Digital Fiber Sensor
FS-N10 Series Instruction Manual

Read this manual before using the product in order to achieve maximum performance. Keep this manual in a safe place after reading it so that it can be used at any time.

**Danger**
Failure to follow these instructions may lead to death or serious injury.

**Warning**
Failure to follow these instructions may lead to injury.

**Caution**
Failure to follow these instructions may lead to product damage (product malfunction, etc.)

This provides useful tips for the feature being described.

This provides additional information on proper operation.

### Hints on Correct Use

- This product is just intended to detect the object(s). Do not use this product for the purpose to protect a human body or a part of human body.
- This product is not intended for use as explosion-proof product. Do not use this product in a hazardous location and/or potentially explosive atmosphere.
- This product uses DC power. Do not apply AC power. The product may explode or burn if an AC voltage is applied.
- Do not wire the amplifier line along with power lines or high-tension lines, as the sensor may malfunction or be damaged due to noise.
- When using a commercially available switching regulator, ground the frame ground terminal and ground terminal.
- Do not use the FS Series outdoors, or in a place where extraneous light can enter the light-receiving element directly.
- Due to individual dispersion characteristics and the difference in fiber unit models, the maximum sensing distance or displayed value may not be the same on all units.
- If the sensor is used for a long time with the APC function enabled and the LED is imposed, replace the sensor if even small changes in received light intensity should be detected for constant and ‘END APC’ will be displayed. The sensor can still be used in this case. However, the sensor may still be used in this case. However, the sensor may still be used in this case. However, the sensor may still be used in this case. However, the sensor may still be used in this case. However, the sensor may still be used in this case. However, the sensor may still be used in this case. However, the sensor may still be used in this case. However, the sensor may still be used in this case. However, the sensor may still be used in this case. However, the sensor may still be used in this case. However, the sensor may still be used in this case. However, the sensor may still be used in this case. However, the sensor may still be used in this case. However, the sensor may still be used in this case. 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Press the [SET] button with workpiece.

1. Press the [SET] button with workpiece.
   - The values will be set and the sub-menu (green display) will appear.
   - Press the [SET] button once with no workpiece, and then press it once again with the workpiece.
   - The [SET] button with no workpiece will be displayed on the sub-menu (green display).

2. Press the [SET] button with workpiece.
   - The values will be set and the sub-menu (green display) will appear.
   - If the workpiece is absent and when it is present, the display will show the difference in light intensity.
   - Press and hold the [SET] button for three seconds or more.

Other Calibration Methods

Increased Resistance to Dust and Dirt

Maximum Sensitivity Calibration

In the state shown below, press and hold the [SET] button for three seconds or more. Stop pushing when "SET" flashes.

The sensitivity is set slightly higher than the received light intensity.

Calibrate with a Moving Workpiece

Fully Automatic Calibration

Press and hold the [SET] button with no workpiece in place. While "SET" is flashing, pass a workpiece through. (Continue pressing the [SET] button while the workpiece passes through.)

Position Workpiece

Positioning Calibration

Press the [SET] button with no workpiece, and then press the [SET] button once again with the workpiece.

Simple, User Friendly Functions

Setting the Current Value to 100.0

With the FS-N10 Series, you can set the current value to 100.0 using simple operations.

Standardizing the current value makes it possible for the sensor amplifiers to instantly differentiate reductions in light intensity and is useful in predicting the need for maintenance.

For the FS-N10 Series, you can set the current value to 100.0 using simple operations.

Common to Thrustam and Reflective Models

Press and hold until "SET" flashes.

Common to Thrustam and Reflective Models

Press [SET] button once with no workpiece.

Press and hold until "SET" flashes.

Press and hold until "SET" flashes.

Settings complete.
### Preset Function
This function adjusts the current value to "0.00".

- With light received, press the [PRESET] button. The current value is set to "0.00".
- Pressing the [PRESET] button changes the setting and current value as shown below.
  - **Presetting with preset disabled:**
    - The setting is changed to "0.00". The setting can be changed via the normal calibration method.
  - **Presetting with preset enabled:**
    - Only the current value is changed to "0.00". The setting is not changed.

#### Handy Uses for the Preset Function
This function is most useful when performing simple detection using a thru-beam model fiber unit (e.g., completely blocked detection, such as when all light axes of the fiber unit are interrupted by opaque workpieces).

#### Work-Preset Function
This function sets conditions that will serve as reference, to "0.00".

- After executing the Preset function in a condition in which you would like "0.00" to be displayed, executing this function in a condition in which you would like "0.00" to be displayed, will adjust any two points to "0.00" and "0.00".

The Work-Preset function can be used while the Preset function is in use (when Preset is enabled).

#### Maximum Sensitivity Preset Function
This function sets conditions that will serve as reference, to "0.00" and adjusts conditions with slightly high light intensity as "0.00".

- When using this function with reflective models, "0.00" will be displayed when there is a workpiece, and "0.00" will be displayed when there is no workpiece, making it easy to know when the workpiece is present or absent. Additionally, even when with a reflective model, the background has higher light intensity than the workpiece, if you set a condition with low light intensity to "0.00", the background will display as "0.00" and when the workpiece is present, it will be displayed as "0.00".

#### Full Auto Preset Function
This function automatically differentiates between two conditions (presence/absence of workpiece) and adjusts the current values to "0.00" and "0.00". This is effective for cases when the workpiece is moving at high-speed.

- Press and hold the [PRESET] button with no workpiece in place. While the "绿[PST]" is flashing, pass a workpiece through. (Continue pressing the [PRESET] button while the workpiece passes through.)

#### Set Current Value to "0"
This function is primarily used with reflective models.

- Press and hold the [PRESET] button and [SET] button at the same time.

- The current value is set to "0.00".
- Green "PST" lights up

#### Disable the Zero Shift Function
Press and hold the [PRESET] button to disable the zero shift function.

#### Maximum Sensitivity Preset Function
- Near-maximum values while the [PRESET] button is being pressed and held are adjusted to "0.00" and near-minimum values are adjusted to "0.00".
- The setting value is changed to "0.00".
- The green "PST" indicator will light up.

#### Handy Uses for the Saturation Recovery Function
This function is useful when the intensity value is saturated after installation.

- When the saturation recovery function is enabled, press the [SET] button while pressing the [MODE] button to cancel it.

#### Adjusting the current intensity value when it is too large (when saturated).

- **PST** indicator is flashing. Press and hold the [PRESET] button for 3 seconds or more then release your finger when "绿[PST]" is flashed.

#### Disable Saturation Recovery
This function is useful for the saturation recovery function.

- When the saturation recovery function is enabled, press the [SET] button while pressing the [MODE] button to cancel it.

#### Handy Uses for the Saturation Recovery Function
- This function corrects the saturation via a simple operation, by automatically calibrating the light transmission level and light intensity gain.
Output Switch

Either light-ON (L-on) mode or dark-ON (D-on) mode can be selected.

1. While the current value is displayed, press the [MODE] button once.

2. Use [ ] to switch the output (L-on→D-on), then press the [MODE] button again. The output change completes, and the display returns to the current value.

Connecting to External Devices

Cable Types

For FS-N11N, FS-N12N, FS-N13N, FS-N14N:

- FS-N11M/N12M/N13M/N14M
- FS-N11N/N12N/N13N/N14N
- FS-N11P/N12P/N13P/N14P

- FS-N11MN
  - *1 FS-N11N/N13N only
  - *2 FS-N13N/N14N only

- FS-N11CP/N12CP/N13CP/N14CP
  - *1 FS-N11CP/N13CP only
  - *2 FS-N13CP/N14CP only
  - *3 FS-N11CP/N12CP only

- OP-73864 (Cable length: 2 m)
- OP-73865 (Cable length: 10 m)

Error Displays and Corrective Actions

<table>
<thead>
<tr>
<th>Error display</th>
<th>Cause</th>
<th>Solution</th>
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<tbody>
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<td>ErC</td>
<td>Overcurrent in the control output.</td>
<td>Check the load and return the current within the rated value.</td>
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<td>EiE</td>
<td>Failed to write/load the internal data.</td>
<td>Perform initialization (p.4).</td>
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<td>End APC</td>
<td>Large load on the light source.</td>
<td>Replace the sensor if highly precise detection is required.</td>
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<td>Loc</td>
<td>The keylock function is ON.</td>
<td>For disabling (setting) method, see &quot;FS-N10 Series User’s Manual&quot;.</td>
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Consult your nearest KEYENCE office regarding error displays other than the ones listed above.

Connecting to External Devices

■ Cable Types

FS-N11N/N12N/N13N/N14N

FS-N11P/N12P/N13P/N14P

FS-N11MN

FS-N11CP/N12CP/N13CP/N14CP

■ M8/e-CON Connector Types

FS-N11N/N12N/N13N/N14N

FS-N11P/N12P/N13P/N14P

FS-N11MN

FS-N11CP/N12CP/N13CP/N14CP

■ M8 connector Cable (Sold Separately)

For FS-N11N/N12N/N13N/N14N:

- OP-73864 (Cable length: 2 m)
- OP-73865 (Cable length: 10 m)

■ Error Displays and Corrective Actions

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Initializing the Settings

■ Initialization Method

1. Press and hold the [SET] and [RESET] buttons simultaneously for three seconds.

2. Use [ ] to select "L-on", then press the [MODE] button.

3. Use [ ] to select "D-on", then press the [MODE] button. After initialization is complete, the display returns to the current value.

■ Initial Settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power mode</td>
<td>FINE</td>
</tr>
<tr>
<td>Detection mode</td>
<td>Std (Normal)</td>
</tr>
<tr>
<td>Setting value</td>
<td>90</td>
</tr>
<tr>
<td>Output switch</td>
<td>L-on</td>
</tr>
</tbody>
</table>

Using a Fiber Cutter and Cautions for Use

■ Using a Fiber Cutter

1. Insert the fiber into the cutter hole.
2. Bring down the blade in a single, swift motion to cut the fiber.

■ Cautions for Using a Fiber Cutter

- The fiber cutter comes with the fiber unit.

- Failure to follow the cautions below could reduce the detection range.

  • When cutting a fiber unit to be attached to the FS-N10 Series, be sure to use a gray fiber cutter (OP-87098).
  • Stopping the blade midway could cause a bad cut plane, reducing the detection range.
  • Do not use the same hole twice.

Function Configuration

■ Basic Setting

Press and hold [MODE] for 3 seconds or more

- HIGH SPEED mode
- FINE mode
- TURBO mode
- SUPER mode
- ULTRA mode
- MEGA mode

Percentage Calibration

Normal sensitivity setting method

Zero-shift calibration

Settings complete

Go to detection setup mode

Go to display setup mode

Go to system setup mode

Return to normal display

*1 You can press the [MODE] button to set between the range of -99% to 99%.
**Detection Settings**

- **Stg- Func**
  - Timer OFF
  - Off-delay timer \(^*1\)
  - On-delay timer \(^*1\)
  - One-shot timer \(^*1\)
- **etc Std etc**
  - Normal (light intensity) detection mode
  - DATUM1 mode \(^*2\)
  - DATUM2 mode \(^*2\)
  - Area detection mode
  - Rising Edge Detection Mode
  - Falling Edge Detection Mode
- **etc Lf etc**
  - External input off
  - External calibration input
  - Preset input
  - Zero shift input
  - Reset input
  - Light transmission OFF input
  - Pause mode transition input \(^*3\)
  - Sleep mode transition input
  - Light emission power selection \(^*4\)
  - Analog scaling \(^*5\)

**System Settings**

- **Stg- SYS**
  - Disable APC
  - Enable APC
  - Eco feature off
  - Enable eco feature
  - Reduce power consumption (response time 4 times slower)
  - Standard current value display (4 times hysteresis)
  - Normal operation
  - Twice the number of interference-prevention units as set (response time 2 times slower)
  - Disable common key operations
  - Enable common key operations

**Display Settings**

- **Stg- d dSP**
  - Normal display method
  - Reverse display
  - Sub-display off
  - Extended display
  - Bar display
  - Excess gain display
  - Light intensity hold display \(^*1\)
  - Excess gain hold display \(^*1\)
  - L-on / D-on display
  - Disable the saturation of the Preset function \(^*2\)
  - Enable the saturation of the Preset function

**Two Output** \(^*2\)

- **Off**
  - Settings complete
  - Go to display setup mode
  - Go to system setup mode
  - Return to original detection setup mode

*1 Press the button to set between the range of \(i\) and \(9999\)(ms).
*2 Press the button to set the retouch sensitivity to a range of between \(W\) and \(W\) and set the warning output level to a range of between \(12\) and \(2\).
*3 Press the button to toggle between \(OFF/ON\).
*4 Can be set between the range of \(1\) and \(530\).
*5 Can be set between the range of \(1\) and \(9999\).
*6 Can be used only for the types with the external input.
*7 Only monitor output types (FS-N11MN).
### Specifications

**Type**

<table>
<thead>
<tr>
<th>Type</th>
<th>Standard 1 output</th>
<th>High functionality 2 output</th>
<th>Monitor output</th>
<th>G-line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable/M8 connector</td>
<td>Cable</td>
<td>M8 connector*</td>
<td>Cable</td>
<td>M8 connector*</td>
</tr>
</tbody>
</table>

**Main unit/expansion unit**

<table>
<thead>
<tr>
<th>Model</th>
<th>Main unit</th>
<th>Expansion unit</th>
<th>Main unit</th>
<th>Expansion unit</th>
<th>Main unit</th>
<th>Expansion unit</th>
<th>Main unit</th>
<th>Expansion unit</th>
<th>Main unit</th>
<th>Expansion unit</th>
</tr>
</thead>
</table>

**Control output**

- 1 output
- 1 output
- 1 output
- 1 output
- 1 output
- 2 output
- 2 output
- 2 output
- 1 output
- N/A

**Monitor output (1 to 5 V)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Main unit</th>
<th>Expansion unit</th>
<th>Main unit</th>
<th>Expansion unit</th>
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<th>Main unit</th>
<th>Expansion unit</th>
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<th>Expansion unit</th>
</tr>
</thead>
</table>

**Control**

- Timer function
  - Timer ON/OFF, OFF delay, ON delay, One-shot
- Control output
  - NPN output
    - NPN open collector 24 V; 1 output max: 100 mA or less; 2 output total: 100 mA or less (used stand-alone)/20 mA or less (multiple connections); residual voltage 1 V or less
  - PNP output
    - PNP open collector 24 V; 1 output max: 100 mA or less; 2 output total: 100 mA or less (used stand-alone)/20 mA or less (multiple connections); residual voltage 1 V or less
- Monitor output
  - 1 to 5 V output voltage; load resistance 10 kΩ or more; repeat precision: ± 0.5% of F.S.; 1 ms response time (HIGH SPEED, FINE, TURBO)²

**External input**

<table>
<thead>
<tr>
<th>Model</th>
<th>Main unit</th>
<th>Expansion unit</th>
<th>Main unit</th>
<th>Expansion unit</th>
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<th>Expansion unit</th>
<th>Main unit</th>
<th>Expansion unit</th>
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**Light source LED**

<table>
<thead>
<tr>
<th>Model</th>
<th>Main unit</th>
<th>Expansion unit</th>
<th>Main unit</th>
<th>Expansion unit</th>
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