↳ *Position the measured object at the desired distance. Connect the teach input* ***teach Q1*** *for ≥ 2 sec. to +U_B. After that, connect the teach input to GND. The switching output is taught.*

Teaching takes place towards the switching point.

These default values are preset:

- Function characteristics of the switching output: "light switching"
- Switching point: 1000mm
- Hysteresis: 20mm

You can change these values using the key pad and LCD display.

Teach procedure for ODSL 30/D… (2 switching outputs)

↳ *Position the measured object at the first desired distance. Connect the teach input* ***teach Q1/Q2*** *for ≥ 2 sec. to +U_B. The LEDs are flashing simultaneously. Reconnect the teach input to GND. The first switching output is taught.*

↳ *Now, position the measured object at the second desired distance. Connect the teach input* ***teach Q1/Q2*** *for ≥ 2 sec. to +U_B. The LEDs are flashing alternatingly. Reconnect the teach input to GND. The second switching output is taught. In non-operational mode, the teach input is connected to GND.*

Teaching takes place towards the switching points.

These default values are preset:

- Function characteristics of the switching outputs: "light switching"
- Switching point Q1: 1000mm, switching point Q2: 1500mm
- Hysteresis: 20mm each

You can change these values using the key pad and LCD display.

Teach procedure for ODSL 30/24… (3 switching outputs)

↳ *Switching outputs Q1/Q2: Teach procedure is the same as for ODSL 30/D…*

↳ *Switching output Q3: Teach procedure is the same as for ODSL 30/V… via teach input* ***teach Q3***

Teaching takes place towards the switching points.

These default values are preset:

- Function characteristics of the switching outputs: "light switching"
- Switching point Q1: 1000mm, switching point Q2: 1500mm, switching point Q3: 2000mm
- Hysteresis: 20mm each

You can change these values using the key pad and LCD display.

10 Software

General description

The programming software can be used both for the direct configuration of data, with the ODS connected, and "offline" without a sensor connected, for the generation of device configurations. For this purpose, the command **Type!**, explained in section 10.3.1 can be used. After starting the program a dialog is displayed in which you have to choose the device variant (see section 10.3). After the offline generation of a parameter configuration, this configuration can be transmitted to the ODS after connection to the PC has been established.

The order number for the software can be found in section 4.5 or section 8.5.

Notice

In connection with the ODSL 30, the programming software can only be used for the display of measurement values, but not for the configuration of the device.

10.1 Connection to a PC

10.1.1 Connection of the ODSL 8 to a PC

The ODSL 8 is connected to a PC via the programming terminal UPG 5. The terminal is simply inserted between the ODSL 8 and the connection cable. The UPG 5 is connected to the PC via the serial interface cable that ships with the UPG 5.

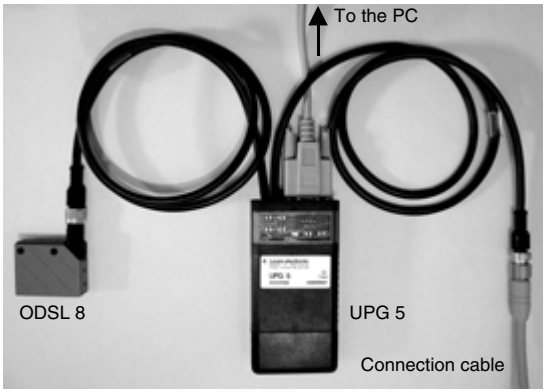


Figure 10.1: Connection of the ODSL 8 to a PC via the programming terminal UPG 5

10.1.2 Connection of the ODSL 30 to a PC

The ODSL 30 is connected to a PC via the programming terminal UPG 5. The terminal is simply inserted between the ODSL 30 and the connection cable. The UPG 5 is connected to the PC via the serial interface cable that ships with the UPG 5.

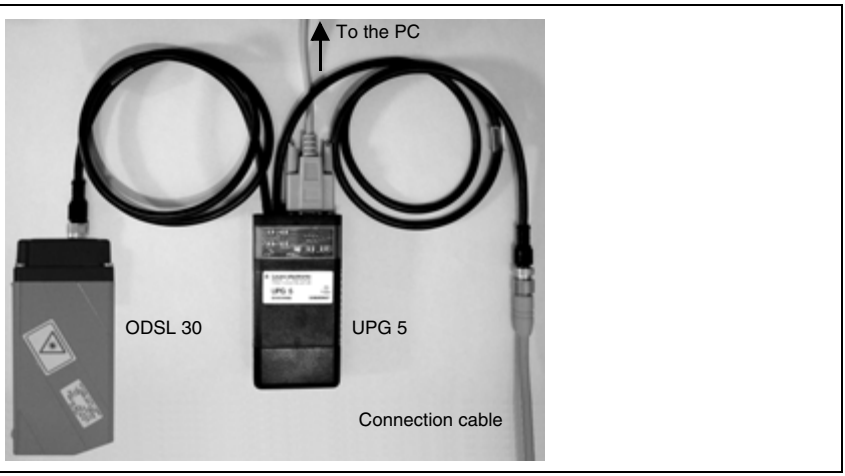


Figure 10.2: Connection of the ODSL 30 to a PC via the programming terminal UPG 5

Notice

The measurement values of the ODSL 30 can visualised on the PC using the ODS programming software. For this purpose, the left arrow key (up arrow) on the key pad must be pressed while the device is switched on. After that, the ODSL 30 is in PC configuration mode. However, a configuration of the device via the ODS programming software is not possible.

10.1.3 Connection of the ODSL 96 to a PC

A special parameter plug is situated behind the plastic cover on the backside of the ODS 96. Connection between the ODS 96 and the PC is established by means of the cable included in the shipment.

↳ *Connect the cable to the parameter plug on the ODS 96 and to a free serial interface (COM port) on the PC. More information on the definition of the interface can be found in section 10.3.1.*

10.2 Installation of the Programming Software

Requirements for the installation of the programming software:

- Windows 95/98/NT/2000/XP,
- 486 processor or faster,
- 4 MByte RAM,
- 2 MByte free disk space
- and a CD-Rom drive.

Starting the Installation File

↳ *Insert the installation CD into your CD drive.*

↳ *Choose **Start** → **Run**. Insert drive and name of the installation file (e.g.: d:\setup.exe) and hit **OK**.*

↳ *In the following window, define the path for the installation directory and confirm with **End**.*

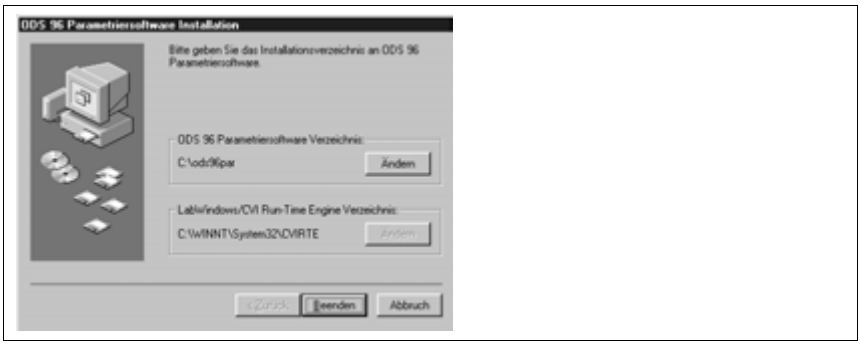


Figure 10.3: Installation directory

↳ *Follow the installation routine.*

10.3 Starting the Program

After successful installation and restart of the computer, the programming software is ready to use.

↳ *Choose the ODS 96 programming software icon from the program group.*

Without connected ODS, the following window appears after the program start, letting you choose a device:

Additional window without connected ODS

Figure 10.4: Device selection

If an ODS is connected, the following window appears:

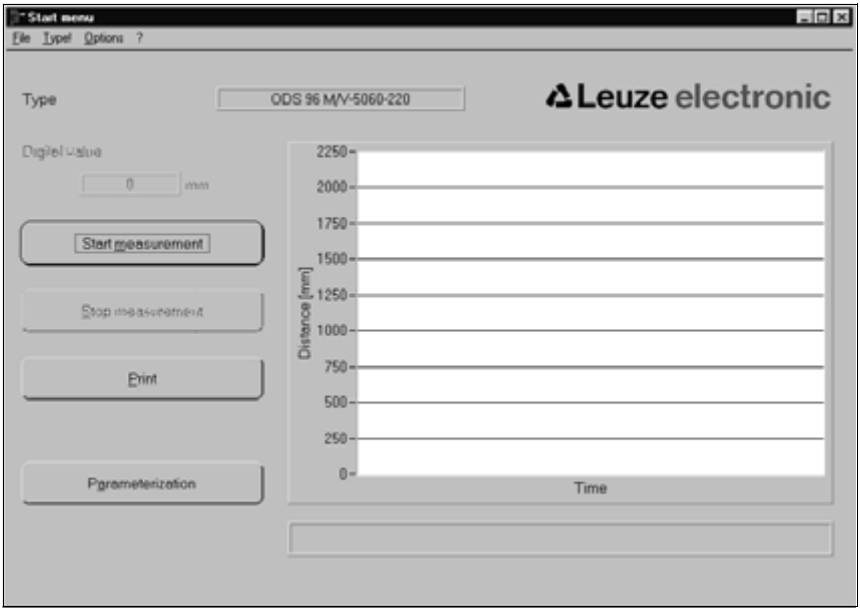


Figure 10.5: Start menu before measurement

The software automatically recognises the connected sensor with its default settings.

10.3.1 Description of the Menu Commands

Menu item "File"

Under menu item **File** you can switch to parameterisation mode or quit the program.

Menu item "Type!"

The menu item **Type!** is used for the default setting of parameters and the generation of parameter files without an ODS being connected. It lets you choose a device variant that you wish to configure.

Menu item "Options"

The following three possibilities are offered under **Options**:

- **Language selection** to choose the language for dialog.
- **Interface** to choose the port to which the cable to the ODS is connected (standard: COM 1). The programming software automatically recognises the interface used. Choosing a different port could become necessary if more than one sensor is connected.
- **Change password**: first enter your old, then your new password and confirm with **OK**.

Menu item "?"

Choose **About…**, for information on programming software (product, program, device version, as well as for the address of Leuze electronic).

10.3.2 Measurement

By clicking the button **Start measurement**, the current measurement data of the connected ODS are transmitted and plotted in the adjacent diagram as a function of time.

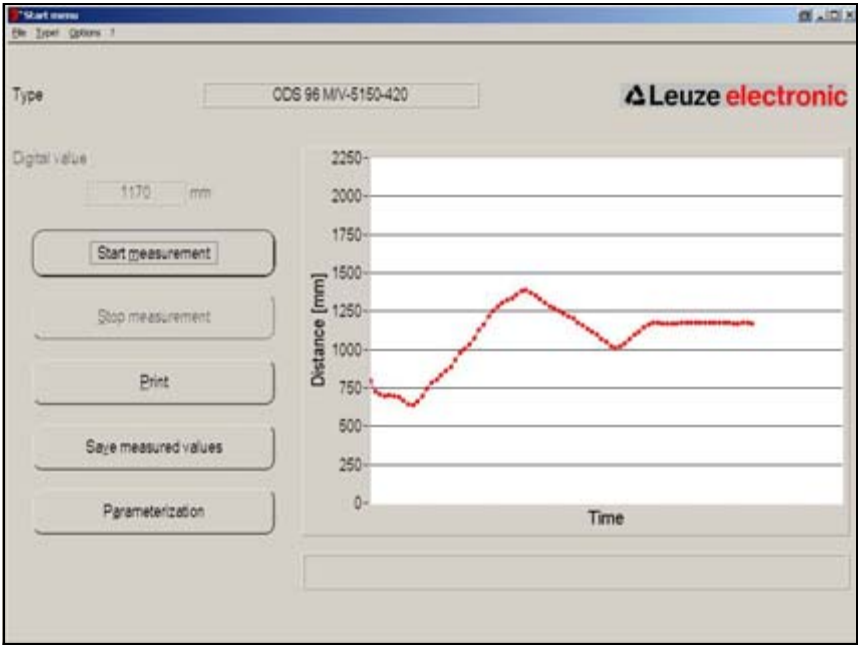


Figure 10.6: Display of the current measurement values of the ODS connected

This function permits easy checking of the device parameters that have been set, and lets you verify the proper functioning of the device.

By clicking the button **Stop Measurement**, you terminate the transmission of the measurement values from the ODS and freeze the measurement diagram.

With a subsequent click on the button **Print**, the diagram is output on your standard Windows printer.

10.3.3 Parameterisation

At this point, the various programming possibilities will be explained. Compared with the teach-in at the device, the software offers an extended functionality. For programming purposes, proceed as follows:

Switching to Parameterisation Mode

↳ *Click on* ***Parameterisation*** *in the start window.*

Password

If the program has been started for the first time, the password has to be entered. The factory-set password is: **ODS**.

After entering and confirming the following window appears:

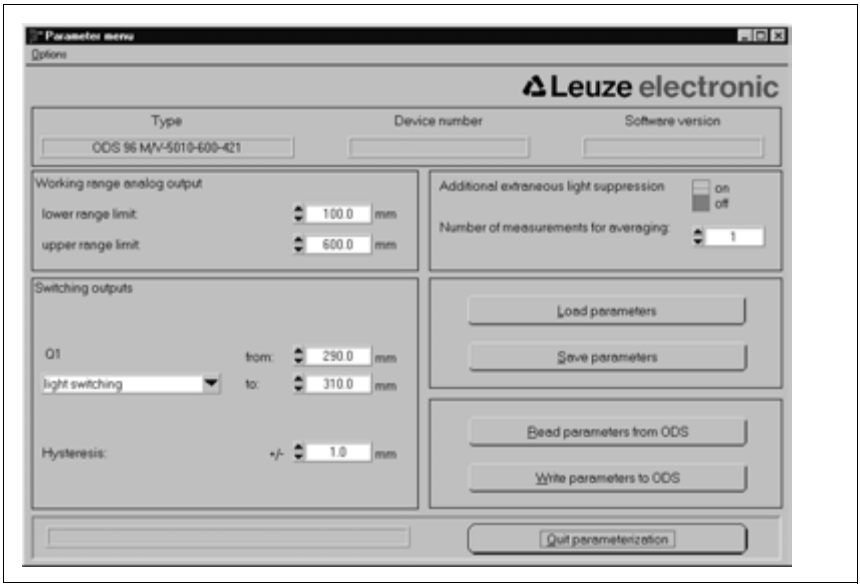


Figure 10.7: Example "Configuration Level": ODS 96 with analogue output

In the upper part of the window, information on the connected ODS device variant is displayed.

Menu item "Options"

The entire ODS parameter set is stored in a base value parameter file. In case of necessary service, the command **Options** → **Write default parameters** can be used to transmit the contents of this file to the ODS.

The command **Options** → **Write customer parameters**, triggers the same result as the button **Write parameters to ODS**.

Working range analogue output

You can adjust which distance corresponds to a voltage of 1 V, 4 mA at the analogue output (lower range limit) and which distance corresponds to a voltage of 10 V, 20 mA (upper range limit). This lets you spread the characteristic output curve according to your requirements.

It is also possible to invert the working range of the analogue output, i.e., the selected value of the lower range limit is larger than that of the upper range limit. This creates a descending characteristic output curve.

Notice

The adjustable working ranges depend on the device variant selected. The check for plausibility and validity of the values entered is only carried out once the parameters are transmitted to the ODS. The admissible value range is then displayed.

In the case of ODS variants without analogue output, this window area is disabled.

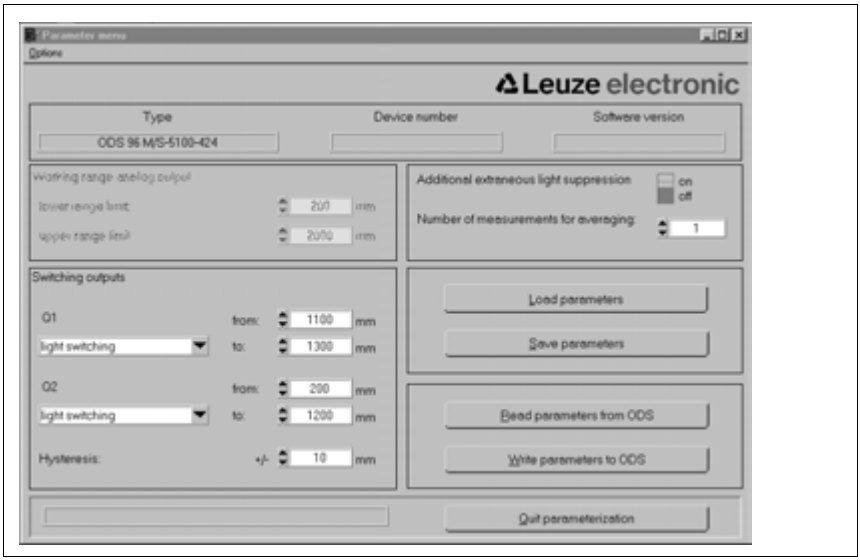


Figure 10.8: Example "Configuration Level": ODS 96 without analogue output with 2 switching outputs

Switching outputs

Depending on the ODS variant, values for either one or two switching outputs can be set. The adjustable parameters have the following meaning:

- **Light switching**: in case an object is inside the area defined under "from - to", the switching output is **active (high)**.
- **Dark switching**: in case an object is inside the area defined under "from - to", the switching output is **inactive**.

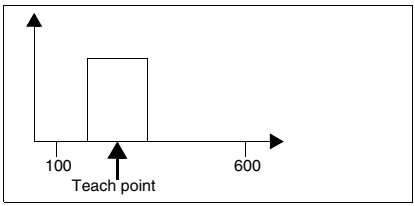
Notice

A switching range that has been set via the programming software remains current if a teach-in is subsequently carried out on the device.

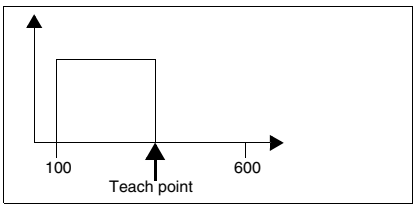
For the ODS 96, it is possible to set values that exceed the limits of the measurement range.

- **Hysteresis**: Expansion of the switching range for switching off. For switching on, the set switching points remain always valid.

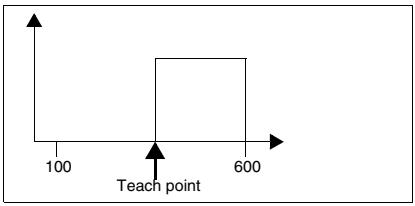
Programming through software, teaching through teach input



One switching output with both signal edges inside the measurement range → switching output width symmetrical around the teach point.



One switching output, first signal edge has been programmed on the lower range limit → the second signal edge will be taught through the teach input.



One switching output, second signal edge has been programmed on the upper range limit → the first signal edge will be taught through the teach input.

The combination "Programming through software, teaching through teach input" can be performed independently for each switching output. This means also for ODS variants with more than one switching output.

Additional extraneous light suppression

All conventional measures have been taken to render the ODS 96 insensitive towards extraneous light. For particularly difficult extraneous light conditions, the micro-controller built into the ODS 96 permits an additional extraneous light suppression through a special type of signal processing.

Notice

For the ODSL 8, an additional extraneous light suppression is not possible.

Number of measurements for averaging

Particularly objects with uneven or reflective surface require the measurement value be taken from the average of several measurements instead of just one.

Notice

The higher the number of measurements for averaging is chosen, the lower is the number of measurements per time unit (refreshing of measurement results).
This function only works in the ODSL 8 and ODS 96.

Load parameters

- *Use this button if you want to reload settings that have already been stored. You can select the desired configuration file in the dialog window that opens.*

Save parameters

Save personal settings:

- *Click on the button **Save Parameters to File** to store the current configuration as file. In the dialog window that opens, you can specify the name (`*.par`) and the path of the configuration file you wish to save.*

Notice

Leuze electronic can only deliver replacement sensors with default settings. You as customer are responsible for correct storage of your changed data sets. Back-up your device configuration on data carriers.

Read parameter from ODS

↳ *Click this button if you wish to load the current device parameters of the ODS connected. The ODS will then transmit the parameters to the PC.*

Write parameters to ODS

↳ *After having finished work in the parameterisation mode, use this button to write the current parameters to the ODS.*

Quit parameterisation

By clicking the button **Quit Configuration**, you exit the configuration level and return to the start menu.

To ensure that the parameters have been correctly transmitted to the ODS, you should click this button only after the message **Parameters transmitted to ODS** appears in the status line, located in the bottom left corner of the parameter window.

11 Appendix

11.1 Updating the parameter files of the ODS programming software

Update from diskette

- *Copy file ODS96PAR.DAT from A: to C:\ods96par.*
- *Copy all files from A:\DATA to C:\ods96par\DATA.*

Update from the Internet

- *Select the Leuze WWW server (http://www.leuze.de).*
- *Change to the download directory (DOWNLOAD -> BUSINESS UNIT OPTOSENSORS -> Measuring sensors).*
- *Download the file updODS96.exe for the respective operating system.*
- *Un-pack the self-extracting ZIP-files into the program directory.*

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D/GB 093/04 – 03/04 Artikel-Nr. 500 82 091