

Original operating instructions

## LV 453B Fiber optic amplifier

### IMPLEMENTATION AND OPERATION



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<b>1</b>	<b>About This Document</b> .....	<b>2</b>
1.1	EC Declaration of Conformity .....	2
1.2	Download Area .....	2
<b>2</b>	<b>Safety</b> .....	<b>3</b>
<b>3</b>	<b>Device Description</b> .....	<b>4</b>
3.1	Specification .....	4
3.2	Outline Dimensional Diagram .....	4
3.3	Setting .....	5
3.3.1	Input-Output Circuit Diagram .....	5
3.3.2	Output Switching Method .....	5
<b>4</b>	<b>Functions</b> .....	<b>6</b>
4.1	Object Detection – 2 Point Teach .....	6
4.2	Strengthen Dust and Pollution Resistance .....	6
4.2.1	Maximum Sensitivity Adjustment .....	6
4.3	Automatic Adjustment .....	7
4.3.1	Adjust With Moving Detection Object .....	7
4.4	Position Adjustment .....	7
4.4.1	Confirm the Detection Object Position .....	7
4.5	Percentage Adjustment .....	7
4.5.1	Detect Transparent Objects or Tiny Objects (Set Threshold Based on the Ratio of Light) .....	7
4.5.2	Intelligent Adjustment Error .....	8
4.6	Threshold Fine-Tuning .....	8
4.7	Settings .....	9
4.7.1	Light Intensity Adjustment .....	9
4.7.2	Reliable Detection Against Dust and Dirt Altering the Incoming Light Level .....	9
4.7.3	Setting Initialization .....	9
4.7.4	Setting Storage .....	10
4.7.5	Reset Incoming Light to Display "0" .....	10
4.7.6	Output Triggered within a Set Range of Incoming Light .....	11
4.8	Detail Setting .....	11
4.9	Installation of Fiber Optic Sensors .....	17
4.9.1	Install to DIN Rail .....	17
4.9.2	Remove From DIN Rail .....	17
4.9.3	Fiber Optic Cutter .....	17
4.9.4	Install Fiber Optic .....	17
<b>5</b>	<b>Error Indication</b> .....	<b>18</b>
<b>6</b>	<b>Maintenance (Troubleshooting)</b> .....	<b>19</b>
<b>7</b>	<b>Service and Support</b> .....	<b>19</b>

## **1 About This Document**

### **1.1 EC Declaration of Conformity**

The device meets the basic requirements and the other relevant provisions of the machinery directive 2006/42/EC.



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


### **1.2 Download Area**

You can find the original operating instructions and the EU Declaration of Conformity by entering the part number of the device in the search field on our website [www.leuze.com](http://www.leuze.com).

The part number can be read on the name plate of the device under the "Part No." entry.

## 2 Safety

 <b>WARNING</b>	
	<p>To ensure the safe operation of the machine, it is necessary to supply electricity with a fixed amount of power source.</p> <p>This product does not belong to explosion-proof structure. Do not use it in flammable or explosive environment.</p> <p>This product should not be used for human protection devices and human testing purposes.</p>

<b>NOTE</b>	
	<ul style="list-style-type: none"> <li>⌘ Do not use in places where water, oil or chemicals are used.</li> <li>⌘ Do not use in direct sunlight.</li> <li>⌘ Do not use in places with corrosive gas.</li> <li>⌘ Do not use in places with strong electric and magnetic fields.</li> <li>⌘ Do not use in places where vibration and shock exceed the rated range.</li> <li>⌘ Do not use in places with high temperature and easy condensation.</li> <li>⌘ Do not use in case of damaged shell.</li> <li>⌘ Please correctly connect the load.</li> <li>⌘ Do not load short circuit, otherwise it will lead to damage, cause fire danger.</li> <li>⌘ Please pay attention to the polarity of the power supply to prevent wrong wiring.</li> <li>⌘ Please separate the sensor from the high-voltage line and power line. If the same line is used, it will induce each other and cause wrong action or damage.</li> <li>⌘ Do not disassemble, repair or modify this product without permission.</li> </ul>

### 3 Device Description

#### 3.1 Specification

Series	LV453B (Fiber Amplifier)	
Light Source	Red 4 element LED (625nm)	
Supply Voltage	DC12~24 ±10% (VPP) <10%	
Switching Mode	Light ON / Dark ON (Selectable)	
Output Mode	NPN / PNP (Separate variant)	
Control Output:	Load supply voltage: 26.4VDC Max. load current: <100mA Max.	
Response Time	Super High Speed (SHS)	40µs
	High Speed (HS)	250µs
	Standard (STD)	1ms
	High Precision (LR)	18ms
Protection Circuit	Power supply reverse polarity protection	
	Output short circuit protection	
	Output with reverse protection	
Ambient Humidity	25%~85%RH (No dew)	
Operating Temperature Range	-10~55°C (No dew)	
Material Quality	Case: ABS, standard cable (black) PVC	

#### 3.2 Outline Dimensional Diagram

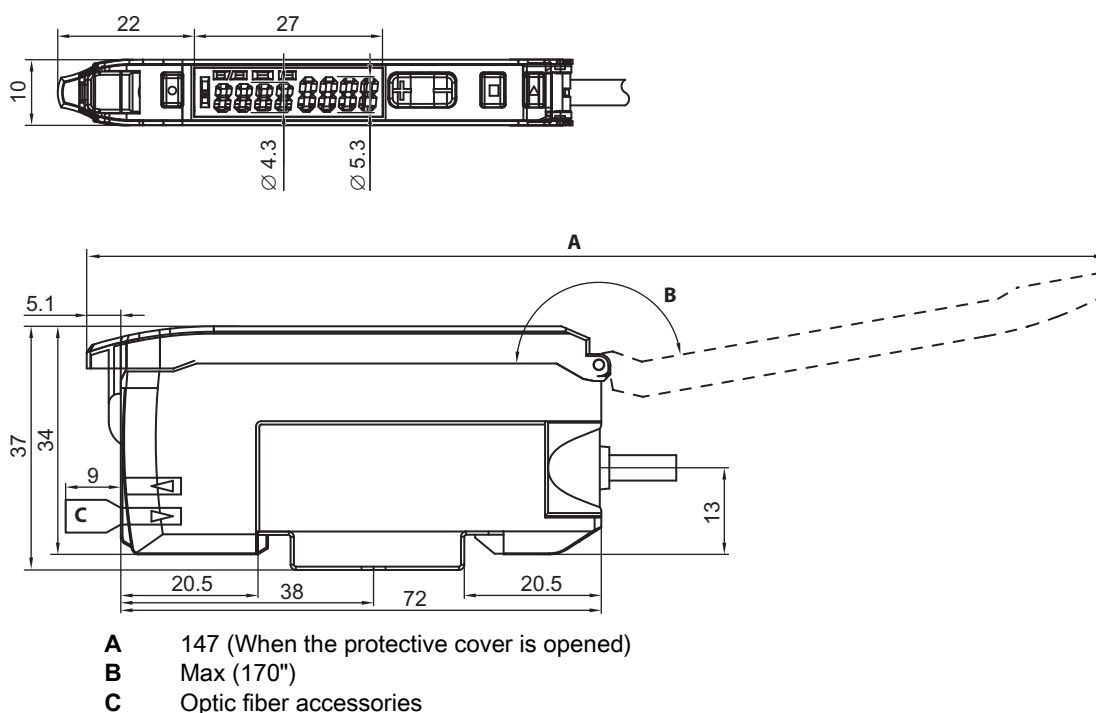
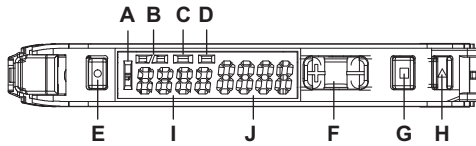


Figure 3.1: Outline Dimensional Diagram

### 3.3 Setting



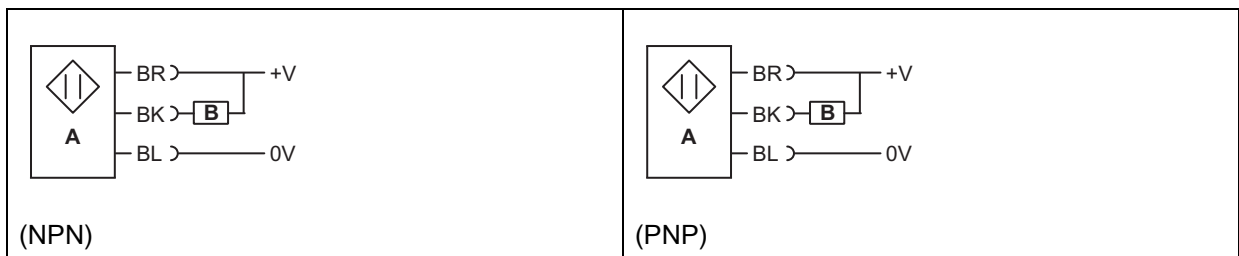
- A** Orange LED: on when output is triggered
- B** L/D indicator  
D: Dark-on  
L: Light-on
- C** ACC indicator orange LED: on when Adaptive Compensation Control is enabled
- D** Blue LED: on when ST (Smart Teach) is pressed
- E** Teach button: performs ST
- F** Threshold setting: fine tuning Up (+) and Down (-)
- G** Mode selector
- H** Light-on/Dark-on switch
- I** Switching threshold: green 4-digit display
- J** Incoming Light level: red 4-digit display

Light Intensity adjustment	
Setting initialization	
Button locked	
Reset to "0"	

- + Press simultaneously
- > Press in sequence

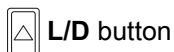
see chapter 4.7 "Settings".

#### 3.3.1 Input-Output Circuit Diagram



- A** Main Control Circuit
- BR** Brown
- BK** Black
- BL** Blue

#### 3.3.2 Output Switching Method





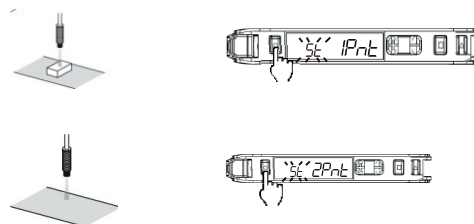
- Through beam type** (with object detected):  
"ON" when Dark-on, "OFF" when Light-on (L/D indicator light) **D** is on.
- Diffuse reflective type** (with object detected):  
"OFF" when Dark-on, "ON" when Light-on (L/D indicator light) **L** is on.



## 4 Functions

### 4.1 Object Detection – 2 Point Teach

1. Press the **ST** button  when the object is in position.
2. Press the **ST** button  again when the object is removed.



→ Setting is finished.

**Smart Teach setting:** adjust the light intensity according to the incoming light taught during 2 point teach.

**Threshold setting:** threshold is set to the middle after Smart Teach is performed on step 1 and step 2.


#### NOTE



The order of 1 and 2 can be reversed.

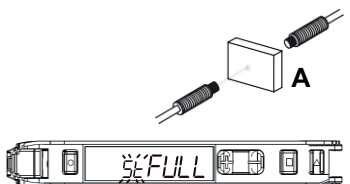
### 4.2 Strengthen Dust and Pollution Resistance

#### 4.2.1 Maximum Sensitivity Adjustment

1. Press and hold the **ST** button  for more than 3 seconds and release the button when (FULL) appeared.

**Through beam type:** perform when object is present.

**Diffuse reflective type:** perform when no object is present.



A Detection object



↪ Press more than 3 seconds



Red digits switch from (1Pnt) to (FULL).

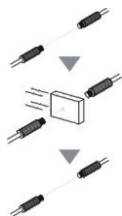
**Smart Teach setting:** incoming light is adjusted to "0".

**Threshold setting:** threshold is set 7% above the Incoming Light level during teach.

### 4.3 Automatic Adjustment

#### 4.3.1 Adjust With Moving Detection Object

1. Press **ST** button  and hold for 3 seconds to switch from (IPnt) to (FULL) and continue to hold for another 4 seconds to select (Auto). Release **ST** button  when object is not present.



↪ Press the button for more than 7 seconds




→ Setting is finished

**Smart Teach setting:** adjust the maximum incoming light.

**Threshold setting:** threshold value is set to the average value between the maximum and minimum amount of light received during the teach process.

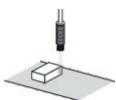
### 4.4 Position Adjustment

#### 4.4.1 Confirm the Detection Object Position

1. Press the **ST** button  when there is no object present.



2. Place object in the desired position and press **ST** button  again and hold for 3 seconds, the red display will change mode from (2Pnt) to (PoS).




**Smart Teach Setting:** the Incoming Light level is adjusted to half the adjusted light intensity.

**Threshold setting:** threshold is set to the same value as the amount of light received in step 2.

### 4.5 Percentage Adjustment

#### 4.5.1 Detect Transparent Objects or Tiny Objects (Set Threshold Based on the Ratio of Light)

1. Set the Percentage adjustment to **ON** in the Setting mode, see chapter 4.8 "Detail Setting".
2. Press the **ST** button  when there is no object present.

**Smart Teach Setting:** light intensity is set to optimum.

**Threshold setting:** threshold is calculated as follows:  
Incoming Light value in step 2 x Percentage adjustment level + Incoming Light value in step 2).

#### NOTE

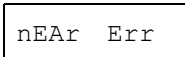
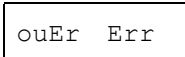
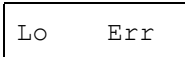


When set to Percentage adjustment, Smart Teach (ST) can only be used for adjusting the light intensity.




→ Setting is finished

### 4.5.2 Intelligent Adjustment Error

Error Name / Display / Reason	Type of Adjustment	Countermeasure
Near Error  Difference between the amount of light received at set point 1 and set point 2 is too low	2-point Automatic adjustment and Positioning adjustment	<ul style="list-style-type: none"> <li>↺ Switch to a mode where the Response Time of the amplifier is slower.</li> <li>↺ Decrease the distance between sender and receiver (Through beam type).</li> <li>↺ Move the fiber closer to the detected object (Diffuse reflective type).</li> </ul>
Over Error  Too much incoming light	All	<ul style="list-style-type: none"> <li>↺ Increase the light adjustment level.</li> <li>↺ Use a small-diameter fiber.</li> <li>↺ Increase the sensing distance between transmitter and receiver (Through beam type).</li> <li>↺ Move the fiber away from the detecting object (Diffuse reflective type).</li> </ul>
Low Error  Too little incoming light	Beyond Maximum Sensitivity adjustment	<ul style="list-style-type: none"> <li>↺ Reduce the light adjustment level.</li> <li>↺ Reduce the sensing distance between transmitter and receiver (Through beam type).</li> <li>↺ Bring the sensor closer to the object (Diffuse reflective type).</li> </ul>

**NOTE**


 The adjustment range of the intelligent adjustment is about 20-1/100 times. When the Detection Function is selected as **LR** mode, the range of adjustment is about 1.6 ~ 1/100 times because the initial value is large.

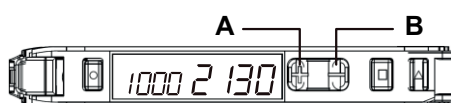
To change the level of light intensity, see chapter 4.8 "Detail Setting".

### 4.6 Threshold Fine-Tuning

- Set threshold via **UP/DOWN** button .

**NOTE**

 Continuous press button for quick adjustment of threshold value.



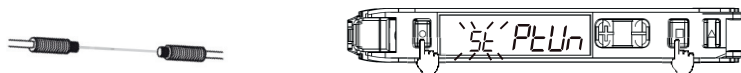
- A** Threshold increase
- B** Threshold decrease

## 4.7 Settings

### 4.7.1 Light Intensity Adjustment

#### Restore Light Changes Caused by Dust or Dirt

1. When no object is present, press button  and **MODE** button  for more than 1 second.



↪ Press more than 1 second.

→ Setting is finished

**Smart Teach setting:** the intensity of the emitted light is set to the optimal level.

**Threshold setting:** the intensity will not change if the Incoming Light level is low. The threshold is set to the minimum value with that an output is turned ON/OFF correctly.

The position adjustment should be performed with the detecting object present.

### 4.7.2 Reliable Detection Against Dust and Dirt Altering the Incoming Light Level

#### ACC Function

ACC Function is recommended for Through beam type product.

1. Perform Smart Teach (ST) see chapter 4.7 "Settings".
2. Turn on the ACC Function in Setting mode.

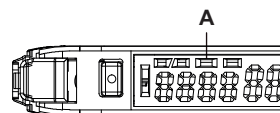
#### NOTE



Step 1 and 2 may be reversed.

↪ The ACC Function will be turned off when the Smart Teach leads to an error / Incoming Light level is low.

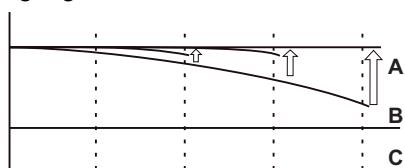
↪ The Incoming Light level is adjusted to the light intensity to ensure stable threshold.



**A** Indicates that the light will turn on when the ACC Function is valid

With these settings, the sensor is not affected by dust, dirt, temperature change, or positioning fault.

Incoming Light level









- A** Correct internal Incoming Light level to keep display value stable.
- B** Internal Incoming Light level
- C** Time



If the Incoming Light level cannot be corrected, the value of the red digit decreases and ACC flashes to indicate that correction is not possible.

### 4.7.3 Setting Initialization

Initialize all settings and return to factory state.

1. Press **ST** button  and **L/D** button  and hold for 3 seconds.

2. Select (rSt) through **UP/DOWN** button  and press **MODE** button .
3. Select (rSt init) through **UP/DOWN** button  and press **MODE** button  to confirm.

NOTE	
	Pressing <b>L/D</b> button  will inverse the output mode.









↪ Press more than 3 seconds.

Item	Initial Value
Threshold	55
Control output	L-ON







\* All other setting functions are set back to off.



#### 4.7.4 Setting Storage

##### Save current Setting

1. Press **ST** button  and **L/D** button  for more than 3 seconds.
2. Select (SAvE) through **UP/DOWN** button  and press **MODE** button .
3. Select (SAvE Yes) through **UP/DOWN** button  and press **MODE** button  to confirm.

##### Read the saved settings

1. Press **ST** button  and **L/D** button  for more than 3 seconds.
2. Select (rSt) through **UP/DOWN** button  and press **MODE** button .
3. Select (rSt USEr) through **UP/DOWN** button  and press **MODE** button  to confirm.

NOTE	
	Pressing <b>L/D</b> button  will cause output inversion.

##### Button lock

Turn off all button operation functions and press the button to display (Loc) on

- Execute / release (same procedure).

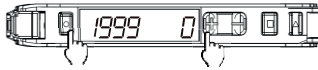


↪ Hold both buttons (either **UP**  or **DOWN**  and **MODE** button ) for more than 3 seconds at the same time.

#### 4.7.5 Reset Incoming Light to Display "0"

Displays the Incoming Light level as "0" and the threshold changes accordingly.

- Enable



↳ Press both buttons at the same time for more than 3 seconds.

- Disable



↳ Press both buttons at the same time for more than 3 seconds.

NOTE	
	After performing the ACC Function the reset function is disabled.

#### 4.7.6 Window Mode

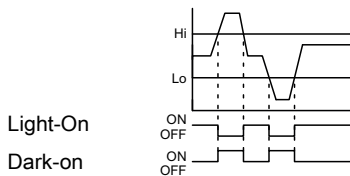
##### Output Triggered within a Set Range of Incoming Light

1. Press the **MODE** button for 3 seconds to enter the Setting mode.
2. Press the **MODE** button to choose Area Detection mode [ArEA]. Press to turn on Area Detection mode. Press the **MODE** button for 3 seconds to exit the Setting mode.  
Press the **MODE** button to switch between threshold HIGH and LOW. The green digital display will flash out HIGH or LOW and shows the threshold afterwards.
3. HIGH and LOW must be set separately by pressing the Smart Teach (ST) button . Always the value shown (HIGH or LOW) is set.

When the percentage adjustment function is enabled, the threshold is set as follows:

**HIGH:** The Percentage adjustment value x Incoming Light received in step 3 (high) + Incoming Light received in step 3 (high).

**LOW:** The Percentage adjustment value x Incoming Light received in step 3 (low) + Incoming Light received in step 3 (low).

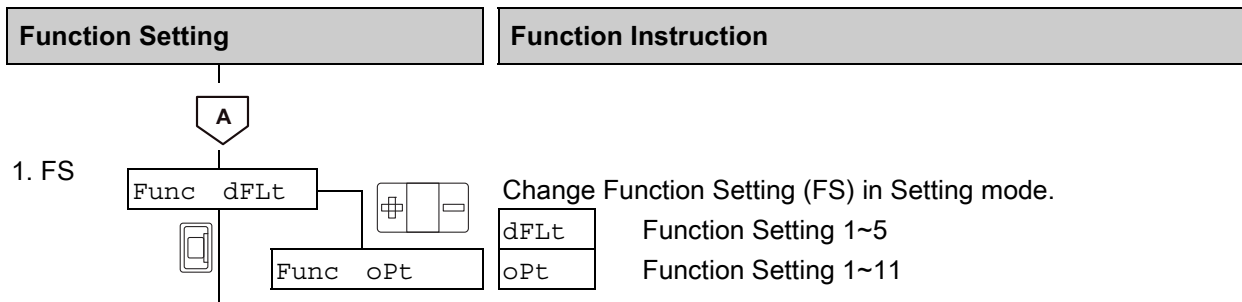


#### 4.8 Detail Setting

Press **MODE** button for more than 3 seconds to switch to Setting mode.

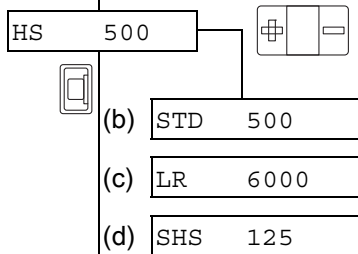
In Setting mode, the following functions can be selected by following the instruction below.

↳ The initial function shown is the factory default.

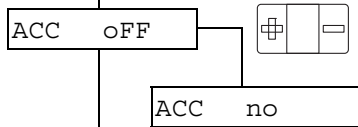


**Function Setting**

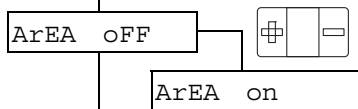
2. Detection Function



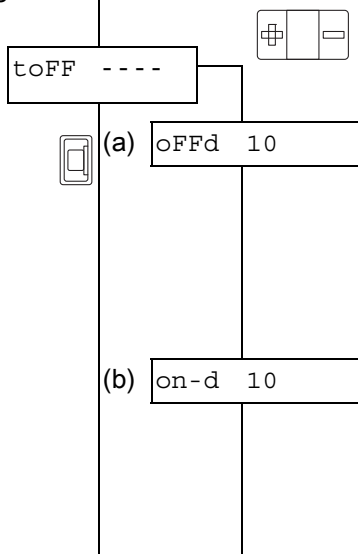
3. ACC Function



4. Area Detection Function



5. Timing Function



**Function Instruction**

Change the Incoming Light level and Response Time.

	Detection Function	Response Time	Light Intensity
(a)	<b>HS</b> High speed mode	250µs	1 (benchmark)
(b)	<b>STD</b> Standard mode	1ms	1 Times
(c)	<b>LR</b> Long Range mode	18ms	12 Times
(d)	<b>SHS</b> Ultra-high speed	40µs	0.25 Times

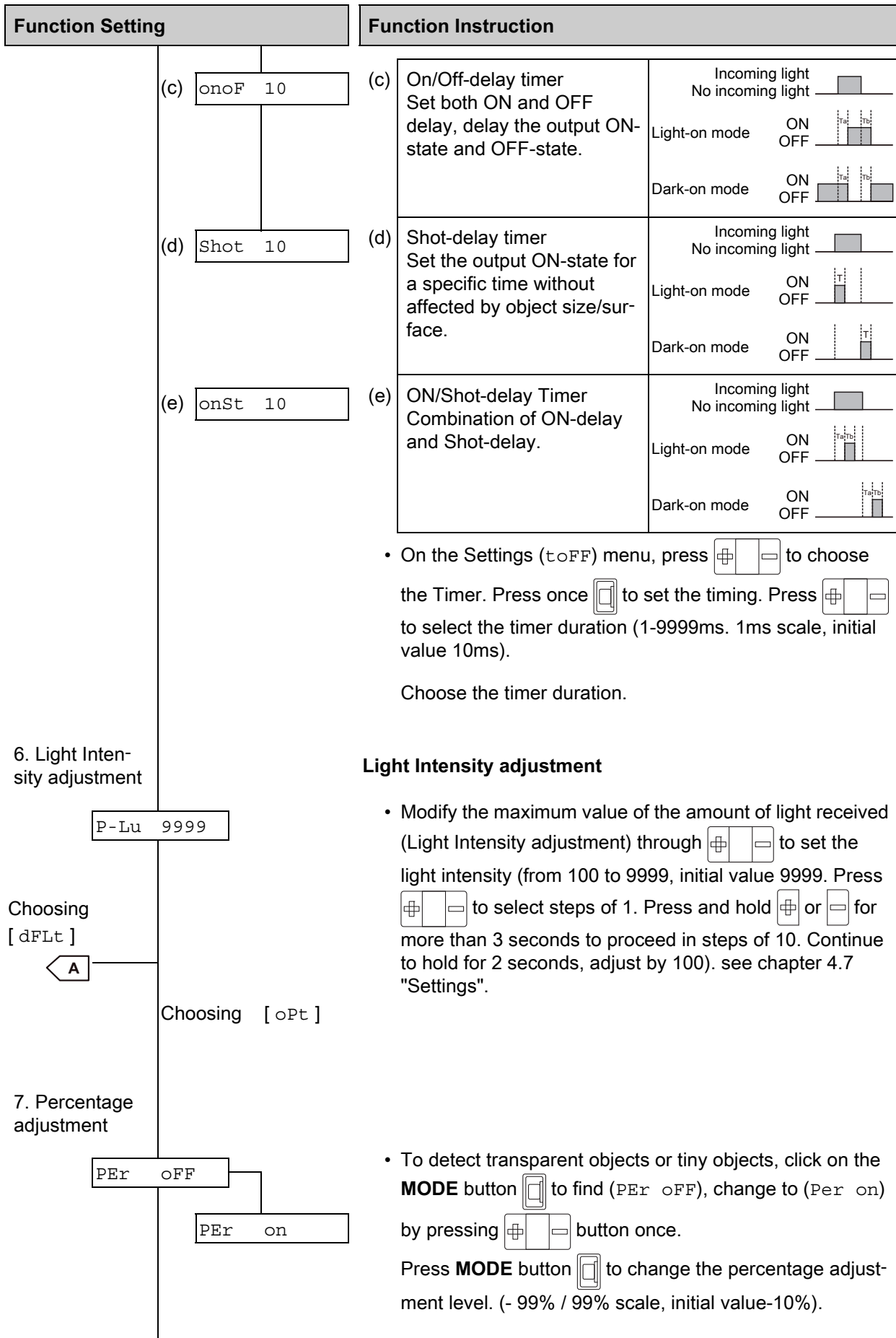
When the mode of the Detection Function is changed, the Smart Teach is removed.

**NOTE**

**i** When you want to enable Area Detection, make sure to set threshold value using **ST** button for HIGH and LOW respectively. You can manually change the state (HIGH or LOW) via **MODE** button to complete the setting.

Output timer setting

(a)	<p><b>Off-delay timer</b> Delays the switch off of the output by the selected time.</p>	<p>Incoming light No incoming light</p> <p>Light-on mode ON OFF</p> <p>Dark-on mode ON OFF</p>
(b)	<p><b>On-delay timer</b> Delay the output ON-state after detection.</p>	<p>Incoming light No incoming light</p> <p>Light-on mode ON OFF</p> <p>Dark-on mode ON OFF</p>



6. Light Intensity adjustment

P-Lu 9999

Choosing [ dFLt ]



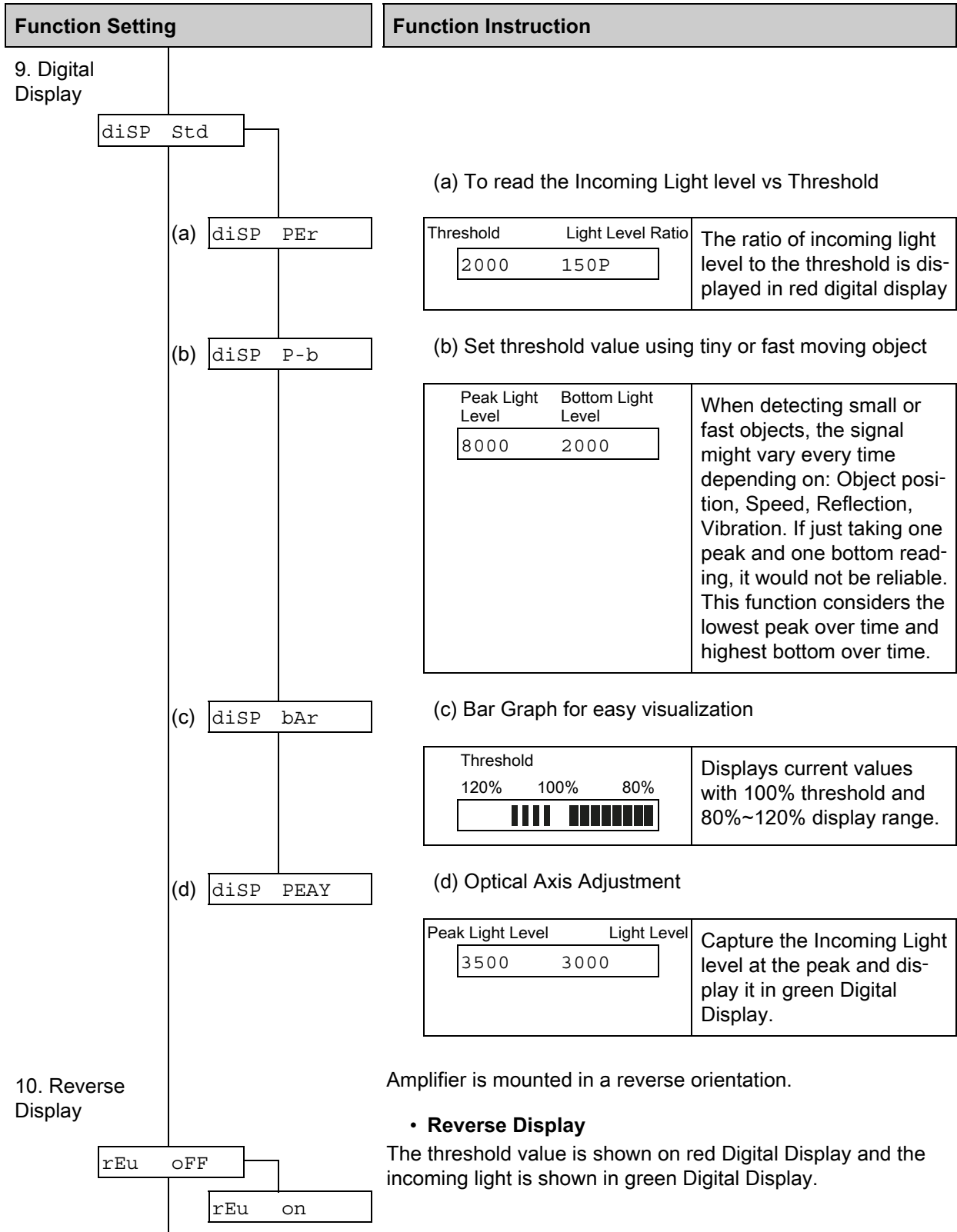
Choosing [ oPt ]

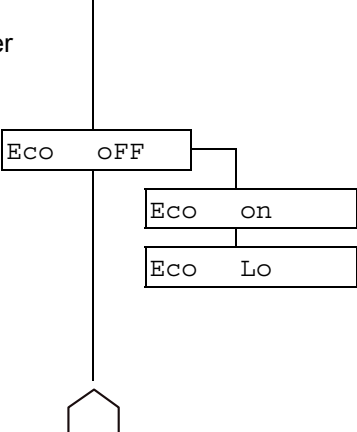
7. Percentage adjustment

PER OFF

PER on

Function Setting	Function Instruction												
<p>8. Differential</p> <div style="border: 1px solid black; padding: 2px; margin: 5px 0;">diFF OFF</div> <div style="margin-left: 20px;"> <p>(a) <div style="border: 1px solid black; padding: 2px;">diFF 1</div></p> <p>(b) <div style="border: 1px solid black; padding: 2px;">diFF 2</div></p> <p>(c) <div style="border: 1px solid black; padding: 2px;">diFF 3</div></p> <p>(d) <div style="border: 1px solid black; padding: 2px;">diFF 4</div></p> <p>(e) <div style="border: 1px solid black; padding: 2px;">diFF 5</div></p> </div>	<p>Differential: Detects Incoming Light level change.  Detects if the value of Incoming Light level changes and sets Response Time. The display shows the change of the Incoming Light level of the set Response Time in red digital display. The change in the Incoming Light level is shown in red digital display.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th>Differential Setting *</th> <th>Response Time</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">250µs</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">500µs</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">1ms</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">10ms</td> </tr> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">100ms</td> </tr> </tbody> </table> <p style="margin-top: 10px;">* Lower numbers = faster but more sensitive to noise.  Higher numbers = slower but more stable detection.</p> <ul style="list-style-type: none"> <li>• You can set the Response Time through the button. When Differential is enabled, the sensor does not trigger immediately when incoming light changes a little amount. Instead, the sensor will only switch on the output when the light level changes more than the threshold during the selected response time. The sensor stops using Smart Teach algorithms (automatic optimization). You are now telling the sensor to behave in a strict, manual, timing-based way. The amplifier will not automatically adjust sensitivity anymore.</li> <li>• Smart Teach features are turned off.</li> </ul> <p style="margin-top: 10px;">The Light Intensity adjustment stays ON.  → The sensor is still allowed to automatically increase or decrease LED brightness (Light Intensity)  → to maintain a strong usable signal.</p> <p style="margin-top: 10px;">Brightness Level  1 (full power) – 100% light output  1/100 – 1% light output.  The sensor can auto-correct the light level up to 100× to keep detection stable.</p>	Differential Setting *	Response Time	1	250µs	2	500µs	3	1ms	4	10ms	5	100ms
Differential Setting *	Response Time												
1	250µs												
2	500µs												
3	1ms												
4	10ms												
5	100ms												

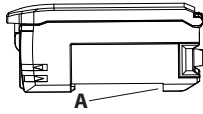


Function Setting	Function Instruction
<p>11. Power Saving</p>  <p>The diagram shows a vertical line starting from the 'Function Setting' header. To the left of this line is the text '11. Power Saving'. The line descends to a box labeled 'Eco OFF'. From the right side of this box, a horizontal line extends to the right, then a vertical line goes down to a box labeled 'Eco on'. From the right side of the 'Eco on' box, a horizontal line extends to the right, then a vertical line goes down to a box labeled 'Eco Lo'. From the bottom of the 'Eco Lo' box, a horizontal line extends to the right, then a vertical line goes down to a house-shaped icon.</p>	<p>ECO Mode for power saving</p> <ul style="list-style-type: none"> <li>• <b>Low Eco ON</b> When operation button is not pressed, Digital Display and indicators will turn off completely after 25 seconds.</li> <li>• <b>Low Eco LO</b> When operation button is not pressed, digital display and indicators will be dimmed after 25 seconds.</li> </ul>

## 4.9 Installation of Fiber Optic Sensors

### 4.9.1 Install to DIN Rail

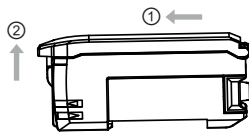
1. Insert the fiber optic amplifier into the slot on the side of the rail and push onto the rail until you hear the click.



A DIN rail slot side of fiber optic amplifier

### 4.9.2 Remove From DIN Rail

1. Push the unit in direction ① .
2. Lift up in the direction ② .

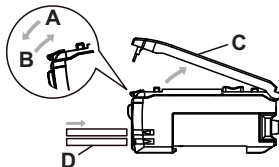


### 4.9.3 Fiber Optic Cutter

- Use a fiber cutter. Insert the fiber optic unit into the cutter hole to the position to cut off.
- Press the blade down in a single stroke to cut the fiber optic.

### 4.9.4 Install Fiber Optic

1. Open the cover.
2. Lift up the lock lever.
3. Insert the fiber firmly into the inlet fully until it reaches the end completely.
4. Press the lock lever back to the original position to secure the optical fiber.



- A Push to lock lever  
 B Push to unlock lever  
 C Protection cover  
 D Optical fiber

#### NOTE



When installing a fiber cable into the inlet, make sure the single optical fiber unit is inserted into the upper side of the mounting hole (Transmitter) and the multi-core optical fiber to the lower side (Receiver). This is important for coaxial fibers.

## 5 Error Indication

Error Name	Reason	Strategy
ACC Error	Incoming Light level decrease because of dust or dirt.	Wipe the fiber optic unit to remove dust resided on the surface. Perform Smart Teach (ST) to restore the Incoming Light level, see chapter 4.7.1 "Light Intensity Adjustment".
EEPROM Error	Read / write internal data failed	Reconnect the power. If not restored, perform initialization operation, see chapter 4.7.3 "Setting Initialization".
Lock ON	Button locked	Unlock the key, see chapter 4.7.4 "Setting Storage".
Current Over	Control overload current of output	Confirm the load of the control output and set it in the rated range. Please confirm if the load is short circuit, see chapter 3.3.1 "Input-Output Circuit Diagram".

## 6 Maintenance (Troubleshooting)

Fault	Reason	Strategy
Blank on screen	The state of power off, or disconnected	Check wiring, power supply voltage, and power supply capacity, "see chapter 3.3.1 "Input-Output Circuit Diagram".
Nothing is displayed on the digital display	Power saving is ON state	Turn off the ECO Mode function, see chapter 4.8 "Detail Setting".
Cannot be checked or detected even if the threshold value is minimum	The Detection Function has been set to a small Incoming Light level due to dust or dirt	When set to <b>LR</b> mode, the Incoming Light level increases and the amount of light displayed increases, see chapter 4.8 "Detail Setting".
Incoming light display variation	Affected by dust or dirt and temperature changing	If you use the ACC Function, the Incoming Light level display can be stabilized, see chapter 4.7 "Settings".
Output indicator blinking	Be affected by mutual interference, etc.	Confirm the connection status of the sensor and power it up again, see chapter 3.3.1 "Input-Output Circuit Diagram".
The amount of light is displayed as-(negative)	Zero reset is open state	Disable the return to zero, see chapter 4.7 "Settings".
	Differential function is open state	Turn off the Differential function, see chapter 4.8 "Detail Setting".
Set unknown		Please perform the set initialization operation, see chapter 4.7 "Settings".

## 7 Service and Support

### Service Hotline

You can find the contact information for the hotline in your country on our website [www.leuze.com](http://www.leuze.com) under **Contact and support**.

### Repair Service and Returns

Defective devices are repaired in our service centers competently and quickly. We offer you an extensive service packet to keep any system downtimes to a minimum. Our service center requires the following information:

- Your customer number
- Product description or part description
- Serial number or batch number
- Reason for requesting support together with a description

Please register the merchandise concerned. Simply register return of the merchandise on our website [www.leuze.com](http://www.leuze.com) under **Contact and support > Repair service and returns**.

To ensure quick and easy processing of your request, we will send you a returns order with the returns address in digital form.