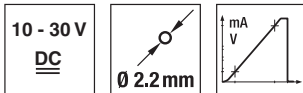


LV463.XR

Long Range amplifier with analog output for fiber optics

en 01-2016/11 50135324



- Extra large operating ranges
- Two, large, easy-to-read displays for the simultaneous display of the signal value and the switching threshold
- Simple operation and easy-to-understand menu functions for optimum configuration
- Internal multiplex operation of up to six units
- Line teach or external transmitter activation
- Three different teach modes for fast sensor adjustment
- One switching output and one analog output for each
- One indicator diode for each of the two outputs
- Connection via cable or cable with M12 connector

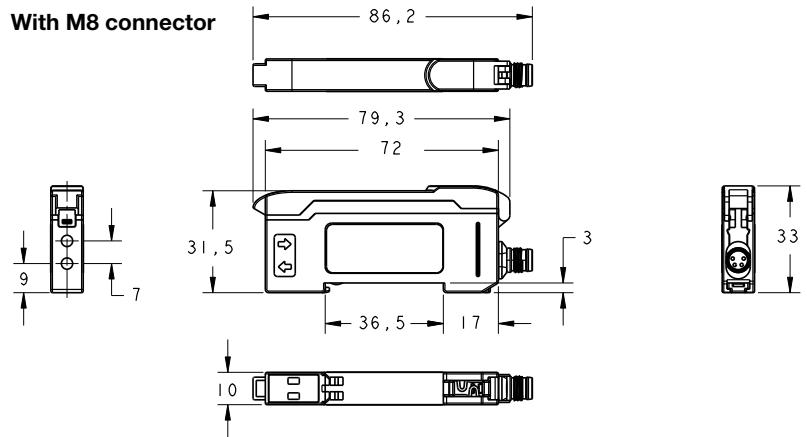
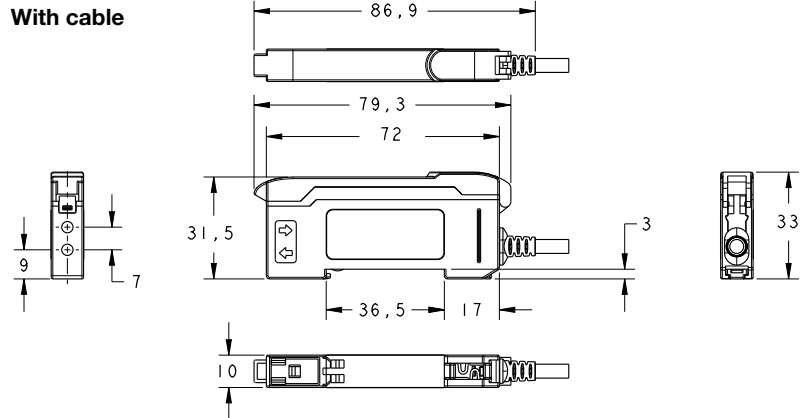


Accessories:

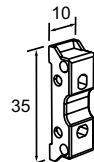
(available separately)

- Plastic fiber optics (KF, KFX)
- Glass fiber optics (GF)
- Ready-made cables (KB ...)
- Mounting device (BTU LV463)

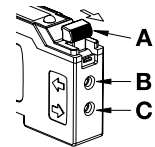
Dimensioned drawing



Mounting accessories



BTU LV463
Part no. 50120869



- A Clamping lever for fiber optic cable (unlock in direction of arrow)
- B Connection for fiber optics receiver
- C Connection for fiber optics transmitter

Electrical connection

5-pin connector

12-24V DC +	1	BR/BN
multi funct	2	WS/WH
GND	3	BL/BU
OUT 1	4	SW/BK
Analog OUT	5	GR/GY

5-wire cable

12-24V DC +	BR/BN
multi funct	WS/WH
GND	BL/BU
OUT 1	SW/BK
Analog OUT	GR/GY

- multi funct: - OFF
- Line teach
- Activation input
- Multiplex operation
Details → Description of the subfunctions

NOTE: Open lead wires must be connected to a terminal box.

We reserve the right to make changes • DS_LV463XRA_en_50135324.fm

Technical data

Optical data		Throughbeam principle		Scanning principle	
Operating range/scanning range ¹⁾		Up to 5000mm		Up to 1350mm	
Light source		LED (modulated light)			
Wavelength	LV463.XR... LV463I.XR...	660nm (visible red light) 880nm (infrared light)			
Timing					
Readiness delay		≤ 500ms			
Internal cycle time		100µs			
		Signal range	Extra Long Range (XLR)	Long Range (LR)	Standard (STD)
Response time			24ms	8ms	2ms
Switching frequency ²⁾			21Hz	62.5Hz	250Hz
Display area (digits)			0 ... 9999	0 ... 9999	0 ... 9999
Repeatability			180µs	180µs	180µs
Increased protection against optical crosstalk			Yes	Yes	Yes
Increased protection against ambient light through energy-saving lamps			Yes	Yes	Yes
Electrical data					
Operating voltage U _B ³⁾		12 ... 24VDC ± 10 %			
Residual ripple		≤ 10 % of U _B			
Open-circuit current		≤ 40mA @ 24VDC			
Switching output		See part number code			
Switching output time functions		Switch-on/-off delay, passing contact (on actuation or fall-back), (combinations are limited) → <i>Combinations of timing functions</i>			
Adjustable times (time functions)		0 ... 9999ms			
Signal voltage high/low		≥ (U _B - 2.5V) / ≤ 2.5V			
Output current		≤ 100mA			
Switching threshold		Adjustable using the teach function or +/- buttons			
Analog output		See part number code			
Output residual ripple		< 0.5% of analog range end value			
Load resistance		Current output: R _L ≤ (U _B - 4) / 0.02 Ω (< 1kΩ bei U _B = 24VDC), Voltage output: R _L ≥ 2.5kΩ			
Indicators					
Yellow LED		Switching output active and signal in analog range			
Display		2 x 7-segment LED, 4-digit, Red: signal strength, Green: switching threshold			
Mechanical data					
Housing		ABS/PC black/red, transparent PC cover			
Weight		50g with M8 connector, 63g with 2000mm cable 70g with 150mm cable and M12 connector			
Connection type		M8 connector, 4-pin, or 2000mm cable, 4 x 0.25mm ² , or 150mm cable with M12 connector, 4-pin Clamp-mounting, 2 x Ø 2.2mm			
Fiber optic connection					
Environmental data					
Ambient temp. (operation/storage)		-10°C ... +55°C / -20°C ... +85°C			
Protective circuit ⁴⁾		2, 3			
Degree of protection		IP 50, NEMA 1			
Standards applied		EN 60947-5-2			
Certifications		UL 508, C22.2 No.14-13 ³⁾ 5)			
Additional functions					
Sensor adjustment		Menu-driven using display and rocker push button			

Notes

	NOTE
Detailed specifications on the range/scanning range are enclosed in the data sheets of our fiber optics type KF , KFX or GF .	

Explanation of the signal ranges

Extra Long Range (XLR):
Extra long operating range, longest response time, display area 0 ... 9999

Long Range (LR):
Long operating range with good response time; display area: 0 ... 9999

Standard (STD):
Medium operating range and medium response time; display area: 0 ... 9999

Speed (S):
Short operating range and short response time; display area: 0 ... 9999

High Speed (HS):
Short operating range, very short response time; display area: 0 ... 9999

Observe intended use!
⚠ This product is not a safety sensor and is not intended as personnel protection.
⚠ The product may only be put into operation by competent persons.
⚠ Only use the product in accordance with its intended use.

LV463.XR

Long Range amplifier with analog output for fiber optics

Part number code

L	V	4	6	3	I	.	X	R	7	/	4	T	C	-	1	5	0	-	M	1	2
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Operating principle

LV Fiber optic amplifiers

Series

463 463 series

Light source

Not specified Red light

I Infrared light

Design

Not specified Standard design

XV High-speed version

XR Long-range version

Setting

7 Adjustment by means of control panel
(7-segment red/green LED displays, slide switch, rocker push button)

Pin assignment of connector pin 4 / black cable wire (OUT1)

4 PNP transistor switching output, light switching

2 NPN transistor switching output, light switching

P PNP transistor switching output, dark switching

N NPN transistor switching output, dark switching

L IO-Link

X Not assigned (n. c.)

Pin assignment of connector pin 2 / white cable wire (multi funct)

T Multifunction input (teach, activation or multiplex operation)

Pin assignment of connector pin 5 / gray cable wire (analog OUT)

C Analog current output (0...20mA / 4...20mA), configurable

V Analog voltage output (0...5V / 1...6V / 0...10V), configurable

Connection technology

Not specified Connection cable, standard length 2000mm, 4/5-wire ¹⁾

M8 M8 connector, 4-pin ²⁾

150-M8 Cable, length 150mm, with M8 connector, 4-pin ²⁾

150-M12 Cable, length 150mm, with M12 connector, 4/5-pin ¹⁾

1) Devices with 1 x OUT and multifunction input: 4-wire or 4-pin,

Devices with 2 x OUT and multifunction input: 5-wire or 5-pin.

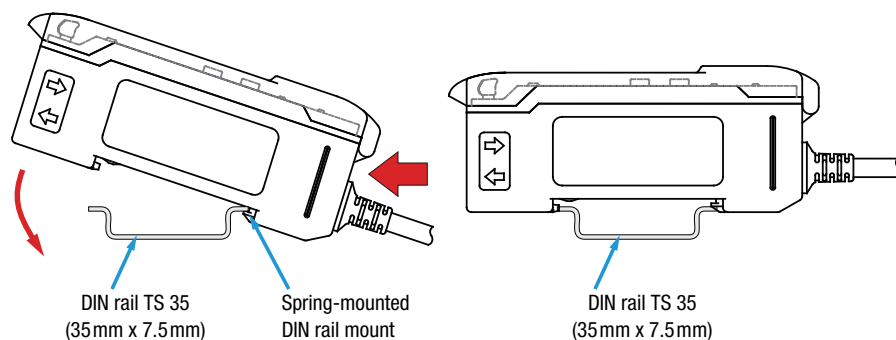
2) Not possible for devices with 2 x OUT and multifunction input.

Order guide

The sensors listed here are preferred types; current information at www.leuze.com

With analog current output			With analog voltage output		
Features	Order code	Part no.	Features	Order code	Part no.
Infrared light, PNP switching output	LV463I.XR7/4TC-150-M12	50134005	Infrared light, PNP switching output	LV463I.XR7/4TV-150-M12	50134002
Infrared light, PNP switching output	LV463I.XR7/4TC	50134004	Infrared light, PNP switching output	LV463I.XR7/4TV	50134001
Red light, PNP switching output	LV463.XR7/4TC-150-M12	50133991	Red light, PNP switching output	LV463.XR7/4TV-150-M12	50133986
Red light, PNP switching output	LV463.XR7/4TC	50133990	Red light, PNP switching output	LV463.XR7/4TV	50133985
Red light, NPN switching output	LV463.XR7/2TC-150-M12	50133993	Red light, NPN switching output	LV463.XR7/2TV-150-M12	50133988
Red light, NPN switching output	LV463.XR7/2TC	50133992	Red light, NPN switching output	LV463.XR7/2TV	50133987

Mounting the amplifier

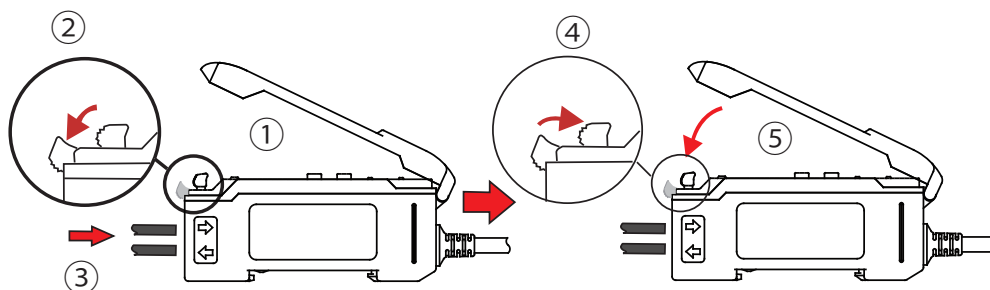


The amplifier is mounted as shown on a TS 35 DIN rail while disconnected from voltage.



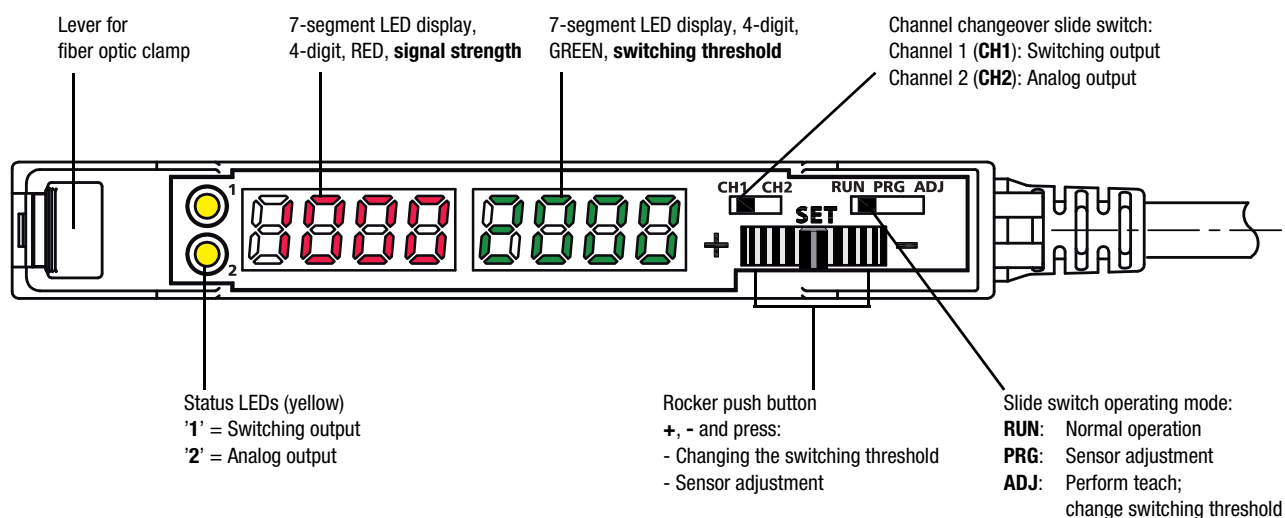
Alternatively, the amplifier can also be mounted without a DIN rail using the mounting accessory and M3 screws.

Installing the fiber optics



- ① Open the transparent protective cover.
- ② Push down the lever of the fiber optic clamp to open.
- ③ Lead the **KF/KFX/GF** type fiber optics in completely as far as they will go (ca. 12mm deep) into the fiber optic intake.
When doing so, observe the transmitter/receiver assignment on the amplifier (transmitter at bottom / receiver on top).
- ④ Pull up the lever of the fiber optic clamp to close.
Check if the clamp is secure by pulling lightly on the fiber optics.
- ⑤ Close the transparent protective cover.

Operating and display elements



LV463.XR

Long Range amplifier with analog output for fiber optics

	Selector switch Operating mode	RUN: Normal operation - no settings possible ADJ: Press rocker push button: the set teach is executed. Rock to left - right: change the switching threshold, left = + and right = -. PRG: Menu-driven device setting via display and rocker push button
	Selector switch Channel switching	CH1: Display values and settings refer to the binary switching output. CH2: Display values and settings refer to the analog output.
	Rocker push button - Set switching threshold - Navigation in menu	The rocker push button can be rocked to the right and to the left and pressed in the middle position. Rock +, -: In the ADJ operating mode, the switching threshold can be increased (+) or decreased (-) by rocking. In the PRG operating mode, rock to navigate in the menu. Button: Press the rocker push button in the middle position to accept a setting made in the PRG operating mode.
	Indicator Signal strength	In the RUN and ADJ operating modes, the display shows the current signal value. In the PRG operating mode, information on menu navigation appears on the display.
	Switch position CH1 : Display Switching threshold Switch position CH2 : Display Analog signal	Switch in position CH1 : In the RUN and ADJ operating modes, the display shows the currently set switching threshold. In the PRG operating mode, information on menu navigation appears on the display. Switch in position CH2 : In the RUN and ADJ operating modes, the display shows the current analog signal. In the PRG operating mode, information on menu navigation appears on the display.
	Status LEDs (yellow) 1 - State of switching output 2 - State of analog output	LED ON 1: Switching output active, 2: Signal within the analog range. LED OFF 1: Switching output inactive, 2: Signal outside of the analog range.

RUN operating mode - normal operation

The **RUN** operating mode is the standard operating mode in which the sensor detects objects; it signals this according to the set functions. If the selector switch for the operating mode is in the **RUN** position, no changes to the device can be made via the operational controls. This setting is thus suitable for protection against unintended operation and changes to device settings.



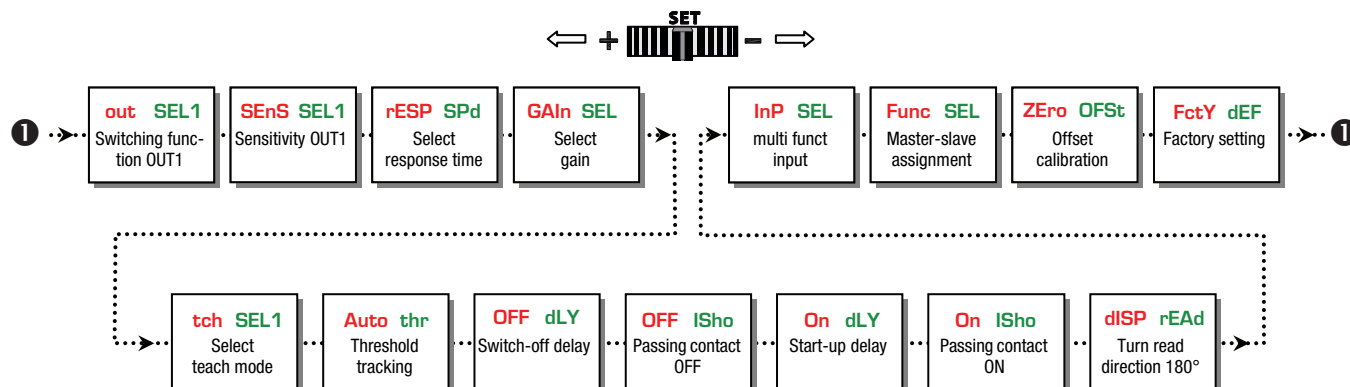
	NOTE
The multi funct multifunction input always takes precedence over the Operating mode selector switch.	
This means that the amplifier can be taught via the multifunction input (remote teach) or configured (remote configuration) in the RUN operating mode as well.	

PRG operating mode - sensor adjustment channel 1 (CH1)

The LV463 can be adjusted to meet customer requirements with a simple menu-driven system. To do this, set the **selector switch** for the **operating mode** to position **PRG**.

CH1 CH2 RUN PRG ADJ

Depending on the position of the channel selector switch, settings can be made for the binary switching output (**CH1**) or the analog output (**CH2**). Rock to right or left with the rocker pressure switch to freely navigate through the subfunctions.



NOTE

The settings for functions **rESP SPd** and **GAln SEL** act on the switching output **and** the analog output.

Selecting a subfunction and changing the setting

1. Rock to left or right to select the desired subfunction.
2. Press rocker push button in middle position. The currently set value is displayed statically.
3. Rock to right or left to display the selectable adjustment values - these flash slowly.
4. Accept the new value by pressing the rocker push button in the middle position.
Fast flashing indicates that the new value is accepted.
5. Automatic return to the heading for the subfunction.
6. Press again to statically display the previously selected value.

Description of the subfunctions

Subfunction	Possible settings / value range	Factory setting (default)	Explanation
out SEL1 Switching function OUT1	Lon don	Lon	Lon: Switching output light switching : If throughbeam fiber optics are installed, the switching output is active when the light path is free. If a scanning system is installed, the switching output is active when an object is detected. The status LED illuminates when the switching output is active. don: Switching output dark switching : The switching behavior is the inversion of the light switching setting.
SEaS SEL1 Sensitivity in switching point OUT1	Std hiGh Lo	Std	The sensitivity in the switching point is adjusted via the hysteresis. High: Small hysteresis, e.g., for exact switching during object positioning. Std: Standard hysteresis; suitable for most applications. Lo: Large hysteresis, e.g., for very reliable switching on objects. Also for applications with strong vibrations on probe.
rESP SPd ¹⁾ Select response time	$t_{\text{RESP}} =$ 24 ms (signal range XLR) 8 ms (signal range LR) 2 ms (signal range STD) 1000 µs (signal range S) 500 µs (signal range HS)	2 ms	The response time is the max. time required by the switching output to switch to the active state following a signal change at the input. From this, the switching frequency can be calculated as follows: $f = \frac{1}{2 \cdot t_{\text{RESP}}} \text{ [Hz]}$ Notice: A change to the response time is equivalent to a change to the signal range.

1) The settings for functions **rESP SPd** and **GAln SEL** act on the switching output **and** the analog output.

LV463.XR

Long Range amplifier with analog output for fiber optics

Subfunction	Possible settings / value range	Factory setting (default)	Explanation
GAIn SEL 1) Select gain	Gain stage $t_{RESP} = 24\text{ms: Gn 1 ... Gn 7}$ $8\text{ms: Gn 1 ... Gn 6}$ $2\text{ms: Gn 1 ... Gn 6}$ $1000\mu\text{s: Gn 1 ... Gn 6}$ $500\mu\text{s: Gn 1 ... Gn 5}$ Auto GAIn	Auto GAIn	The gain stage can be set either by manually presetting the gain factor or automatically by selecting Auto GAIn . The left, red display shows the current signal value. The gain stage should be selected so that the signal value is approximately in the middle of the display area. If Auto GAIn is selected, the device automatically determines the optimum gain setting during teaching.
tch SEL 1 Select teach mode	Teach modes 1 Pt tch (static), 2 Pt tch (static), dYn tch (dynamic)	1 Pt tch	Presetting a suitable teach process. To trigger the teach event, see Teaching operating mode . 1-point teach, static: during teaching, the current signal value is accepted as the new switching threshold. Actuate the rocker push button to make fine adjustments to the threshold. 2-point teach, static: the switching threshold is calculated at approximately midway between two signal values, e.g., teach to two different objects or teach to the same object at two different distances from the probe. Example: signal value 1 = 100 digits, signal value 2 = 400 digits → Switching threshold = 280 digits. Actuate the rocker push button to + or - to make fine adjustments to the threshold. Dynamic teach: suitable for processes that cannot be stopped for teaching. When the teach event is started, the sensor begins to scan the signal values. On the left, red display, the signal values are constantly displayed. At the end of the teach event, the switching threshold is calculated at approximately midway between the smallest and largest signal value.
Auto thr Threshold tracking	Tracking the switching threshold oFF (aus), On (ein)	oFF	The function is only available during dynamic teaching. If the function is switched on, the switching threshold is automatically and continuously optimized by the sensor in such a way that maximum functional reliability is ensured. This can be used to compensate for, e.g., soiling or process changes. Warning message: thr ALrt: The limit of threshold tracking is reached - the sensor continues to operate. Cleaning and, if necessary, alignment of the fiber optics recommended Error message: thr Err: The limit of threshold tracking is exceeded - the sensor stops operating . Cleaning and, if necessary, alignment of the fiber optics urgently necessary
OFF dLY Switch-off delay	0 (off), 1 ... 9999 ms (milliseconds)	0	Switch-off delay (OFF Delay): Individually adjustable from 1 ... 9999ms. Combination options → Combining timing functions
OFF ISho Passing contact OFF	0 (off), 1 ... 9999 ms (milliseconds)	0	Passing contact on fall-back (OFF 1-Shot): Individually adjustable from 1 ... 9999ms. Combination options → Combining timing functions
On dLY Switch-on delay	0 (off), 1 ... 9999 ms (milliseconds)	0	Switch-on delay (ON Delay): Individually adjustable from 1 ... 9999ms. Combination options → Combining timing functions
On ISho Passing contact ON	0 (off), 1 ... 9999 ms (milliseconds)	0	Passing contact on actuation (ON 1-Shot): Individually adjustable from 1 ... 9999ms. Combination options → Combining timing functions
dISP rEAd Turn read direction 180°	dISP rEAd , PV3 dSIP	dISP rEAd (same read direction as other texts)	Changes the read direction of the two 7-segment displays by 180°.

1) The settings for functions **rESP SPd** and **GAIn SEL** act on the switching output **and** the analog output.

InP SEL multi funct input	oFF , tch InP , SYnc PLc , SYnc Int	oFF	With the setting, you define the function of the multi funct multifunction input (pin 2/ws-WH). oFF: Pin/cable without function tch InP: Pin/cable can be used as teach input for line teach or for remote configuration. Further details on this topic → Line teach / remote teach . → Remote configuration special function . SYnc PLc: Pin/cable can be used as activation input. Further details on this topic → Synchronous operation of multiple amplifiers . SYnc Int: Setting for multiplex operation of up to 6 fiber optic amplifiers. For this purpose, all multi funct multifunction inputs (pin 2/ws-WH) are connected to one another. The master unit (defined with the next subfunction) generates a timing signal that is received by the slave units (defined with the next subfunction) via the parallel connection. In a fixed time frame, each slave successively activates its transmitter for a brief time and delivers a signal value. To avoid mutual interference, the transmitter is then deactivated again. Further details on this topic → Multiplex operation of multiple amplifiers .
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Subfunction	Possible settings / value range	Factory setting (default)	Explanation
Func SEL Master-slave assignment	SL 1, SL 2, SL 3, SL 4, SL 5, mA 2, mA 3, mA 4, mA 5, mA 6	SL 1	These settings only need to be made if multiplex operation (master-slave operation) of multiple sensors is desired. A maximum of 6 sensors can be synchronized with one another in multiplex operation. Here, exactly one master and 1 ... 5 slaves are always needed. Settings for master: mA n (number): Defines that this unit functions as a master and a total of n sensors were wired in parallel. Value range n = 2 ... 6. Example: mA 4 means: unit is the master, a total of 4 sensors are wired to one another via the multi funct multifunction input. Setting for slaves: SL n (number): Defines that this unit functions as a slave and has individual address n. Value range address n = 1 ... 5. Example: SL 3 means: unit is aslave with individual address 3. Further details on this topic → Multiplex operation of multiple amplifiers
ZErO OFSt Offset calibration	no, YES	no	This subfunction is used for suppressing an offset signal that can result, e.g., from crosstalk between transmitter and receiver at the fiber optic head. To activate this function, select YES and confirm the selection by pressing the rocker push button. The current signal value is now set to 0. To perform another offset calibration, the previous calibration must first be reset. To do this, select no and confirm by pressing the rocker push button. Now again perform the offset calibration as previously described. Note: Resolution is lost when using offset suppression! Example: display area = 4000digits, offset value = 550 digits → Remaining resolution = 3450digits
FctY dEF Factory setting	no, YES	no	Attention! Resets all sensor settings to factory settings. If desired, select YES and execute by pressing the rocker push button.

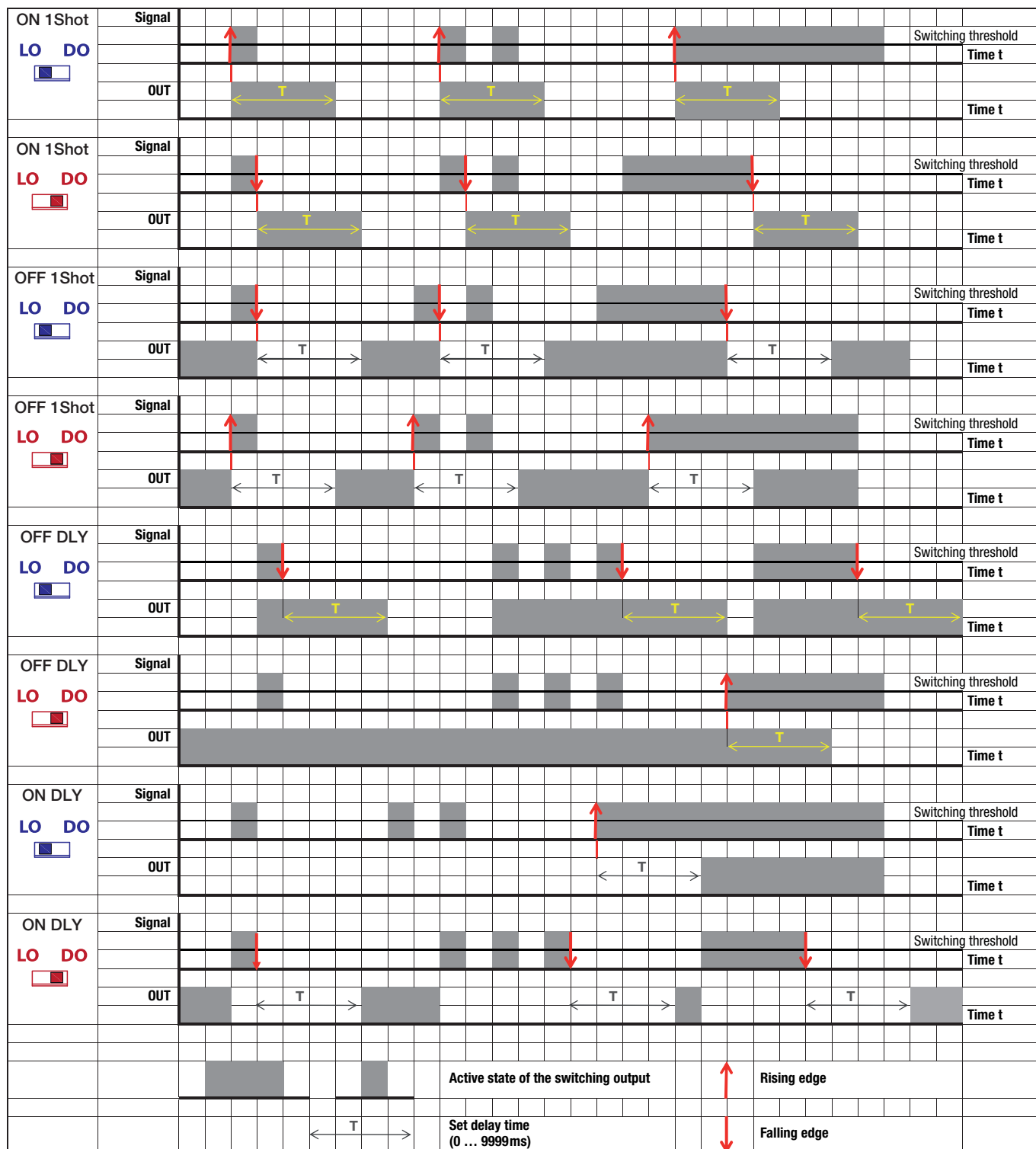


Tip!

The maximum operating range can be achieved as follows:

- Set **rESP SPd** to **24ms** (signal range **XLR**).
- Set **GAIn SEL** to the highest gain stage.
- The switching threshold can be set to minimum 32 digits, the amplifier detects objects up to display value **0**.

Time functions



Combining timing functions

Timing functions can only be combined to a limited extent. Impermissible combinations are suppressed from the subfunctions menu. Here is an overview of the permissible combinations (•):

	OFF dLY Switch-off delay	OFF ISho Passing contact OFF	On dLY Switch-on delay	On ISho Passing contact ON
OFF dLY Switch-off delay		•	•	
OFF ISho Passing contact OFF	•			
On dLY Switch-on delay	•			•
On ISho Passing contact ON			•	

Operating mode ADJ - teaching the switching output (CH1)

Set the selector switch for the channel to position **CH1** (switching output).

CH1 CH2 RUN PRG ADJ

Set the selector switch for the operating mode to the **ADJ** position.

Depending on the setting of the **Select teach mode** subfunction (**teach SEL**), one of the following teach modes appears:

- **Static 1-point teach**
- **Static 2-point teach**
- **Dynamic teach**

Teach process

Step	Static 1-point teach	Static 2-point teach	Dynamic teach
①	Place object in light beam. The red display shows the signal value, the green display the current switching threshold.	Place object in light beam. The red display shows the signal value, the green display the current switching threshold.	Press the rocker push button. The green display shows dYn , the red display the current signal value. The amplifier now scans signal values for approx. 1 minute.
②	Press the rocker push button; the teach value is accepted.	Press the rocker push button, first teach value is accepted.	Move several objects through the light beam; to end the event, press the rocker push button again. After the scanning time elapses, the teach event ends automatically.
③	Following a successful teach, PASS appears on the green display and the signal value is displayed as the new switching threshold. In the event of a faulty teach, FAIL appears on the red display. In this case, the signal value may be too small and cannot be accepted as a teach value (→ Table with minimum teach values as a function of the setting). Check object and/or placement and repeat event.	2nd appears on the green display; the red display shows the current signal value. Place object 2 or object at distance 2 and press the rocker push button within one minute . The second teach value is accepted. If the rocker push button is not pressed within one minute, the teach event is interrupted and the previous switching threshold is retained. Following a successful teach, PASS appears on the green display. The new switching threshold now lies approximately midway between the two taught signal values. In the event of a faulty teach, FAIL appears on the red display. In this case, the minimum distance between the two teach points may be too small (→ Table with minimum teach values as a function of the setting). Try to set a larger distance between the two signal values and repeat the event.	Following a successful teach, PASS appears on the green display. The new switching threshold now lies between the maximum and the minimum of the scanned signal values. In the event of a faulty teach, FAIL appears on the red display. In this case, the minimum distance between the scanned signal values may be too small (→ Table with minimum teach values as a function of the setting). Try to set a larger distance between the signal values and repeat the event.
④	The switching threshold can be freely increased or decreased at a later time by rocking the rocker push button to the left (+) and right (-). The change is accepted if both displays flash briefly several times.	The switching threshold can be freely increased or decreased at a later time by rocking the rocker push button to the left (+) and right (-). The change is accepted if both displays flash briefly several times.	The switching threshold can be freely increased or decreased at a later time by rocking the rocker push button to the left (+) and right (-). The change is accepted if both displays flash briefly several times.

Tip!

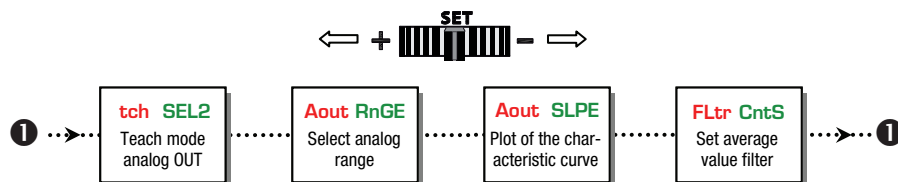
For reliable function, the difference between the signal value while an object is present and the signal value with no object should be at least 10 ... 20%. In general: the larger the difference, the more reliable the detection.

PRG operating mode - sensor adjustment channel 2 (CH2)

The LV463 can be adjusted to meet customer requirements with a simple menu-driven system. To do this, set the **selector switch** for the **operating mode** to position **PRG**.

CH1 CH2 RUN PRG ADJ

Depending on the position of the channel selector switch, settings can be made for the binary switching output (**CH1**) or the analog output (**CH2**). Rock to right or left with the rocker pressure switch to freely navigate through the subfunctions.



NOTE

The settings for functions **rESP SPd** and **GAIn SEL** act on the switching output **and** the analog output (see "PRG operating mode - sensor adjustment channel 1 (CH1)" on page 6).

Selecting a subfunction and changing the setting

1. Rock to left or right to select the desired subfunction.
2. Press rocker push button in middle position. The currently set value is displayed statically.
3. Rock to right or left to display the selectable adjustment values - these flash slowly.
4. Accept the new value by pressing the rocker push button in the middle position.
Fast flashing indicates that the new value is accepted.
5. Automatic return to the heading for the subfunction.
6. Press again to statically display the previously selected value.

Description of the subfunctions

Subfunction	Possible settings / value range	Factory setting (default)	Explanation
tch SEL2 Teach mode analog OUT	2Pt tch	2Pt tch	Teach analog output (static 2-point teach) The analog range is always set with two points. The factory setting cannot be changed. Point 1 corresponds to the start of the analog range . Point 2 corresponds to the end of the analog range .
Aout RnGE Select analog range	Devices with current output : 4-20 mA 0-20 mA Devices with voltage output : 0-5 V 1-6 V 0-10 V	Current output: 4-20 Voltage output: 0-10	Select analog range The desired current range or voltage range for the analog output can be selected here.
Aout SLPE Plot Characteristic output curve	POS nEG	POS	Characteristic output curve The desired plot of the analog characteristic curve can be selected here: POS : rising characteristic curve. nEG : falling characteristic curve.
FLtr CntS Set average value filter	1 2 4 8 16 1024 2048	1	Set average value filter Set here is the number of measurement values that are averaged before the analog output value is updated. Increasing the filter counter reduces the noise component of the analog signal, but increases the time constant of the signal. The resulting reaction time is the product of the set response time and the filter counter of the average value filter. Example: set response time = 1000 µs; filter counter = 64: 1000 µs x 64 = 64,000 µs = 64 ms

Operating mode ADJ - teaching the analog output (CH2)

Set the selector switch for the channel to position **CH2** (analog output).



Set the selector switch for the operating mode to the **ADJ** position.

The analog range is always set with two points:

- **Static 2-point teach**

Point 1 corresponds to the **start of analog range**.

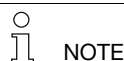
Point 2 corresponds to the **end of analog range**.

Teach process

Step	Static 2-point teach
①	Place the object in the light beam at the location for the start of analog range . The red display shows the signal value, the green display shows the current analog value.
②	Press the rocker push button. On the green display, SEt and [Value for start of analog range] flash alternately. Press the rocker push button again to accept the current signal value on the red display. On the green display, SEt and [Value for end of analog range] now flash alternately.
③	Place the object in the light beam at the location for the end of analog range . The red display shows the new signal value. On the green display, SEt and [Value for end of analog range] continue to flash alternately. Press the rocker push button again to accept the signal value.
④	After the setting has been made successfully, PASS flashes three times on the green display. The red display then shows the current signal value and the green display shows the [Value for end of analog range] . Note: An incorrect setting results in either the error message Err RnGE (impermissible assignment of the analog range) or Lo SPAn (insufficient signal difference between start and end of analog range, see note below). Please repeat the process with corrected setting.
	The assignment of the analog range can be adjusted later on. With Rock to left (+) , the taught signal value appears on the red display and [Value for end of analog range] appears on the green display. With Rock to right (-) , the taught signal value appears on the red display and [Value for start of analog range] appears on the green display. To make an adjustment, rock in the + or - direction to the desired value. The new value flashes and is accepted by pressing the button. If the button is not pressed, both displays flash slowly a few more times. Afterward, the device automatically accepts the new setting and indicates this by quickly flashing the displays. Note: The characteristic curve can likewise be adjusted through the assignment of the start and end of the analog range. If the first signal value is smaller than the second, the result is a rising characteristic curve. If the first signal value is larger than the second, the result is a falling characteristic curve. The Characteristic output curve menu function (Aout SLPE) inverts the current characteristic curve.

Values for start and end of analog range depending on setting for **Aout RnGR**

	[Value for start of analog range]	[Value for end of analog range]
Devices with current output :	4	20
	0	20
Devices with voltage output :	0	5
	1	6
	0	10



NOTE

Error message **Lo SPAn**:

The minimum permissible difference between the signal values for start and end of analog range is 100 digits independent of the signal range.

If the set value is smaller, the error message is displayed and the start of analog range is automatically adjusted to the minimum difference.

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Line teach (remote teach) - channel 1 (CH1) or channel 2 (CH2)

Subfunction setting:



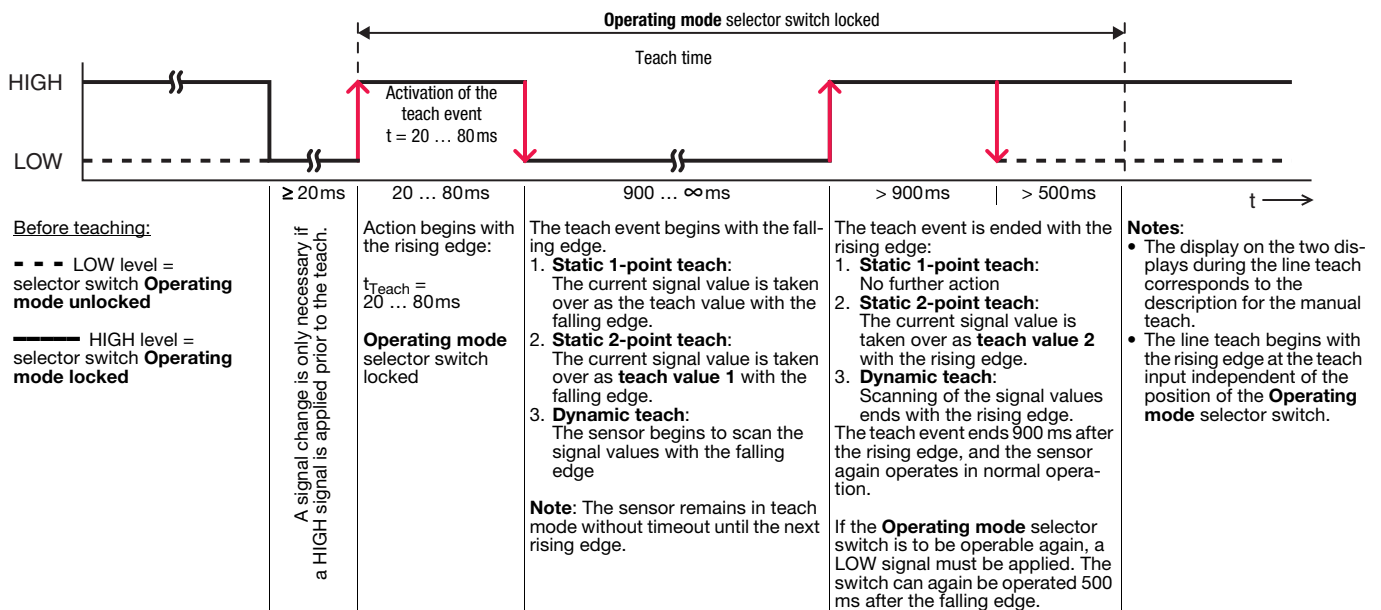
Signal level at **multi funct** teach input:

- The following description applies to PNP switching logic!
- I With the NPN models, the signal levels are inverted!

Timing for the line teach

Which line teach is performed is set in the **Select teach mode** **tch SEL** subfunction.

Depending on the setting, this may be a static 1-point teach, a static 2-point teach or a dynamic teach.



Locking the amplifier via the teach input

A **static HIGH signal** ($\geq 20 \text{ ms}$) on the teach input **locks the Operating mode selector switch** independent of its position. No manual configuration or adjustment can be performed (e.g., protection against erroneous operation or manipulation).

If the teach input is not connected or if a **static LOW signal** is applied, the **Operating mode selector switch is unlocked** and all functions can be accessed as described.

Special function: Remote configuration

In addition to the described line teach, a simple pulse-pause signal at the teach input can be used to perform a partial configuration of the device. To do this, make this setting in the submenu:



NOTE

- For the pulse sequences described in the following for device configuration via the teach input, the following conventions apply:
- **Signal level:** The description applies for **PNP devices** (active high). For NPN devices (active low), the pulse sequences are to be inverted accordingly.
 - **Pulse length T:** HIGH and LOW pulses are the same length: $0.04s < T < 0.8s$.
 - **Pause length P:** The following applies for the pauses between the pulse sequences: $P > 1s$.

Settings for CH1 - switching output

Teach mode	1-point teach	
	2-point teach	
	Dynamic teach	
Switching function OUT1	Light switching	
	Dark switching	

Settings for CH2 - analog output

Select analog range	0-10V / 0-20mA	
	0-5V / 4-20mA	
	1-6V / no function	
Characteristic output curve	Rising characteristic curve	
	Falling characteristic curve	

Settings for CH1 and CH2 - response time and gain

Select response time	Response time 500µs	
	Response time 1000µs	
	Response time 2ms	
	Response time 8ms	
	Response time 24ms	
Select gain	Auto GAIN	
	Gn1	
	Gn2	
	Gn3	
	Gn4	
	Gn5	
	Gn6	
	Gn7	

1) Not adjustable for response time 500 µs

2) Not adjustable for response times 500 µs, 1000µs, 2ms and 8 ms

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Multiplex operation of multiple amplifiers

If multiple light axes are arranged immediately adjacent to one another, mutual interference may occur, recognizable by a strongly fluctuating display.

To avoid this undesirable behavior, **up to 6 devices can operate in multiplex operation**. To do this, it is only necessary to connect the **multi funct** multifunction input (pin 2/ws-WH) of all participating amplifiers in addition to the voltage supply and switching signal.



- For settings, see subfunctions:

CH1 CH2 RUN PRG ADJ

InP SEL multi funct input	→	SYnc Int Multiplex operation
Func SEL Master-slave assignment	→	mAn Master assignment
		SL 1... SL 5 Slave assignment

- Maximum 6 / minimum 2 units: 1 x master + 1 ... 5 slaves.
- Each unit can be either a master (**mAn** or slave (**SL**).
- The master also requires the information on the number of units connected in parallel (**n** = 1 + number of slaves).
- Each slave also receives an individual **address 1 ... 5** (max.)
- The master generates a timing signal on pin 2 or on cable ws/WH.
- Each slave switches on its transmitter for 1 ms depending on its address.
- In multiplex operation, the cycle time is based on the total number of units:
cycle time = number of units • 1.5ms + 0.5ms.

Synchronous operation of multiple amplifiers / operation with activation input

If may also be necessary to query multiple light axes **simultaneously** (synchronously) . There are two ways to do this:

Model 1:

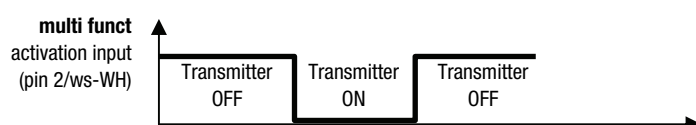
Wiring and adjustment according to section **Multiplex operation of multiple amplifiers**, but all slaves receive an **identical address from 1 ... 5**. Result: Master and slaves have a time offset of 1.5 ms; slaves with the same address operate synchronously.

Model 2:

Synchronous operation through an external activation signal at the **multi funct** input (pin 2/ws-WH). Subfunction setting:



Function:



The transmitter is **deactivated with a high signal**. The transmitter is **activated without actuation or with a low signal**.