Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Standard type</th>
<th>Moisture sensing type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NPN</td>
<td>NPN1</td>
</tr>
<tr>
<td>D3RF-T</td>
<td>1 output</td>
<td>D3RF-T (NPN)</td>
</tr>
<tr>
<td>D3RF-CN</td>
<td>2 output</td>
<td>D3RF-CN (NPN) 2</td>
</tr>
<tr>
<td>D3RF-DP</td>
<td>2 output</td>
<td>D3RF-DP (NPN) 2</td>
</tr>
<tr>
<td></td>
<td>NPN</td>
<td>D3RF-TG (NPN1)</td>
</tr>
<tr>
<td></td>
<td>4 output</td>
<td>D3RF-TG (NPN1) 4</td>
</tr>
</tbody>
</table>

- **Power source, voltage:** 12-24VDC ±10%, excluding ripple
- **Power consumption:** 1 output: 5mA max. (30mA or less), 24V; 2 output: 150mA max. (30mA or less), 24V
- **Response Time:** 10ms/1.5ms ± 10%
- **Control output:** 1 output / 2 output, NPN / PNP, Open collector 100mA / 30V or less
- **Output method:** Light on / Dark on, Switching type in the function
- **Display/circuit protection:** Incorporated
- **Light source:** Red LED (633nm) / IR LED (850nm)
- **Indicator light:** Display Indicator light: Orange (Ch 1 / Ch 2) + 7 segment display
- **Tension setting:** Teaching / Manual adjustment
- **External input:** Teach-in, Emitter stop, Synchronous, Counter reset (only for 2 output type)
- **Operating temperature humidity:** -25°C ~ 55°C, 95% RH (No freezing or no condensation)
- **Installation:** 35°C ± 10°C, No freezing or no condensation
- **Shock resistance:** 10 ~ 55Hz Amplitude 1.5mm, 2 hours for each direction of X, Y, and Z
- **Material:** PC, Cover, Case
- **Weight:** Cable type: 71g (including connector)

Dimensions

- **Dimensions:** (D3RF-T / D3RF-CN / D3RF-DP)

Display/Indicator/Buttons

- **Input:** 1CH output indicator (orange) / Main display (red) / Adjust button (Up/Down)
- **Output:** 2CH output indicator (orange) / *2 output type (D3RF-DP only) / Sub display (green) / Mode button / Teaching button

Input/Output Schematic

- **NPN**:
- **PNP**:

- **Pin layout**:
  1. 12-24VDC
  2. External input
  3. 3V
  4. Control output

- **CAUTION**:
  - Do not use the sensor in transient state after power on (approx. 300ms).
  - Do not use with the high voltage cable or the power line.
  - Do not use with the high voltage cable or the power line.
  - Do not disassemble, repair, or convert the product.

Installing Amplifier

- **Mounting and Removing from DIN rail**:
  - **Mounting of Amplifier Unit**
    - Hook the claw on the connecting side of fiber cable to the DIN rail. 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. Connect 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-lining 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

<table>
<thead>
<tr>
<th>Operating (RUN mode)</th>
<th>Setup</th>
<th>Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>It shows as example when it's actually detecting object. It goes to this mode after power up.</strong> Ex)</td>
<td><strong>200 100</strong></td>
<td><strong>L-d Lon</strong></td>
</tr>
<tr>
<td>Sensing Threshold level</td>
<td>Function</td>
<td>Setup Value</td>
</tr>
<tr>
<td>Ex)</td>
<td><strong>2Pt 1Pt</strong></td>
<td><strong>L-2 d Lon</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Mode of teaching</strong></td>
<td></td>
</tr>
</tbody>
</table>

Buttons
Buttons work as follows according to its mode

<table>
<thead>
<tr>
<th>Buttons</th>
<th>Operating (RUN mode)</th>
<th>Setup / Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adjust (+ UP)</strong></td>
<td>Increase threshold level</td>
<td>Change the Setup function and mode of Teaching</td>
</tr>
<tr>
<td><strong>Adjust (- DOWN)</strong></td>
<td>Decrease threshold level</td>
<td></td>
</tr>
<tr>
<td><strong>MODE</strong></td>
<td>Switch to Setup mode</td>
<td>Set the setup</td>
</tr>
<tr>
<td><strong>TEACHING</strong></td>
<td>Switch to Teaching mode</td>
<td>Execute Teaching</td>
</tr>
</tbody>
</table>

Setup menu

Basic setup

1. Choose the value setting by [MODE] button over 3 sec.
2. Define the setup by [MODE] button and go back to top of each menu.

Basic menu

These are the basic menus that can be set up before using the device. Please refer to the manual for further setup function.

<table>
<thead>
<tr>
<th>Function</th>
<th>Menu</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch Light ON and Dark OFF</td>
<td>L-d Lon</td>
<td><strong>L-d Lon</strong></td>
</tr>
<tr>
<td>Set response speed</td>
<td>rESP</td>
<td>Set response speed</td>
</tr>
<tr>
<td>Set Timer and Delay</td>
<td>dELy</td>
<td>Set Timer and Delay</td>
</tr>
<tr>
<td>Enter to Expert mode (refer Expert menu)</td>
<td>Ep3</td>
<td>Enter to Expert mode</td>
</tr>
<tr>
<td>Initialize setup to default</td>
<td>rSEt</td>
<td>Initialize setup to default</td>
</tr>
<tr>
<td></td>
<td>End</td>
<td>Exit setup menu</td>
</tr>
</tbody>
</table>

Expert menu

These are the menus for functions that are available in the Expert menu. The Expert menu is available from Ep3 in the Basic menu.

<table>
<thead>
<tr>
<th>Function</th>
<th>Menu</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set main display to 0 (zero)</td>
<td>0Sr</td>
<td><strong>0Sr</strong></td>
</tr>
<tr>
<td>Display mode</td>
<td>dISP</td>
<td>Display mode for operating (RUN mode)</td>
</tr>
<tr>
<td>Eco mode</td>
<td>Eco</td>
<td>Eco mode</td>
</tr>
<tr>
<td>Rotate the display 180 degrees</td>
<td>turn</td>
<td>Rotate the display 180 degree</td>
</tr>
<tr>
<td>Specify hysteresis percentage</td>
<td>HyS</td>
<td>Specify hysteresis percentage</td>
</tr>
<tr>
<td>Set detection level (edge level)</td>
<td>PrcS</td>
<td>Set detection mode (edge level)</td>
</tr>
<tr>
<td>Switch ON/OFF Counter and specify UP/DOWN function</td>
<td>cnt</td>
<td>Switch ON/OFF Counter and specify UP/DOWN function</td>
</tr>
<tr>
<td>Set function of external input</td>
<td>InPt</td>
<td>Set function of external input</td>
</tr>
<tr>
<td>Set ON/OFF ASC (Automatic Sensitivity Control)</td>
<td>ASC</td>
<td>Set ON/OFF ASC (Automatic Sensitivity Control)</td>
</tr>
<tr>
<td>Specify Emitter power</td>
<td>Spor</td>
<td>Specify Emitter power</td>
</tr>
<tr>
<td>Specify level of Key Lock</td>
<td>LocL</td>
<td>Specify level of Key Lock</td>
</tr>
<tr>
<td>Save the current setup</td>
<td>SAuE</td>
<td>Save</td>
</tr>
<tr>
<td>Exit expert menu</td>
<td>End EPt</td>
<td>Exit expert menu</td>
</tr>
<tr>
<td>Lock buttons</td>
<td>Loc</td>
<td>Lock buttons</td>
</tr>
</tbody>
</table>

Teaching menu

<table>
<thead>
<tr>
<th>Function</th>
<th>Menu</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set threshold at the center between object and without object.</td>
<td>2Pt</td>
<td><strong>2Pt</strong></td>
</tr>
<tr>
<td>Set threshold at minimum level that can detect object stably.</td>
<td>1Pt</td>
<td><strong>1Pt</strong></td>
</tr>
<tr>
<td>Set the threshold at around 90% of sensing level without object for through beam application.</td>
<td>thru</td>
<td><strong>thru</strong></td>
</tr>
<tr>
<td>Set the threshold at around sensing level <strong>±10%</strong>.</td>
<td>ZonE</td>
<td><strong>ZonE</strong></td>
</tr>
<tr>
<td>Through Teaching</td>
<td>Auto</td>
<td><strong>Auto</strong></td>
</tr>
<tr>
<td>Auto Teaching</td>
<td>P-t</td>
<td><strong>P-t</strong></td>
</tr>
<tr>
<td>Percent Teaching</td>
<td>0P-t</td>
<td><strong>0P-t</strong></td>
</tr>
<tr>
<td>Zero % Teaching</td>
<td>End tEch</td>
<td><strong>End tEch</strong></td>
</tr>
</tbody>
</table>

Setup Threshold manually

At RUN mode, press [MODE] button and adjust the threshold. [MODE] button blinks and shows it can be adjusted. Press [MODE] button while “Far” is blinking, and press [MODE] button while “Near” is blinking to adjust the threshold.
Teaching

Press TEACH button for 3 seconds.

1.2 point Teaching

2Pt 2Pt

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

2.1 point Teaching

1Pt

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

3.1 point Teaching

1Pt

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

thru 250

Top
Threshold is set at around 10% of sensing level.
Good for detecting transparent object like Glass and Film.

5. Zone Teaching

ZonE 25

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

6. Automatic Teaching

Auto Start

Auto Stop

Auto 250

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

Teaching is executed while object is moving on the production line.

7. Percent Teaching

P-t 90

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".

8. Zero percent Teaching

OP-t 10

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".

End tTech

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

Expert mode

Setup parameters for further function.

4-1. Zero reset

Set main display to 0 (zero).

on
Reset the main display.

4-2 Display mode

Choose display mode from following three

- dia Digital mode
  - bar Bar display mode
  - pct Percent mode

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

4-4 Rotation

Turn off angle.

on
Rotate the display.

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

4-5 Hysteresis

Set Hysteresis percentage.

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

Set filter level for edge detection

- Filtt 1000
  - 1000 Hz Faster
- Filtt 200
  - 200 Hz
- Filtt 50
  - 50 Hz
- Filtt 20
  - 20 Hz
- Filtt 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 output type (DI/DO/T)."
Useful function

Switch channel (only for the 2 output type D3PF-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 function is only for "ch2" of the 2 output type (D3PF-TD).
- Threshold of CH1 is used for this function so please change to CH1 when you set threshold.

Key Lock
Make the buttons unavailable to prevent operation mistakes.
Press "button for 3 seconds to lock buttons at a time while RUN mode.
Press "button for 3 seconds in setup menu while sub display is not blinking.
- You can choose a Lock level from two in "Expert mode 4-11. Lock level".
- Switching to percent display by single action
Press "button at a time, the display switches to percent display.
- You can set the sensing level to "100%" or "1%" by pressing "button at a time.
Before Fitting After Fitting

Error
Following are error messages when error occurred while Teaching. Please try again accordingly.
- Error 1: Sensing level is not enough
- Error 2: Sensing level is saturated
- Error 3: Difference of sensing level between two points

Option

- 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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