

Digital Fiber Amplifier



# D3RF/D3IF Series

- D3RF-T
- D3RF-TC 4
- D3RF-TD
- D3IF-T
- D3IF-TC 4

## Instruction Manual

- Thank you for purchasing D3RF Series. We hope you are fully satisfied with this product and enjoy its performance.
- Carefully read this instruction manual and keep it for future reference.

Carefully read and understand the safety precautions before operation. The important information is provided to protect your health and property. Do not apply any other installing or operating procedure other than that described in this manual.

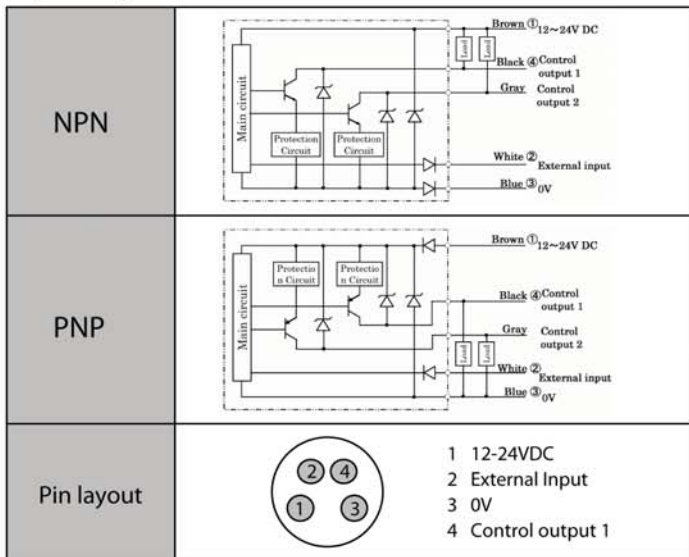
### Safety Precautions



- It is dangerous to wire or attach/remove the connector with the power on. Make sure to turn off the power before operation.
- Make sure to use the product with the protective cover attached and closed.
- Installing in the following places may result in malfunction:
  1. A dusty or steamy place.
  2. A place generating corrosive gas.
  3. A place directly receiving scattering water or oil.
  4. A place suffered from heavy vibration or impact.
- The product is not designed for outdoor use.
- Do not use the sensor in transient state after power on (approx. 300ms).
- Do not wire with the high voltage cable or the power line. Failure to do this will cause malfunction by induction or damage.
- The sensor performance or digital display values may depend on the individual units or the condition of detected product.
- This product is not an explosion-proof construction. Do not use the product under flammable, explosive gas or liquid environment.
- Do not use the product in water.
- Do not disassemble, repair, or convert the product. Failure to do this may cause failure, fire, or electric shock.
- Operate within the rated range.

This product cannot be use as a safety device to protect human body.

### Input/Output Schematic



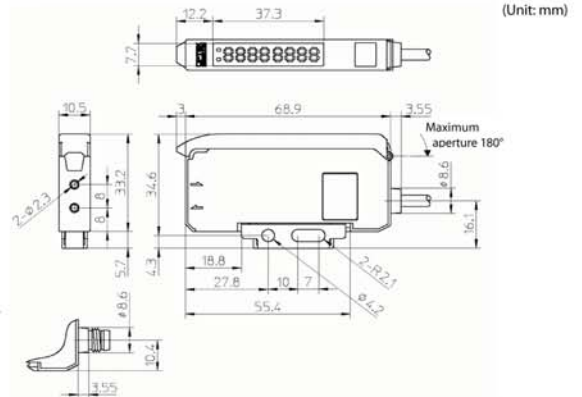
\* Gray line (Control output 2) is only for the 2 output type (D3RF-TD).

### Specifications

Model		Standard type	Moisture sensing type
Cable Type	1 output	D3RF-T (N/P)	D3IF-T (N/P)
	2 output	D3RF-TD (N/P)	-
M8 Connector Type	1 output	D3RF-TC (N/P) 4	D3IF-TC (N/P)4
	2 output	-	-
Power source, voltage		12-24VDC±10%including a ripple	
Power consumption	Normal	1 output : 864mW max.(36mA or less / 24V) ,2 output : 936mW max.(39mA or less / 24V)	
	Eco All	1 output : 600mW max.(25mA or less / 24V) ,2 output : 672mW max.(28mA or less / 24V)	
Response Time		1-HS:16μs / 2-FS:70μs / 3-ST:250μs / 4-LG:500μs / 5-PL:1ms / 6-UL:2ms / 7-EL:8ms	
Control output		1 output / 2 output , NPN / PNP Open collector 100mA / 30V or less Load current : 100mA or less , Residual voltage : 1.8V or less	
Output method		Light on / Dark on Switching type in the function	
Short-circuit protection		Incorporated	
Light source		Red LED (632nm)	IR LED (1,450nm)
Indicator light / Display	1 output	Output Indicator light : Orange (Ch 1) / 7 segment 8 digit display	
	2 output	Output Indicator light : Orange (Ch 1 / Ch 2) / 7 segment 8 digit display	
Sensitivity setting		Teaching / Manual adjustment	
Timer function		OFF, On delay timer, Off delay timer, One-shot timer, On delay-off delay timer, On delay-one-shot timer	
Timer time		0.1ms~9.999s	
External input setting		Teach-in, Emitter stop, Synchronous, Counter reset (only for 2 output type)	
Output setting	1 output	Output 1	
	2 output	Output 2	
Operating temperature /humidity		-25~+55°C/35~85%RH (No freezing and No condensation)	
Store temperature /humidity		-30~+70°C/35~85%RH (No freezing and No condensation)	
Shock resistance		10~55Hz Amplitude 1.5mm 2 hours for each direction of X,Y and Z	
Protective category		IP50	
Material		PC : Cover, Case	
Weight	Cable type : 71g (Including cordes)		
	M8 Connector type : 25g		

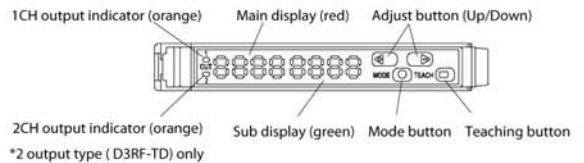
### Dimensions

- D3RF-T
- D3RF-TD
- D3IF-T



- D3RF-TC 4
- D3IF-TC 4

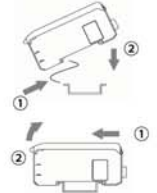
### Display/Indicator/Buttons



### Installing Amplifier

#### Mounting and Removing to/from DIN rail

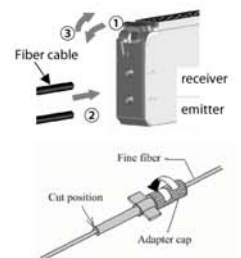
- Mounting of Amplifier Unit  
Hook the claw on the connecting side of fiber cable to the DIN rail. Then press down the hook until it locks.



- Removing of Amplifier Unit  
Pushing the unit to the direction of ①, hold up the connecting side of fiber cable and remove the unit.

#### How to connect the fiber cables

- ① Open fiber lock lever.
- ② Insert fiber into holes to stop.
- ③ Return fiber lock lever until it stops.



#### CAUTION

With Coaxial reflection fiber, set single core fiber or white-lined fiber

#### How to use Fine fiber

- ① Turn adapter cap anticlockwise completely, then appropriately insert the fiber.
- ② Cut the excess fiber with fiber cutter.

## Display and Buttons

### Switching display

Display shows as follows according to its mode

Operating (RUN mode)	Setup	Teaching
It shows as example when it's actually detecting object. It goes to this mode after power up. Ex.) <b>200 100</b> Sensing Threshold level	It switches to this Setup mode by pressing "MODE" button over 3 seconds. Ex.) <b>L--d L on</b> Function Setup Value	It switches to this Teaching mode by pressing "TEACH" button over 3 seconds. Ex.) <b>2Pt 1Pt</b> Mode of teaching

### Buttons

Buttons work as follows according to its mode

Buttons	Operating (RUN mode)	Setup / Teaching
Adjust (+ UP)	Increase threshold level	Change the Setup function and mode of Teaching
Adjust (- DOWN)	Decrease threshold level	
MODE	Switch to Setup mode	Set the setup
TEACHING	Switch to Teaching mode	Execute Teaching

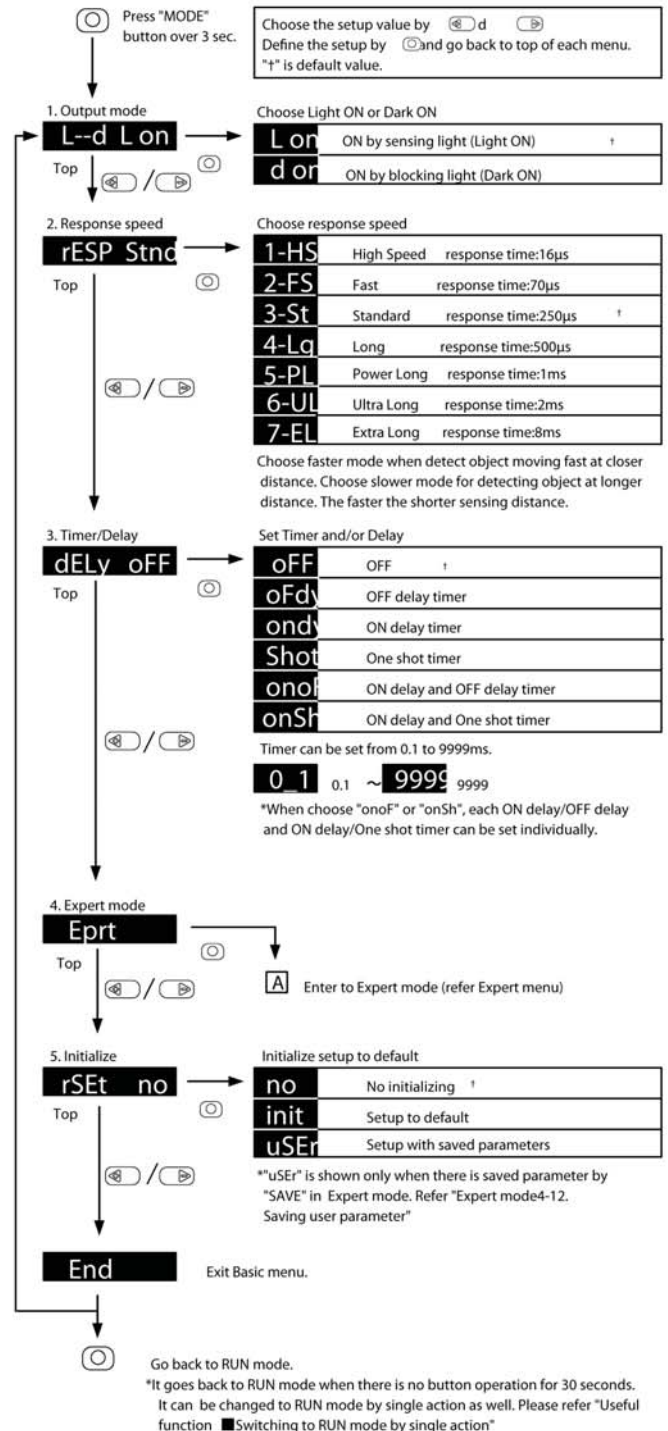
## Setup menu

Basic menu		
These are basic menu that to be setup before using. Please refer Expert menu for further setup function.		
Display	Menu	Function
L--d	Output mode	Switch Light ON and Dark ON
rESP	Response speed	Set response speed
dELy	Timer/Delay	Set Timer and Delay
Eprt	Expert mode	Enter to Expert mode (refer Expert menu)
rSEt	Initialize	Initialize setup to default
End	Exit	Exit setup mode

Expert menu		
These are menu for function that setup in detail. Expert menu is available from "Eprt" in Basic menu.		
Display	Menu	Function
0rSt	Zero reset	Set main display to 0 (zero).
diSP	Display mode	Set display mode for operating (RUN mode)
Eco	Eco mode	Set Eco mode
turn	Rotation	Rotate the display 180 degree
HyS	Hysteresis	Specify hysteresis percentage
PrcS	Detection mode	Set detection mode (edge/level)
cnt	Counter	Switch ON/OFF Counter and specify UP/DOWN direction
InPt	External input	Set function of external input
ASc	ASC	Set ON/OFF ASC (Automatic Sensitivity Control)
Spor	Emitter Power	Specify Emitter power
LocL	Lock level	Specify level of Key Lock
SAuE	Save	Save the current setup
End EPr	Exit	Exit expert menu
Loc	Lock	Lock buttons (refer useful function)

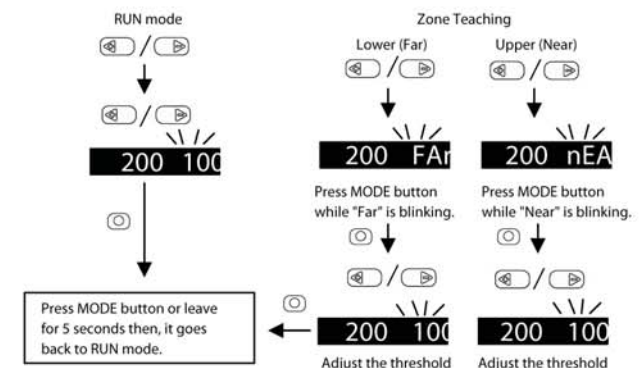
Teaching menu		
Threshold level can be set by these menu. Please refer "Teaching".		
Display	Menu	Function
2Pt	2 Point Teaching	Set the threshold at the center between with object and without object.
1Pt	1 Point Teaching	Set the threshold at minimum level that can detect object stably with.
thru	Through Teaching	Set the threshold at around 90% of sensing level without object for through beam application.
ZonE	Zone Teaching	Set the threshold at around sensing level $\pm 10\%$ .
Auto	Automatic Teaching	Set the threshold at the center between maximum and minimum level.
P-t	Percent Teaching	Threshold can be set any percentage.
0P-t	Zero % Teaching	Set the threshold at any percentage and execute zero reset.
End tEch	End of Teaching	Exit Teaching mode.

## Basic setup



## Setup Threshold manually

At RUN mode, press [Left] [Right] threshold display blinks that shows it can be adjusted. Adjust the threshold by [Left] [Right] can adjust upper and lower threshold when it's Zone Teaching mode.



# Teaching

Press TEACH button for 3 seconds. Choose Teaching mode by pressing [Left] [Right]. Then, press [Enter] to confirm. When Teaching is done, it goes back to RUN mode after the threshold blinks. You can refer current sensing level by pressing MODE [Enter] while teaching.

**1. 2 point Teaching**  
**2Pt 1Pt** → Press TEACH → **2Pt 2Pt** → Press TEACH → **2Pt 250**

Top  
 Threshold is set at center of 1st and 2nd level.  
 Teach twice with object and without object.

Diffuse reflective  
 1st: With object to detect  
 2nd: Without object

**2. 1 point Teaching (1)**  
**1Pt** → Press TEACH → **1Pt 250**

Top  
 Threshold is set at minimum level that enable stable detection.  
 Good for long distance

Thru-beam  
 Diffuse reflective  
 With object to detect  
 Without object and background

**3. 1 point Teaching (2)**  
**1Pt** → Press TEACH → **1Pt 250**

Top  
 Teaching with only background for diffuse reflective mode. Threshold is set at minimum level that enable stable detection.

Diffuse reflective  
 Without object and with background

**4. Through Teaching**  
**thru** → Press TEACH → **thru 250**

To  
 Threshold is set at around 90% of sensing level.  
 Good for detecting transparent object like Glass and Film.

Thru-beam  
 Reflective  
 Without object  
 Without object and with reflector

**5. Zone Teaching**  
**ZoneE** → Press TEACH → **ZoneE 25**

To  
 Threshold is set at around sensing level ±10%.  
 Good for detecting object in the area specified.

Diffuse reflective  
 Without object and with background or with object.

Threshold Sensing level  
 Near Upper ≈ +10%  
 Lower Far ≈ -10%

**6. Automatic Teaching**  
**Auto Strt** → Press TEACH → **Auto Stop** → Press TEACH → **Auto 250**

Top  
 Threshold is set at the center between maximum and minimum level. Good for teaching without stopping production line.

Diffuse reflective  
 Thru-beam  
 Teaching is executed while object is moving on the production line.

**7. Percent Teaching**  
**P-t 90** → Press TEACH → **P-t 90** → Adjust percentage → **P-t 85** → Press TEACH → **Teaching 100 85**

Top  
 You can set threshold at any percentage adjusted.  
 By setting sensing level without object that block the beam as 100%, it can detect the level as relative percentage level.  
 Re-Teaching can be done by single button action while RUN mode. Refer "Useful function" Fitting in".

Thru-beam  
 Without object

**8. Zero percent Teaching**  
**OP-t 10** → Press TEACH → **OP-t 10** → Adjust percentage → **OP-t 15** → Press TEACH → **Teaching 0 15**

Top  
 Set any percentage adjusted to 0% as threshold.  
 For diffuse reflective mode, set the sensing level with only background 0% and detect the level as relative percentage level.  
 Re-Teaching can be done by single button action while RUN mode. Refer "Useful function" Fitting in".

Diffuse reflective  
 Without object and with background

**End tEch** Exit the Teaching mode  
 By pressing TEACH button, it goes back to RUN mode.

# Expert mode

Setup parameters for further function. From [A] "Basic menu" Choose the setup value by [Left] [Right]. Define the setup by [Enter] and go back to top of each menu. "+" is default value.

**4-1. Zero reset**  
**OrSt OFF** → Set main display to 0 (zero)

<b>OFF</b>	No action	↑
<b>ON</b>	Reset the main display	

Reset the sensing level shown on the main display to zero and shift the threshold shown on the sub display as much as the main display shifted. This function is not active when percent mode and edge detection mode.

**4-2. Display mode**  
**diSP dig** → Choose display mode from following three

<b>dig</b>	Digital mode	↑	Ex.) <b>200 220</b>
			Sensing level Threshold
<b>bAr</b>	Bar display mode		Ex.) <b>    </b>
	Bar increases according to sensing level from right		
<b>Pct</b>	Percent mode		Ex.) <b>100 110</b>
	"_" means it's percentage		Sensing level Threshold
			100% 110%

**4-3. Eco mode**  
**Eco OFF** → Set Eco mode

<b>OFF</b>	No action	↑
<b>diSP</b>	Power off sub display (green) and darken main display (red).	
<b>rESP</b>	Double emitting cycle. Actual response time will be doubled as well.	
<b>ALL</b>	Power off sub display, darken main display and double emitting cycle. Actual response time will be doubled as well. Brightness of the display will be changed 20 seconds after the setup.	

Current consumption of "Eco ALL" will be 30% less than "Eco OFF".

**4-4. Rotation**  
**turn OFF** → Rotate the display 180 degree

<b>OFF</b>	No action	↑	Ex.) <b>turn OFF</b>
<b>ON</b>	Rotate the display		Ex.) <b>000000</b>

This is effective when you have to mount the sensor opposite direction.

**4-5. Hysteresis**  
**HyS P 5** → Set Hysteresis percentage

<b>P 5</b>	Set from 1 % to 40 %
<b>P 1</b>	1%
<b>P 40</b>	40%

Set the hysteresis according to the condition. When it's unstable because of chattering, set bigger percentage. When to detect slight difference, set smaller percentage.

**4-6. Detection mode**  
**PrcS Stnd** → Set Detection mode

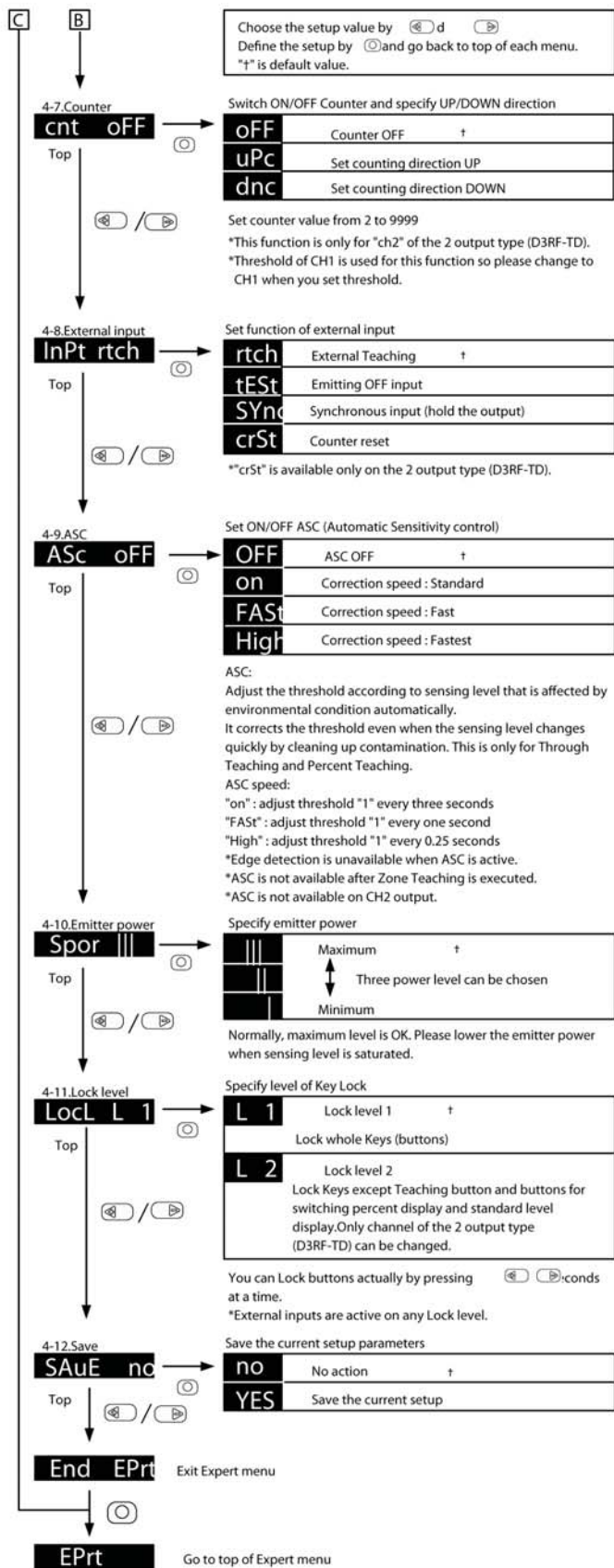
<b>Stnd</b>	Detect by sensing level	↑
<b>hd 9</b>	Detect UP edge	
<b>hd7</b>	Detect Down edge	

Set filter level for edge detection

<b>Filt 1000</b>	1,000 Hz	↑	Faster
<b>Filt 200</b>	200 Hz		
<b>Filt 50</b>	50 Hz		
<b>Filt 20</b>	20 Hz		
<b>Filt 5</b>	5 Hz		Slower

↑ ↓ speed of edge detection

Edge detection mode:  
 Detect changes of sensing level in a certain period.  
 "Detect UP edge" : Detect the sensing level increasing  
 "Detect Down edge" : Detect the sensing level decreasing  
 \*Only Automatic Teaching can be executed when edge detection is activated.  
 \*Percent display mode is unavailable when edge detection is activated.  
 \*Only CH1 can be set Edge detection for the 2 output type (D3RF-TD).  
 \*Hysteresis will be fixed to 1% when Edge detection is active.  
 \*Edge detection won't work correctly when the sensing level is saturated or there is no light received.  
 \*Filter to be "Slower" to detect sensing level that swings slower.



**Note**

- Some menu won't be shown depends on the setup. It's not a malfunction.
- Time of pressing buttons to activate not specified on this manual is 0.3 seconds.
- When the parameter value is ready to set, sub display will blink.
- Following parameters of the 2 output type (D3RF-TD) can be specified individually for Output 1 (ch1) and Output 2 (ch2). Other parameters are specified commonly. Threshold, Output mode, Timer and its value, Teaching menu

## Useful function

### Switch channel (only for the 2 output type D3RF-TD)

Press button then, the channel number will be blinking and switch to the channel.



Threshold of CH2 will be copied to CH1 under following condition after external teaching. This is useful when you want to set single threshold level to both CH1 and CH2.

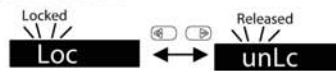
- ASC and Edge detection are inactive.
- Teaching mode of CH1 is same as CH2.
- Display is showing level of CH2.
- \*You can switch channel from any setup menu.

### Key Lock

Make the buttons unavailable to prevent operation mistake.

Press 3 seconds to Lock buttons at a time while RUN mode.

Do same to cancel it..



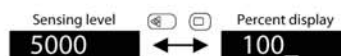
You can choose a Lock level from two in "Expert mode 4-11.Lock level".

### Switching to RUN mode by single action

By pressing button for 3 seconds in setup menu while sub display is not blinking,

### Switching to percent display by single action

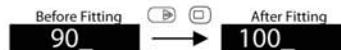
Press and buttons at a time then, the display switches to percent display.



You can setup this function at "Expert mode 4-2.Display mode" as well. Do same to get back to standard display mode.

### Fitting in (set sensing level to "100%/0%")

When "Percent Teaching" or "Zero % Teaching" is chosen in Teaching menu, you can set the sensing level to "100%" or "0%" by pressing buttons at a time. This is effective when detection get unstable.



## Error

Following are error messages when error occurred while Teaching. Please try again accordingly.

<b>Err1</b>	Sensing level is not enough
<b>Err2</b>	Sensing level is saturated
<b>Err3</b>	Difference of sensing level between two points

## Option

	<b>End unit</b>
	BEF-EB01- W190 (2 pieces)

- Specification is subject to change without notice.
- Please contact following when you had any problems and questions regarding to this products.



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