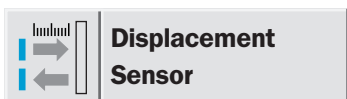




D i s p l a c e m e n t S e n s o r 0 D





Scanner and measuring system at the same time



T

The displacement sensors of the OD series are scanners and measuring systems at the same time. Thanks to intelligent microcontroller technology, we have been able to combine all functions in a compact device for the first time: precise measuring and reliable presence control, this sensor can do both.

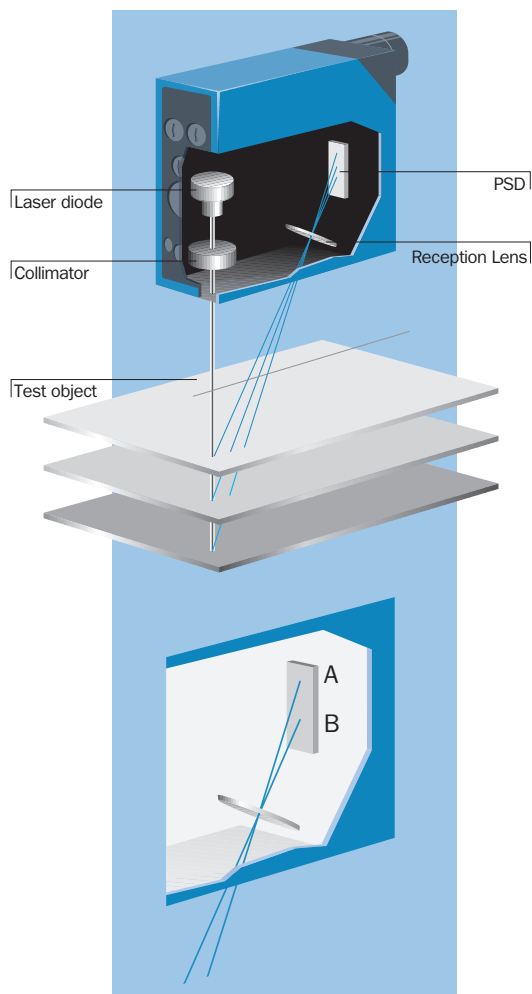
The calibration of the analog output and the setting of the scanning range of the control output is easy with Teach-in.

There are components in almost all manufacturing sectors that must fulfill the highest demands for precision and optics. The displacement sensors of the OD series detect the smallest deviations, depressions or lack of flatness immediately even in the μm range.

Type with metal housing and a class 2 laser is suited for applications that require the smallest spot dimensions for precise measuring. The plastic model OD 25 with red LED light source is suited for large-area recording of raw surfaces.

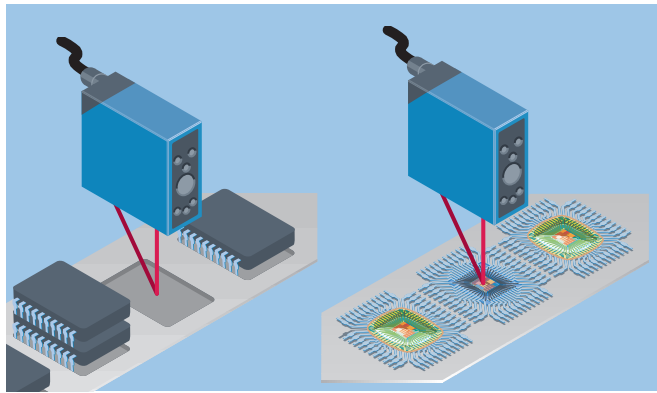
Temperature ranges between -10 and $+40$ °C as well as humid or dusty environments are no longer a problem.

▼ **The all-in-one sensor with proven PSD technology:** The proven triangulation measurement is the physical basis of the displacement sensor in the OD series. Optics, switches and signal processing are designed for the highest resolutions with simultaneously high linearity.

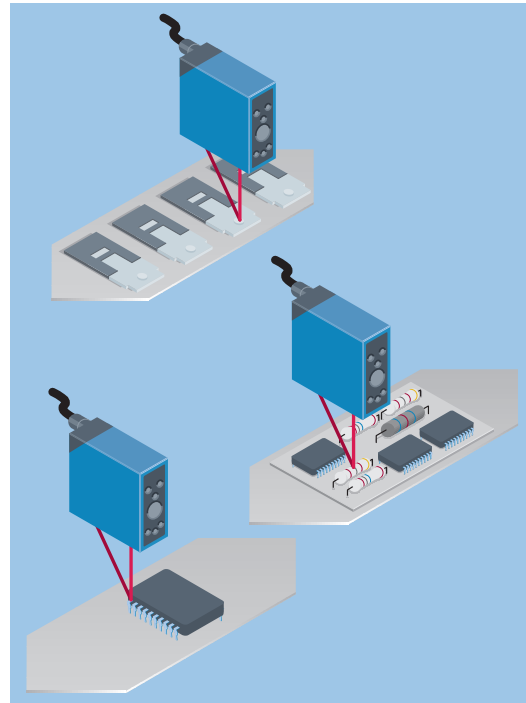
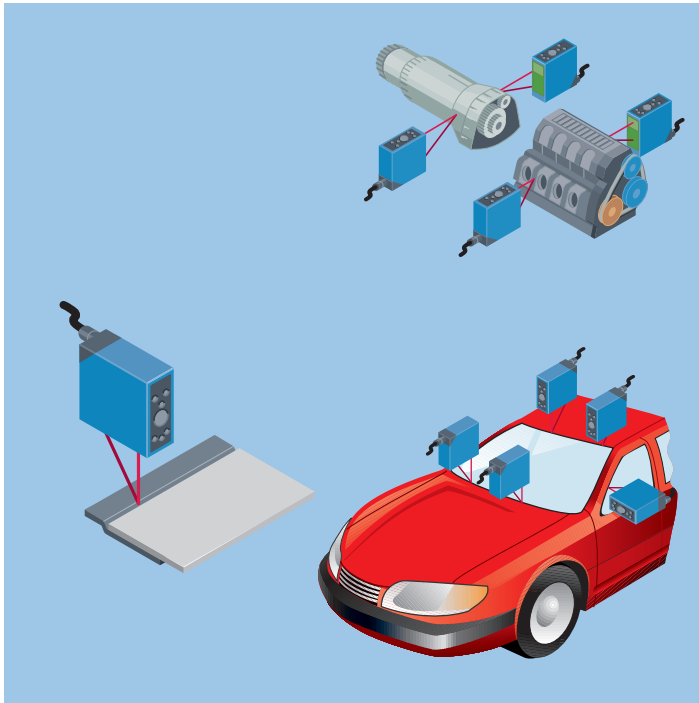


▲ **Triangulation measurement:** The site of the light spot on the PSD detector is dependent on the distance of the detected object. The signals A and B change depending on the position of the light spot. The calculation of the signals in the microcontroller then gives a linear output signal depending on the distance of the object.

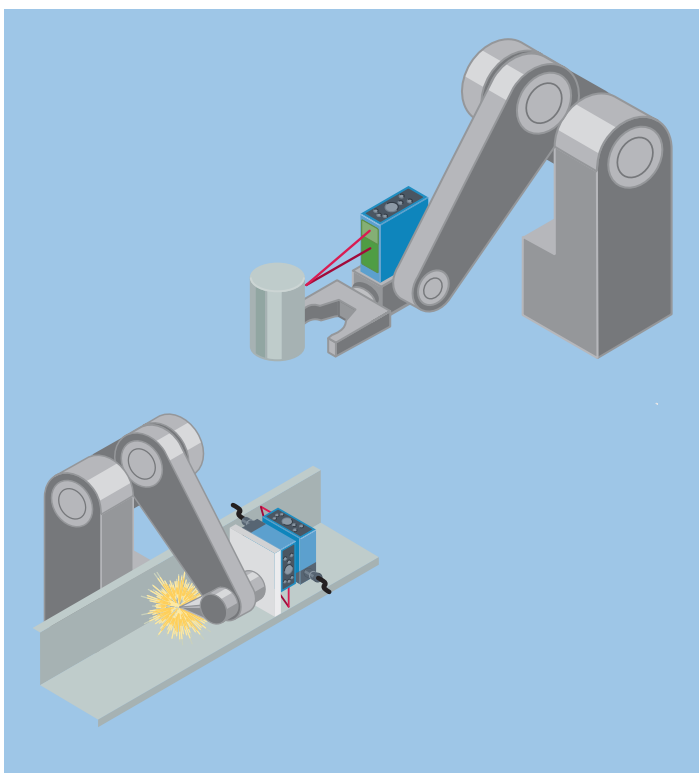
▼ **Automobile industry:** Measuring raw and low-reflection engine and gear components with an OD displacement sensor. Localization and checking of welds and bodywork parts in passenger car mass production. Multicolored surfaces are detected reliably.



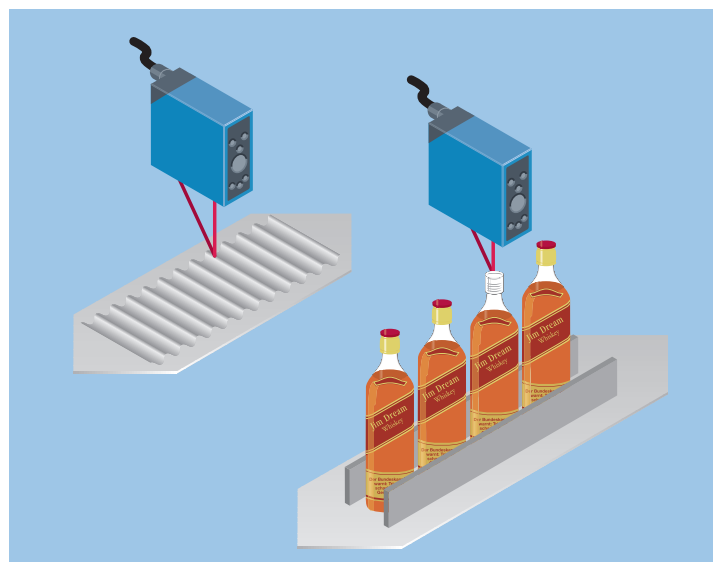
◀ **Semiconductor industry:** Measuring the epoxy resin deposit in IC manufacturing with the OD displacement sensor. Detection of missing ICs in the packaging of blister tapes. The OD is also designed for low-reflecting, light-absorbing surfaces.



◀ **Electronics industry:** Checking the switching behavior of relay contacts and mechanical switches with an OD displacement sensor. Checking the IC contacts before assembling boards. Making sure whether electrical components are present.

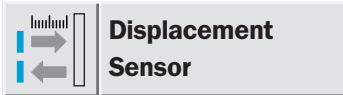


▲ **Robotics:** Alignment and targeted control of robot arms and control of welding robots in special purpose engineering or in mass production with an OD displacement sensor.



▲ **Paper and packaging industry:** Checking wave shapes and heights in cardboard production in cardboard packaging. The large light spot of the LED model enables measuring raw surfaces. Presence checks and checks of the curves of bottles and beaker caps. Multicolored surfaces do not affect the measuring behavior.

Displacement Sensors from the OD Series



Displacement Sensor

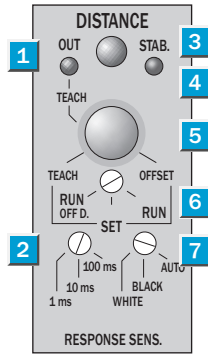
- Setting and calibration with Teach-in
- Laser and LED models
- Blanking input for synchronization for demanding measurement jobs



Description of the operating panel

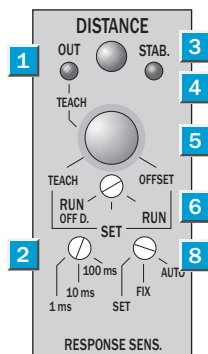
Setting options

OD 25-05P132
OD 25-05P830
OD 25-05N132
OD 25-05N830



Setting options

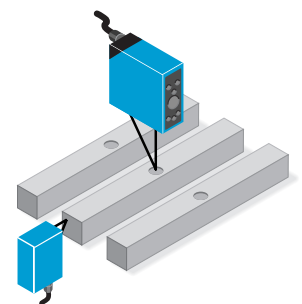
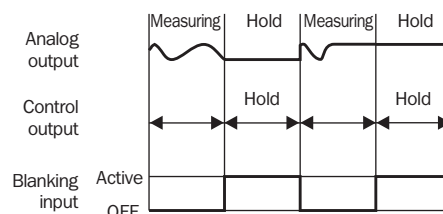
OD 30-04P142	OD 130-50P142
OD 30-04P840	OD 130-50P840
OD 30-04N142	OD 130-50N142
OD 30-04N840	OD 130-50N840
OD 50-10P142	OD 250-150P142
OD 50-10P840	OD 250-150P840
OD 50-10N142	OD 250-150N142
OD 50-10N840	OD 250-150N840
OD 100-35P142	
OD 100-35P840	
OD 100-35N142	
OD 100-35N840	



- 1** Output indicator/Teach-in indicator
In the RUN mode, the LED display shows the “open collector” status: orange = output ON; off or does not light = output OFF.
- 2** Response time with 3 positions
The positions 100 ms, 10 ms, and 1 ms are selected depending on the desired response time and resolution. The longer the response time, the better the resolution.
- 3** Distance indicator (DISTANCE)
Display for the distance from the sensor front to the object. In the scanning range: LED display lights red (closer than middle), orange (middle), or green (farther than middle). This distance indicator blinks red-green when the object is out of the measurement range.
- 4** Stable indicator (STAB.)
The LED display lights green when there is light reception with reserve. It does not light when there is sufficient reception, and it lights red if reflectance is too weak or strong.
- 5** Teach-in button – Set mode (during Teach-in)
 - a) Setting the scanning distance: The LED lights green 1x when the first distance is set and 2x when the second distance is set. It lights red 1x if there is an operating error.
 - b) Setting the offset: The LED lights green 3x when the offset is set. It lights red 1x if there is an operating error.
 - c) Resetting the offset: The LED lights green 3x when the offset is reset.
- 6** Mode selector with 3 positions
The positions SET, RUN, and RUN with OFF DELAY are required for Teach-in.
- 7** OD 25:
Sensitivity selector with 3 positions
WHITE (white object), BLACK (black object), and AUTO (gray and/or multicolored object). WHITE or BLACK is selected dependent on the reflection when the selector is set to AUTO.
- 8** OD 30/OD 50/OD 100/OD 130/OD 250:
AUTO: Automatic amplifier control (gain) depending on reflectance.
SET/FIX: Switch setting SET: Reflectance is taught by Teach-in. Switch setting FIX: Amplification is set after Teach-in with the switching function FIX.

Description of the blanking input (SH)

- When the blanking input is active, the control and the analog output retain their previous status (PNP type: active – level is HIGH; NPN type: active – level is LOW.)

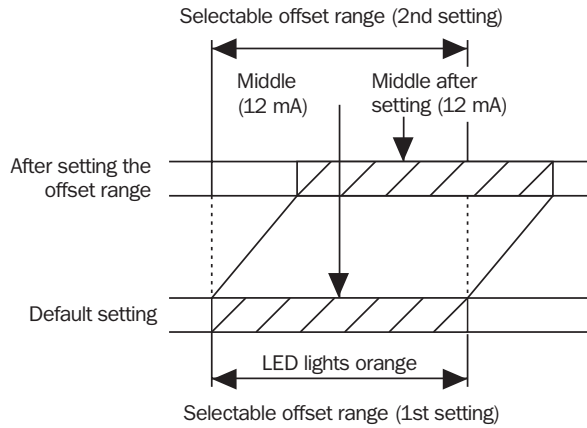


Beschreibung Funktionen

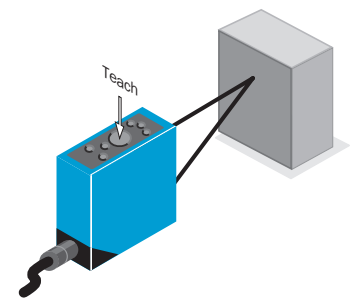
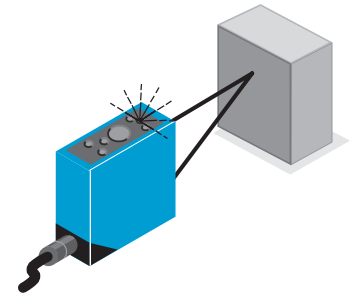
Two steps for calibrating the analog output

1. Position the object at the average scanning distance. The LED distance indicator lights orange.
2. Switch the Mode selector to SET. Press the Teach-in button for 2 to 5 seconds or trigger it via the connecting cable. The Teach-in display lights green 3x. Switch the Mode selector to RUN or RUN with OFF DELAY: the calibration is adopted.

The Teach-in input is independent of the position of the Mode selector.



▼ 1. Position of the sensor



▲ 2. Teach-in calibration of the analog output

Two steps for resetting the offset

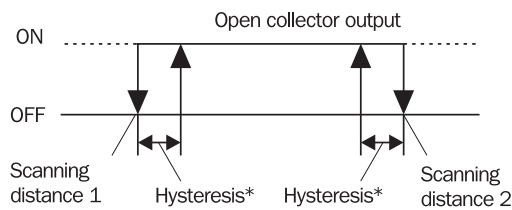
1. Switch the Mode selector to SET.
2. Press the Teach-in button longer than 5 seconds or trigger it via the connecting cable.

Three steps for setting the control output

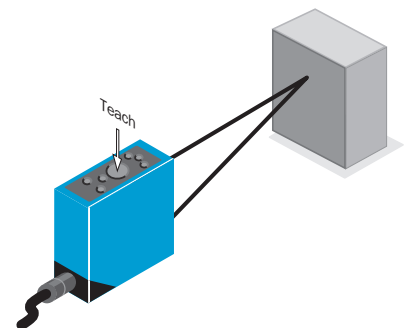
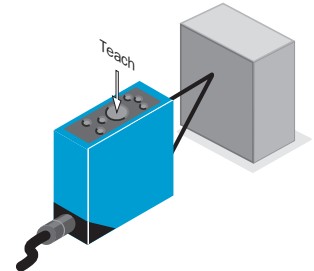
1. Switch the Mode selector to SET. Position the object at the scanning distance 1. Press the Teach-in button for fewer than 2 seconds or trigger it via the connecting cable.
2. Position the object at the scanning distance 2. Press the Teach-in button for fewer than 2 seconds or trigger it via the connecting cable.
3. Switch the Mode selector to RUN or RUN with OFF DELAY.

The Teach-in input is independent of the position of the Mode selector.

* The hysteresis depends on the response time: the longer the response time, the smaller the hysteresis. The basic principle applies: the higher the reflectance, the smaller the hysteresis.




▼ Object in scanning distance 1



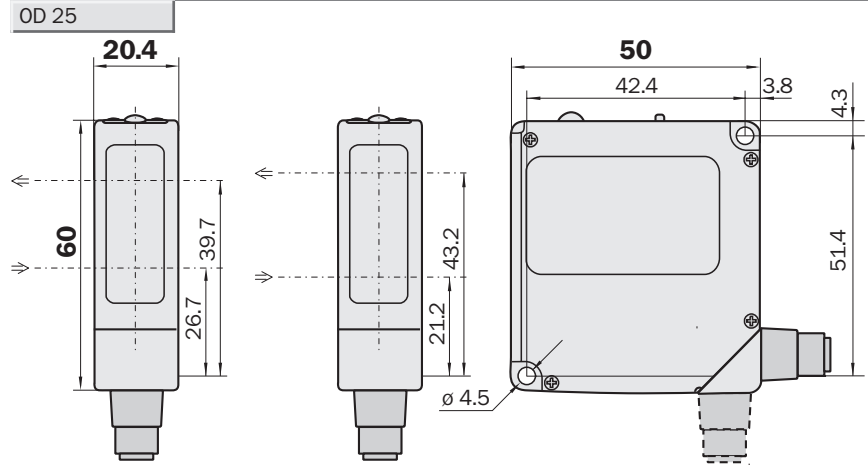
▲ Object in scanning distance 2

Displacement Sensors from the OD Series

 **Measuring range**
25 ± 5 mm

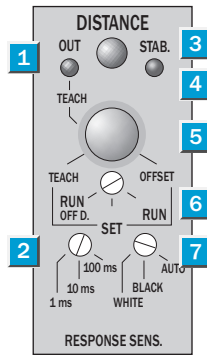
Displacement Sensor

Dimension illustration



Setting options

- OD 25-05P132
- OD 25-05P830
- OD 25-05N132
- OD 25-05N830

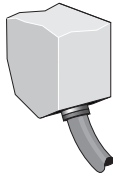


- 1 Teach-in indicator/output indicator
- 2 Response time selector
- 3 Distance indicator
- 4 Stable indicator
- 5 Teach-in button
- 6 Mode selector
- 7 Sensitivity selector
- 8 Mounting hole, \varnothing 4.5 mm
- 9 Connecting cable 2 m (optional 5 m) or M 12 plug; 90° rotatable

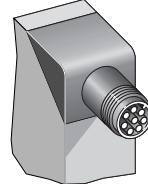
Connection type

- OD 25-05P132
- OD 25-05N132

- OD 25-05P830
- OD 25-05N830



6 x 0.2 mm²

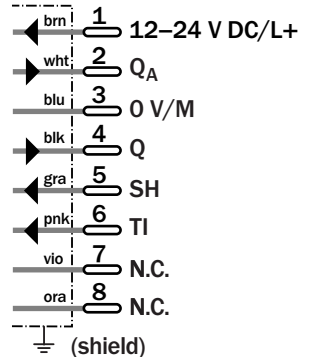
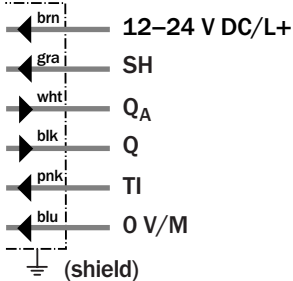


8-pin, M 12



Accessories

- ODC evaluation unit
- Cable receptacle with cable



Technical data		OD	25-05 P132	25-05 P830	25-05 N132	25-05 N830					
Measuring range	25 ± 5 mm										
Light source	LED, red light										
Analog output	4–20 mA , 0–300 Ω										
Control output ⁴⁾	PNP; 30 V/100 mA Open collector										
	NPN; 30 V/100 mA Open collector										
Accuracy	±1 % FS ²⁾ /18 % – 90 %, ±4 % FS ²⁾ /6 %										
Linearity	±1 % FS ²⁾ /18 % – 90 %, ±3 % FS ²⁾ /6 %										
Drift	± 0.05 %/°C FS ²⁾										
Resolution of analog output ³⁾	3/10/30 μm, 100/10/1 ms										
Analog output freq. response – 3 dB	100 ms – 6.7/s, 10 ms – 54/s, 1 ms – 770/s										
Teach-in input (TI)	NPN LOW = active, PNP HIGH = active										
Hold input (SH)	NPN LOW = active, PNP HIGH = active										
Timer	40 ms off delay										
VDE protection class	III										
Sensitivity to ambient light	10000 lx (sun), 3000 lx (artificial light)										
Supply voltage V _s	12–24 V DC , –5 %/+10 %										
Power consumption ⁴⁾	120 mA (at 24 V)										
Warmup time ⁵⁾	15 min maximum										
EMC	EN 50081-2, EN 50082-2										
Enclosure rating	IP 67										
Circuit protection ⁶⁾	A, B, D										
Ambient temperature T _A ⁷⁾	Operation: –10 ... +40 °C										
	Storage: –20 ... +60 °C										
Connection	Cable 2 m ⁸⁾										
	Plug ⁹⁾										
Housing	PBT (housing), Glass (window)										

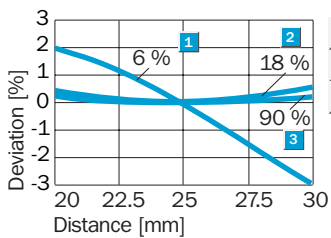
¹⁾ Minimum teachable distance window is 4 ... 10 times resolution of analog output
²⁾ FS = Full Scale = 10 mm/OD25, 20 mm/OD50

³⁾ 90 % remission
⁴⁾ Without load
⁵⁾ For applications with the highest resolution and preciseness

⁶⁾ A = inputs and outputs reverse-polarity protected
 B = outputs protected against short-circuits
 D = pulse interference suppression

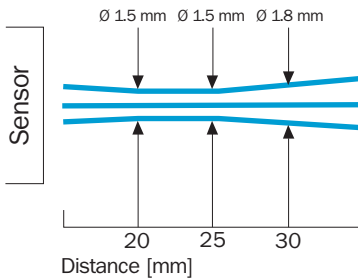
⁷⁾ Do not bend cable at temperatures lower than 0 °C
⁸⁾ Types with 5 m cables are available on request
⁹⁾ 2 m pre-fabricated cable, Part no. 6 020 663

Deviation OD 25-05 (LED)



- 1 Deviation on black
- 2 Deviation on gray
- 3 Deviation on white

Light spot diameter OD 25-05 (LED)



Ordering information

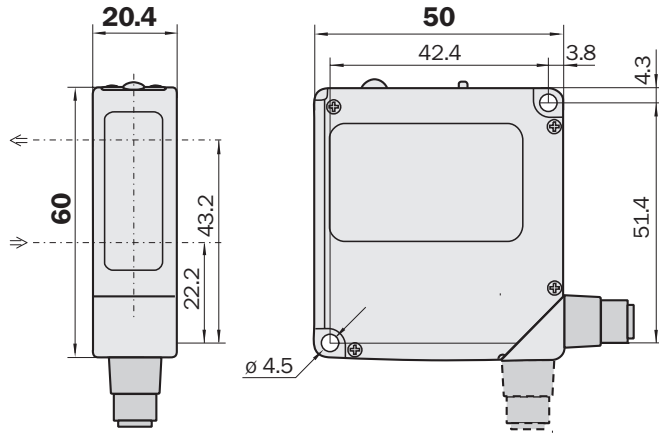
Type	Part no.
OD 25-05P132	6 020 643
OD 25-05P830	6 020 647
OD 25-05N132	6 020 642
OD 25-05N830	6 020 646

Displacement Sensors from the OD Series

	Measuring ranges 30 ± 4
	$50 \pm 10/100 \pm 35$
	$130 \pm 50/250 \pm 150$ mm
Displacement Sensor	

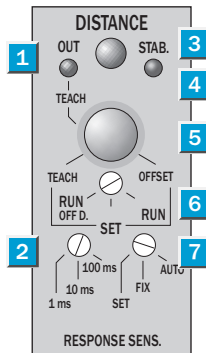
Dimension illustration

OD 30	OD 50
OD 100	
OD 130	
OD 250	



Setting options

All types

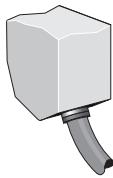


- 1 Teach-in indicator/output indicator
- 2 Response time selector
- 3 Distance indicator
- 4 Stable indicator
- 5 Teach-in button
- 6 Mode selector
- 7 Sensitivity selector
- 8 Mounting hole, $\varnothing 4.5$ mm
- 9 Connecting cable 2 m (optional 5 m) or M 12 plug; 90° rotatable

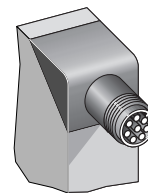
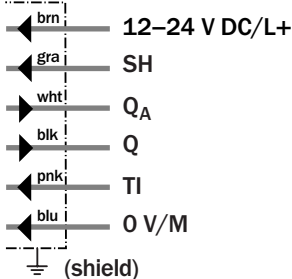


Connection type

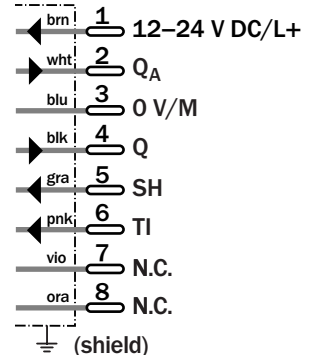
OD 30-04P142	OD 130-50P142	OD 30-04P840	OD 130-50P840
OD 30-04N142	OD 130-50N142	OD 30-04N840	OD 130-50N840
OD 50-10P142	OD 250-150P142	OD 50-10P840	OD 250-150P840
OD 50-10N142	OD 250-150N142	OD 50-10N840	OD 250-150N840
OD 100-35P142		OD 100-35P840	
OD 100-35N142		OD 100-35N840	



6 x 0.2 mm²



8-pin, M 12

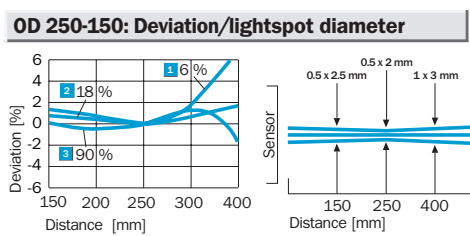
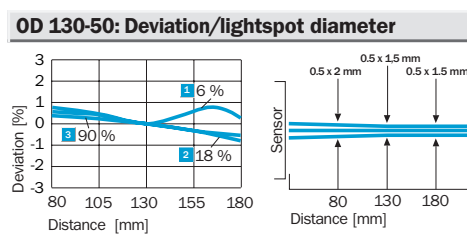
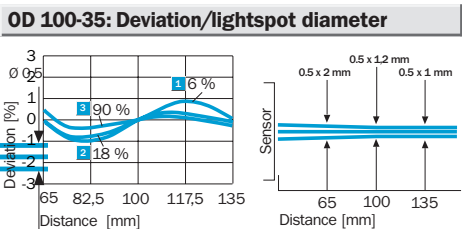
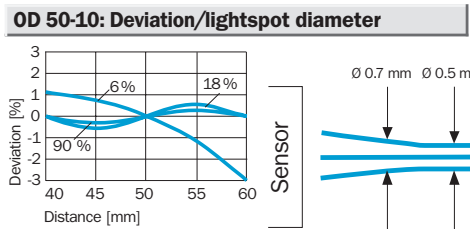
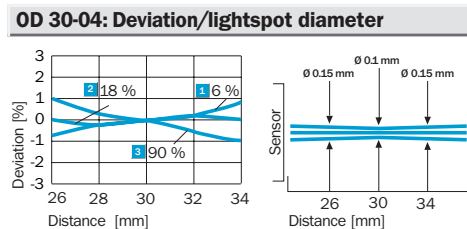


Accessories
ODC evaluation unit
Cable receptacle with cable

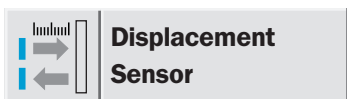
Technical data		OD	30-04	50-10	100-35	130-50	250-150			
			P/N ¹⁾ 142 ²⁾ 840 ³⁾	P/N ¹⁾ 142 ²⁾ 840 ³⁾	P/N ¹⁾ 142 ²⁾ 840 ³⁾	P/N ¹⁾ 142 ²⁾ 840 ³⁾	P/N ¹⁾ 142 ²⁾ 840 ³⁾			
Measuring range	30 mm ± 4 mm									
	50 mm ± 10 mm									
	100 mm ± 35 mm									
	130 mm ± 50 mm									
	250 mm ± 150 mm									
Light source	Laser class 2 IEC 60825: 1998									
Analog output	4–20 mA , 0–300 Ω									
Control output⁴⁾	PNP/NPN; 30 V/100 mA Open collector									
Accuracy	± 2 % FS ⁵⁾ /90 % – 6 %									
	± 3 % FS ⁵⁾ /90 % – 18 %									
Linearity	± 0,5 % FS ⁵⁾ /90 % – 6 %									
	± 1,5 % FS ⁵⁾ /90 % – 6 %									
	± 3 % FS ⁵⁾ /90 % – 18 %									
Drift	± 0,02 %/°C FS ⁵⁾									
Resolution of analog output⁶⁾	3/10/30 μm, 100/10/1 ms									
	10/3/1 μm, 1/10/100 ms									
	150/50/15 μm, 1/10/100 ms									
	200/70/20 μm, 1/10/100 ms									
	1500/500/150 μm, 1/10/100 ms									
Analog output freq. response – 3 dB	100 ms – 5/s, 10 ms – 42/s, 1 ms – 720/s									
	100 ms – 6,7/s, 10 ms – 54/s, 1 ms – 770/s									
Teach-in input (TI)	NPN LOW = active, PNP HIGH = active									
Hold input (SH)	NPN LOW = active, PNP HIGH = active									
Timer	40 ms off delay									
VDE protection class	III									
Sensitivity to ambient light	10000 lx (sun), 3000 lx (artificial light)									
Supply voltage V_s	12–24 V DC, –5 %/+10 %									
Power consumption⁷⁾	75 mA (at 24 V)									
Warmup time⁸⁾	10 min. maximum									
EMC	EN 50081-2, EN 50082-2									
Enclosure rating	IP 67									
Circuit protection⁹⁾	A, B, D									
Ambient temperature T_A¹⁰⁾	Operation: –10 ... +40 °C									
	Storage: –20 ... +60 °C									
Housing	Zinc (housing), Glass (window)									

Ordering information	
Type	Part no.
OD 30-04P142	6 021 839
OD 30-04P840	6 021 841
OD 30-04N142	6 021 840
OD 30-04N840	6 021 842
OD 50-10P142	6 020 637
OD 50-10P840	6 020 641
OD 50-10N142	6 020 636
OD 50-10N840	6 020 640
OD 100-35P142	6 022 476
OD 100-35P840	6 022 478
OD 100-35N142	6 022 477
OD 100-35N840	6 022 479
OD 130-50P142	6 021 847
OD 130-50P840	6 021 849
OD 130-50N142	6 021 848
OD 130-50N840	6 021 850
OD 250-150P142	6 021 851
OD 250-150P840	6 021 853
OD 250-150N142	6 021 852
OD 250-150N840	6 021 854

- 1) P = PNP; N = NPN
- 2) Connection: Cable 2 m
- 3) Connection: Plug 2 m pre-fabricated cable, Part no. 6 020 663
- 4) Minimum teachable distance window is 4 ... 10 times resolution of analog output
- 5) FS = Full Scale = 8 mm/OD 30, 70 mm/OD 100, 100 mm/OD 130, 300 mm/OD 250
- 6) 90 % remission
- 7) Without load
- 8) For applications with the highest resolution and preciseness
- 9) A = inputs and outputs reverse-polarity protected
 B = outputs protected against short-circuits
 D = pulse interference suppression
- 10) Do not bend cable at temperatures lower than 0 °C



- 1 Deviation on black
- 2 Deviation on grey
- 3 Deviation on white



Industrial application possibilities for decentral automation



The ODC evaluation unit expands the functions of the displacement sensors in the OD series: Decentral automation with additional computing and processing functions.

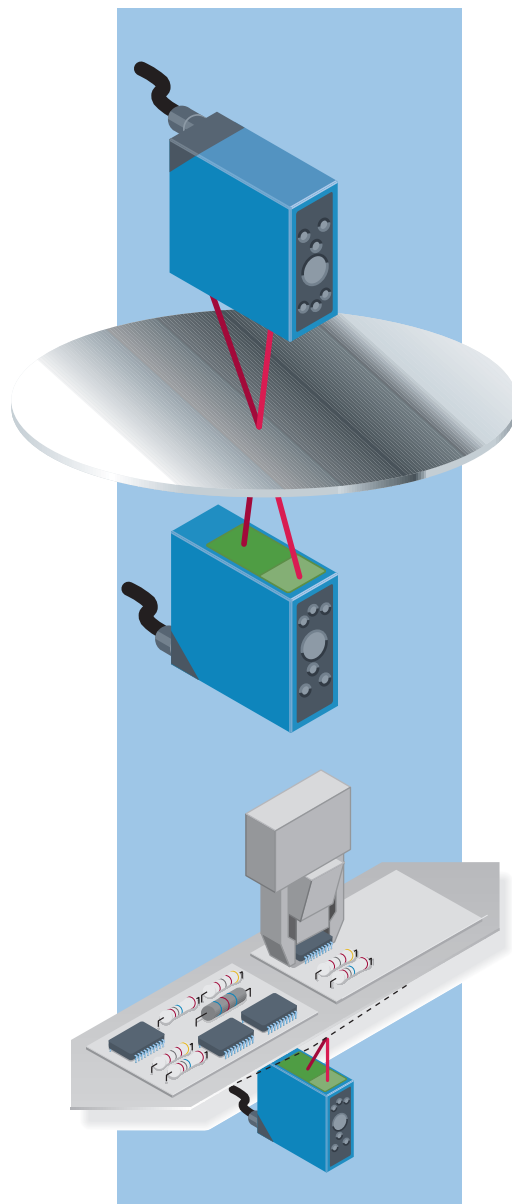
An integrated Profibus-DP interface enables the simplest connection to superordinate controls.

Thickness can be determined directly with a combination of two OD displacement sensors and an ODC evaluation unit.

“Peak-(Bottom-)Hold”, “Peak-to-Peak”, “Sample-and-Hold”, and “Automatic peak and bottom value holds” and additional filter functions are features that are available when the displacement sensors of the OD series are supplemented with the ODC evaluation unit.

The selection of the respective functions is done easily using a keyboard on the clearly structured display.

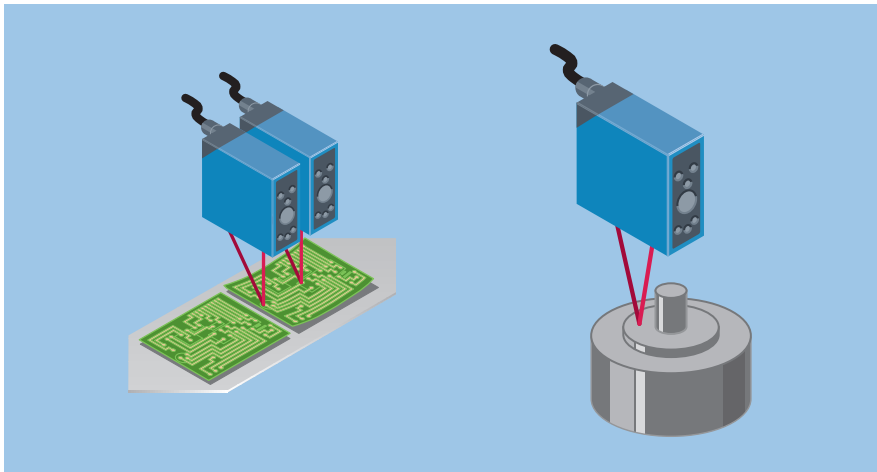
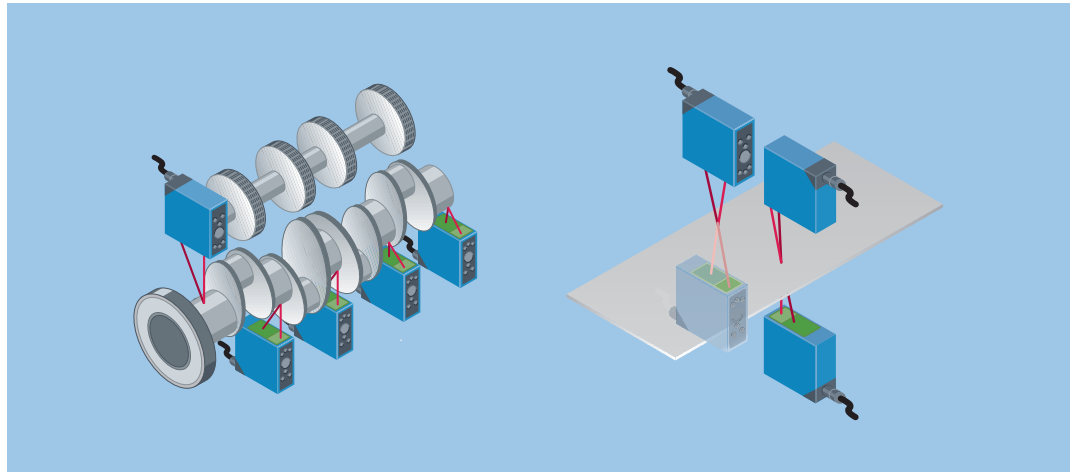
Supplemented with the mounting socket ODC-SOC (available as accessory), installation is fast and provides additional advantages: Replacement of the ODC evaluation unit without loosening the connections to terminals; possibility to fit the ODC evaluation unit at a later date to avoid damages during the installation phase.



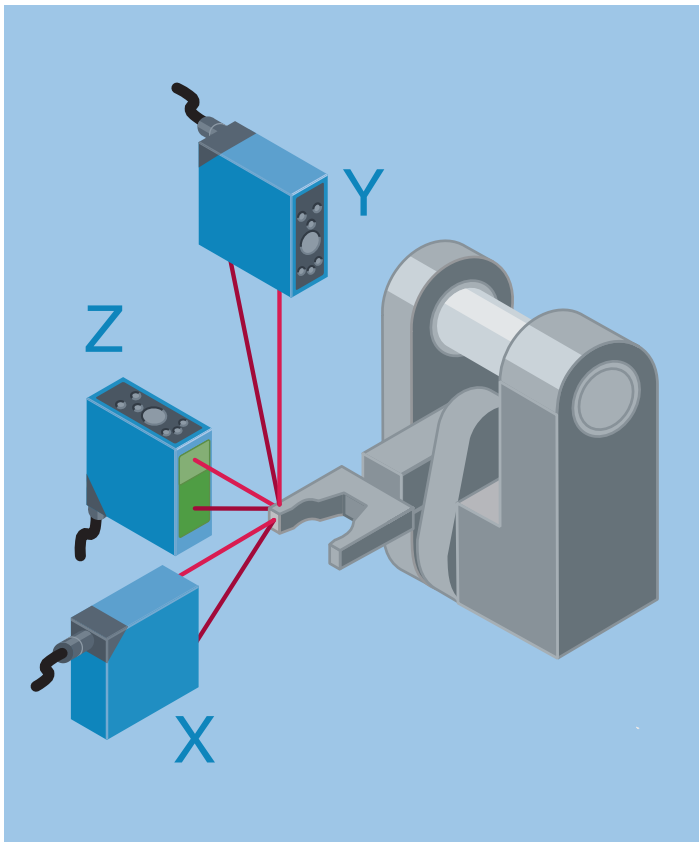
▲ **Semiconductor industry:** Thickness check and determination of wafers and ceramic substrates. The highly precise measurement is not influenced by reflecting scattered light. During assembly of boards, precise positioning is a must.



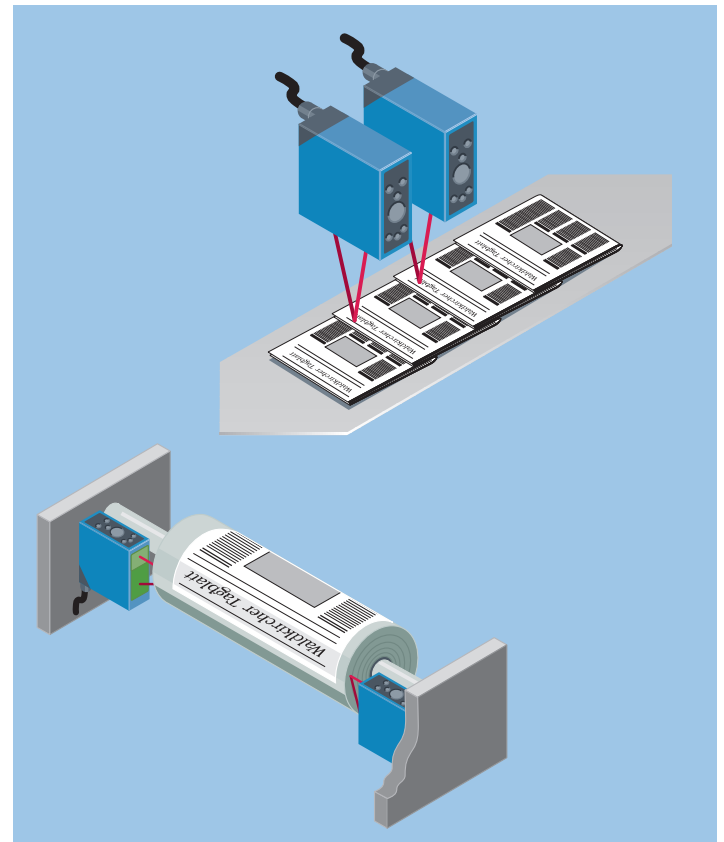
► **Automobile industry:** Tolerance checks of cams and crankshaft bearings with two or more OD displacement sensors and the ODC control equipment in an engine factory. The measured dimensions are even shown reliably in the μm range as absolute values on the ODC and transmitted per Profibus to the control. Determination of board strengths of almost all normally used materials and control of coating facilities are typical applications.



◄ **Electronics industry:** Checking the sagging of boards with a measurement arrangement consisting of two displacement sensors with an ODC control device in a motherboard design or assembly. Checking micrometer components in tape recorders, walkmans, CD players or memory drives. Low-reflection surfaces do not affect reliable measuring.

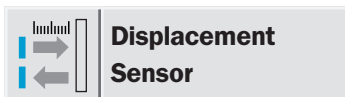


▲ **Robotics:** Zero point calibration and positioning control of robot arms in production lines with the OD displacement sensor and the ODC control unit. A closed loop control of the robot can be created via Profibus.



▲ **Paper and packaging industry:** Checking and counting newspaper or (thin) brochures after the folding process. Checking centering of paper-guiding axes and rollers in a printing plant.

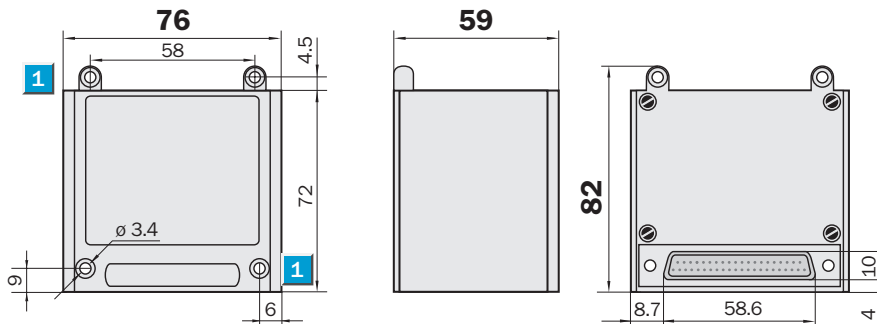
ODC Evaluation unit for OD Displacement sensors



**Displacement
Sensor**

- Advanced digital signal processing
- Measuring value processing for difficult applications
- RS 232 and Profibus

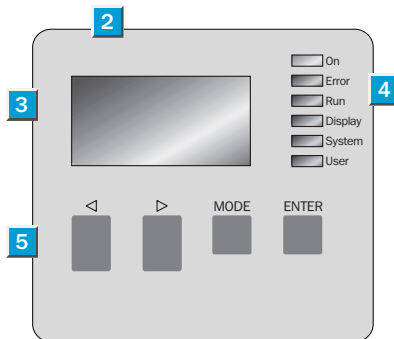
Dimension illustration



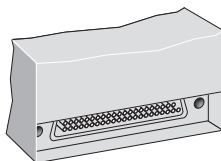
Setting options

ODC 100-P120

- 1 Mounting hole, \varnothing 3,4 mm
- 2 Electronics module
- 3 LC Display
- 4 Status LEDs
- 5 Film keyboard



Connection type 37-pin, Sub D connector



Accessories

Mounting socket ODC-SOC
 Extension cable ODC \leftrightarrow ODC-SOC, 37-pin,
 Sub D female and male connector
 ODC-IM-021 (1 m) 6 021 803
 ODC-IM-022 (2 m) 6 021 804
 ODC-IM-023 (3 m) 6 021 805

1	+24 V/L+
2	PE
3	In-Sig. 2 - (GND)
4	In-Sig. 2 + (Q _A)
5	Shield 2
6	Q 2
7	Autozero
8	Teach sen. 2 (TI)
9	Hold sen. 2 (SH)
10	H
11	L
12	Error
13	RTS
14	TxD
15	+24 V/L+
16	PE
17	PE
18	+5 V
19	PB +
20	GND/M
21	PE
22	In-Sig. 1 - (GND)
23	In-Sig. 1 + (Q _A)
24	Shield 1
25	Q 1
26	Sync
27	Teach sen. 1 (TI)
28	Hold sen. 1 (SH)
29	HH
30	LL
31	Go
32	CTS
33	RxD
34	GND/M
35	PE
36	GND/M
37	PB -

Technical data		ODC 100	-P120									
Analog inputs	Two inputs, 0 ... 20 mA (can be selected according to device type)											
Accuracy	± 0.05 % (Full Scale)											
Scanning frequency	2 kHz max.											
Measuring value calculation	Linearization, Offset, Autozero Scaling A, B, A + B, A - B, K - (A + B) ¹⁾											
Measurement function	Peak/Bottom/Hold, Peak-to-Peak-Hold, Sample/Hold, Autom. Peak Hold											
Filter functions	HIGH-pass, LOW-pass, Averaging											
Interfaces	RS 232 Profibus DP											
Control outputs ²⁾	PNP; 30 V/100 mA Open collector											
Outputs	HH, H, Go, L, LL and PNP (can be selected according to device type) Error											
Inputs	Sync, Autozero											
Off delay	60 ms fixed for the outputs											
Supply voltage V_s	24 V DC ± 10 %											
EMC	EN 50081-1, EN 50082-2											
VDE protection class	III											
Enclosure rating	IP 20											
Ambient temperature	Operation: 0 ... +40 °C Storage: -30 ... +60 °C											
Housing material	Zinc											

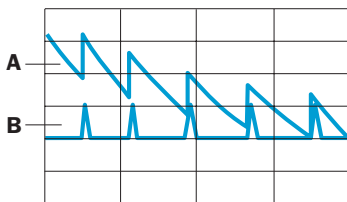
¹⁾ A = Sensor 1
B = Sensor 2

²⁾ Total current of all outputs < 500 mA

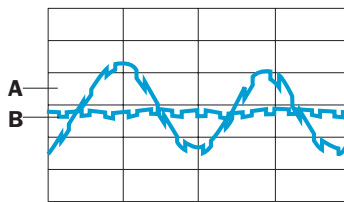
Technical features

High-pass filter

Function: Elimination of the low-frequency components of the analog input signal.
Effect: Gradual signal changes are ignored, i.e., only fast changes are recorded.



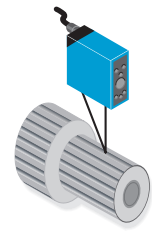
A Non-filtered data: Height difference and height are displayed.
B Filtered data: Only the height difference is displayed.



A Non-filtered data: Number of grooves and the eccentricity are displayed.
B Filtered data: Only the number is displayed.

Ordering information

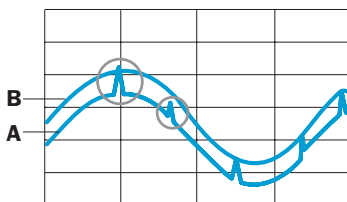
Type	Part no.
ODC 100-P120	6 022 480



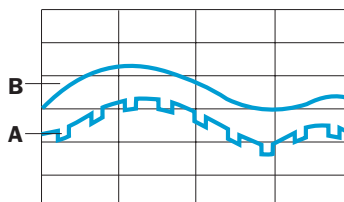
Measuring the groove depth or numbers of grooves

Low-pass filter

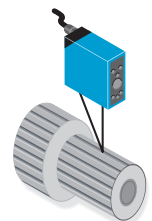
Function: Elimination of the high-frequency components of the analog input signal.
Effect: Fast signal changes are ignored, i.e., only gradual changes are recorded.



A Non-filtered data: Interferences are displayed.
B Filtered data: Measurement curve is displayed without interferences.



A Non-filtered data: Grooves and eccentricity are displayed.
B Filtered data: Only the eccentricity is displayed.

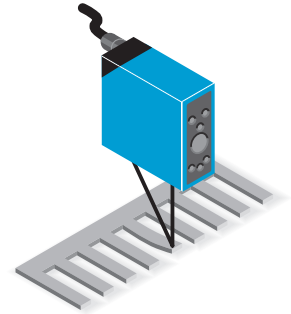
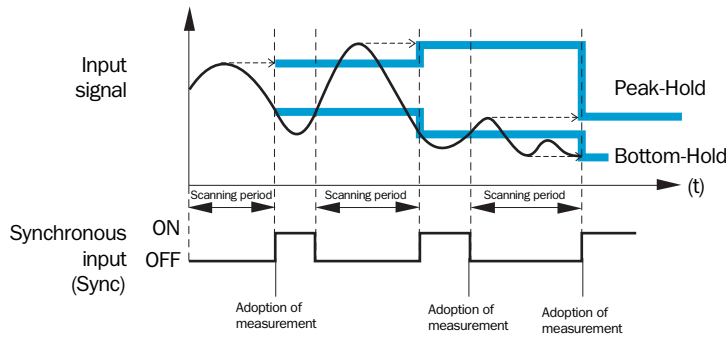


Measurement whether the collector runs round

Time behavior graphs

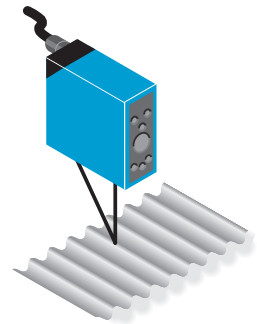
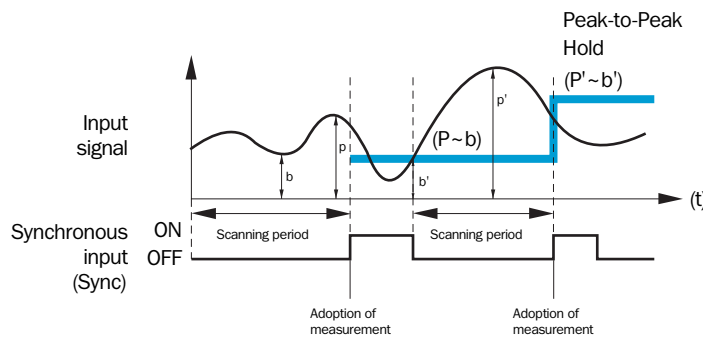
Peak-Bottom-Hold

The "Peak-(Bottom-)Hold" function is used for measuring the highest (lowest) value during a specific time period.



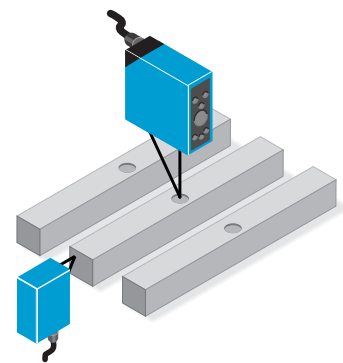
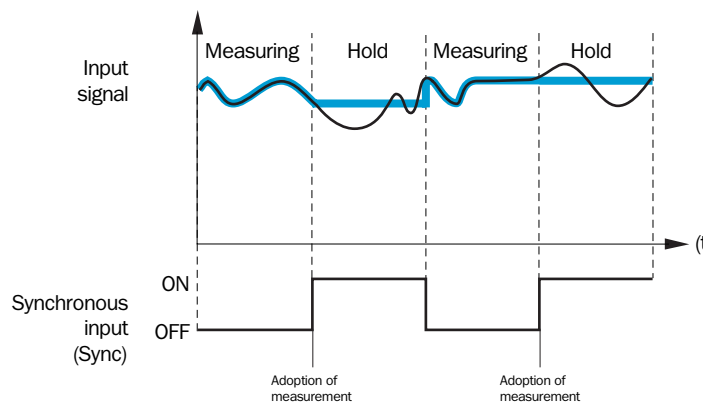
Peak-to-Peak-Hold

The "Peak-to-Peak" function is used for measuring the difference between the highest and lowest values during the preset time period.



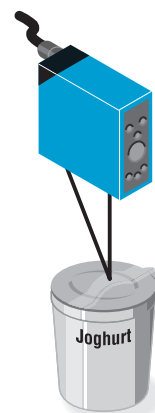
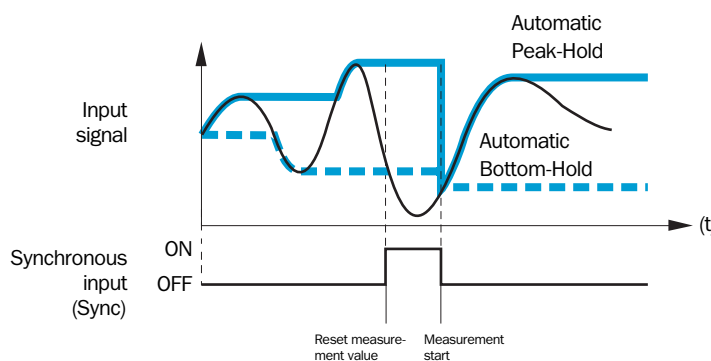
Sample/Hold

The "Sample-and-Hold" function is used for measuring the value during a specific time period.



Automatic Peak-Bottom-Hold

The "Automatic Peak- and Bottom-Hold" function is used for measuring the highest (lowest) value from the beginning of the measurement.

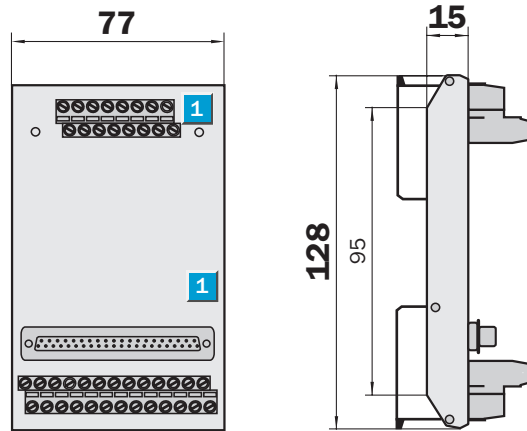




Mounting socket
ODC-SOC

- ODC-SOC:
Mounting socket for tophat
profile rail mounting

Dimension illustration mounting socket ODC-SOC



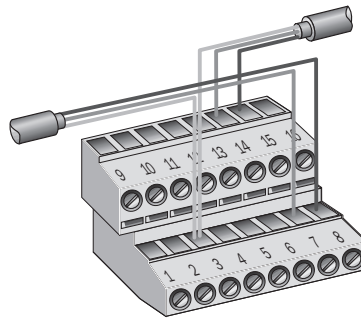
Connection option

- 1 Taphole for screwing the ODC evaluation unit, M 3



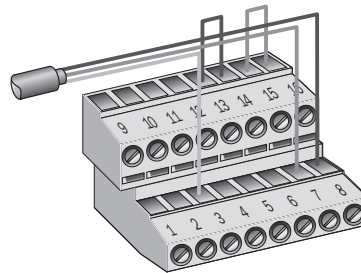
Terminal assignment X1

X1, Module not connected to the end of the field bus cable



1	GND/M
2	GND/M
3	PE
4	GND
5	TxD
6	RxD
7	PB +
8	PB -
9	+24 V/L+
10	+24 V/L+
11	RTS
12	CTS
13	+5 V
14	PB +
15	PB -
16	GND/M

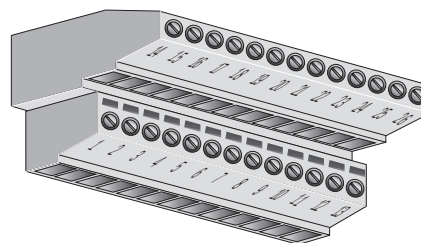
X1, Module connected to the end of the field bus cable



Ordering information

Type	Part no.
ODC-SOC	6 020 985

Terminal assignment X2



1	+24 V/L+	14	+24 V/L+
2	GND/M (0 V)	15	GND/M (0 V)
3	In-Sig. 1- (GND)	16	In-Sig. 2- (GND)
4	In-Sig. 1+ (Q _A)	17	In-Sig. 2+ (Q _A)
5	Shield 1	18	Shield 2
6	Q 1	19	Q 2
7	Sync	20	Autozero
8	Teach sen. 1 (TI)	21	Teach sen. 2 (TI)
9	Hold sen. 1 (SH)	22	Hold sen. 2 (SH)
10	HH	23	H
11	LL	24	L
12	Go	25	Error
13	GND/M	26	+24 V/L+

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