

OD Max Displacement Sensor



Sensorkopf und Verstärker-Einheit
Sensor Head and Amplifier Unit



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1 Symbols and Abbreviations Used

Warnings: Please read and observe these carefully!



CAUTION

Warnings are designed to protect you from dangers or help you avoid damage to the sensor.



Refers to the keys of the control panel (see Controls).



Indicates for which version of the OD Max (S = Standard Version; T = Transparent Version) the corresponding parameters are available.



Indicates whether or not the 123 key can be used for setting the parameter.



Indicates whether the settings of the parameter can be individually chosen for each memory bank or whether these are universally valid.

... / ... Indicates different settings, depending on the version (left = Standard; right= Transparent).

256 Settings shown in bold identify the default setting of a parameter.

Application Refers to the application-related use of certain settings.

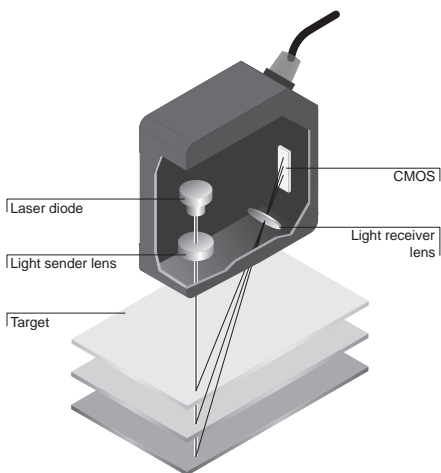
Note Refers to the correlation of a parameter with another one or provides additional background knowledge.

2 Correct Use

OD Max is an optoelectronic displacement sensor used for optical and non-contact measurement of distances to objects.

2.1 Operating Principle

OD Max is an optical displacement sensor consisting of a sensor head and an amplifier unit. The OD Max is mounted such that the emitted laser beam hits an object. The high-precision measurement of the distance from the sensor to the target follows the principle of triangulation, based on the reflection of the laser beam.



3 Safety Instructions



CAUTION

The OD Max is not a safety module complying with the EU Machinery Directive.

- ▶ Read the Operating Instructions prior to assembly and startup.
- ▶ Connection, assembly and setting must only be performed by specialist staff.
- ▶ Observe national safety and accident prevention regulations.
- ▶ Do not use the OD Max in explosive areas.
- ▶ Only use original system components.
- ▶ Do not look into the laser beam.
- ▶ Repairs must only be performed by the manufacturer. Interventions and modifications of the device are not permitted.
- ▶ Wiring work must only be performed with the supply voltage disconnected.
- ▶ Avoid direct beams of ambient light falling onto the receiving element.

- ▶ Use of controls, adjustments or performance of procedures other than the specified herein may result in hazardous radiation exposure.



CAUTION

3.1 Warnings for Laser Products

When exported to the USA, the OD Max series sensors are subject to FDA laser classification. The test results for the sensors have been communicated to the Center for Devices and Radiological Health (CDRH). Please contact the manufacturer for further details.

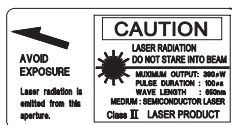
3.1.1 OD30-05T1, OD85-20T1 and OD350-100T1

Type	Red laser diode
Max. power	≤ 1 mW
Pulse duration	100 μs
Wavelength	650 nm
Laser class acc. to	2 (EN/IEC/JIS)
Laser class acc. to	2 (FDA)
Complies with	21 CFR 1040.10 (CDRH)



3.1.2 OD25-01T1

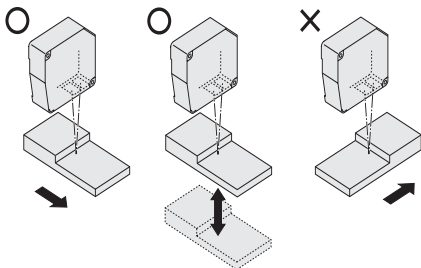
Type	Red laser diode
Max. power	$\leq 390 \mu\text{W}$
Pulse duration	100 μs
Wavelength	650 nm
Laser class acc. to	1 (EN/IEC/JIS)
Laser class acc. to	2 (FDA)
Complies with	21 CFR 1040.10 (CDRH)



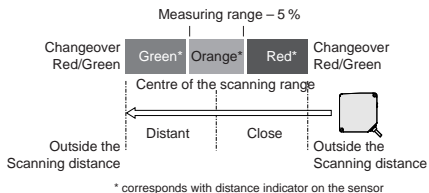
4 Operation Startup

4.1 Mechanical Installation

- ▶ Install the active sensor face parallel to the surface to be measured. Observe preferred direction of the sensor.



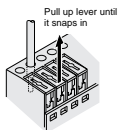
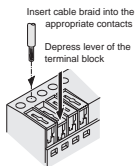
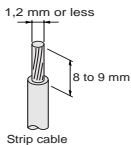
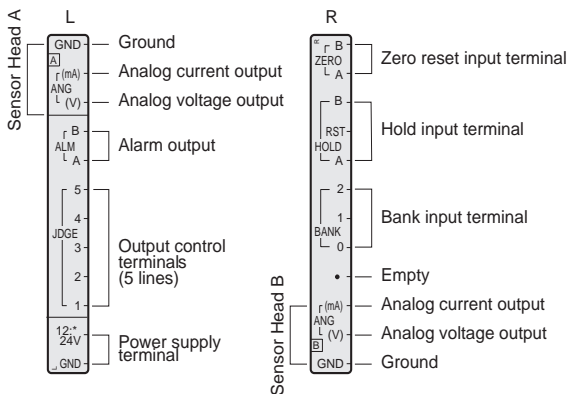
- ▶ In case of highly reflective object surfaces, slightly tilt OD 30-05T1, OD85-20T1 and OD350100T1 to the material surface (orthogonal alignment of the tilted sensor face to the object face).
- ▶ Select a suitable fixing, for highly accurate measurements.
- ▶ Choose the distance to the object such that the measuring tasks can be performed. Where possible, make measurements in the centre of the measuring range.



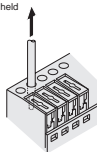
- ▶ In order to avoid errors, when installing several sensors, prevent the laser spot of a sensor from being in the visual range of another sensor.

4.2 Electrical Installation

4.2.1 Wiring of the Terminal Blocks

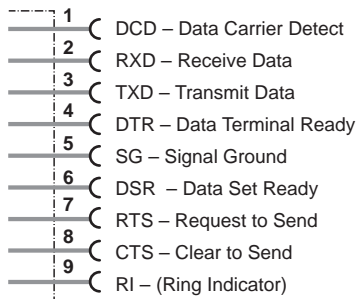


Ensure that the cables are firmly held



4.2.2 RS232 Connection

Connection of the external periphery with an RS232C cable (non-crossed, 9-pin, socket-socket cable):

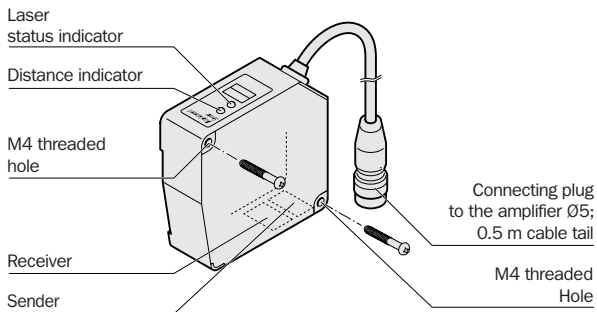


4.2.3 Connection of Sensor Head and Amplifier Unit

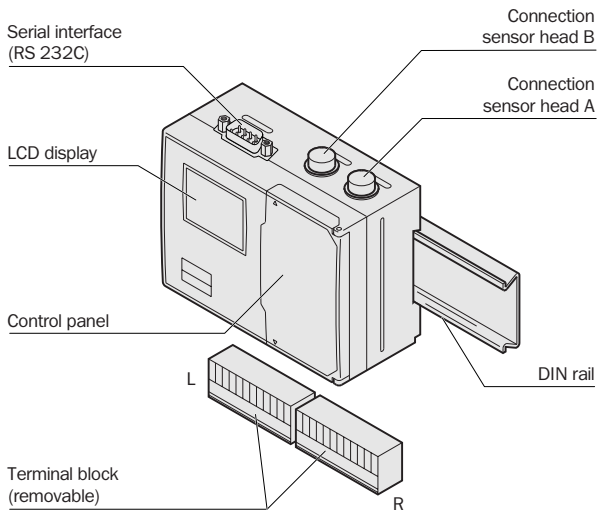
Connect the sensor heads with the amplifier unit by pushing the bayonet connector onto the socket.

5 Basic Information Prior to Use

5.1 Overview of the Sensor Head



5.2 Overview of the Amplifier Unit



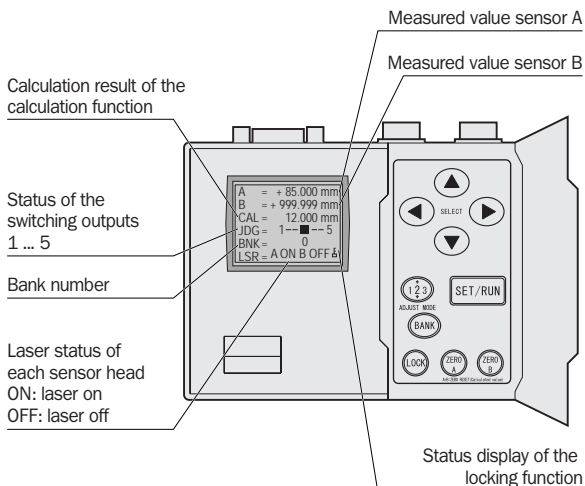
5.3 LCD Display

5.3.1 Representation of Measured Values

Blue measured value: current and real measured value, displayed

Black measured value: held value, displayed

Red measured value: no measurement possible.



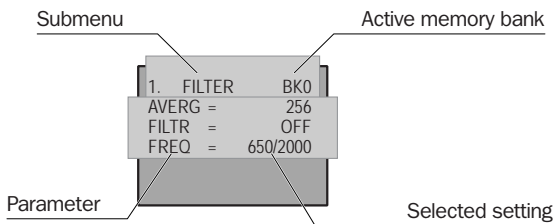
Depending on the sensor head used, a different number of decimal places is displayed:

Sensor type 25 mm:
4 places after the decimal point.

Sensor types 30 and 85 mm:
3 places after the decimal point.

Sensor type 350 mm:
2 places after the decimal point.

5.3.2 Menu



5.4 Controls

UP/DOWN keys
Selection of the submenu level or selection of the parameter to be set.

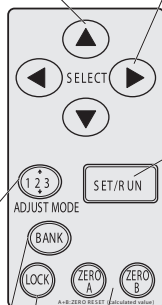
RIGHT/LEFT keys
Selection of the submenu to be displayed or selection of the setting for a parameter

1-2-3 key
Activates and deactivates the digit place function for freely definable numeric values and settings. When being active, the place can be selected using the RIGHT/LEFT keys, and the value of the selected place can be changed using the UP/DOWN keys.

SET/RETURN key
Selection of the display mode

BANK key
Selects the active memory bank and associated settings.
Note: the memory bank can also be selected using the BANK inputs (also see Memory Behaviour of the OD Max).

LOCK key
The key locks are activated and deactivated by pressing this key for more than a second.
Note: The lighting of the keys is off when key lock is active.



ZERO A/ZERO B key
Zero setting of the measured value or of the calculation result (simultaneously pressing both keys) by pressing the key(s) for at least 1 sec. By pressing the key(s) again for 2 or more seconds, the zero set is cancelled. The zero set (input signal = 10 ms) as well as the cancellation of the zero set (input signal = 500 ms) can also be effected via the ZERO inputs.
Note: the execution of the ZERO reset also affects the behaviour of the outputs.

5.5 Examples of Navigation

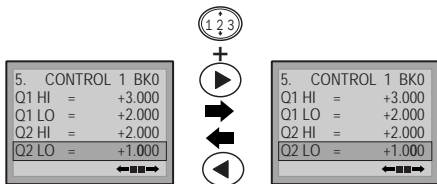
A B = CAL = JDG = 1 -- 5 BNK = 0 LSR = A ON B OFF	SET/RUN	1. FILTER BK0 AVERG = 256 FILTR = OFF FREQ = 650/2000	Changing the display mode
--	---------	--	---------------------------

1. FILTER BK0 AVERG = 256 FILTR = OFF FREQ = 650/2000	▶	2. CALCUL. 1 BK0 FORMU = A K = + 0.000	Changing the submenu
--	---	--	----------------------

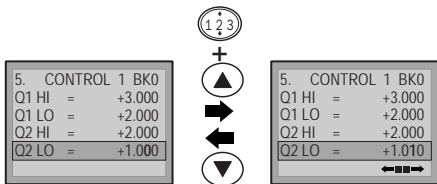
1. FILTER BK0 AVERG = 256 FILTR = OFF FREQ = 650/2000	▲	1. FILTER BK0 AVERG = 256 FILTR = OFF FREQ = 650/2000	Changing the parameter to be set/ changing to the submenu level
--	---	--	--

1. FILTER BK0 AVERG = 256 FILTR = OFF FREQ = 650/2000	▶	1. FILTER BK0 AVERG = 1024 FILTR = OFF FREQ = 650/2000	Changing the setting
--	---	---	----------------------

1. FILTER BK0 AVERG = 256 FILTR = OFF FREQ = 650/2000	(BANK)	1. FILTER BK1 AVERG = 256 FILTR = OFF FREQ = 650/2000	Changing the active memory bank
--	--------	--	---------------------------------

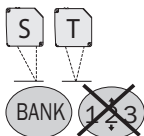


Selection of the character to be freely defined



Selection of the value of the character selected

6 Functions and Settings



6.1 Averaging

Submenu	Parameter	Settings
1. FILTER	AVERG	OFF; 4; 16; 64; 256 ; 1024; 4096

Setting how many measurements are averaged for the measured value output. The averaging is a so-called floating averaging: there is an updated data output every 0.1 ms.

Averaging Setting	Response Time
Avg 1 (=OFF)	0.5 ms
Avg 4	1 ms
Avg 16	2 ms
Avg 64	8 ms
Avg 256	30 ms
Avg 1024	110 ms
Avg 4096	450 ms

Application

Avg 1 (=OFF) ←————→ Avg 4096

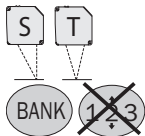
Used:

- For smooth surfaces
- For good environmental conditions
- When fast response time is required
- When current distance is of great importance (for dynamic processes)

Used:

- For rough surfaces, which need to be smoothed (for dynamic processes)
- For bad environmental conditions
- When high accuracy is required (for static processes)
- When the trend of distance is of interest (for dynamic processes)

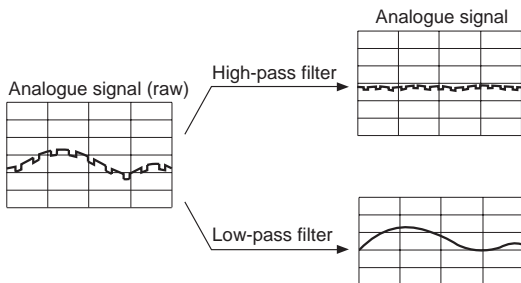
Note When using the averaging function, the high- or low-pass filter must not be active (FILTR = OFF).



6.2 Filter Functions

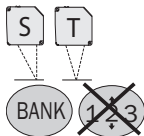
Submenu	Parameter	Settings
1. FILTER	FILTR	OFF; HIPASS; LOPASS

With the parameter FILTR, the high-pass or the low-pass filter is activated.



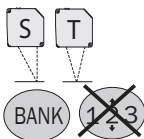
Application The high-pass or the low-pass filter is used when cyclical, regular signals with a known frequency need to be filtered out.

Note When using the high- or low-pass filter, no averaging must be active (AVERG = OFF).



Submenu	Parameter	Settings
1. FILTER	FREQ	650/2000; 350/800; 200/ 400; 100/200; 50/100; 25/ 50; 15/ 20; 10/ 10 [Hz]

FREQ sets the limit frequency for the high- or low-pass filter used. When using the high-pass, the left-hand value defines its lower limit frequency. When using the low-pass, the right-hand value indicates which frequency must not be exceeded that changes in distance are recognized and output.



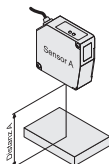
6.3 Calculation Functions

Submenu	Parameter	Settings
2. CALCUL.1	FORMU	A; B; A+B; A-B; -A-B; K-A-B; K+A+B; K+A-B; K+A; K+B

Using the FORMU parameter, different arithmetical calculation formula can be selected to solve customer-specific applications.

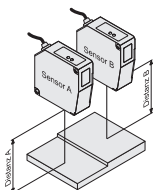
Application

Distance measurement



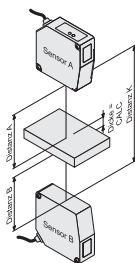
$$\text{CALC} = A$$

Flatness measurement



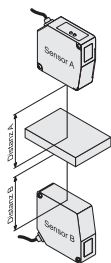
$$\text{CALC} = A - B$$

Thickness measurement

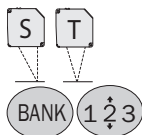


$$\text{CALC} = K - A - B$$

Centricity measurement

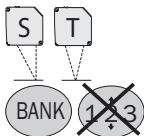


$$\text{CALC} = A - B$$



Submenu	Parameter	Settings
2. CALCUL.1	K	-9.999,999...0... +9.999,999 / -999,9999...0... +999,9999

By the parameter K, the constant K used for the calculation formula can be set - e.g. for taking into account a reference distance for a thickness measurement.

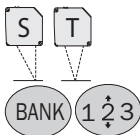


Submenu	Parameter	Settings
3. CALCUL.2	SIGNA; SIGNB	FAR SIDE +; NEARSIDE +

SIGNA and SIGNB resp., serve to determine the sign convention on the display.

FAR SIDE + The measured value increases when the distance to the measured object increases.

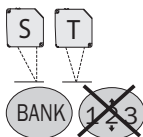
NEARSIDE+ The value increases when the distance to the object reduces.



Submenu	Parameter	Settings
3. CALCUL.2	SFT A; SFT B; SFT C	- 9.999,999...0... + 9.999,999 / -999,9999...0... +999,9999

With SFT A, SFT B and SFT C the measurement results and the calculation result for the calculation and display are displaced.

Note The offset implemented by a ZERO reset is automatically stored as setting for the SFT parameters.



6.4 Measurement Functions

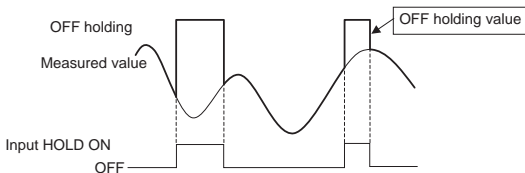
Submenu	Parameter	Settings
4. HOLD	HEAD A; HEAD B; CALCU	OFF; SAMPLE; PEAK; BOT- TOM; P-P; AUTOPEAK; AUTOBOTTOM

HEAD A, HEAD B and CALCU, resp., serve to define different holding functions for the sensor heads and the calculation result. Based on the settings, corresponding values are held and provided at the output.

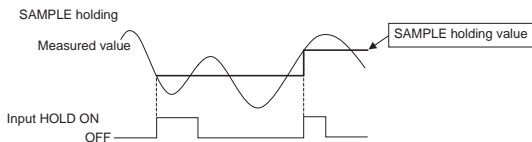
Note The setting of the parameter INPUT determines whether the hold functions for the sensor heads or the calculation result will be active.

Measurement in real-time; switching off the laser (HOLD = OFF)

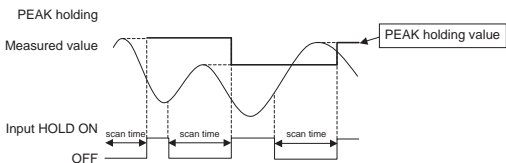
The measurement occurs in real-time for the standard setting OFF. In this setting, the lasers of the sensor heads can be switched off via the hold inputs.



Measurement at a certain time (HOLD = SAMPLE)

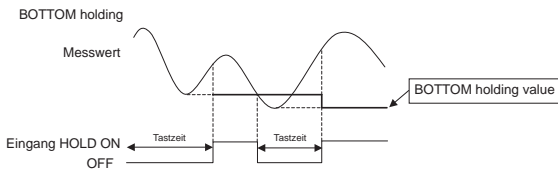


Measurement of the maximum distance within a time interval (HOLD = PEAK)



Measurement of the minimum distance within a time interval (HOLD = BOTTOM)

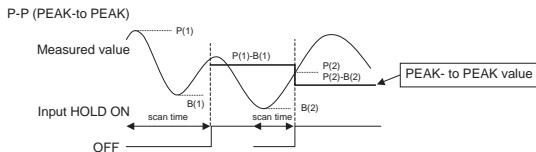
Application Measuring the diameter of an object rolling by underneath the sensor.



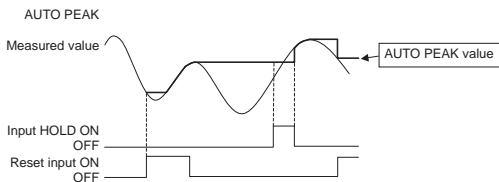
Measurement of the maximum height difference within a time interval (HOLD = PK-PK)

Application In practice, for instance, the runout or true running of a shaft can be measured.

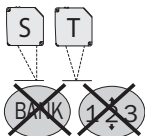
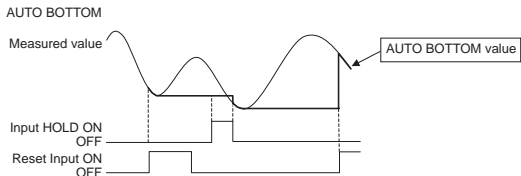
Note When using PK-PK for a sensor head the value is offset by the min measuring range (e.g. 65 mm for 85 mm version; due to functionality of analogue output).



Automatic measurement of the maximum distance (HOLD = AUTOPEAK)

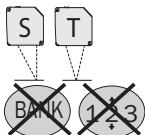


Automatic measurement of the minimum distance (HOLD = AUTOBOTTOM)



Submenu	Parameter	Settings
4. HOLD	INPUT	[A][B]; [][CAL]

INPUT serves to activate the holding functions and the hold inputs for the sensor heads or for the calculation result (via hold input B).

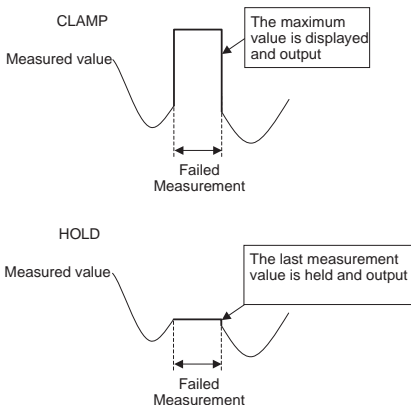


Submenu	Parameter	Settings
4. HOLD	ALARM	CLAMP; HOLD

ALARM defines the sensor behaviour in case of failed measurement.

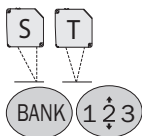
CLAMP: In case of failed measurement the maximum value is displayed (e.g. + 9999.999) and output (e.g. 24 mA).

HOLD: The value of the last successful measurement is held in the case of a measuring error.



Application The HOLD setting is useful especially when checking continuous processes in which, for example, gaps need to be ignored.

Note The alarm output will output every failed measurement, irrespective of this setting.



6.5 Switching Outputs

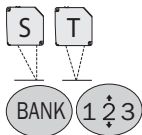
Submenu	Parameter	Settings
5. CONTROL1	01 HI	-9.999,999... 3 ... + 9.999,999 /
6. CONTROL2		-999,9999... 0,6 ... +999,9999
7. CONTROL3		
	01 LO; 02 HI	-9.999,999... 2 ... + 9.999,999 /
		-999,9999... 0,4 ... +999,9999
	02 LO; 03 HI	-9.999,999... 1 ... +9.999,999 /
		-999,9999... 0,2 ... +999,9999
	03 LO; 04 HI	-9.999,999... -1 ... +9.999,999 /
		-999,9999... -0,2 ... +999,9999
	04 LO; 05 HI	-9.999,999... -2 ... +9.999,999 /
		-999,9999... -0,4 ... +999,9999
	05 LO	-9.999,999... -3 ... +9.999,999 /
		-999,9999... -0,6 ... +999,9999

The threshold values of the five switching outputs are defined via the submenus CONTROL.

Note The switching outputs are based on the calculation result.

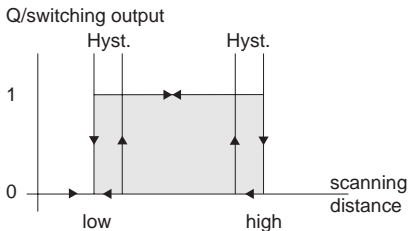
Note The HI parameter of the respective output has to be assigned to a greater value than the LO parameter (e.g. 01 HI > 01 LO).

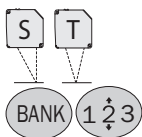
Note The parameters HYTE and TIMER also affect the behaviour of the switching outputs.



Submenu	Parameter	Settings
7. CONTROL3	HYSTE	0...0,1...+9.999,999/ 0...0,02...+999,9999

Setting the hysteresis and power-up delay of the switching outputs, resp., to prevent unstable or slow behaviour.

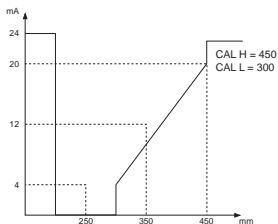
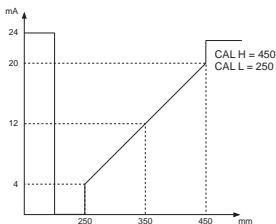




6.6 Analogue Outputs

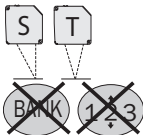
Submenu	Parameter	Settings
8. ANALOG1	CAL H	-9.999,999... 5 ... +9.999,999 / -999,9999... 1 ... +999,9999
	CAL L	-9.999,999... 5 ... +9.999,999 / -999,9999... 1 ...+999,9999

Setting the behaviour of the analogue outputs for the calculation result by the assignment of values to CAL L (4 mA/-5 V) and CAL H (20 mA/+5 V).



Note The upper limit must be assigned to the higher calculation result. The calculation formula must be inverted in order to reverse the analogue output.

Note These settings are only active when the setting $\square\square[\text{CAL}]$ is active for the parameter OUTPT.



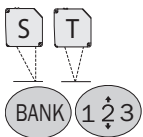
Submenu	Parameter	Settings
8. ANALOG1	OUTPT	[A][B]; $\square\square[\text{CAL}]$

OUTPT defines whether the measurement results of the two sensor heads or the calculation result is output via the analogue outputs.

[A][B]: The measurement results of the two sensor heads are output.

$\square\square[\text{CAL}]$: The calculation result is output via the analogue output B.

Analogue output A is not active in this setting.

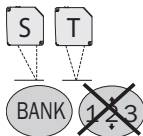
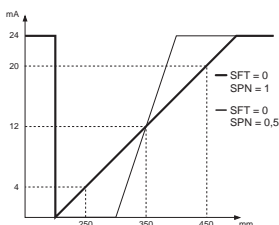
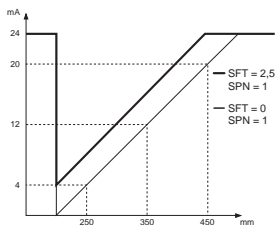


Submenu	Parameter	Settings
9. ANALOG2	SFT A; SFT B	-5,000...0... +5,000 V
	SPN A; SPN B	0,1...1

With SFT A, SFT B, SPN A, SPN B the behaviour of the analogue outputs for sensor head A and B is defined.

With SFT, the behaviour of the analogue outputs is shifted up or down. With SPAN, the behaviour of the analogue output as it increases is affected.

Note These settings are only active when they are set to active by the parameter OUPPT (OUTPT=[A][B]).

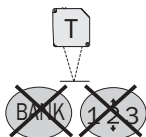


6.7 Sensitivity of the System

Submenu	Parameter	Submenu
10. SENSIT/	HEADA; HEADB/	AUTO; MIN; 1; 2; 3; 4; 5; 6; 7; 8; 9; MAX
10. HEAD	SENSA; SENSB	AUTO; MIN; 1; 2; 3; 4; 5; 6; 7; 8; 9; MAX

HEADA, HEADB/, SENSA, SENSB serve to regulate the light sensitivity of the sensor heads.

Note The setting AUTO, determines the optimum setting for different surface conditions. During the automatic readjustment, which takes up to 2 ms, the device may not detect correctly.

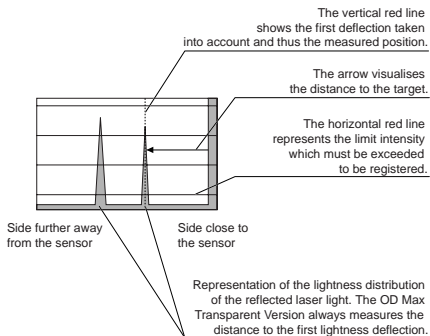


Submenu	Parameter	Settings
10. HEAD	MODE	MEASURE; ! IMAGE A; ! IMAGE B

MODE changes the display mode.

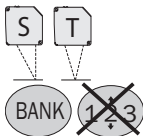
MEASURE: The device is in the measurement mode, and the measurement results are displayed.

! IMAGE A / B: After leaving the menu, the lightness distribution on the receiving element for the corresponding sensor is displayed.



Note OD25-01T1 only (OD Max Transparent).

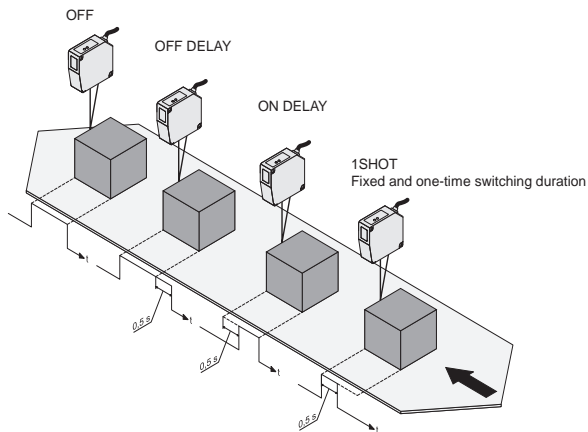
Note There is no output of the measured values when the lightness distribution is displayed.



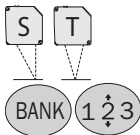
6.8 Timer Functions for the Switching Outputs

Submenu	Parameter	Settings
11. TIMER	MODE	OFF; OFF DELAY; ON DELAY; 1SHOT

MODE activates the different time functions for the switching outputs.



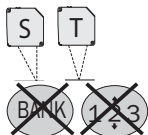
Application The use of a timer function is useful for instance when short-term measured value conditions need to be ignored or when a minimum switching time is necessary for subsequent devices.



Submenu	Parameter	Settings
11. TIMER	TIMER	0...60,000 s

TIMER determines the time used for the timer function.

TIMER= 0...60,000 s

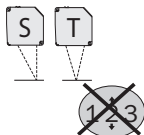


6.9 Memory Behaviour

Submenu	Parameter	Settings
11. MEMORY	WRITE	ENABLE; DISABLE

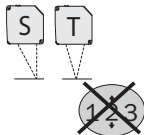
Setting whether ZERO resets are stored and thus remain active after a power down.

Note Due to the limited life of the memory, the storage should be deactivated when frequent ZERO resets are performed.



Submenu	Parameter	Settings
12. MEMORY	RESET	NO; YES

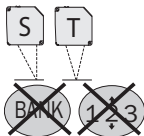
By selecting and confirming the setting YES, the system is returned to default settings.



Submenu	Parameter	Settings
13. BANK	BANK	0; 1; 2; 3; 4; 5; 6; 7

In the BANK submenu, by bank key and via the external bank inputs (see following switching diagram) the active memory bank can be selected.

Bank No.	Bank 2 Input	Bank 1 Input	Bank 0 Input
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON



6.10 Serial Data Communication

Submenu	Parameter	Settings
14. RS232C	BAUD	9600; 19200; 38400; 115200 [bps]
	DATA	7; 8 [bit]
	PARIT	NONE; EVEN; ODD

For data communication via RS232, three parameters must be set according to the external periphery.

The baud rate for communication must be set for the parameter BAUD. The parameter DATA defines how many bits a data word consists of. The parity of the communication is set using the parameter PARIT.

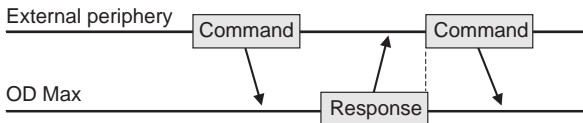
7 RS232 Interface

7.1 Communication Description Specifications of the data communication

Syncro system	Communication/asynchronous
Baud rate	9600/ 19200/ 38400/115200 bps
Transmission code	ASCII
Bits per data word	7/8 bits
Stop bits	1 bit
Parity	Even number / Odd number / None
Data classification	STX * ETX

Communication procedure

Data communication means the sending of commands and receiving of responses. Prior to sending a new command, the system's response to the previous command must have been received.



Command input and data output

The commands and the responses are surrounded by start (STX = Start of Text) and end (ETX = End of Text) characters.

The final command, which is sent to the sensor system, consists of two or three part commands separated by a space character.

1.	2.	3.	4.	5.
STX	Command	Space	Command	ETX

e.g.: ^BFILTER AVERAGE^C

1.	2.	3.	4.	5.	6.	7.
STX	Command	Space	Command	Space	Command	ETX

e.g.: ^BTIMER MODE OFF^C

Response:		
1.	2.	3.
STX	RESPONSE	ETX

e.g.: ^B+34.123^C

Depending on the command, there is either the output of the current state of an output (e.g. +125.4563), the current setting (e.g. OFF), the confirmation of the command (i.e. >) or an error message (i.e. ?).

Timing

The response time of the OD Max, related to the serial data communication, is 1 ms. The time required for data transmission can be calculated based on the baud rate.

Note In case of continuous data output, a character is output every 5 to 10 ms, irrespective of the baud rate.

7.2 Communication Commands

7.2.1 Settings

The current setting is requested by entering the commands 1 and 2. This setting is modified when sending a command consisting of all three commands.

Command 1	Command 2	Command 3	Command 1	Command 2	Command 3	
FILTER	AVERAGE	OFF	CAL	FORMULA	A	
		4			B	
		16			A+B	
		64			A-B	
		256			-A-B	
		1024			K-A-B	
		4096			K+A+B	
		FILTER			OFF	K+A
	HIPASS				K+B	
	LOWPASS				K	-9999.999... +9999.999 / -999.9999... +999.9999
	FREQ	650/2000		SIGN_A		FAR SIDE+
		350/800				NEAR SIDE+
		200/400		SIGN_B		FAR SIDE+
		100/200				NEAR SIDE+
		50/100		SFT_A		-9999.999... +9999.999 / -999.9999... +999.9999
25/50		SFT_B				
15/20	SFT_CAL					
10/10						

Command 1	Command 2	Command 3	Command 1	Command 2	Command 3	
HOLD	A	OFF	CONTROL	Q1_HI	-9999.999... +9999.999 / -999.9999... +999.9999	
		SAMPLE		Q1_LO		
		PEAK		Q2_HI		
		BOTTOM		Q2_LO		
		P-P		Q3_HI		
		AUTOPEAK		Q3_LO		
		AUTOBOTTOM		Q4_HI		
				Q4_LO		
	B	OFF		Q5_HI		
		SAMPLE		Q5_LO		
		PEAK		HYSTE	0...+9999.999 / 0...+999.9999	
		BOTTOM				
		P-P				
		AUTOPEAK				
		AUTOBOTTOM				
		CAL			OFF	ANALOG	CAL_HI	-9999.999... +9999.999/ -999.9999... +999.9999
	SAMPLE		CAL_LO			
	PEAK		OUTPUT		AB	
	BOTTOM			CAL		
	P-P		SFT_A	-5.000...+5.000		
	AUTOPEAK		SFT_B	-5.000...+5.000		
	AUTOBOTTOM		SPN_A	0.100 ... 1.000		
	INPUT		AB	SPN_B	0.100 ... 1.000	
		CAL				
	ALARM	CLAMP				
		HOLD				

Command 1	Command 2	Command 3	Command 1	Command 2	Command 3		
SENS	A	AUTO	TIMER	MODE	OFF		
		MAX			OFF_DELAY		
		9			ON_DELAY		
		8			1SHOT		
		7		TIMER	0.000 to 60.000		
		6					
		5	MEMORY	WRITE	ENABLE		
		4			DISABLE		
		3		RESET	NO		
		2			YES		
		B	BANK	1	BANK	BANK	0
				MIN			1
				AUTO			2
				MAX			3
	9			4			
	8			5			
	7			6			
	6			7			
	5						
	4						
	3						
	2						
	1						
	MIN						

7.2.2 Data Output and Querying of Output States

By sending the two commands, the current calculation values or measured values or the current states of the switching outputs are requested.

Command 1	Command 2	-	Description
MEASURE	A		One-time output of the corresponding measured value or of the calculation result.
	B		One-time output of the corresponding measured value or of the calculation result.
	CAL		One-time output of the corresponding measured value or of the calculation result.
	Q1		One-time output of the state of the corresponding switching output. An active output means "ON", an inactive output means "OFF".
	Q2		One-time output of the state of the corresponding switching output. An active output means "ON", an inactive output means "OFF".
	Q3		One-time output of the state of the corresponding switching output. An active output means "ON", an inactive output means "OFF".
	Q4		One-time output of the state of the corresponding switching output. An active output means "ON", an inactive output means "OFF".
	Q5		One-time output of the state of the corresponding switching output. An active output means "ON", an inactive output means "OFF".
	ALARM_A		One-time output of the state of the corresponding alarm output. An active output means "ON", an inactive output means "OFF".
	ALARM_B		One-time output of the state of the corresponding alarm output. An active output means "ON", an inactive output means "OFF".
	START_A		Continuous output of the corresponding measured value or of the calculation result.
	START_B		Continuous output of the corresponding measured value or of the calculation result.
	START_CAL		Continuous output of the corresponding measured value or of the calculation result.
STOP		Ending of the continuous output of measured values or calculation results.	

7.2.3 Operating the Inputs

Through the following commands, the states of the inputs can be influenced via RS232. The inputs remain in the corresponding status until another change occurs.

Command 1	Command 2	-	Description
HOLD_IN	ON_A		Sets the hold input A to active.
	ON_B		Sets the hold input B to active.
	OFF_A		Sets the hold input A to inactive.
	OFF_B		Sets the hold input B to inactive.
	RESET		Simulates a rising edge at the reset input.
ZERO	A		Performing a zero reset for the corresponding sensor head or the calculation result.
	B		Performing a zero reset for the corresponding sensor head or the calculation result.
	CAL		Performing a zero reset for the corresponding sensor head or the calculation result.
	CAN_A		Cancelling the zero reset for the corresponding sensor head or the calculation result.
	CAN_B		Cancelling the zero reset for the corresponding sensor head or the calculation result.
	CAN_CAL		Cancelling the zero reset for the corresponding sensor head or the calculation result.

7.2.4 Data Storage Function

This setting is modified by entering all three commands. The current setting is output when the first two commands are entered.

Command 1	Command 2	Command 3	Description
BUFFER	MODE	OFF	The data storage function is deactivated.
		AFTER	The measured or calculation values are stored after the trigger signal is applied.
		BEFORE	The measured or calculation values, which existed before the active signal at the trigger input, are written to the memory.
		CENTER	Half the stored measured or calculation values come from before the trigger signal, the other half comes thereafter.
	DATA	A	The measured value of sensor A is saved in every memory cycle.
		B	The measured value of sensor B is saved in every memory cycle.
		CAL	In every memory cycle, the calculation result is written to memory.
		A&B	The measured values of both sensors are stored in every memory cycle. Note: The first half of the memory is used for sensor A, the second half is used for sensor B.
	RATE	1	Setting every nth measured value which is written to memory.
		2	For setting 4, for instance, every 4th measured value is written to memory.
		4	
		8	This results in a memory cycle of $400 \cdot s$ ($4 \cdot$ measuring cycles).
		16	
		32	
		64	
		128	
		256	
		512	
		1024	
		2048	
4096			
8192			
16384			
32786			

Command 1	Command 2	Command 3	Description
BUFFER	SIZE	100	Setting the size of the memory used.
		200	
		300	
		400	
		500	
		600	
		700	
		800	
		900	
		1000	
		1100	
		1200	
		1300	
		1400	
		1500	
	1600		
	1700		
	1800		
	1900		
	2000		
	TRIGGER		Setting the trigger signal to active and thus triggering the memory operation. Confirmation is provided after all values are stored. Note: The signal can also come via the HOLD RST input, if no holding function is active. Note: For storage to be performed again, "old" values must be output prior to this.
	READ		Output of the stored measured or calculation values. Note: The output only occurs after the memory is full.

7.3 Dealing with Problems

There is no response:

- ▶ Check the device connection.
- ▶ Check that the basic settings of both devices match.
- ▶ Check for the use of start and end characters.

The response is an error message:

- ▶ Check the spelling of the commands (e.g. capitalisation and space characters).
- ▶ Take into account the maximum number of places before and after the decimal point.
- ▶ Take into account the settings' range of values.
- ▶ Reduce influence of external disturbances.
- ▶ Possibly reduce the baud rate.

7.3.1 ASCII Code Table

ASCII				ASCII				ASCII			
Dez	Okt	Hex	Character	Dez	Okt	Hex	Character	Dez	Okt	Hex	Character
0	0	0	NUL	43	53	2B	+	86	126	56	V
1	1	1	SOH ^A	44	54	2C	,	87	127	57	W
2	2	2	STX ^B	45	55	2D	-	88	130	58	X
3	3	3	ETX ^C	46	56	2E	.	89	131	59	Y
4	4	4	EOT ^D	47	57	2F	/	90	132	5A	Z
5	5	5	ENQ ^E	48	60	30	0	91	133	5B	[
6	6	6	ACK ^F	49	61	31	1	92	134	5C	\
7	7	7	BEL ^G	50	62	32	2	93	135	5D]
8	10	8	BS ^H	51	63	33	3	94	136	5E	^
9	11	9	TAB ^I	52	64	34	4	95	137	5F	_
10	12	0A	LF ^J	53	65	35	5	96	140	60	`
11	13	0B	VT ^K	54	66	36	6	97	141	61	a
12	14	0C	FF ^L	55	67	37	7	98	142	62	b
13	15	0D	CR ^M	56	70	38	8	99	143	63	c
14	16	0E	SO ^N	57	71	39	9	100	144	64	d
15	17	0F	SI ^O	58	72	3A	:	101	145	65	e
16	20	10	DLE ^P	59	73	3B	;	102	146	66	f
17	21	11	DC1 ^Q	60	74	3C	<	103	147	67	g
18	22	12	DC2 ^R	61	75	3D	=	104	150	68	h
19	23	13	DC3 ^S	62	76	3E	>	105	151	69	i
20	14	14	DC4 ^T	63	77	3F	?	106	152	6A	j
21	25	15	NAK ^U	64	100	40	@	107	153	6B	k
22	26	16	SYN ^V	65	101	41	A	108	154	6C	l
23	27	17	ETB ^W	66	102	42	B	109	155	6D	m
24	30	18	CAN ^X	67	103	43	C	110	156	6E	n
25	31	19	EM ^Y	68	104	44	D	111	157	6F	o
26	32	1A	SUB ^Z	69	105	45	E	112	160	70	p
27	33	1B	ESC	70	106	46	F	113	161	71	q
28	34	1C	FS	71	107	47	G	114	162	72	r
29	35	1D	GS	72	110	48	H	115	163	73	s
30	36	1E	RS	73	111	49	I	116	164	74	t
31	37	1F	US	74	112	4A	J	117	165	75	u
32	40	20	Space	75	113	4B	K	118	166	76	v
33	41	21	!	76	114	4C	L	119	167	77	w
34	42	22	"	77	115	4D	M	120	170	78	x
35	43	23	#	78	116	4E	N	121	171	79	y
36	44	24	\$	79	117	4F	O	122	172	7A	z
37	45	25	%	80	120	50	P	123	173	7B	{
38	46	26	&	81	121	51	Q	124	174	7C	|
39	47	27	'	82	122	52	R	125	175	7D	}
40	50	28	(	83	123	53	S	126	176	7E	~
41	51	29	)	84	124	54	T	127	177	7F	DEL
42	52	2A	*	85	125	55	U				

8 Technical Specifications/ Product Overview

8.1 Technical Specifications: Sensor Heads

OD	30-05T1	85-20T1	350-100T1
Measuring range	30 ± 5 mm	85 ± 20 mm	350 ± 100 mm
Light source	red laser diode class 2(II) ¹⁾		
Beam size	30 x 100 µm	70 x 290 µm	300 x 700 µm
Linearity/accuracy	±0.1% FS ²⁾ /6 % ... 90 %		
Resolution ³⁾	1 µm	5 µm	50 µm
Supply voltage U_V	via amplifier		
Temperature drift	±0.01 % FS		
Protection	IP 67		
VDE Protection Class	III		
Ambient temperature	Operation -10 ... +45 °C ⁴⁾ Storage -20 ... +60 °C		
Ambient light (incandescent lamp)	max. 3,000 lx		
Vibration resistance	10/s ... 55/s ⁵⁾		
Impact resistance	50 G (500 m/s ²)		
Weight	250 g (incl. 50 cm cable)		
Material	Sensor housing: die-cast aluminium		
Cable length	max. 10 m with extension cable		

1) Wavelength 650 nm, max. power 1 mW

2) FS = Full Scale: OD30-05T1 = 10 mm; OD85-20T1 = 40 mm; OD350-100T1 = 200 mm

3) Averaging: 256 times; object: ceramics, white; distance: centre

4) Non-condensing

5) Double amplitude 1.5 mm, 2 h on the XYZ axes

Note OD30-05T1, OD85-20T1 and OD350-100T1 can only be combined with the amplifier units AOD-P1/N1.

OD	25-01T1
Measuring range	25 ± 1 mm
Light source	red laser diode class 1(II) ¹⁾
Beam size	25 x 35 µm
Linearity/accuracy	±0.1% FS ²⁾ /6 % ... 90 %
Resolution ³⁾	0.1 µm
Supply voltage U_V	via amplifier
Temperature drift	±0.01 % FS
Protection	IP 67
VDE Protection Class	III
Ambient temperature	Operation -10 ... +45 °C ⁴⁾ Storage -20 ... +60 °C
Ambient light (incandescent lamp)	max. 3,000 lx
Vibration resistance	10/s ... 55/s ⁵⁾
Impact resistance	50 G (500 m/s ²)
Weight	250 g (incl. 50 cm cable)
Material	Sensor housing: die-cast aluminium
Cable length	max. 10 m with extension cable

1) Wavelength 650 nm, max. power 390 · W

2) FS = Full Scale: OD30-05T1 = 10 mm; OD85-20T1 = 40 mm; OD350-100T1 = 200 mm

3) Averaging: 256 times; object: ceramics, white; distance: centres

4) Non-condensing

5) Double amplitude 1.5 mm, 2 h on the XYZ axes

Note OD25-01T1 can only be combined with the amplifier units AODG-P1/N1.

8.2 Technical Specifications: Amplifier Units

AOD / AODG-		P1	N1
Output		PNP	NPN
Response time		0.5 ms	
Supply voltage U_V		12 ... 24 V DC \pm 10 %	
Current consumption ¹⁾		250 mA/24 V	
Analogue output	ANG(V)[A],[B]	Output voltage \pm 5 V/F.S. ²⁾	
	ANG(mA)[A],[B]	Output current 4 ... 200 mA/F.S. ³⁾	
Alarm output	ALM A, ALM B	PNP Open Collector	NPN Open Collector
Control output	JDGE 1 ... 5	PNP Open Collector	NPN Open Collector
		max. 100 mA / 24 V DC ⁴⁾	
Bank input	BANK 0 ... 2	ON if connected with 12 ... 24 V	ON if connected with GND
		8 banks selected	
Hold input	HOLD A, HOLD B, HOLD RST	ON if connected with 12 ... 24 V	ON if connected with GND
		Laser off or measured value held (selectable in menu)	
Zero Reset input	ZERO A, ZERO B	ON if connected with 12 ... 24 V	ON if connected with GND
Additional Features ⁵⁾			
Display		LCD Display	
Protection		IP 20	
Ambient temperature		Operation -10 ... +45 °C ⁶⁾ Storage -20 ... +60 °C	
Vibration strength		10/s ... 55/s ⁷⁾	
Impact strength		20 G (196 m/s ²)	
Weight		240 g (incl. terminals)	
Material	Housing	Polycarbonate	
	Terminals	Nylon 66	

1) When connecting 2 sensor heads. Includes analogue voltage output.

2) Output impedance 100 Ω , resolution 1 mV

3) Load impedance max. 300 Ω , resolution 1.5 • A

4) Residual voltage max. 1.8 V

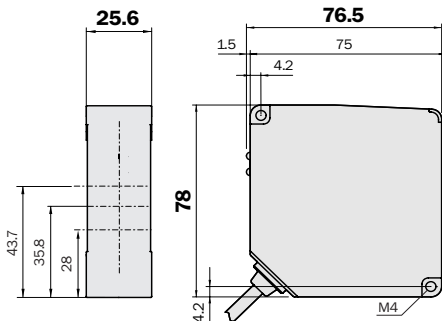
5) Average scan time, filter mode (limit frequency), arithmetical calculations, hold setting, sensor head sensitivity setting, timer function, memory function, memory bank function, auto zero, reset

6) Non-condensing

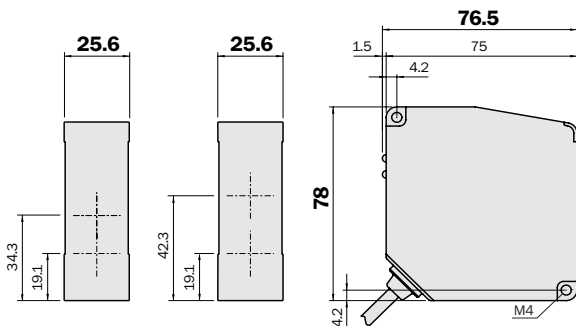
7) Double amplitude 1.5 mm, 2 h for XYZ axes

8.3 Dimensional Drawings: Sensor Heads

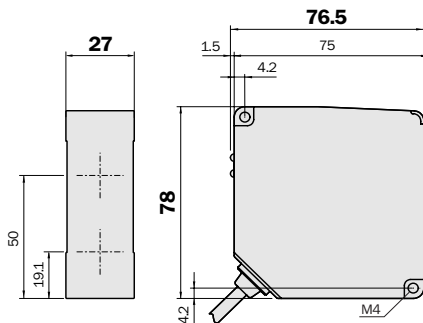
8.3.1 OD25-01T1



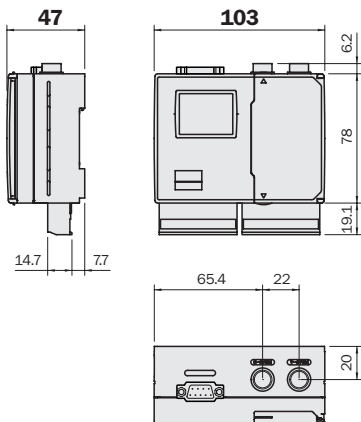
8.3.2 OD30-05T1 and OD85-20T1



8.3.3 OD350-100T1



8.4 Dimensional Drawing: Amplifier Unit



8.5 Scope of Supply: Amplifier Unit

- ▶ Evaluation Unit
- ▶ 2 terminal blocks
- ▶ Operating Instructions

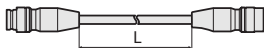
8.6 Scope of Supply: Sensor Head

- ▶ Sensor head incl. 0.5 m cable tail
- ▶ 3 screws
- ▶ Quick Set Up

8.7 Available Accessories

- ▶ 2 m extension cable
- ▶ 5 m extension cable

Option: extension cable to the amplifier connection



Length	Cable type	Order No.
2 m	DSL-1210-G02M	6028943
5 m	DSL-1210-G05M	6028944

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