

Digital Fiber Amplifier

D3RF/D3IF Series

D3RF-T□ D3IF-T□
D3RF-TC□4 D3F-TC□4
D3RF-TD□

Instruction Manual

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

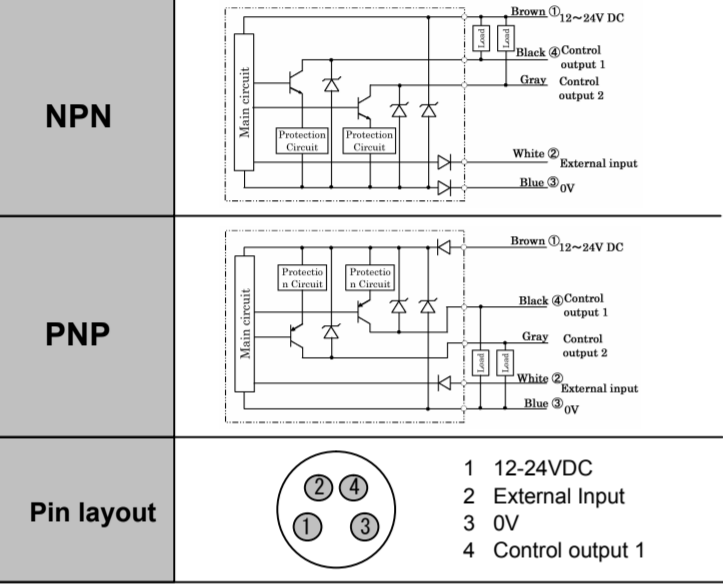
Carefully read and understand the safety precautions before operation. The important information is provided to protect your health and property. Do not apply any other installing or operating procedure other than that described in this manual.

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:
 - A dusty or steamy place.
 - A place generating corrosive gas.
 - A place directly receiving scattering water or oil.
 - 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.

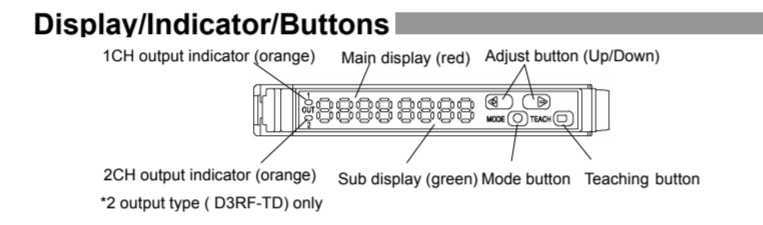
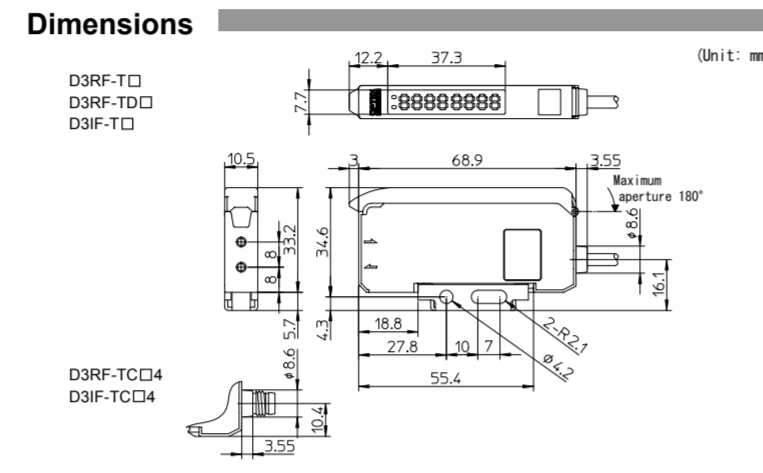
This product cannot be used as a safety device to protect human body.

Input/Output Schematic



Specifications

Model	Standard type	Moisture sensing type
Cable Type	D3RF-T (N/P)	D3IF-T (N/P)
M8 Connector Type	D3RF-TD (N/P)	D3IF-TC (N/P)4
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) 2 output: Output indicator light (Orange) (Ch 1) / 7 segment 8 digit display (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	Output 1 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	



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**
 - Open fiber lock lever.
 - Insert fiber into holes to stop.
 - 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 antiockwise 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) 200 100 Sensing Threshold level	It switches to this Setup mode by pressing "MODE" button over 3 seconds. Ex) L - - d L on Function Setup Value	It switches to this Teaching mode by pressing "TEACH" button over 3 seconds. Ex) 2Pt 1Pt 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
0r5t	Zero reset	Set main display to 0 (zero).
dSP	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
Prc5	Detection mode	Set detection mode (edge/level)
cnt	Counter	Switch ON/OFF Counter and specify UP/DOWN direction
inp	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
SruE	Save	Save the current setup
End EPrt	Exit	Exit expert menu
Loc	Lock	Lock buttons (refer useful function)

Teaching menu

Threshold level can be set by these menu. Please refer "Teaching".

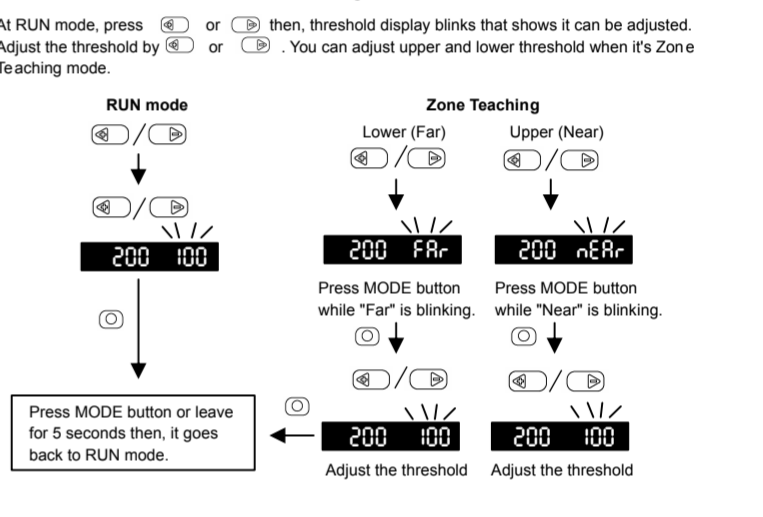
Display	Menu	Function
2Pt	2 Point Teaching	Set the threshold at the center between with object and without object.
1Pt	1 Point Teaching	Set the threshold at minimum level that can detect object stably with.
thrU	Through Teaching	Set the threshold at around 90% of sensing level without object for through beam application.
zonE	Zone Teaching	Set the threshold at around sensing level ±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

- Output mode**
Press "MODE" button over 3 sec.
Choose the setup value by [▲] and [▼]. Define the setup by [↵] and go back to top of each menu. "*" is default value.
L - - d L on → L on ON by sensing light (Light ON) *
L - - d L on → d on ON by blocking light (Dark ON)
- Response speed**
Choose response speed
rESP Stnd → 1-HS High Speed response time: 16μs
rESP Stnd → 2-FS Fast response time: 70μs
rESP Stnd → 3-ST Standard response time: 250μs *
rESP Stnd → 4-LG Long response time: 500μs
rESP Stnd → 5-PL Power Long response time: 1ms
rESP Stnd → 6-UL Ultra Long response time: 2ms
rESP Stnd → 7-EL Extra Long response time: 8ms
Choose faster mode when detect object moving fast at closer distance. Choose slower mode for detecting object at longer distance. The faster the shorter sensing distance.
- Timer/Delay**
Set Timer and/or Delay
dELY oFF → oFF OFF *
dELY oFF → oNdY ON delay timer
dELY oFF → ShoT One shot timer
dELY oFF → onoF ON delay and OFF delay timer
dELY oFF → onSh ON delay and One shot timer
Timer can be set from 0.1 to 9999ms.
0.1 0.1 ~ 9999 9999
*When choose "onoF" or "onSh", each ON delay/OFF delay and ON delay/One shot timer can be set individually.
- Expert mode**
EPrt Enter to Expert mode (refer Expert menu)
- Initialize**
Initialize setup to default
rSEt no → no No initializing *
rSEt no → rnt Setup to default
rSEt no → uSEr Setup with saved parameters
**"uSER" is shown only when there is saved parameter by "SAVE" in Expert mode. Refer "Expert mode4-12. Saving user parameter"

Go back to RUN mode.
*It goes back to RUN mode when there is no button operation for 30 seconds. It can be changed to RUN mode by single action as well. Please refer "Useful function" Switching to RUN mode by single action"

Setup Threshold manually



Teaching

Press TEACH button for 3 seconds.

Choose Teaching mode by pressing [▲] or [▼]. Then, press [↵] 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 [↵] while teaching.

- 2 point Teaching**
2Pt 2Pt → 2Pt 250
Top: Threshold is set at center of 1st and 2nd level. Teach twice with object and without object.
- 1 point Teaching (1)**
1Pt → 1Pt 250
Top: Threshold is set at minimum level that enable stable detection. Good for long distance.
- 1 point Teaching (2)**
1Pt → 1Pt 250
Top: Teaching with only background for diffuse reflective mode. Threshold is set at minimum level that enable stable detection.
- Through Teaching**
thrU → thrU 250
Top: Threshold is set at around 90% of sensing level. Good for detecting transparent object like Glass and Film.
- Zone Teaching**
zonE → zonE 250
Top: Threshold is set at around sensing level ±10%. Good for detecting object in the area specified.
- Automatic Teaching**
Auto StcP → Auto StcP → Auto 250
Top: Threshold is set at the center between maximum and minimum level. Good for teaching without stopping production line.
- Percent Teaching**
P-t 90 → P-t 90 → P-t 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".
- Zero percent Teaching**
0P-t 10 → 0P-t 10 → 0P-t 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".

Exit the Teaching mode [↵] By pressing TEACH button, it goes back to RUN mode.

Expert mode

Setup parameters for further function.

- 4-1 Zero reset**
0r5t oFF → oFF No action *
0r5t oFF → on 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**
dSP d.9 → d.9 Digital mode * Ex) 200 250
dSP d.9 → bRr Bar display mode Ex) #####
dSP d.9 → Pct Percent mode Ex) 100, 100
* " " means it's percentage Sensing level Threshold
100% 110%
- 4-3 Eco mode**
Eco oFF → oFF No action *
Eco oFF → dSP Power off sub display (green) and darken main display (Red). This will work 20 seconds after the setup.
Eco oFF → rESP Double emitting cycle. Actual response time will be doubled as well.
Eco oFF → RL 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 → oFF No action * Ex) turn oFF
turn oFF → on Rotate the display Ex) 000000
This is effective when you have to mount the sensor opposite direction.
- 4-5 Hysteresis**
HYS P S → P S Set from 1% to 40%
HYS P S → P 1 ~ P 40
1% 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**
Prc5 Stnd → Stnd Detect by sensing level *
Prc5 Stnd → hd.f Detect UP edge
Prc5 Stnd → hd.d Detect Down edge
Set filter level for edge detection
F.lt 1000 1,000 Hz * Faster
F.lt 200 200 Hz
F.lt 50 50 Hz
F.lt 20 20 Hz
F.lt 5 5 Hz Slower
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.

Useful function

- 4-7 Counter**
cnt oFF → oFF Counter OFF *
cnt oFF → uPc Set counting direction UP
cnt oFF → dnc Set counting direction DOWN
Set counter value from 2 to 9999
*This function is only for "ch2" of the 2 output type (D3RF-TD).
*Threshold of CH1 is used for this function so please change to CH1 when you set threshold.
- 4-8 External input**
inp rctch → rctch External Teaching Sensing level Threshold
inp rctch → tESc Emitting OFF input
inp rctch → Sync Synchronous input (hold the output)
inp rctch → crSE Counter reset
*"crSE" is available only on the 2 output type (D3RF-TD).
- 4-9 ASC**
Asc oFF → oFF ASC OFF *
Asc oFF → on Correction speed: Standard
Asc oFF → FRst Correction speed: Fast
Asc oFF → R.9h Correction speed: Fastest
ASC speed:
on: adjust threshold "1" every three seconds
FAST: adjust threshold "1" every one second
High: adjust threshold "1" every 0.25 seconds
*Edge detection is unavailable when ASC is active.
*ASC is not available after Zone Teaching is executed.
*ASC is not available on CH2 output.
- 4-10 Emitter power**
SPor ##### → ##### Maximum *
SPor ##### → ##### Three power level can be chosen
SPor ##### → ##### Minimum
Normally, maximum level is OK. Please lower the emitter power when sensing level is saturated.
- 4-11 Lock level**
LocL L 1 → L 1 Lock level 1 *
LocL L 1 → L 2 Lock level 2
LocL L 1 → L 2 Lock Keys except Teaching button and buttons for switching percent display and standard level display Only channel of the 2 output type (D3RF-TD) can be changed.
You can Lock buttons actually by pressing [▲] [▼] 3 seconds at a time.
*External inputs are active on any Lock level.
- 4-12 Save**
SruE no → no No action *
SruE no → YES Save the current setup

Exit Expert menu [↵] EPrt Go to top of Expert menu

Preventing saturation while teaching

You can see light level as following by pressing Mode button [↵] while teaching. Please press Mode button [↵] for 3 seconds. Then, the emitting level will be changed to get optimized light level, around half of saturated level, automatically. Please press Teaching button [↵] after that so that teaching to be done correctly.

9999 → 9999 Red → 5000 End
3 seconds
Current light level Emitting power to be optimized Optimization is done

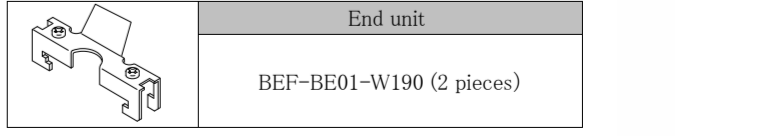
* Saturated light level is "3000" for response speed 1-HS and 2-FS. "9999" for response speed 3-ST ~ 7-EL.
* To cancel this function, please set Emitter power as "11 || 11", "11 ||", "11" instead of "Adi".

Error

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

Err 1	Sensing level is not enough
Err 2	Sensing level is saturated
Err 3	Difference of sensing level between two points

Option



① ⑩ → http://www.optex-fa.com/rohs_cn/

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

Manufactured and sold by :
OPTEX FA CO., LTD.
600-8815 Kyoto, Shimogyo, Awata Choudoji 91, Japan
TEL +81-(0)75-325-2920 FAX +81-(0)75-325-2921
Website: <http://www.optex-fa.com>

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

Digital Fiber Amplifier

OPTEX FA

D3RF Series

D3RF-TM□ D3RF-TDM□
D3RF-TMC□4 D3RF-TDS□
D3RF-TS□ D3RF-TSC□4

Instruction Manual

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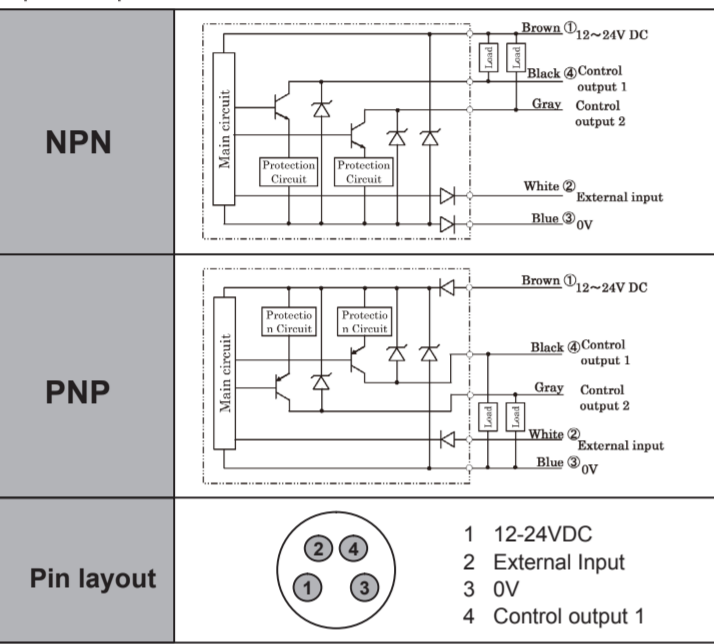
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 - A place generating corrosive gas.
 - A place directly receiving scattering water or oil.
 - A place suffered from heavy vibration or impact.
 - The product is not designed for outdoor use.
 - Do not use the sensor in transient state after power 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 used as a safety device to protect human body.

Input/Output Schematic



Teaching

Press TEACH button for 3 seconds.

Choose Teaching mode by pressing [] or []. Then, press [] 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 while teaching.

- 2 point Teaching**

Threshold is set at center of 1st and 2nd level. Teach twice with object and without object.
- 1 point Teaching (1)**

Threshold is set at minimum level that enable stable detection. Good for long distance.
- 1 point Teaching (2)**

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

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

Threshold is set at around sensing level $\pm 10\%$. Good for detecting object in the area specified.
- Automatic Teaching**

Threshold is set at the center between maximum and minimum level. Good for teaching without stopping production line.
- Percent Teaching**

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.
- Zero Teaching**

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.

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

Specifications

Model	Master unit	Slave unit
D3RF-TM (NPN)	1 output	2 output
D3RF-TDM (NPN)	1 output	2 output
D3RF-TS (NPN)	1 output	2 output
D3RF-TMC (NPN/4)	1 output	2 output
D3RF-TSC (NPN/4)	1 output	2 output
D3RF-TDS (NPN/4)	1 output	2 output
D3RF-TSC (PNP/4)	1 output	2 output
D3RF-TDS (PNP/4)	1 output	2 output

Power consumption: Normal 1 output: 864mW max (25mA or less / 24V), 2 output: 1036mW max (25mA or less / 24V); Eco All 1 output: 620mW max (25mA or less / 24V), 2 output: 672mW max (25mA or less / 24V)

Response Time: 1-1H: 16 μ s (no interconnection), 25 μ s (interconnected) / 2-1H: 70 μ s (no interconnection), 85 μ s (interconnected) / 3-1H: 250 μ s / 4-L: 300 μ s / 5-P: 1.5ms (8.2 μ s / 2ms / 7.6 μ s) / 6-1H: 1.5ms / 7-EL: 1.5ms

Control output: 1 output / 2 output: 12-24VDC (including a ripple)

Output method: Photo-coupled protection

Light source: Red LED (652nm)

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

Teaching / Manual adjustment: OFF / On delay timer: OFF / Delay timer: One-shot timer; On delay-off delay timer: On delay-off delay timer; On delay-off delay timer: On delay-off delay timer

Time function: Teach-in: Emitter stop: Synchronous Counter reset (only for 2 output type)

Output setting: Output 1: 1 output; Output 2: 2 output

Number of cross talk prevention: 1-1H: 2 units / 2-1H: 4 units / 3-1H: 4 units / 4-L: 4 units / 5-P: 4 units / 6-1H: 4 units / 7-EL: 4 units / 8-1H: 4 units / 9-P: 4 units / 10-1H: 4 units / 11-1H: 4 units / 12-1H: 4 units / 13-1H: 4 units / 14-1H: 4 units / 15-1H: 4 units / 16-1H: 4 units / 17-1H: 4 units / 18-1H: 4 units / 19-1H: 4 units / 20-1H: 4 units / 21-1H: 4 units / 22-1H: 4 units / 23-1H: 4 units / 24-1H: 4 units / 25-1H: 4 units / 26-1H: 4 units / 27-1H: 4 units / 28-1H: 4 units / 29-1H: 4 units / 30-1H: 4 units / 31-1H: 4 units / 32-1H: 4 units / 33-1H: 4 units / 34-1H: 4 units / 35-1H: 4 units / 36-1H: 4 units / 37-1H: 4 units / 38-1H: 4 units / 39-1H: 4 units / 40-1H: 4 units / 41-1H: 4 units / 42-1H: 4 units / 43-1H: 4 units / 44-1H: 4 units / 45-1H: 4 units / 46-1H: 4 units / 47-1H: 4 units / 48-1H: 4 units / 49-1H: 4 units / 50-1H: 4 units / 51-1H: 4 units / 52-1H: 4 units / 53-1H: 4 units / 54-1H: 4 units / 55-1H: 4 units / 56-1H: 4 units / 57-1H: 4 units / 58-1H: 4 units / 59-1H: 4 units / 60-1H: 4 units / 61-1H: 4 units / 62-1H: 4 units / 63-1H: 4 units / 64-1H: 4 units / 65-1H: 4 units / 66-1H: 4 units / 67-1H: 4 units / 68-1H: 4 units / 69-1H: 4 units / 70-1H: 4 units / 71-1H: 4 units / 72-1H: 4 units / 73-1H: 4 units / 74-1H: 4 units / 75-1H: 4 units / 76-1H: 4 units / 77-1H: 4 units / 78-1H: 4 units / 79-1H: 4 units / 80-1H: 4 units / 81-1H: 4 units / 82-1H: 4 units / 83-1H: 4 units / 84-1H: 4 units / 85-1H: 4 units / 86-1H: 4 units / 87-1H: 4 units / 88-1H: 4 units / 89-1H: 4 units / 90-1H: 4 units / 91-1H: 4 units / 92-1H: 4 units / 93-1H: 4 units / 94-1H: 4 units / 95-1H: 4 units / 96-1H: 4 units / 97-1H: 4 units / 98-1H: 4 units / 99-1H: 4 units / 100-1H: 4 units

Operating temperature / Humidity: 25 \pm 5 \circ C/35 \pm 85%RH (No freezing and No condensation) / 2

Storage temperature / Humidity: 30 \pm 7 \circ C/35 \pm 85%RH (No freezing and No condensation)

Shock resistance: 10 \sim 55Hz Amplitude 1.5mm 2 hours for each direction of X, Y and Z

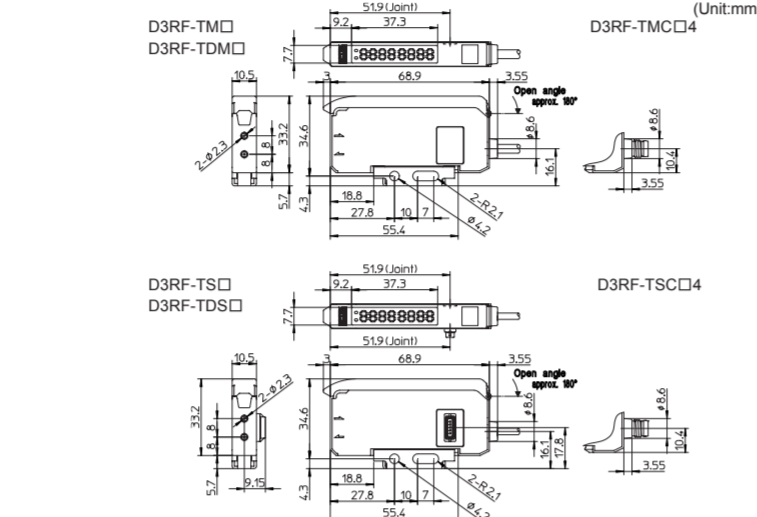
Protective category: IP62

Protective category: PC Cover: Case

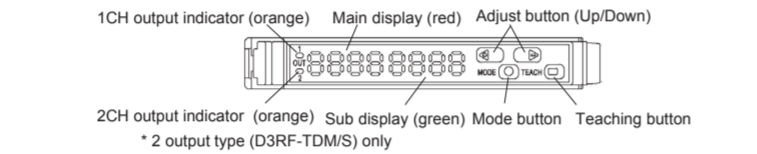
Weight: Cable type: 71g (including cord); MI Connector type: 25g

*1 These mean maximum number of units can be prevented cross talk. Response Time of every unit must be set same mode.
*2 Temp. Maximum units interconnected: 25 \circ C \sim 50 \circ C: 3 units (output current: 100mA max.)
*3 25 \circ C \sim 50 \circ C: 8 units (output current: 50mA max.); 25 \circ C \sim 45 \circ C: 15 units (output current: 20mA max.)

Dimensions



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
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.

How to use Fine fiber
1. Turn adapter cap anticlockwise completely, then appropriately insert the fiber.
2. Cut the excess fiber with fiber cutter.

Interconnection
Mount each sensor on DIN rail and slide to interconnect one by one. Mount the End Plates at both ends. * Up to 16 units can be interconnected.

Note
- Confirm that Power supply is OFF while installation.
- Use DIN rail and End Plates (BEF-EB01-W190) for installation.
- Confirm that environmental temperature is in specification. (refer a note "2" at "Specifications")
- Install the protective cover at the end connector of slave unit.
- Don't remove sensors from DIN rail while it's interconnected.
- Remove the End plates, slide the sensor and remove one by one from DIN rail.

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.) 200 100	It switches to this Setup mode by pressing "MODE" button over 3 seconds. Ex.) L - - d L on	It switches to this Teaching mode by pressing "TEACH" button over 3 seconds. Ex.) 2Pt 1Pt
SensingThreshold level	Function Setup Value	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

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
dELAY	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

These are menu for function that setup in detail. Expert menu is available from "EPrt" in Basic menu.

Display	Menu	Function
0rSEt	Zero reset	Set main display to 0 (zero).
d.SP	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/delay)
cnt	Counter	Switch ON/OFF Counter and specify UP/DOWN direction
inpT	External input	Set function of external input
copy	Copy setup	Copy setup to sensors interconnected
RL 0	All Zero Clear/Reset	Set all display of sensors interconnected to Zero "0"
Rtch	All Teaching	Execute Teaching on every sensor interconnected
RSc	ASC	Set ON/OFF ASC (Automatic Sensitivity Control)
SPor	Emitter power	Specify Emitter power
LocL	Lock level	Specify level of Key Lock
SRuE	Save	Save the current setup
End EPrt	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

Press "MODE" button over 3 sec.

Choose the setup value by [] and []. Define the setup by [] and go back to top of each menu. "*" is default value.

- Output mode**
L - - d L on
ON by sensing light (Light ON) +
d on ON by blocking light (Dark ON)
- Response speed**
rESP 5tnd
Choose response speed
1-HS High Speed response time:16 μ s (no slave unit), 22 μ s (with slave unit)
2-FS Fast response time:70 μ s (no slave unit), 85 μ s (with slave unit)
3-SE Standard response time:250 μ s +
4-L9 Long response time:500 μ s
5-PL Power Long response time:1ms
6-UL Ultra Long response time:2ms
7-EL Extra Long response time:8ms
Choose faster mode when detect object moving fast at closer distance. Choose slower mode for detecting object at longer distance. The faster the shorter sensing distance.
- Timer/Delay**
dELAY off
Set Timer and/or Delay
oFF OFF delay timer
oFdy ON delay timer
Shot One shot timer
oNoF ON delay and OFF delay timer
oNsh ON delay and One shot timer
Timer can be set from 0.1 to 9999ms.
*When choose "on" or "onsh", each ON delay/OFF delay and ON delay/One shot timer can be set individually.
- Expert mode**
EPrt
Enter to Expert mode (refer Expert menu)
- Initialize**
rSEt no
Initialize setup to default
no No initializing +
nrt Setup to default
uSEr Setup with saved parameters
*uSEr is shown only when there is saved parameter by "SAVE" in Expert mode. Refer "Expert mode 4-15. Saving user parameter"

Exit Basic menu.
Go back to RUN mode.
*It goes back to RUN mode when there is no button operation for 30 seconds. It can be changed to RUN mode by single action as well. Please refer "Useful function" Switching to RUN mode by single action

Setup Threshold manually

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

Zone Teaching
Lower (Far) Upper (Near)
200 FR- 200 nER-
Press MODE button while "Far" is blinking. Press MODE button while "Near" is blinking.
Adjust the threshold

Expert mode

Setup parameters for further function.

- 4-1 Zero reset**
0rSEt off
Set main display to 0 (zero)
oFF No action +
on 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**
d.SP di 9
Choose display mode from following three
di 9 Digital mode Ex.) 200 200
bRr Bar display mode Ex.) |||||
Pct Percent mode Ex.) 100 100
Sensing level Threshold
Sensing level 100% Threshold 110%
- 4-3 Eco mode**
Eco off
Set Eco mode
oFF No action +
d.SP Power off sub display, darken main display (red). This will work 20 seconds after the setup.
rESP Double emitting cycle. Actual response time will be doubled as well.
RL 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
oFF No action + Ex.) turn off
on Rotate the display Ex.) 180 00
This is effective when you have to mount the sensor opposite direction.
- 4-5 Hysteresis**
HYS P 5
Set Hysteresis percentage
Set from 1% to 40%
P 1 ~ P 40
1% 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 5tnd
Set Detection mode
Stnd Detect by sensing level +
hd f Detect UP edge
hd d Detect Down edge
di FF Differential mode
Set filter level for edge detection
F.Lt 1000 1,000 Hz + Faster
F.Lt 200 200 Hz
F.Lt 50 50 Hz
F.Lt 20 20 Hz
F.Lt 5 5 Hz Slower
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-TDM/S).
*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.
Differential mode:
It detects difference of sensing level from the sensor unit next to it at master side. The display shows "1024" when sensing levels are same. When the sensing level is smaller than the sensor unit at master side, the display shows smaller value than "1024". When its bigger, the display shows bigger value than "1024".
* Differential mode is available only for the slave unit (D3RF-TS/TDS).
- 4-7 Counter**
cnt off
Switch ON/OFF Counter and specify UP/DOWN direction
oFF Counter OFF +
uPc Set counting direction UP
dnc Set counting direction DOWN
Set counter value from 2 to 9999
*This function is only for "ch2" of the 2 output type (D3RF-TDM/S).
*Threshold of CH1 is used for this function so please change to CH1 when you set threshold.
- 4-8 External input**
inpT rtch
Set function of external input
rtch External Teaching +
tESt Emitting OFF input
SYnc Synchronous input (hold the output)
cRSt Counter reset
Rtch Set Teaching input for all sensor units
*"orSt" is available only on the 2 output type (D3RF-TDM/S)
* "Atch" is available only on the master unit (D3RF-TM/TDM)
- 4-9 Copy setup**
copy no
Copy the master setup to other slave units
no No action +
yES Copy the setup
* "Copy setup" is available only on the master unit (D3RF-TM/TDM)
* The setup of slave unit that is locked by "Key Lock" function won't be changed.
- 4-10 All Zero Clear/Reset**
RL 0 no
Reset the displays of sensor units interconnected to Zero "0"
no No action +
Stnd Standard mode
yES Reset display to Zero "0"
The display of master unit and other slave units interconnected will be reset to Zero "0". The reset functionality is same as "4-1 Zero reset"
* "All Zero Clear/Reset" is available only on the master unit (D3RF-TM/TDM).
* The display of slave unit that is locked as "Lock level 1" won't be changed.
- 4-11 All Teaching**
Rtch no
Execute Teaching on every sensor interconnected
no No action +
yES Execute All Teaching
Teaching mode of each sensor unit can be independently set. When one of the master unit and slave units is set as 2 point Teaching, the display of the master unit shows "Atch 2Pt" so press MODE button [] for 2nd Teaching.
* The Teaching for the slave unit shows "Lock level 1" by "Key Lock" function will be inactive.
* "All Teaching" is available only on the master unit (D3RF-TM/TDM)
- 4-12 ASC**
RSc off
Set ON/OFF ASC (Automatic Sensitivity Control)
oFF ASC OFF +
on Correction speed : Standard
FRSt Correction speed : Fast
H.9h Correction speed : Fastest
Adjust the threshold according to sensing level that is affected by environmental condition automatically.
It corrects the threshold even when the sensing level changes quickly by cleaning up contamination. This is only for Through Teaching and Percent Teaching.
ASC speed:
"on": adjust threshold "1" every three seconds
"FAST": adjust threshold "1" every one second
"High": adjust threshold "1" every 0.25 seconds
*Edge detection is unavailable when ASC is active.
*ASC is not available after Zone Teaching is executed.
*ASC is not available on CH2 output.
- 4-13 Emitter power**
SPor |||||
Specify emitter power
Maximum +
||| Three power level can be chosen
Minimum
Normally, maximum level is OK. Please lower the emitter power when sensing level is saturated.
- 4-14 Lock level**
LocL 1
Specify level of Key Lock
L 1 Lock level 1 (+)
Lock whole Keys (buttons)
L 2 Lock level 2
Lock Keys except Teaching button and buttons for switching percent display and standard level display. Only channel of the 2 output type (D3RF-TDM/S) can be changed.
You can Lock buttons actually by pressing [] [] 3 seconds at a time.
*External inputs are active on any Lock level.

Useful function

Switch channel (only for the 2 output type D3RF-TDM/S)
Press [] button then, the channel number will be blinking and switch to the channel.
CH1 display CH2 display
200 250 200 100
CH1 CH2
CH1

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.

All Key Lock
Make the buttons unavailable to prevent operation mistake.
Press [] for 3 seconds to Lock buttons at a time while RUN mode. Do same to cancel it.
Locked Released
Loc uNc
You can choose a Lock level from two in "Expert mode 4-14. 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.
Sensing level % Percent display
5000 4500 100. 90.
You can set 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 [] and [] buttons at a time. This is effective when detection get unstable.
Before Fitting 90. 85. After Fitting 100. 85.
9999 9999 Add 5000 End
Current light level Emitting mode to be optimized Optimization is done

Preventing saturation while teaching
You can see light level as following by pressing Mode button [] while teaching. Please press Mode button [] for 3 seconds. Then, the emitting level will be changed to get optimized light level, around half of saturated level, automatically.
Please press Teaching button [] after that so that teaching to be done correctly.
9999 3 seconds 9999 Add 5000 End
Current light level Emitting mode to be optimized Optimization is done

* Saturated light level is "3000" for response speed 1-HS and 2-FS. "9999" for response speed 3-T ~ 7-EL.
* To cancel this function, please set Emitter power as "|||", "||", "I" instead of "Ad".

Error
Err 1 Sensing level is not enough
Err 2 Sensing level is saturated
Err 3 Difference of sensing level between two points

Option
End unit
BEF-EB01-W190 (2 pieces)

① ⑩ → http://www.optex-fa.com/rohs_cn/
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