



## Digital Fiberoptic Sensor FS-N40 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.

For detailed FS-N40 Series setting methods and for details on the functions of the FS-N40 Series, see the "FS-N40 Series User's Manual".

### ■ Symbols

The following symbols are used in this instruction manual to enable the recognition of important information at a glance. Be sure to read these messages carefully.

	<b>It indicates a hazardous situation which, if not avoided, will result in death or serious injury.</b>
	<b>It indicates a hazardous situation which, if not avoided, could result in death or serious injury.</b>
	<b>It indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.</b>
	<b>It indicates a situation which, if not avoided, could result in product damage as well as property damage.</b>

## 1 Before Operation

### Safety Precautions

	<ul style="list-style-type: none"> <li>This product is only intended to detect objects. Do not use this product for the purpose of protecting a human body or a part of a human body.</li> <li>This product is not intended for use as an explosion-proof product. Do not use this product in a hazardous location and/or potentially explosive atmosphere.</li> </ul>
	<ul style="list-style-type: none"> <li>This is a direct current (DC) power supply type sensor. Application of an alternating current may result in explosion or fire.</li> </ul>
	<ul style="list-style-type: none"> <li>Use separate conduits for power lines and high-voltage lines. Use of a common conduit may result in device malfunction due to noise or damage to the sensor.</li> <li>Always ground the frame ground terminal when using an off-the-shelf switching regulator.</li> <li>Do not use this product outdoors.</li> </ul>

### Precautions on Regulations and Standards

#### ■ CE Marking

KEYENCE Corporation has confirmed, on the basis of the following specifications, that this product complies with the essential requirements of the applicable EU Directive(s). Be sure to consider the following specifications when using this product in the member states of the European Union.

#### ● EMC Directive, applicable standard: EN60947-5-2, Class A

Ensure that the cable length is 30 meters or less. These specifications do not give any guarantee that the end-product with this product incorporated complies with the essential requirements of the EMC Directive. The manufacturer of the end-product is solely responsible for confirming the compliance of the end-product itself according to the EMC Directive.

#### ■ UL Certificate

This product is a UL/c-UL certified product.

- UL File No.: E301717
- Category: NRKH/NRKH7(NRKH2/NRKH8: FS-N42N(P))
- Enclosure Type 1 (based on UL50)

Be sure to consider the following specifications when using this product as a UL/c-UL certified product.

- Use a power supply with Class 2 output defined in NFPA70 (NEC: National Electrical Code).
- Connect the power supply, external input, and control output to a single power supply with Class 2 output.
- Use OP-73864, OP-73865 or OP-85498 cable with FS-N41C when the field wiring is required.

#### ■ FCC Regulations

This product complies with the following regulations specified by the FCC.

- Applicable regulation FCC Part 15 Subpart B Class A
- This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

#### • FCC Caution

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### Package Contents

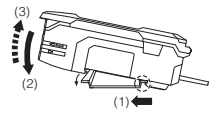
- Main unit
- Instruction manual

## 2 Installation and Wiring

### Mounting the Main Unit

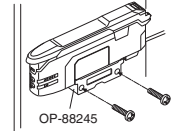
#### ■ Mounting the Main Unit on a DIN rail

- Align the claw at the bottom of the main unit with the DIN rail, as shown in the figure. While pushing the main body in the direction of arrow 1, push down in the direction of arrow 2.
- To remove the sensor, raise the main body in the direction of arrow 3 while pushing the main body in the direction of arrow 1.



#### ■ Installation on a wall (main unit only)

- Attach the main unit to the optional mounting adapter (OP-88245), and then insert M3 screws into the two locations shown in the figure to secure the main unit in place.

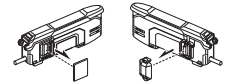


### Connecting Multiple Amplifiers

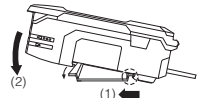
Up to 16 expansion units can be connected to 1 main unit. However, each dual output type will be treated as 2 expansion units.

	<b>When connecting to multiple amplifiers or when mounting main units together, mount the units on a DIN rail installed on a metal surface.</b>
	<ul style="list-style-type: none"> <li>Be sure to turn the power off before connecting multiple expansion units.</li> <li>Do not touch the expansion connector.</li> </ul>

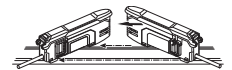
- Remove the protection covers from the main unit and expansion unit(s).



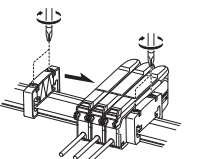
- Install the amplifiers on the DIN rail one at a time.



- Slide the main unit and expansion unit(s) together. Mate the two claws of the expansion unit with the recesses on the main unit side until a click is heard/felt.



- Attach the end units (optional, sold separately: OP-26751) to the DIN rail on both sides of the amplifiers in the same way as step (2).



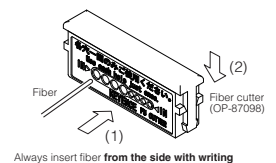
- Secure the amplifiers between the end units. Tighten the screws from the top (two screws x two units) with a Phillips screwdriver to fix the end units in place.

OP-26751 (a set of two)

### Fiber Unit Installation

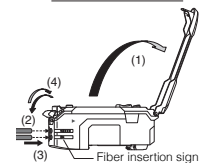
#### ■ Using a fiber cutter

- Insert the fiber into the cutter hole.
- Bring down the blade in a single, swift motion to cut the fiber. (Do not use a hole that has already been used.)



#### ■ Connecting to the amplifier unit

- Open the cover (1), and then lower the lever in the direction indicated by (2).
- Insert the fiber unit into the installation holes (approximately 14 mm). (3)
- Move the lever back in the direction indicated by (4).

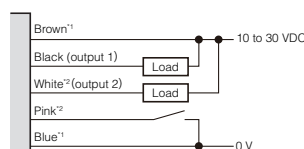


	<b>When installing a coaxial reflective fiber in the main unit, install the single-core fiber in the transmission installation hole and the multi-core fiber in the reception installation hole.</b>
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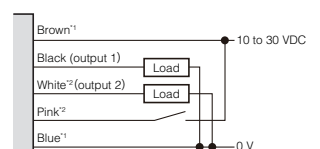
### Wiring (Cable Type)

#### ● FS-N41N/N42N/N43N/N44N



\*1 FS-N41N/N43N only  
\*2 FS-N43N/N44N only

#### ● FS-N41P/N42P/N43P/N44P



\*1 FS-N41P/N43P only  
\*2 FS-N43P/N44P only

## Wiring (M8 Connector Type: FS-N41C)

Select NPN or PNP and the function of I/O pin (2) during the initial settings.

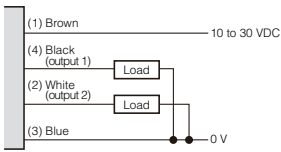
Sensor pin layout



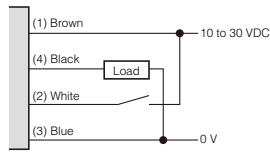
FS-N41C supports "IO-Link: Specification V.1.1/COM2 (38.4 kbps)". The setting file (IODD) can be downloaded from Keyence's web site (<http://www.keyence.com>).

### ● When using the sensor in PNP mode

OUT1 + OUT2

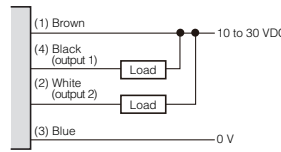


OUT1 + INPUT

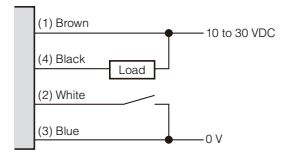


### ● When using the sensor in NPN mode

OUT1 + OUT2



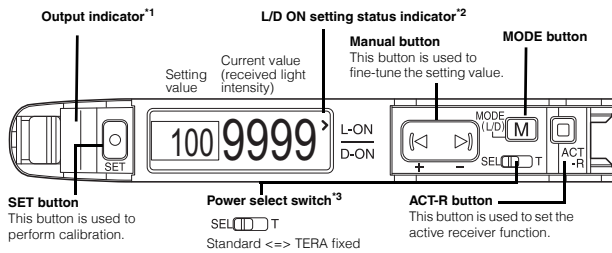
OUT1 + INPUT



The wire colors indicate the colors when using an OP-73864/73865 M8 connector cable (sold separately).

## 3 Basic Settings

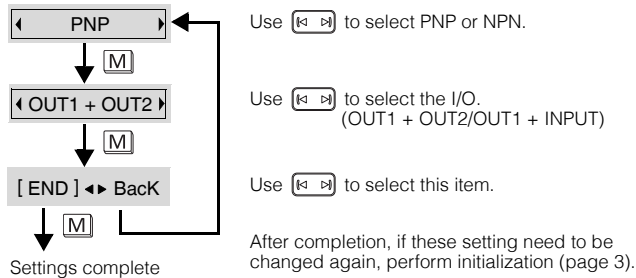
### ■ Names and functions



- \*1 On dual output types (including the FS-N41C), the indicator operates according to the output channel selected with the output channel selection switch.
- \*2 On dual output types (including the FS-N41C), this becomes the output indicator. It displays the current output status of channels 1 and 2.
- \*3 On dual output types (including the FS-N41C), this becomes the output channel selection switch. It is not present on zero line types (FS-N40).

### ■ Initial settings (FS-N41C only)

When turning on the sensor for the first time, or when the sensor has been initialized, select the initial settings shown below.



### ■ Basic settings

#### ● Switching the output style (Light ON/Dark ON)

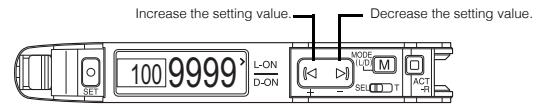
- 1 Press [M] once. Switch L-On/D-On
- 2 Use [←] [→] to switch the output style.
- 3 Press [M] three times.

#### ● Switching the display language

- 1 Press [M] twice. Language / 语言
- 2 Use [←] [→] to select the language.
- 3 Press [M] twice.

#### ● Fine-tuning the setting value (threshold)

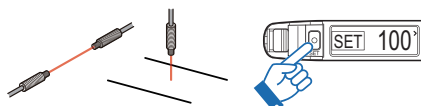
Use [←] [→] to adjust the value. Hold down the button to make adjustments more quickly.



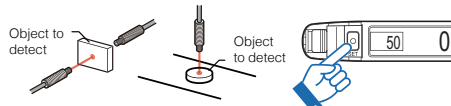
### ■ Basic calibration methods

#### ● 2-point calibration (the most basic setting method)

1 Press [SET] with no object to detect present.



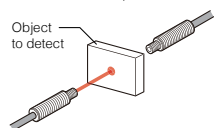
2 Press [SET] with an object to detect present.



This sets the setting value to the midpoint between the received light intensities of points 1 and 2. If "----" blinks for 2 seconds on the display, the difference between the received light intensities is small, and detection may be unstable.

#### ● Maximum sensitivity calibration

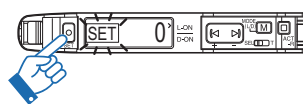
Thru-beam model: With an object to detect present



Reflective model: With no object to detect present



1 With the items arranged as shown in the figures on the left, hold down [SET] for 3 seconds or more. When SET blinks, release this button.



The setting value is set slightly higher than the received light intensity when the setting was configured.

## 4 Useful Functions

### ● Initialization

Initialize all the settings and return the sensor to its factory default state.

- 1 Hold down and for 3 seconds or more.
- 2 Press once.
- 3 Press once.
- 4 Press once.

### ● Key lock

Disable button operations.

- 1 Hold down and for 3 seconds or more.

Cancel: Use the same procedure.



### ● Saturation avoidance function

Use this function when the received light intensity does not change from the maximum displayed value.

- 1 Press and simultaneously.

Cancel: Use the same procedure.



### ● Zero shift function

Use this function to change the received light intensity display to zero.

- 1 Press and simultaneously.

Cancel: Hold down and for 3 seconds or more.



### ● Active receiver (ACT-R)

This function makes the fiber unit's receiver blink in green.

#### Operation when the sensor is shipped from the factory

When the sensor output is ON, the fiber unit's receiver lights in green. (This is linked to the output.)

#### To change the normal lighting status of the receiver (change the settings)

- 1 Press three times. Active Rec. Set
- 2 Use to select the status from those shown below.

Output Link: The receiver will light when the output is ON.  
 Reversed Op: The receiver will light when the output is OFF.  
 Always On: The receiver will be lit always.  
 Disable: The receiver will be off always.

- 3 Press twice to return to the normal status.

#### To force the receiver to blink in green (pairing mode)

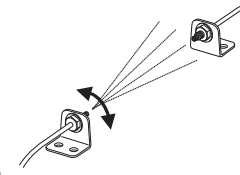
- 1 Press once. ACT-R Blinking
- 2 Press .
- 3 The light-receiving side blinks in green.
- 4 Press four times to return to the normal status.

#### To make it easy to perform optical-axis alignment (optical-axis alignment assist mode)

- 1 Press twice. Opt Axis Assist
- 2 Press to make the light-receiving side blink in green.
- 3 Move the tip of the fiber unit within the movable range.

The light-receiving side lights in green near the peak light intensity within the range in which the tip moved.

Align the optical axis within the middle of the range in which the light-receiving side lights.



- 4 When you finish the alignment, press three times.

The sensor returns to the normal status.

## 5 Specifications

The response times are listed on the following page.

Model	NPN output PNP output	FS-N41N FS-N41P	FS-N42N FS-N42P	FS-N43N FS-N43P	FS-N44N FS-N44P	FS-N41C <sup>1</sup> (selectable output) <sup>2</sup>	FS-N40
Cable/connector	Cable					M8 connector <sup>2</sup>	-
Main unit/expansion unit	Main unit	Expansion unit	Main unit	Expansion unit	Main unit	Expansion unit	
Number of control outputs	1	1	2	2	2 <sup>3</sup>	None <sup>4</sup>	
Number of external inputs	-	-	1	1	1 <sup>3</sup>	-	
Light source LED	Transmitter side: Red, four-element LED (wavelength: 660 nm)						
Control output	Open-collector, 30 V or less 100 mA or less per output, 100 mA or less total for 2 outputs (when used as a solitary unit)/ 20 mA (when used as an expansion unit)						
	Residual voltage	NPN 1.4 V or less (output current: 10 mA or less)/ 2 V or less (output current: 10 to 100 mA) PNP 1.6 V or less (output current: 10 mA or less)/ 2.2 V or less (output current: 10 to 100 mA)					-
External input	Input time: 2 ms (ON)/20 ms (OFF) or longer <sup>5</sup>						
Unit expansion (excluding the FS-N41C)	Up to 16 units (17 units connected in total including the main unit). However, each two output type will be treated as two expansion units.						
Protection circuit	Protection against reverse power connection, output overcurrent, output surge, and reverse output connection						
Mutual interference prevention	S-HSPD/HSPD: 0 units, FINE: 4 units, TURBO/SUPER/ULTRA/MEGA/TERA: 8 units (The mutual interference prevention values are twice those shown here when Double is set.)						
Power supply	Power supply voltage	10 to 30 VDC (including 10% ripple (P-P) or less), class 2 or LPS <sup>6</sup>					
	Power consumption <sup>7</sup>	NPN FS-N40 During normal operation: 870 mW or less (34 mA or less at 24 V/62 mA or less at 12 V) ECO ON: 800 mW or less (31 mA or less at 24 V/56 mA or less at 12 V) ECO FULL: 710 mW or less (28 mA or less at 24 V/49 mA or less at 12 V) One output type (FS-N41P/N42P) and FS-N41C During normal operation: 910 mW or less (36 mA or less at 24 V/65 mA or less at 12 V) ECO ON: 840 mW or less (33 mA or less at 24 V/60 mA or less at 12 V) ECO FULL: 750 mW or less (30 mA or less at 24 V/52 mA or less at 12 V) PNP FS-N41C Two output type (FS-N43P/N44P) During normal operation: 990 mW or less (39 mA or less at 24 V/72 mA or less at 12 V) ECO ON: 920 mW or less (36 mA or less at 24 V/66 mA or less at 12 V) ECO FULL: 830 mW or less (33 mA or less at 24 V/59 mA or less at 12 V)					
Ambient light	Incandescent lamp: 20,000 lx or less, sunlight: 30,000 lx or less						
Ambient temperature	-20°C to +55°C (no freezing) <sup>8</sup>						
Vibration resistance	10 to 55 Hz; double amplitude 1.5 mm; 2 hours each for X, Y, and Z axes						
Shock resistance	500 m/s <sup>2</sup> ; 3 times each for X, Y, and Z axes						
Case material	Main unit and cover: polycarbonate						
Weight	Approx. 78 g	Approx. 48 g	Approx. 83 g	Approx. 73 g	Approx. 25 g	Approx. 23 g	

<sup>1</sup> IO-Link Specification V.1.1/COM2 (38.4 kbps) is supported.

<sup>2</sup> Ensure the cable length is 30 m or less for the M8 connector type. In case of connecting with IO-Link, set it to 20 m or less.

<sup>3</sup> Output 2 and the external input are selectable.

<sup>4</sup> This counts as 1 output when connecting multiple units to the FS-MC8N/P, NU Series.

<sup>5</sup> The input time becomes 25 ms (ON)/25 ms (OFF) when external calibration input is selected.

<sup>6</sup> When expanding the system to 9 or more units, use a power supply voltage of 12 V or higher.

<sup>7</sup> The load current is excluded. The power consumption including the load when the maximum number of units are connected is 38 W max.

<sup>8</sup> When expanded by 1 to 2 units: -20°C to +55°C. When expanded by 3 to 10 units: -20°C to +50°C. When expanded by 11 to 16 units: -20°C to +45°C. When using 2 outputs, 1 unit is counted as 2 units. Note that all the temperature prescriptions assume that the sensor has been mounted on a metal surface.

Exercise special care when installing the product in an airtight space.

## WARRANTIES AND DISCLAIMERS

- (1) KEYENCE warrants the Products to be free of defects in materials and workmanship for a period of one (1) year from the date of shipment. If any models or samples were shown to Buyer, such models or samples were used merely to illustrate the general type and quality of the Products and not to represent that the Products would necessarily conform to said models or samples. Any Products found to be defective must be shipped to KEYENCE with all shipping costs paid by Buyer or offered to KEYENCE for inspection and examination. Upon examination by KEYENCE, KEYENCE, at its sole option, will refund the purchase price of, or repair or replace at no charge any Products found to be defective. This warranty does not apply to any defects resulting from any action of Buyer, including but not limited to improper installation, improper interfacing, improper repair, unauthorized modification, misapplication and mishandling, such as exposure to excessive current, heat, coldness, moisture, vibration or outdoors air. Components which wear are not warranted.
- (2) KEYENCE is pleased to offer suggestions on the use of its various Products. They are only suggestions, and it is Buyer's responsibility to ascertain the fitness of the Products for Buyer's intended use. KEYENCE will not be responsible for any damages that may result from the use of the Products.
- (3) The Products and any samples ("Products/Samples") supplied to Buyer are not to be used internally in humans, for human transportation, as safety devices or fail-safe systems, unless their written specifications state otherwise. Should any Products/Samples be used in such a manner or misused in any way, KEYENCE assumes no responsibility, and additionally Buyer will indemnify KEYENCE and hold KEYENCE harmless from any liability or damage whatsoever arising out of any misuse of the Products/Samples.
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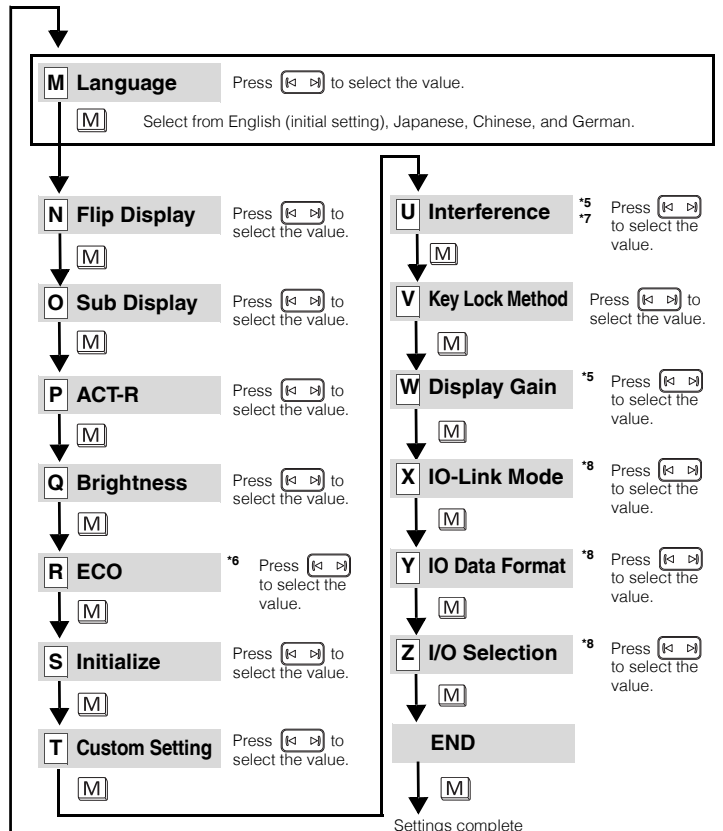
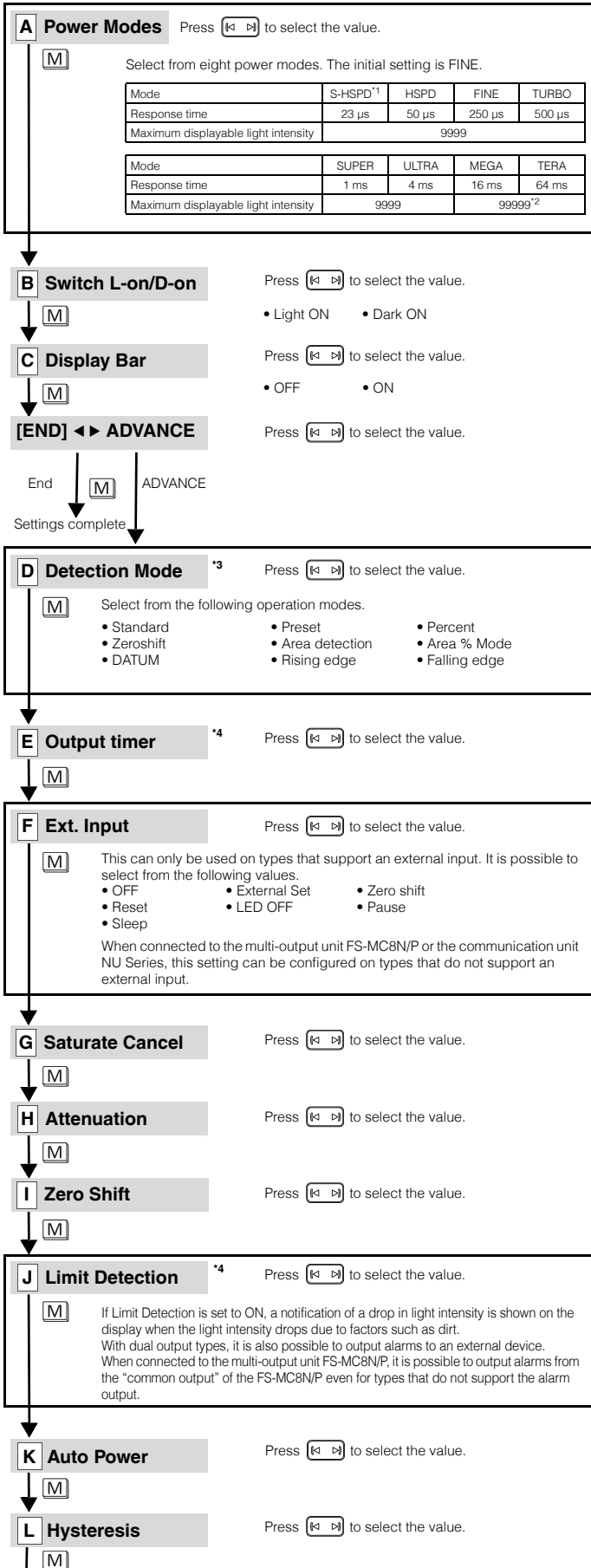
### BUYER'S TRANSFER OBLIGATIONS:

If the Products/Samples purchased by Buyer are to be resold or delivered to a third party, Buyer must provide such third party with a copy of this document, all specifications, manuals, catalogs, leaflets and written information provided to Buyer pertaining to the Products/Samples.

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# 6 Detailed Settings

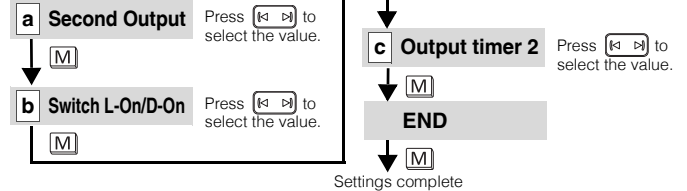
Hold down **[M]** for 3 seconds or more to enter the settings menu. Then, press **[M]** to change the item and press **[← ▶]** to switch the setting value. Press **[M] + [↶ ↷]** when an item is being set to return to the previous item.



## Output 2 setting

1  2 When using a dual output type, if the output channel selection switch is set to the "2" side, output 2 can be set.

Hold down **[M]** for 3 seconds or more to enter setup mode.



<sup>\*1</sup> When S-HSPD is selected for Power Modes Output 2 of dual output types is fixed to OFF. IO-Link communication cannot be used (FS-N41C).  
<sup>\*2</sup> This is 65535 when connected to an NU Series unit.  
<sup>\*3</sup> When S-HSPD is selected for Power Modes Area detection, Area % Mode, DATUM, Rising edge, or Falling edge cannot be selected.  
<sup>\*4</sup> This cannot be used when S-HSPD is selected for Power Modes.  
<sup>\*5</sup> This cannot be used when S-HSPD or HSPD is selected for Power Modes.  
<sup>\*6</sup> When S-HSPD is selected for Power Modes, FULL cannot be selected for the ECO function. The IO-Link communication cannot be used when FULL is selected for ECO (FS-N41C).  
<sup>\*7</sup> This item is not displayed on the FS-N41C.  
<sup>\*8</sup> This item is only displayed on the FS-N41C.

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Specifications are subject to change without notice.

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