FUWEI

Guangzhou FUWEI Electronic Technology Co.,Ltd

FSD22 Series

CMOS LASER SENSOR

Precautions

- Please make sure that the power supply voltage is within the rated voltage range before powering on
- The time from powering-on to normal detection of the sensor is 100ms, please ensure that the sensor is used after 100ms of powering-on
- When using different power sources for the sensor and load, be sure to turn on the power of the sensor first
- When the sensor is not used, it is recommended to cut off the power of the load first and then turn off the power of the sensor
- Do not subject the sensor to severe external forces (such as hammer hits,etc.) during installation, so as not to damage the sensor performance
- Avoid using thinner, alcohol or other organic solvents when cleaning

Safety Warning

- Do not use in an environment with flammable, explosive or corrosive gases.
- Do not use in an environment with oil or chemicals.
- Do not use in an environment with high humidity.
- Do not use in direct sunlight.
- Do not use under other environmental conditions that exceed the rated value.
- Do not disassemble, repair or modify the product without permission.

End-of-life Disposal

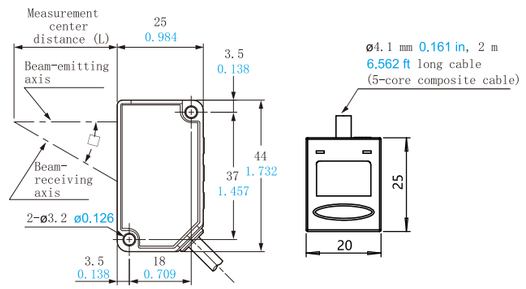
When the product is disposed of, please dispose of it as industrial waste.

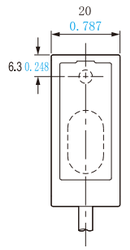
Specification

Type		Measurement center 30mm type	Measurement center 50mm type	Measurement center 100mm type	Measurement center 200mm type	Measurement center 400mm type
Model No.	NPN output	FSD22-30N-UI	FSD22-50N-UI	FSD22-100N-UI	FSD22-200N-UI	FSD22-400N-UI
	PNP output	FSD22-30P-UI	FSD22-50P-UI	FSD22-100P-UI	FSD22-200P-UI	FSD22-400P-UI
Measurement center distance		30mm	50mm	100mm	200mm	400mm
Measurement range		±5mm	±15mm	±35mm	±80mm	±200mm
Repeatability		10μm	30μm	70μm	200μm	300μm (measurement distance 200 to 400mm) 800μm (measurement distance 400 to 600mm)
Linearity		±0.3%F.S.		%F.S.	±0.3	±0.3%F.S. (measurement distance 200 to 400mm) ±0.4%F.S. (measurement distance 400 to 600mm)
Temperature characteristic		0.03%F.S./°C				
Light source		Red semiconductor laser Class 2 [JIS / IEC / GB / FDA (Note 2)] Max. output: 1mW, Emission peak wavelength: 655nm				
Beam diameter (Note 3)		Approx. ø50μm	Approx. ø70μm	Approx. ø120μm	Approx. ø300μm	Approx. ø500μm
Supply voltage		12 to 24V DC ±10%, Ripple P-P 10% or less				
Power consumption		40mA or less (at 24V DC supply voltage), 65mA or less (at 12V DC supply voltage)				
Control output		〈NPN output type〉 NPN open-collector transistor • Maximum sink current: 50mA • Applied voltage: 30V DC or less (Between control output to 0V) • Residual voltage: 1.5V or less (At 50mA sink current) • Leakage current: 0.1 mA or less		〈PNP output type〉 PNP open-collector transistor • Maximum source current: 50mA • Applied voltage: 30V DC or less (Between control output to +V) • Residual voltage: 1.5V or less (At 50mA source current) • Leakage current: 0.1 mA or less		
	Output operation	Switchable either Light-ON or Dark-ON				
	Short-circuit protection	Incorporated (Auto reset type)				
Analog output	Analog voltage output	• Output range: 0 to +5V (at alarm: +5.2V) • Output impedance: 100Ω				
	Analog current output	• Output range: 4 to 20mA (at alarm: 0mA) • Load impedance: 300Ω or less				
Response time		Switchable between 1.5ms / 5ms / 10ms				
External input		〈NPN output type〉 NPN non-contact input • Input conditions Invalid: +8 to +V DC or Open Valid: 0 to +1.2V DC • Input impedance: Approx. 10kΩ		〈PNP output type〉 PNP non-contact input • Input conditions Invalid: 0 to +0.6V DC or Open Valid: +4 to +V DC • Input impedance: Approx. 10kΩ		
Protection		IP67 (IEC)				
Degree of pollution		2				
Ambient temperature		−10 to +45°C (No dew condensation or icing allowed), Storage: -20 to +60°C				
Ambient humidity		35 to 85% RH, Storage: 35 to 85% RH				
Ambient illuminance		Incandescent lamp: Acceptance surface illuminance 3,000lx or less				
Operating altitude		2,000m or less				
Cable		0.2mm² 5-core composite cable, 2m long				
Material		Enclosure: Aluminum die-cast, Front cover: Acrylic				
Weight		Approx. 35g (without cable), approx. 85g (including cable)				
Applicable standard		EMC Directive Compliance, FDA Standard, UL Recognition				

Notes: 1) Supply voltage: 24V DC, ambient temperature: +20°C, response time: 10ms, and analog output value of measurement center distance are used for unspecified measurement conditions. The subject is white ceramics.
2) This is based on the FDA Standard, according to Laser Notice No. 50 of the FDA Standard.
3) This is the size in the measurement center distance. These values were defined by using $1/e^2$ (approx. 13.5%) of the center light intensity. Due to leak light outside the specified area, the reflectance around the detecting point may be higher than at the point and this may affect the measurement value.

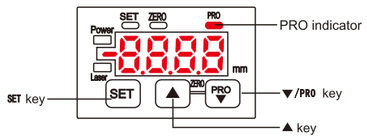
Dimensions



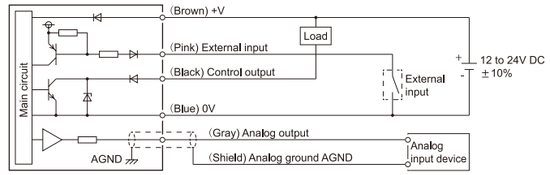


Model No.	Measurement center distance (L)	θ
FSD22-30	30 1.181	30°
FSD22-50	50 1.969	22.5°
FSD22-100	100 3.937	12.5°
FSD22-200	200 7.874	6.3°
FSD22-400	400 15.748	3.2°

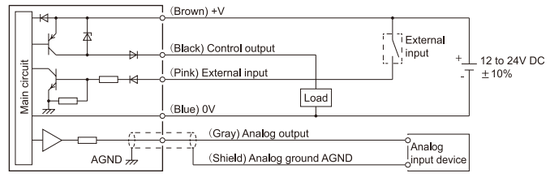
Panel introduction



Dimensions



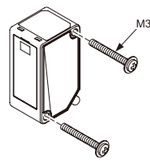
NPN Output Type



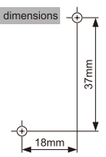
PNP Output Type

Mounting

- When mounting this product, use M3 screws (prepare separately). Use a tightening torque of 0.5N·m for mounting.
- When mounting this product using the sensor mounting bracket (optional), also use a tightening torque of 0.5N·m.



Mounting hole dimensions

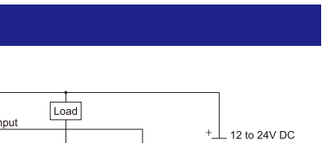


Mounting Direction

- Direction to a movable body

〈When there are differences in material and color〉

・When performing measurements of moving objects with excessively different materials and colors, mount the product per the following directions to minimize measurement errors.



〈Measurement of rotating objects〉

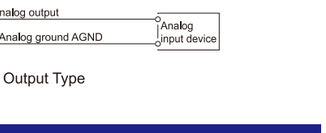
・When measuring rotating objects, mount the product as follows. Measurement can be performed with minimized effect on the object caused by up / down deflection, position deviation and etc.

〈When there is a step〉

・When there is a step in the moving object, mount the product as follows. Measurement can be performed with minimized effect from the edges of the steps.

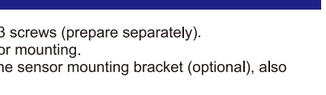
- Measuring of narrow locations and recesses

・When measuring in narrow locations or inside holes, mount the product so that optical path from the light emitting part to light-receiving part is not interrupted.



- Mounting the sensor to a wall

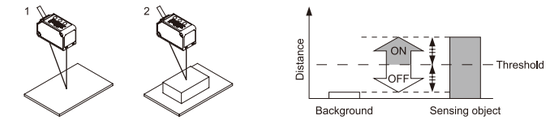
・Mount the product as follows, so that the multiple light reflections on the wall do not emit to the light-receiving part. When the reflection factor on a wall is high, it is effective to use a dull black color.



Teaching

2-point teaching

- This is the basic teaching method.



1. Press the SET key in the background present condition.

2. Press the SET key in the sensing object present condition.

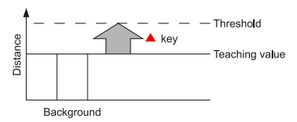
Stable sensing is possible

Stable sensing is not possible

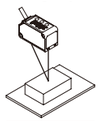
Limit-teaching

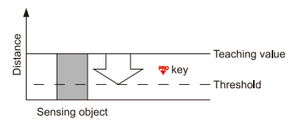
- This is teaching method in case small object or object in background are existing.

〈When an object in background is used as reference〉



〈When a sensing object is used as reference〉





1. Press the SET key in the background present condition or the sensing object present condition.

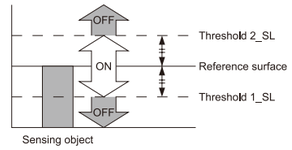
2. When an object in the background is used as a reference, press the ▼ key to set the threshold on the sensor side. When a sensing object is used as a reference, press the key to set the threshold on the sensing object side.

自动

3. Teaching is completed.

1-point teaching (Window comparator mode)

- This is mode is used for setting the threshold range for the distance from the reference value of the sensing object, by performing 1-point teaching. This mode is used for sensing within the threshold range.
- When performing 1-point teaching (window comparator mode), preset "Window comparator mode 1" in the sensing output setting of the PRO mode. For the setting method, refer to "9 PRO MODE SETTING."



1. Press the SET key twice in the sensing object present condition. (1st time: SET mode, 2nd time: Teaching)

Automatic

2. Teaching is completed.

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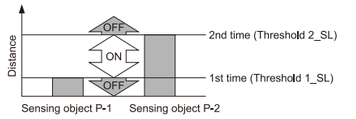
2-point teaching (Window comparator mode)

- This is method to set the threshold range by conducting the 2-point teaching.
- When performing 2-point teaching (window comparator mode), preset “Window comparator mode 2” in the sensing output setting of the PRO mode. For the setting, refer to 9 PRO MODE SETTING.”
- When conducting teaching, use sensing objects (P-1 and P-2) whose distance are different from each other.



1. Press the SET key in the sensing object P-1 present condition. (1st time)

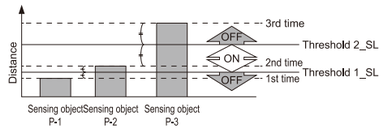
2. Press the SET key in the sensing object P-2 present condition. (2nd time)

Stable sensing is possible

Stable sensing is not possible

3-point teaching (Window comparator mode)

- This is the method to perform 3-point teaching (P-1, P-2, P-3) and to set the threshold range by setting threshold 1_SL in the mid-point between the 1st time and 2nd time, and threshold 2_SL in the mid-point between the 2nd time and 3rd time as shown in the following figure.
- When performing 3-point teaching (window comparator mode), preset “Window comparator mode 3” in the sensing output setting of the PRO mode. For the setting, refer to 9 PRO MODE SETTING.”
- When performing teaching, use sensing objects (P-1, P-2, P-3) with different distance.
- After teaching, P-1, P-2 and P-3 will be automatically rearranged from the smaller value.



1. Press the SET key in the sensing object P-1 present condition. (1st time)

2. Press the SET key in the sensing object P-2 present condition. (2nd time)

3. Press the SET key in the sensing object P-3 present condition. (3rd time)

Stable sensing is possible

Stable sensing is not possible

Span adjustment in rising differential mode or trailing differential mode

- This mode is used to cancel the gradual changes in the measured value, and to only detect sudden changes.
- When performing rising differential mode or trailing differential mode, preset “Rising differential mode” or “Trailing differential mode” in the sensing output setting of the PRO mode. For the setting method, refer to “ 9 PRO MODE SETTING.”
- The threshold can be set by using the threshold value fine adjustment function. For the threshold value fine adjustment function, refer to “ 5 THRESHOLD VALUE FINE ADJUSTMENT FUNCTION.”

1. Press the SET key.

2. Press the ▼ key or ▼PRO key to select the span.

Short span ⇨ d-01 ⇨ d-02 ⇨ • • • • ⇨ d-09 ⇨ d-08 ⇨ Long span

3. Press the SET key to set.

Error Indication

- In case of errors, attempt the following measures.

Error indication	Description	Remedy
<Hold OFF> ---- <Hold ON> Measured value blinks	Insufficient amount of reflected light. The sensing object is out of the sensing range.	Confirm that the sensing distance is within the specification range. Adjust the installation angle of the sensor.
E001	Flash memory is damaged or passed its life expectancy.	Please contact our office.
E011	Load of the sensing output is short-circuited causing an over-current to flow.	Turn OFF the power and check the load.
E021	The semiconductor laser is damaged or passed its life expectancy.	Please contact our office.
E031	• When zero set is set, the measurement is not performed normally. • Since the display setting is set to “Offset”, the zero set function can not be used.	• Confirm that the sensing distance is within the specification range. • Set the display to any setting except “Offset.”
E041	During teaching, the measurement is not performed normally.	Confirm that the sensing distance is within the specification range.

Zero Set Function

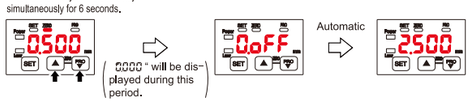
- The zero set function is the function to compulsorily set the measured value to “zero”.
- The zero set indicator (red) will turn ON when the zero set is valid.
- When the zero set function is executed while the peak / bottom hold function is valid, the held measured value will be reset.
- When the display setting is set to Offset, the zero set function cannot be set.

<Zero set setting>

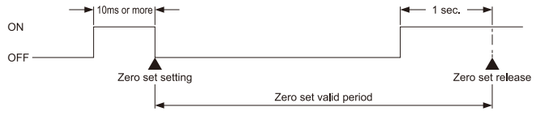
Press the ▲ key and ▼PRO key simultaneously for 3 seconds.

<Zero set release>

Press the UP key and DOWN key simultaneously for 6 seconds.

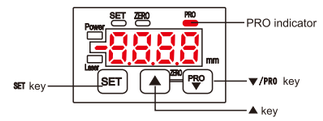


- The setting or releasing of the zero set from an external input operates as in the following figure.



- When the power is turned ON again, zero set from external input can be released. At this time, the zero set will not be saved.
- Even when the zero set is set in the sensor, the zero set can be set or released from an external input. However, when the power is turned ON again, the zero set set in the sensor will be displayed.

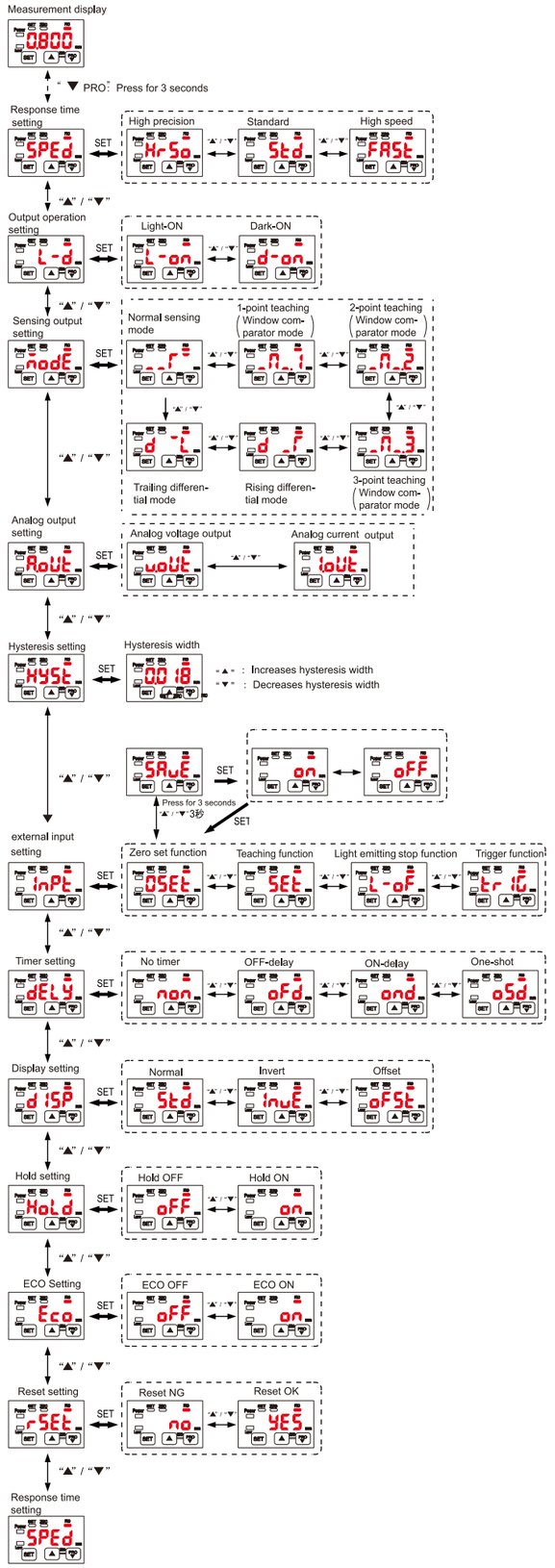
Pro Mode Setting



- The PRO indicator (red) will turn ON when the PRO mode is set.
- When the "▼/PRO" key is pressed for 3 seconds or more in the middle of the PRO MODE setting, the display returns to the measurement display.

Item	Default setting	Description
Response speed setting	Hr5o	Set the response time. “Hr5o”: High precision 10ms, “ 5td”: Standard 5ms “FA5t”: High speed 1.5ms
Output operation setting	L-on	Select the control output operation mode. “L-on”: Light-ON, “d-on”: Dark-ON
Sensing output setting	--r	Set the sensing output. “--r”: Normal sensing mode “n_1”: 1-point teaching (Window comparator mode) “n_2”: 2-point teaching (Window comparator mode) “n_3”: 3-point teaching (Window comparator mode) “d_r”: Trailing differential mode “d_f”: Trailing differential mode
Analog output setting	uout	Sets the output operation of analog output setting. “uout”: Analog voltage output (0 to +5V) “iout”: Analog current output (4 to 20mA)
Hysteresis setting	<FSD22-30> 0010 <FSD22-50> 003 <FSD22-100> 001 <FSD22-200> 02 <FSD22-400> 08	Set the hysteresis width. FSD22-30: 0,001 to 5,00mm FSD22-50: 0,01 to 15,00mm FSD22-100: 0,02 to 35,00mm FSD22-200: 0,1 to 80,0mm FSD22-400: 0,2 to 200,0mm
External input setting	0SEt	Set the external input. “0SEt”: Zero set function, “tEcH”: Teaching function “t-oF”: Light emitting stop function, “tr ig”: Trigger function
Timer setting	non	Set the timer operation. The timer time is fixed at 5ms. “non”: No timer, “ oFd”: OFF-delay timer “ond”: ON-delay timer, “ oSd”: One-shot timer
Display setting	Std	The display of the measured value can be changed. “ Std”: Normal, “ inuE”: Invert, “oF5t”: Offset
Hold setting	oFF	Set the control output and the analog output operation when a measurement error occurs (insufficient light intensity, saturation of light intensity, out of measurement range). “ oFF”: Hold OFF, “ on”: Hold ON
ECO Setting	oFF	The digital display can be set to go OFF when key operation is not performed for 30 seconds. Current consumption can be reduced. “ oFF”: ECO OFF, “ on”: ECO ON
Reset setting	no	Return to the default setting (factory setting). “ no”: Reset NG, “ YES”: Reset OK

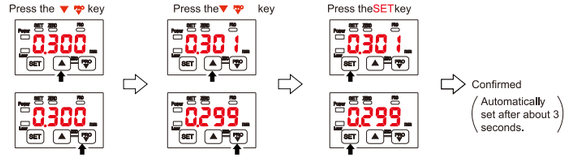
Procedure



Threshold Value Fine Adjustment Function

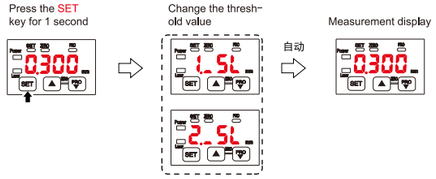
- Fine adjustment of the threshold can be performed in the measurement display.
- Fine adjustment of the threshold can be performed even after teaching.

<Normal sensing mode, rising differential mode or trailing differential mode>

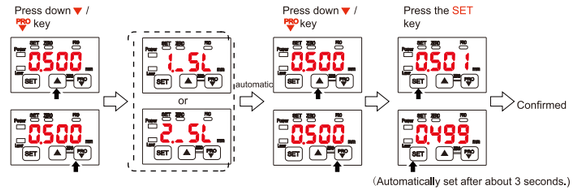


<Window comparator mode>

- When the sensing output is set to window comparator mode, the display of “1_SL” and “2_SL” can be changed by pressing the SET key for 1 second.

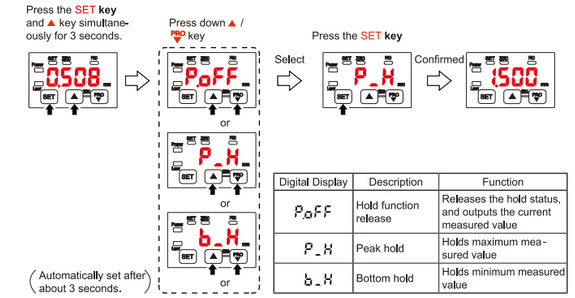


- When performing a fine adjustment of the threshold of “1_SL” or “2_SL” press the ▼ key or ▼PRO key. After “1_SL” or “2_SL” is displayed, the fine adjustment of the threshold can be performed.



Peak / Bottom Hold Function

- The peak / bottom hold function, is for displaying the peak value and bottom value.
- When the zero set function is executed while the peak / bottom hold function is set to “Peak hold” or “Bottom hold”, the held measured value will be reset.



Digital Display	Description	Function
P oFF	Hold function release	Releases the hold status, and outputs the current measured value
P_H	Peak hold	Holds maximum measured value
b_H	Bottom hold	Holds minimum measured value

Key Lock Function

- The key lock function is to prevent acceptance of key operations, so that the conditions set in each setting mode are not changed accidentally.
- When key operation is performed after the key lock is set, “Loc” will be displayed on the digital display.

<Key lock setting>

<Key lock release>

Product specifications are subject to change without notice.

For more information or if you have any questions or suggestions about this product, please feel free to contact us.

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