Poperating Photoelectric Procedures: Sensors

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E3X-DA-S/E3X-MDA

Operation Reference Main Display (Red) Sub-Display (Green) Operation Keys Displays the incident light level or the function name. Displays the threshold and function settings. Used to set functions. LIP MODE 🚺 Power tuning Operation indicator indicator* SET/RUN Mode Selector Switch Used to select SET or RUN mode. Displays SET/RUN **Operation keys** Operation Remarks mode Main display Sub-display Detection/ Adjusting thresholds Incident level Threshold Page 3 adjustment Refer to 3. Setting Thresholds Manually. 1 Executing user-specified Used to execute power tuning F 0 functions (factory-set to and various teaching RUN operations. power tuning) (Factory-set to RUN) →Page 3. Refer to 2. Adjusting the Power. Function Teaching and changing Setting item Setting settings setting details ЖS →Page 4. Refer to 4. Teaching the Threshold. t-En 052nd SET Switching settings →Page 5 Refer to 5. Setting Functions MODE Xr 85 in SET Mode. 0 h

SET/RUN	Operation keys	Operation	Displays		Pomarke
mode	Operation keys	Operation	Main display	Sub-display	neillaiks
RUN (Factory-set to RUN)		Locking and unlocking keys		ON	Locks key operation to prevent incorrect operation. →Page 10 Refer to <i>6. Convenient</i> <i>Functions</i> .
SET		Initialization		YES?	Returns the system to its default settings. →Page 10 Refer to 6. Convenient Functions.

*Except on the E3X-MDA, E3X-DA TW-S, and E3X-DA AT-S.

These models have an operation indicator (ch2) instead of a power tuning indicator.

PTUN

(See note.)

Pres both or 3

OFF



Threshold Liaht level An error has occurred if one of the following displays appears after Error Action The power will not be tuned. The power can be increased up to approximately 5 times the incident light value. Over Error The incident light level is too low for the power tuning target value. The power will be turned to the minimum Bottom Error The incident light level. The power can be decreased down to approximately 1/25th the incident light value. level is too high for the power tuning target value. Note: Press the DOWN Key right after pressing the MODE Key. Setting Thresholds Manually (RUN Mode) A threshold can be set manually. A threshold can also be adjusted manually after teaching to fine-tune it. Light level Threshold (default) Increases threshold. Decreases threshold



- There are four methods that can be used for teaching, as described
- below. Use the method most suitable for the application.
- Teaching (with/without workpiece teaching and automatic teaching) can be
- performed in RUN mode.
- For operating procedures, refer to the Instruction Sheet provided with the product.
- *An error has occurred if OVER, LO, or NEAR is displayed on the sub-display. If

that occurs, repeat the operation from the beginning.

4-1. Setting the Threshold at Maximum Sensitivity

The threshold can be set to the maximum sensitivity. This method is ideal when using a Through-beam Fiber Unit to detect workpieces so that detection is not influenced to any great degree by dust and other environmental factors.



4-2. Teaching a Through-beam Fiber Unit without a Workpiece

A value about 6% less than the incident light level can be set as the threshold. This method is ideal when detecting very small differences in light level, such as when detecting very fine workpieces or transparent workpieces like transparent fibers.



4-3. Teaching a Reflective Fiber Unit without a Workpiece

A value about 6% greater than the incident light level can be set as the threshold. This method is ideal when using a Reflective Fiber Unit to detect workpieces so that detection is not influenced to any great degree by dust and other environmental factors.



return when the setting

has been completed.

To RUN



-1

Functions UP DOWN

	$\sqrt{0}$ / $\sqrt{0}$ Use the UP and DOWN Keys to change the settings.				
Function Setting (display)		Setting (display)	Description		
Det	ection	Super-high-speed: 5X5, High-speed: X5 Standard: 5End, High-precision: XrE5	Used to change the response speed or detection precision.		
Tim	er	Timer disabled:, OFF-delay timer: oFFd, ON-delay timer: on-d, One-shot timer: {5hb	Used to enable or disable timers.		
	Time (timer enabled)	1 to 20 ms: 1-ms increments, 20 to 200 ms: 5-ms increments, 200 ms to 1 s: 100-ms increments, 1 to 5 s: 1-s increments	Used to change timer settings when timers are enabled. The timer can be set from 1 to 5000 ms.		
МО	DE Key	Executes power tuning: $P \in U_{0}$, Executes a zero reset: $0 \in S \in$, With/without workpiece teaching: $2P_{0} \in$, Automatic teaching: $8U \in \mathfrak{o}$	Used to change the function of the MODE Key during operation.		
Power tuning target value (when performing power tuning is selected) Setting range: 100 to 3,900 (increments of 100) Maximum power M: FULL			Used to set target values during power tuning. →Refer to <i>2. Adjusting the Power</i> on page 3.		
		0 3 1 12 0 2 1 1 1 Light level Threshold	Used to display the incident light level and the threshold.		
		0 P 12 3 0 2 C C C C C C C C C C C C C C C C C C	Used to display the incident light level as a percentage of the threshold and the threshold.		
		PEAK BOTM	Used to display the peak and bottom levels of incident light within a set time. (Updated every 2 s.)		
Dis	play switch		Use to display the incident light peak level and no incident light bottom level. (Refreshed when output turns ON or OFF.)		
Display Switch		0 Old Cold Cold Cold Cold Cold Cold Cold Co	Analog bar display. The current detection status is displayed as an analog bar. The bar will lengthen from the right as ON status is reached. (ON: Red, OFF: Green)		
		OBIIIOPERF Current light level PEAK Fixed interval Current light level Peak light level Pea	Used to display the current incident light level and the peak incident light level. Display changes at a fixed interval.		
		Light level Channel (unit number)	Used to display the incident light level and the channel (unit number).		
Display orientation Normal display: d (23, Up/down reversed display: E2) P		Normal display: d (23, Up/down reversed display: £2) P	Used to reverse the orientation of the display.		



Functions (Only functions not supported by standard models are listed. For information on basic functions, refer to information on the standard models.)

	U / U / Use the OF and DOWN keys to change the settings.					
	Function	Setting (display)	Description			
Operation mode *		Light ON: Lon, Dark ON: don,	→Refer to 1. Setting the Operation Mode on page 3.			
Det	ection	Super-high-speed: 585, High-speed: 85, Standard: 56nd, High-precision: 8n E 5, Differential operation: d 188 (advanced models only)	Used to change the response speed and detection precision.			
	Differential edge (differential operation selected)	Single edge: _, , Double edge: _, ,	Used to set the edge to be detected.			
	Differential time	Single edge250 μs: 1, 500 μs: 2, 1 ms: 3, 10 ms: 4, 100 ms: 5, Double edge500 μs: 1, 1 ms: 2, 2 ms: 3, 20 ms: 4, 200 ms: 5	Used to set the differential response time.			
Twin outputs		ATC error output: RERL (ATC models only), Output for each channel: Zollt, Output if level is between the two thresholds: RrER, Self-diagnosis output: SELF	Used to change the output for channel 2. This setting is disabled if differential operation is set for the detection function. (Alarm outputs are always used for differential operation.)			
ATC (E3X-DA□AT-S only)		ATC enabled: on, ATC disabled: oFF	Used to enable or disable ATC.			
	Setting at Power-ON (ATC ON)	No setting: oFF, ATC start processing: REc, Power tuning and ATC start processing: PtRt	Used to set the processing to be performed when the power is turned ON.			

*The operation mode and timer function can be set for each channel specified using the Channel Selector Switch. The settings for other functions will be the same for channel 1 and channel 2.



Functions (Only functions not supported by standard models are listed. For information on basic functions, refer to information on the standard models.)

	Function	Setting (display)	Description	
Detection		Super-high-speed: \$X5, High-speed:X5, Standard: 52nd, High-precision: Xr55, Differential operation: d (FF (advanced models only)	Used to increase the response speed and detection precision.	
	Differential edge (differential operation selected)	Single edge: _f , Double edge: _fi_	Used to set the edge to be detected.	
	Differential time	Single edge250 $\mu s:\ \ \ 500\ \mu s:\ \ \ \ 2,\ 1\ ms:\ \ \ 3,\ 10\ ms:\ \ \ 4,\ 100\ ms:\ \ \ 5,\ 0$ Double edge500 $\mu s:\ \ \ \ 4,\ 1\ ms:\ \ \ 2,\ 2\ ms:\ \ \ 3,\ 20\ ms:\ \ \ 4,\ 200\ ms:\ \ \ 5$	Used to set the differential response time.	
External input		Through-beam, no-workpiece teaching: <code>brud</code> , Reflective, no-workpiece teaching: <code>rFcb</code> , With/Without-workpiece teaching: <code>2Pob</code> , Automatic teaching: <code>Rubo</code> , Power tuning: <code>Pbuo</code> , Zero reset: <code>Drbb</code> , Light OFF: <code>boFF</code> , Counter reset: <code>crbb</code>	Used to change function controlled by external input. (Refer to <i>Instruction Sheet</i> provided with the product.)	
Display switch (Settings are added.)			Used to display the counter value.	
External input memory		Write results to EEPROM: on, Don't write results: off	Used to set writing the results. (Refer to <i>Instruction Sheet</i> provided with the product.)	
Counter		Counter disabled: DFF, Count incremented when output turns ON: CUP, Count decremented when output turns ON: Cdo	Used to set the counter function.	
	Count	Setting range: 1 to 9,999,999	Used to set the counter value when the counter function is enabled.	
External input batch setting		Only Sensor that receives external input: Ich, All linked Sensors: RLL	Used to set linked Amplifiers at the same time using an external input.	

Use the UP and DOWN Keys to change the settings.



E .	inationa	
гι	Inclions)

Function		Setting (display)	Description	
Opera	ation mode	Light ON: Lon, Dark ON: don	→Refer to 1. Setting the Operation Mode on page 3.	
Detect	tion	Super-high-speed: 5X5, High-speed: X5 Standard: 52ad, High-precision: Xa55	Used to change the response speed or detection precision.	
Timer		Timer disabled:, OFF-delay timer: օքեց, ON-delay timer: օրd, One-shot timer: ՙՏհէ	Used to enable or disable timers.	
Т (1	Γime timer enabled)	1 to 20 ms: 1-ms increments, 20 to 200 ms: 5-ms increments, 200 ms to 1 s: 100-ms increments, 1 to 5 s: 1-s increments	Used to change timer settings when timers are enabled. The timer can be set from 1 to 5000 ms.	
Outpu	It setting	Each channel: 2005, AND: 80d, OR: or, Rising edge synchronization: 5,7,7, Falling edge synchronization: 5,7,7, Differential operation: 1-2	Used to change the output details for channel 2.	
۲ c	Timer function for output setting	Timer disabled:, OFF-delay timer: oFFd, ON-delay timer: on-d, One-shot timer: 45hb	Used to enable or disable the timer function for output settings of channel 2.	
٢	Timer time	1 to 20 ms: 1-ms increments, 20 to 200 ms: 5-ms increments, 200 ms to 1 s: 100-ms increments, 1 to 5 s: 1-s increments	Used to change timer setting when timer is enabled. The timer can be set from 1 to 5,000 ms.	
MODE Key		Executes power tuning: PEUn, Executes a zero reset: 0r SE, With/without workpiece teaching: 2PnE, Automatic teaching: 8UEn	Used to change the function of the MODE Key during operation.	
Po (p	ower tuning target value performing power tuning)	Setting range: 100 to 3,900 (increments of 100) Maximum power M: Full	Used to set target values during power tuning. →Refer to <i>2. Adjusting the Power</i> on page 3.	
		0 3 1 12 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Used to display the incident light level and the threshold.	
Display switch		0 P 12 3 0 P 11 1 % light level Threshold	Used to display the incident light level as a percentage of the threshold and the threshold.	
		PEAK BOTM	Used to display the peak and bottom levels of incident light within a set time. (Updated every 2 s.)	
			Use to display the incident light peak level and no incident light bottom level. (Refreshed when output turns ON or OFF.)	
		0 Olection status	Analog bar display. The current detection status is displayed as an analog bar. The bar will lengthen from the right as ON status is reached. (ON: Red, OFF: Green)	
		OBILIZOPERF Fixed interval Current light level PEAK	Used to display the current incident light level and the peak incident light level. Display changes at a fixed interval.	
		03120 Light level Channel	Used to display the incident light level and the channel.	
Displa	ay orientation	Normal display: d (23, Up/down reversed display: £2) P	Used to reverse the orientation of the display.	

 \checkmark / \checkmark Use the UP and DOWN Keys to change the settings.

Note: The operation mode and timer function can be set for each channel. The setting will be executed for channels specified using the Channel Selector Switch.



E3X-DAC-S

Operation Reference Operation Keys Main Display (Red) Sub-Display (Green) Displays the incident light level or the function name. Displays the threshold and function settings. Used to set functions. IIР DOWN O MODE O SET/RUN Mode Selector Switch Used to select SET or RUN mode. Displays SET/RUN **Operation keys** Operation Remarks Sub-display mode Main display Detection/ Adjusting thresholds Threshold Incident level →Page 12 adjustment Refer to 4. Setting Thresholds Manually in RUN Mode. RUN Executing user-specified Used to execute various functions (factory-set to teaching and zero-reset (Factory-set to RUN) 1-point teaching) operations MODE Page 12 Refer to 3. Registering Workpiece Colors with Teaching in SET Mode. Function Teaching and changing Setting items Setting details settings setting details XS →Page 12 Refer to 3. Registering Workpiece Colors with Teaching in SET Mode. SET Switching setting items →Page 13 Refer to 5. Setting Functions Xr 8 5 in SET Mode.

SET/RUN	Operation keys	Operation	olays	Pomarke	
mode	Operation keys	Operation	Main display	Sub-display	nemarks
RUN (Factory-set to RUN)		Locking and unlocking keys		ON	Locks key operation to prevent incorrect operation. →Page 14 Refer to <i>6. Convenient</i> <i>Functions</i> .
SET		Initialization and user reset		YES?	Returns the system to its default settings. →Page 14 Refer to <i>6. Convenient</i> <i>Functions</i> .





)/		Use the UI	and DOWN Key	vs to change the settir	ngs
----	--	------------	--------------	-------------------------	-----

Function	Setting (display)	Description	
Operation mode	ON when matching: ¿ on, ON when not matching: don	→Refer to 2. Setting the Operation Mode on page 12.	
Detection	Super-high-speed: 585, High-speed: 85, Standard: 52 nd, High-precision: 87 E5 Note: If the detection function is changed, be sure to register (i.e., teach) the workpiece color.	Used to change the response speed and detection precision. Note: The fastest mode is I mode (light intensity determination for red, green, or blue)	
Timer	Timer disabled:, OFF-delay timer: off.d, ON-delay timer: oo-d, One-shot timer: (5h)	Used to set a timer for the control output.	
Time (timer enabled)	1 to 5000 ms: to 5000 is 1 to 20 ms: 1-ms increments, 20 to 200 ms: 5-ms increments, 200 ms to 1 s: 100-ms increments, 1 to 5 s: 1-s increments	Used to change the timer setting. Setting range: 1 ms to 5 s	
MODE Key	One-point teaching: Pot, With/without workpiece teaching: Pot, Executes a zero reset: Cr5t (→Refer to 6.1 on page 14.)	Used to change the function of the MODE Key during operation.	
Teaching level	0 to 99%: 🛙 to 🖫	Used to set the teaching level for the threshold when performing 1-point teaching. (Example: The threshold level at the default setting (10) is \$00.) When the setting is 20, the threshold level is 800.	
Display switch	 Match/Threshold: BS8• S88 Excess gain/Threshold: P23• S88 Excess gain/Threshold: P23• S88 Peak/Bottom refreshed every 2 s.: PERP•both Analog bar display: Peak/Bottom Match/Peak refreshed at a set interval.: BS8•PERP Match/Channel: BS8• Zch 	 Used to display the degree of matching and threshold. Used to display the excess gain (i.e., percentage of matching relative to threshold) and threshold. Used to display the peak and bottom degrees of matching at a fixed interval. Used to display the peak degree of matching when there is a match and the bottom degree of matching when there is no match. Used to show the detection status with a bar display. Red bars will be displayed if the degree of match exceeds the threshold. Used to display the peak degree of matching and the peak degree of matching. Used to show the detection status with a bar display. Red bars will be displayed if the degree of match exceeds the threshold. Used to display the present incident level and the peak degree of matching. Used to display the degree of matching and channel number. 	
Display orientation	Normal display: d (23, Up/down reversed display: £2) P	Used to reverse the orientation of the display.	
Output setting	Each channel: 2001, AND: And, OR: or	Used to change the item output on control output 2.	
Timer	Timer disabled:, OFF-delay timer: oFFd, ON-delay timer: oo-d, One-shot timer: (5ht	Used to set timers for the AND/OR control output.	
Time	1 to 5000 ms: { to 5000 ms: } to 5000 ms: 5-ms increments, 20 to 200 ms: 5-ms increments, 200 ms to 1 s: 100-ms increments, 1 to 5 s: 1-s increments	Used to change the timer setting. Setting range: 1 ms to 5 s	
External input	One-point teaching: 1965, With/without workpiece teaching: 2965 Executes a zero reset: 2655, Light OFF: 1655	Used to change function controlled by external input. Refer to the <i>Instruction Sheet</i> provided with the product for information on the effective pulse width.	
External input memory	Write results to EEPROM: an, Don't write results: aFF	Used to set writing the results. (Refer to the <i>Instruction Sheet</i> provided with the product.)	
Judgment mode	C/I automatic judgment: BUE o, C mode: c, I mode: I, BLACK mode: b], P	Used to set the judgment mode (detection method). BLACK mode: The total light intensity for RGB is used for the judgment.	



E3X-SD

1. Display

In addition to an operation indicator (orange), Sensor also has a 7-segment display that shows the excess gain.

Use this display to adjust the optical axis and sensitivity during installation.

Status of indicators (in L-ON mode)	Excess gain	Description
Operation indicator	999% (10 times)	Stable incident light of 110% min.
	100%	Unstable incident light of 90% to 100% or unstable light interruption
•8888	0%	Stable light interruption at 90% or less

2. Sensitivity setting

The sensitivity can be set using the UP and DOWN Keys like an adjuster. It is also possible to easily set the sensitivity with the following three types of teaching.

2-1. Maximum Sensitivity Setting

The sensitivity can be set to the maximum. This setting is best for strong resistance against the effects of dust.

Setting procedure	Switch or key	Display
Set the TEACH/RUN mode selector to TEACH.	TEACH RUN	0 <u>28ch</u> <► 0 103P
Press the UP Key for 3 s min.	UP	
Set the TEACH/RUN mode selector to RUN (start of measurement).	TEACH RUN	0 rUn ► 0 1838

2-2. Teaching with/without Workpiece

Two points, with and without the workpiece, are detected, and the intermediate point is set as the operation level.

Setting procedure	Switch or key	Display
Set the TEACH/RUN mode selector to TEACH.	TEACH RUN	0 <u>28ch</u> <► 0 1039
With a workpiece, press the UP Key.	UP	0
With no workpiece, press the UP Key.	UP	OZPAŁ
Set the TEACH/RUN mode selector to RUN (start of measurement).	TEACH RUN	0 rUn ► 0 1039

2-3. Automatic Teaching

The operating level can be set to the intermediate point between the maximum and minimum of the change detected over time. This setting is best when the workpiece cannot be stopped.

Setting procedure	Switch or key	Display
Set the TEACH/RUN mode selector to TEACH.	TEACH RUN	0 <u>28c</u> h ↔ 0 (039
Press the UP Key.	UP	0
Press the UP Key during detection. Allow the workpiece to pass by while the UP Key is pressed.	UP	ORULO
Set the TEACH/RUN mode selector to RUN (start of measurement).	TEACH RUN	0 rUn ► 0 103P

E3X-NA

Indicators

In addition to an operation indicator (orange), the E3X-NA also has incident level indicators (4 green and 1 red). Use these indicators for optical axis adjustments and maintenance.

Status of indicators (in L-ON mode)	Operation indicator (in L-ON mode)	Incident level
Operation indicator Incident level indicators	Not lit	Approx. 80% max. of operating level
	Not lit	Approx. 80% to 90% of operating level
	Not lit or lit	Approx. 90% to 110% of operating level
	Lit	Approx. 110% to 120% of operating level
	Lit	Approx. 120% min. of operating level

Note: The rightmost indicator will be lit even if the incident level is 0.

E3C-LDA









With no workpiece:

set will flash twice.

The threshold that was

The previous display will return when the setting has been completed.

, Either for 1

Threshold

Threshold

RFCH

Light level

0



External Input Models

E3C-LDA21/LDA51/LDA7/LDA9



Fu	nctions			
) / 💽 Use the l	JP and DOWN Keys to change the settings.		
	Function	Setting (display)	Description	
Det	ection	Super-nigh-speed: 585, High-speed: 85, Standard: 5668, High-precision: 8755, Differential operation: d IFF (advanced models only)	Used to increase response speed and detection precision.	
	Differential edge (differential operation selected)	Single edge: _f , Double edge: _fi_	Used to set the edge to be detected.	
	Differential time	Single edge250 $\mu s:\ l,\ 500\ \mu s:\ l,\ 1\ ms:\ l,\ 10\ ms:\ Y,\ 100\ ms:\ S,\ Double edge500\ \mu s:\ l,\ 1\ ms:\ l,\ 2\ ms:\ J,\ 20\ ms:\ Y,\ 200\ ms:\ S$	Used to set the differential response time.	
Tim	er	Timer disabled:, OFF-delay timer: oFFd, ON-delay timer: on-d, One-shot timer: (5hb	Used to enable or disable timers.	
	Time (timer enabled)	1 to 20 ms: 1-ms increments, 20 to 200 ms: 5-ms increments, 200 ms to 1 s: 100-ms increments, 1 to 5 s: 1-s increments	Used to change timer setting when timer is enabled. The timer can be set from 1 to 5000 ms.	
МО	DE Key	Executes power tuning: PLUA, Executes a zero reset: $0 + 5 +$, With/without workpiece teaching: $2P_{AE}$, Automatic teaching: RUE_{A}	Used to change the function of the MODE Key during operation.	
	Power tuning target value (performing power tuning)	Setting range: 100 to 3,900 (increments of 100) Maximum power M: FULL	Used to set the target value during power tuning.	
		0 3 1 12 0 2 0 0 0 Light level Threshold	Used to display the incident light level and the threshold.	
		0 P 12 3 0 2 0 0 0 % light level Threshold	Used to display the incident light level as a percentage of the threshold and the threshold.	
			Used to display the peak and bottom levels of incident light within a set time. (Updated every 2 s.)	
Display switch			Used to display the incident light peak level and no incident light bottom level. (Refreshed when output turns ON or OFF.)	
		0 of the transformed status	Analog bar display. The current detection status is displayed as an analog bar. The bar will lengthen from the right as ON status is reached. (ON: Red; OFF: Green)	
		OBIE PERK Current light level PEAK	Used to display the current incident light level and the peak incident light level. Display changes at a fixed interval.	
		03120 201 Light level Channel	Used to display the incident light level and the channel.	
		Count (For external input models only)	Used to display the counter value.	
Disp	olay orientation	Normal display: d (23, Up/down reversed display: 52) P	Used to reverse the orientation of the display.	
Ope (twir	eration mode * n-output models only)	Light ON: Lon, Dark ON: don,	→Refer to 1. Setting the Operation Mode on page 16.	
Twii (twi mod	n outputs n-output dels only)	Output for each channel: 2008, Output if level is between the two thresholds: 8768, Self-diagnosis output: 5615	Used to change the output for channel 2. This setting is disabled if differential operation is set for the detection function. (Alarm outputs are always used for differential operation.)	
ATC	(ATC models only)	ATC enabled: on, ATC disabled: of F	Used to enable or disable ATC.	
	Setting at Power-ON (ATC ON)	No setting: oFF, ATC start processing: Rtc, Power tuning and ATC start processing: PtRt	Used to set the processing to be performed when the power is turned ON.	
External input (external input models only) Thru-beam, no-workpiece teaching: bruk, Reflective, no-workpiece teaching: cfck, With/Without-workpiece teaching: cfck, With/Without-workpiece teaching: cfck, Automatic teaching: Rute, Power tuning: Ptun, Zero reset: ufck, Light OFF: toff, Counter reset: cf5t		Thru-beam, no-workpiece teaching: <code>EhrU</code> , Reflective, no-workpiece teaching: <code>FFcb</code> , With/Without-workpiece teaching: <code>2Phb</code> , Automatic teaching: <code>RUE</code> , Power tuning: <code>PEUn</code> , Zero reset: <code>DrSE</code> , Light OFF: <code>LoFF</code> , Counter reset: <code>crSE</code>	Used to change function controlled by external input. (Refer to Instructions provided with the product.)	
Exte	ernal input memory rnal input models only)	Write results to EEPROM: on, Don't write results: off	Used to set writing the results. (Refer to Instructions provided with the product.)	
Cou (exte	Inter Innal input models only)	Counter disabled: ${}_{\Omega}FF$, Count incremented when output turns ON: ${}_{C}UP$, Count decremented when output turns ON: ${}_{C}d{}_{\Omega}$	Used to set the counter function.	
	Count	Setting range: 1 to 9,999,999	Used to set the counter value when the counter function is enabled.	
Exte (exte	rnal input batch setting ernal input models only)	Only sensor that receives external input: <code>lch,</code> All linked sensors: <code>RLL</code>	Used to set linked Amplifiers at the same time using an external input.	

(external input models only) All linked sensors: RLL Used to set linked *The operation mode and timer function can be set for each channel specified using the Channel Selector Switch. The settings for other functions will be the same for channel 1 and channel 2.



Sensors

E3C-LS3R



• Adjustment Method (I)

When the reflectivity of the sensing object is equal to or higher than that of the background object

(1)Place the Sensor at the position of $a = 30_0^{+3}$ mm.

- (2)Move the SENSITIVITY adjuster to the MAX position and make sure that the LIGHT and STABILITY indicators of the amplifier turn ON. If the LIGHT and STABILITY indicators do not turn ON, move the Sensor within a 2 to 3 mm range until the indicators turn ON.
- (3)Remove the sensing object, turn the SENSITIVITY adjuster gradually to the MIN position, and stop turning it when the LIGHT indicator turns OFF. Define this position as point B.
- (4)Place the sensing object in the given position.
- (5)Move the SENSITIVITY adjuster to MIN from the position in (4), turn it gradually to the MAX position, and stop turning it when the LIGHT indicator turns ON. Define this position as point A. The optimum adjustment is made by setting the SENSITIVITY adjuster in the middle of points A and B.

	LIGHT indicator (red)	STABILITY indicator (green)
Sensing object	Lit	Lit
Background objects	Not lit	Lit

Make sure that the states in the above table are established.

E3Z

Slits for Through-beam Models (E39-S65A/B/C/D/E/F (Sold Separately))



Adjustment Method (II)

When the reflectivity of the sensing object is lower than that of the background object

- (1)Place the Sensor at the position of $b = 30^{+3}_{-3}$ mm.
- (2)Remove the sensing object.
- (3)Turn the SENSITIVITY adjuster gradually from the MIN position to the MAX position, and stop turning it when the LIGHT indicator turns OFF. Define this position as point B.
- (4)Place the sensing object in the given position.
- (5)Turn the SENSITIVITY adjuster gradually to the MAX position and stop turning it when the LIGHT indicator turns ON. Define this position as point A.

(6)Set the SENSITIVITY adjuster in the middle of points A and B.

	LIGHT indicator (red)	STABILITY indicator (green)
Sensing object	Not lit	Lit
Background objects	Lit	Lit

Make sure that the states in the above table are established.

Note: To turn ON the output relay with the sensing object (turn the no-contact output "H"), set the operation selector switch to the "DARK ON" position.

Mounting method

- Hook the upper protruding portion of the Slit to the upper indented mounting portion of the Sensor and adjust the position of the Slit so that the Slit will be in parallel to the lens side of the Sensor.
- Press the lower protruding portion of the Slit onto the indented mounting portion of the Sensor until the Slit snaps in.

1. Press the upper portion of the

2. Disconnect the lower protruding portion of the Slit from the Sensor

and remove the Slit.

Mounting condition

Removal method

Slit.



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E3Z

Sensitivity Sensing condition Indicators Procedure Item adjustor $ON \rightarrow OFF$ $\mathsf{OFF}\to\mathsf{ON}$ Photoe ctric Sensor Locate a sensing object at the sensing distance, and turn Sensing object ••0 the sensitivity adjustor clockwise to increase the sensitivity \bigcirc (1) Position A until the operation indicator (orange) is ON. Position A is where the indicator has turned ON. STABILITY OPERATION (green) (orange) Remove the sensing object and turn the sensitivity adjustor clockwise until the E3S-C detects the background object $ON \rightarrow OFF$ $ON \rightarrow OFF$ Photoelectric Senso and the operation indicator (orange) is ON. Position B is (C) where the indicator has turned ON. Turn the sensitivity (2) Position 000 Background \bigcirc \bigcirc adjustor counterclockwise to decrease the sensitivity until (B) B and C the orange operation indicator is OFF. Position C is where STABILITY OPERATION the indicator has turned OFF. (orange) (green) If there is no background object, position C is where the sensitivity adjustor is set to maximum. Set the sensitivity indicator to the position between ON $ON \rightarrow OFF$ (C) Positions A and C (the optimum sensitivity setting). The Photoelectric Sensor will then work normally if the stability (3) Setting indicator (green) is lit with and without the sensing object. OPERATION If it is not lit, stable operation cannot be expected, in which STABII ITY case a different sensing method must be applied. (green) (orange)

Sensitivity adjustment for diffuse-reflective models that turn ON with incident light

Note: When the reflectivity of background object is higher than that of sensing object, move the adjuster to the position A for background object, and move the adjuster to the position B and C for sensing object.

E3ZM/E3ZM-C

Sensitivity adjustment for diffuse-reflective models that turn ON with incident light

Item	Sensing condition	Sensitivity adjustor	Indicators		Procedure
(1) Position A	Photoelectric Sensor		ON → OFF O STABILITY (green)	OFF → ON OPERATION (yellow)	Locate a sensing object at the sensing distance, and turn the sensitivity adjustor clockwise to increase the sensitivity until the operation indicator (yellow) is ON. Position A is where the indicator has turned ON.
(2) Position B and C	Photoelectric Sensor	(C) (B)	ON → OFF O STABILITY (green)	ON → OFF OPERATION (yellow)	Remove the sensing object and turn the sensitivity adjustor clockwise until the E3S-C detects the background object and the operation indicator (yellow) is ON. Position B is where the indicator has turned ON. Turn the sensitivity adjustor counterclockwise to decrease the sensitivity until the yellow operation indicator is OFF. Position C is where the indicator has turned OFF. If there is no background object, position C is where the sensitivity adjustor is set to maximum.
(3) Setting		(A) (C)	ON STABILITY (green)	ON → OFF OPERATION (yellow)	Set the sensitivity indicator to the position between Positions A and C (the optimum sensitivity setting). The Photoelectric Sensor will then work normally if the stability indicator (green) is lit with and without the sensing object. If it is not lit, stable operation cannot be expected, in which case a different sensing method must be applied.

Note: When the reflectivity of background object is higher than that of sensing object, move the adjuster to the position A for background object, and move the adjuster to the position B and C for sensing object.

Operating Procedures: Photoelectric Sensors

E3ZM-B



Note: Depending on the amount of light received, the operation indicator and stability indicator may also change during the teaching operation.

E3ZM-V

Teaching Procedure Two-point Teaching (Button)	
1. Place the point at which you want the Sensor to turn O Then press the teaching button for at least 2 seconds.	ON in the spot position.
	\downarrow
The teaching indicator (red) will start flashing quickly. (ON tea Perform the following operation within 7 seconds after first sta seconds, the Unit will return to the original status.)	aching is being requested.) arting to press the teaching button. (After 7
	*The stability indicator (green) and operation indicator (yellow) will retain their lit or OFF status, and the teaching indicator (red) will flash.
2. Press the teaching button for approximately 0.5 secon The teaching indicator (red) will turn OFF for approxima be completed.	d. tely 0.5 second, and then ON teaching will Lit for approximately 0.5 second
	↓
The operation indicator (red) will start to flash quickly again. (This status will continue until the next teaching operation is ex	• OFF teaching is being requested.) xecuted. Flashes quickly
3. Place the point at which you want the Sensor to turn O	OFF in the spot position.
 Press the teaching button for approximately 0.5 secon The teaching indicator (red) will turn OFF for approxim will be completed. 	d. hately 0.5 second, and then OFF teaching
When Topphing Is Supposeful	When Teaching Is Not Successful
The stability indicator (green) indicates whether detection is stable.	The teaching indicator (red) will flash slowly in cycles of approximately 6 seconds.
 →Detection can be performed stably even with workpiece flopping. (2)Flashing Indicator →Detection may be unstable because of workpiece flopping. 	Repeat the operation starting from step 1.
(3)Indicator OFF \bigcirc	
¥	
Operation returns to normal.	
Point at which the Sensor must turn ON	
Point at which operation must turn OFF Lit OFF OFF	

Remote Automatic Teaching

- 1. Input a pulse with a pulse width of at least 2 seconds but less than 10 seconds into the remote control input (pink).
- 2. Teaching will be executed automatically when the side with the shorter detection time (i.e., the mark) passes by the

spot.

- Allow a passing time of at least 1.5 ms.
- Teaching will be completed when the mark has passed by seven times.
- Teaching will not be successful if there is no difference in the amount of light between the mark and the background.

3. When detection is started, the output will be ON when the shorter detection time (i.e., the mark) is detected.

Note: Determine whether teaching has been completed according to whether the output if ON or OFF for the mark and background. If the output does not turn ON and OFF for the mark and background even after one minute has elapsed since the remote control input was turned ON, teaching was not successful. Turn ON the remote control input again.



* Teaching will be cancelled if seven marks do not pass by within one minute after the remote control is input.

Precautions for Automatic Teaching (Remote)

- The operation mode can be set only to turn ON by the amount of light of the shorter detection time period. To set it to turn OFF by the amount of light of the shorter detection time period, use two-point teaching (manual).
- Automatic teaching (remote) may produce incorrect judgments if there is workpiece flopping or the workpiece surface has level differences or protrusions.

In these cases, use two-point teaching (manual).

• This teaching function cannot be used if the background is not a solid color.

E3S-C

Item	Sensing condition	Sensitivity adjustor	Indica	ators	Procedure
(1) Position A	Photoelectric Sensor	(A) Min. Max.	ON → OFF O STABILITY (green)	OFF → ON LIGHT (red)	Locate a sensing object at the sensing distance, and turn the sensitivity adjustor clockwise to increase the sensitivity until the incident light indicator (red) is ON. Position A is where the indicator has turned ON.
(2) Position B	Photoelectric Sensor	(C) (B) Min. Max.	ON → OFF O STABILITY (green)	ON → OFF LIGHT (red)	Remove the sensing object and turn the sensitivity adjustor clockwise until the E3S-C detects the background object and the incident light indicator (red) is ON. Position B is where the indicator has turned ON. Turn the sensitivity adjustor counterclockwise to decrease the sensitivity until the red light indicator is OFF. Position C is where the indicator has turned OFF. If there is no background object, position C is where the sensitivity adjustor is set to maximum.
(3) Setting		(A) Min. (C) Max.	ON STABILITY (green)	$ON \rightarrow OFF$ LIGHT (red)	Set the sensitivity indicator to the position between Positions A and C (the optimum sensitivity setting). The Photoelectric Sensor will then work normally if the stability indicator (green) is lit with and without the sensing object. If it is not lit, stable operation cannot be expected, in which case a different sensing method must be applied.

Sensitivity adjustment for diffuse-reflective models that turn ON with incident light

Unlike previous photoelectric sensors, the variation in the sensitivity of E3S-CD Diffuse-Reflective Photoelectric Sensors is minimal. This means that when using several E3S-CD Diffuse-Reflective Photoelectric Sensors under the same conditions, the sensitivity can be adjusted on only a single E3S-CD Diffuse-Reflective Photoelectric Sensor, and then the adjustors on the other Units can be set to the same scale position. There is no need to adjust the sensitivity of each Unit individually.

E3S-CL

Sensitivity adjustment for distance-setting models that turn ON with incident light

Item	Sensing condition	Status of distance setting knob	Status of distance setting indicator	Indica	ators	Procedure
(1) Position A	Photoelectric sensor Sensing object	(A) Min. Max.	(A) 1- 3-	ON → OFF O STABILITY (green)	OFF → ON LIGHT (orange)	Place the detected object at the desired location and turn the adjustment knob clockwise until the LIGHT indicator (orange) lights. This is position A.
(2) Position B and C	Photoelectric sensor Sensing object	Min. (C) Max.	(C) 3- (B) 5-	ON → OFF O STABILITY (green)	ON → OFF O LIGHT (orange)	 Background Object Remove the detected object and turn the adjustment knob clockwise until the LIGHT indicator (orange) lights. This is position B. Then turn the adjustment knob counterclockwise until the LIGHT indicator (orange) goes out. This is position C. No Background Object The maximum adjustment setting is used as position C.
(3) Setting		(A) (C) Min. Max.	(A) 1- 3- (C) 5-	ON STABILITY (green)	ON → OFF O LIGHT (orange)	Set the adjustment to halfway between A and C. Confirm that the STABILITY indicator (green) remains lit both with the detected object present and not present. If the STABILITY indicator does not remain lit, reconsider the detection method to enable stable operation.

E3G

E3G-L/ML

Adjustment Steps

Procedure	Operation
1	Install, wire, and turn ON the Sensor.
2	Perform sensitivity adjustments (teaching). →Refer to Distance Setting (Teaching) below.
3	Check that the mode selector switch is set to RUN.

Distance Setting (Teaching)

Select the most appropriate teaching method in reference to the following descriptions.

Application	Teaching without sensing objects (i.e., teaching the background). Setting a threshold in the middle between the background and sensing object for operation.		Detection of glossy objects in front of the background.	Setting the maximum sensing distance of the Sensor.
	+	+	+	↓
Teaching	Normal one-point teaching	Normal two-point teaching	Zone teaching	Maximum distance setting (in normal mode)
Setting method	Press the TEACH button with the background object.	Press the TEACH button with the background object and with the sensing object.	Press the TEACH button with the background object (conveyor, etc.).	Press the TEACH button for longer than three seconds.
Set threshold	Threshold (a) is set to a distance in front of the background of 20% of the background distance.	Threshold (a) is set approximately in the middle between the background and sensing object.	Thresholds (a and b) are set in the sensing distance on condition that the difference between these thresholds are approximately 10% of the whole sensing distance.	The threshold is set so that the stability indicator will turn ON at approximately 2 m if the sensing object is white paper.
Output ON range	The output is ON between the Sensor and La.	The output is ON between the Sensor and La.	The output is ON between La and Lb. (For D–ON) (This utilizes the fact that glossy objects are recognized as being farther away than the background.)	The output is ON whenever the sensing object is located between the Sensor and at a distance of 2.2 m.

La: Distance equivalent to threshold (a) Lb: Distance equivalent to threshold (b) Normal Mode

1. Normal One-point Teaching





2. Normal Two-point Teaching



Normal One-point Teaching

Proce- dure	Operation		
1	Set the mode selector switch to TEACH.		
2	Set the NORMAL/ZONE mode selector switch to NORMAL.		
3	Press the TEACH button with no sensing object • The teaching indicator (red) will turn ON.		
4	Set the mode selector switch to RUN. (Set to L-ON or D-ON mode.)		

Note: Perform normal one-point teaching with the background.

Normal Two-point Teaching

Proce- dure	Operation			
1	Set the mode selector switch to TEACH.			
2	Set the NORMAL/ZONE mode selector switch to NORMAL.			
3	Press the TEACH button with a sensing object located at the sensing position. • The teaching indicator (red) will turn ON.			
4	 Move the sensing object and press the TEACH button with the background. If the teaching is successful, the teaching indicator (green) will turn ON. If the teaching is not successful, the teaching indicator (red) will start to flash. 			
5	If the teaching is successful, set the mode selector switch to RUN to complete the teaching operation. Set the E3G to light- or dark-ON mode with the mode selector switch according to the application. If the teaching is not successful, change the set distance and objec sensing position and repeat two-point teaching from step 3 .			

Zone Teaching

Proce- dure	Operation		
1	Set the mode selector switch to TEACH.		
2	Set the NORMAL/ZONE mode selector switch to ZONE.		
3	 Press the TEACH button with the background. The teaching indicator (red) will turn ON first. Then the teaching indicator (green) will turn ON. 		
4	Set the mode selector switch to RUN. (Set to L-ON or D-ON mode.)		

Note: Perform zone teaching with the background.

Maximum Distance Setting (in Normal Mode)

Use the following procedure to set the maximum distance setting.

Proce- dure	Operation			
1	Set the mode selector switch to TEACH.			
2	Set the NORMAL/ZONE mode selector switch to NORMAL.			
3	 Press the TEACH button for 3 s or more. The teaching indicator (red) will turn ON. The teaching indicator (green) will turn ON in 3 s. 			
4	4 When the teaching indicator (green) will turns ON, it means the teaching was successful. Set the mode selector switch to RUN. (Set to L-ON or D-ON mode.)			

E3JM/E3JK

Adjustment

Item Model	Through-beam Models	Retro-reflective Models	Diffuse-reflective Models
E3JM	For a E3JM with the timer function, the indicator will be lit when incident light is received while the mode is switched to Light-ON, and the indicator will be lit when light is interrupted while the mode is switched to Dark-ON.	The indicator of the Retro- reflective Model with the timer function is lit in the same way as for the Through-beam Model.	The indicator of the Diffuse-reflective Model with the timer function is lit in the same way as for the Through-beam Model.
E3JM, E3JK Common items	Move the emitter and receiver horizontally and vertically, and locate them to the center of the range in which the receiver indicator is lit.	As with the Through-beam Model, adjust the reflector and Sensor. Since the directional angle of the E3JM and E3JK Retro-reflective Models is 1 to 5 degrees, pay careful attention when adjusting the Sensor.	 Sensing object is present. Sensing object is not present. Setting A) Operation A) O

E3MC

ON/OFF Models

Settings

One-output Models (E3MC-A /E3MC-X /E3MC-Y)





510

Registered Color Selection (Bank Selection Input)

One-output Models Only

The E3MC in RUN mode allows bank selection with external bank selection input by combining the bank selection input 1 (yellow) and input 2 (green). The selected bank is indicated with the bank selection indicator.

NPN (E3MC-A11/-X11/-Y11)			PNP (E3MC-A41/-X41/-Y41)		
Bank	Input 1	Input 2	Bank	Input 1	Input 2
1	OPEN	OPEN	1	OPEN	OPEN
2	GND	OPEN	2	Vcc	OPEN
3	OPEN	GND	3	OPEN	Vcc
4	GND	GND	4	Vcc	Vcc

External Synchronous Input Function

The control output status will be held if the input of the external synchronous input terminal (pink) is set to ON. External synchronous input is valid in RUN or ADJ mode. As for the 4-output models, this function applies to the output of all the channels.



Remote Teaching (Remote Control Function)

Mode Setting

When using the remote control function of the Sensor for remote teaching, be sure to set the Sensor to mode B.

Setting Method

Apply power to the Sensor while pressing the SELECT DOWN button and TEACH button together.



Checking Method

Mode A or B of the E3MC will be displayed for 3 s after mode setting. When the mode selector switch is set to TEACH, the mode can be checked from the operation indicator.



Note: 1. The Sensor is set to mode A before shipping.

The current mode selected does not change after the Sensor is turned OFF
 The remote control function is available in RUN mode and ADJ mode only.

4. The E3MC-M□ has three outputs in mode B and no external synchronous

input will be accepted. 5. The same switching procedure can be used for changing to mode A.

Remote Teaching Method

1 Remote teaching with manual input through a mechanical switch

Short-circuit the remote control input for 1.5 s or more to either of the following terminals according to the E3MC model.

NPN type (E3MC-DD11)	Short-circuit to GND (blue) terminal.
PNP type (E3MC-041)	Short-circuit to Vcc (Brown) terminal.

Remote control of teaching, bank selection, and channel selection through the PLC or PT

Input one of the following signals as a remote control input. There will be an answer-back output for 0.3 s if the signal is correctly received.

No.	Control signal	E3MC-	E3MC-M
1	ON 0.3 s	Bank 1 selected.	Channel 1 selected.
2	ON	Bank 2 selected.	Channel 2 selected.
3	ON OFF	Bank 3 selected.	Channel 3 selected.
4	ON	Bank 4 selected.	Not used.
5	ON	Teaching of selected bank.	Teaching of selected channel.

The following is an example of ladder programming.



The following is an example of a timing chart of teaching after bank selection.



3 Remote control of threshold adjustments through the PLC or PT

Input either one of the following signals as remote control input. There will be an answer-back output for 0.3 s if the signal is correctly accepted.

No.	Control signal	All E3MC models	Threshold and
6	ON OFF	Threshold 1 selected.	Threshold 1
7	ON OFF	Threshold 2 selected.	Threshold 3 Threshold 4 Threshold 5
8	ON OFF	Threshold 3 selected.	Threshold 7
9	ON 013 \$ 0.3 \$ 0.6 \$	Threshold 4 selected.	
10	ON 0FF	Threshold 5 selected.	
11	ON OFF	Threshold 6 selected.	
12	ON 0.6 s 0.3 s 0.3 s OFF	Threshold 7 selected.	

The following is an example of ladder programming for setting control signals. Full control of the E3MC is possible using this function together with function 2.



Note:1.The permissible error of each signal pulse is ± 0.1 s max. 2.A minimum interval of 0.6 s is required between signals. 3.Threshold 4 is set after teaching.

Analog Output Models

The following is the setting procedure for the E3MC- \square 81.



Make settings in this order to perform the operation.

Calibration

This Sensor is equipped with a calibration function to align the RGB output voltages using a reference white object. The No. 4 terminal (yellow) is used for A and X types, and the outputs are aligned to 10 V. The No. 1 terminal (white) is used for the Y type, and the outputs are aligned to 7 V.

(1)Place the reference white object in the measurement location.

(2)Input a signal of 24 V, 1 ms min. to the calibration terminal.

(3)The calibration requires approximately 600 ms.

(4)Check the RGB output.

(5)Remove the reference white object, and begin the measurement operation.

Note

- If any color other than white is used for the calibration, the output values will not be aligned and the operation will be canceled, with the Unit returning to its original state.
- If the A or X type calibration is performed using the No. 1 terminal (white), the output value will be 7 V. This will not allow the Unit to be utilized to its full potential.
- If the Y type calibration is performed using the No.4 terminal (yellow), the output cannot be compensated, leading to insufficient operation. Be sure to use the No. 1 terminal (white).

E3M-V

Adjustment Steps

Step	Operation
1	Install, wire, and turn ON the Sensor.
2	Register (i.e., teach) the marks. →Refer to <i>Registering Marks</i> on this page to page 34.
3	Adjust thresholds as required. →Refer to Adjusting Thresholds on page 35.
4	Check that the mode selector switch is set to RUN.

Registering (Teaching) Marks

Select the most appropriate teaching method in reference to the following descriptions.

Application	1 Detec betwo backo has a	ction of clear color differences een the mark and the ground when the background a color pattern.	2 Detection betwo when patte	ction of slight color differences een the mark and background the background has no color rn.	3 Rem wher patte	ote teaching without positioning h the background has no color rn.
		+		. +		. +
Teaching method	1	One-point teaching	2	Two-point teaching	1	Automatic teaching
Output ON range	The c outpu	lefault value will be set, and the It will turn ON at the mark.	The threshold will be set in the middle between the mark and the background, and the output will tu ON at the mark.		The t midd back ON a	threshold will be set in the le between the mark and the ground, and the output will turn at the mark (which has the cost possesses time)

Refer to the following descriptions for each teaching method. One-point teaching and two-point teaching can be controlled remotely. →Refer to *Remote Control Function* on page 36.

1 One-point Teaching

Step	Operation method	Operation condition
1	Set the mode selector switch to TEACH.	
2	Place the mark in the specified location, and press the SET Button. The threshold indicators (red) will light.	Sensor OUT TEACH Mark U V V ADJ RUN Background Press EVEL TEACH TEA
3	Set the mode selector switch to RUN. The output will turn ON at the set mark.	

Note: The reverse of the output described above (Background: ON, Mark: OFF) can be obtained by teaching using the background.

2	Two-point Teaching							
Step	Operation method	Operation condition						
1	Set the mode selector switch to TEACH.							
2	Place the mark in the specified location, and press the SET Button. The threshold indicators (red) will light.	Sensor OUT TEACH Mark TEACH Press RUN LEVEL SET * Threshold indicators (red) lit						
Contin	nued on next nego							

Continued on next page

Step	Operation method	Operation condition
3	If the teaching is OK, move the mark and press the SET button when the mark is at the position of the background. • If the teaching is OK, the detection level indicators (green) will all be lit. • If the teaching fails, the threshold indicators (red) will all flash.	Detection level indicators (green) lit
4	If the teaching is OK, the setting will be completed. Set the mode selector switch to RUN. If the teaching fails, perform the setting again from step 2.	

Note: These teaching steps are for turning output ON at the mark. The output can be set to turn On at the background and turn OFF at the mark by reversing the order of teaching.

3 Automatic Teaching

Step	Operation
1	Check that the mode selector switch is set to either RUN or ADJUST.
2	A pulse of 0.9 s (see note) will be input to the remote control input/output.
3	 Teaching will be performed automatically when the mark is moved. (Teaching will be completed after the mark passes six times.) If teaching is OK, answer-back of 0.3 s will be output from the remote control input/output. If teaching fails, answer-back will not be output. In this case, perform the adjustment again using two-point teaching. (Teaching will not be OK if there is no difference in light levels between the mark and the background.)
4	If answer-back is detected, the setting will be completed. <u>The output will turn ON at the mark (which has the shortest passage</u> time), and measurement will start.

Note: Set input error of each signal pulse to within ± 0.1 s.

Automatic Teaching



Example of Connection with Programmable Controller



Note: Connect the Sensor as shown in the figure above when connecting it to a Programmable Controller.

Precautions for Using Automatic Teaching

In the following application conditions, incorrect judgment may occur using automatic tuning. If this occurs, use onepoint teaching or two-point teaching.

- The background has a color pattern.
- There is a lot of variation in the samples.
- The surface has height differences or protrusions.

Adjusting Thresholds

Fine adjustment of thresholds can be performed after teaching. Operation can be performed remotely.

→Refer to *Remote Control Function* on the next page.

Step	Operation method	Operation condition													
1	Set the mode selector switch to ADJUST.														
2	In the ADJUST mode, specify the direction of adjustment using the Up/Down selector switch. The threshold will transition each time the SET Button is pressed. (Two indicators will be lit at the same time for even-numbered threshold levels.)	Press Thresh- old indica- tors						Up sel Do sel	ward lection vwnwa lection			ET		UP OWN	\[\] \[
		Thresh-	1	2	3	4	5	6	7	8	9	10	11	12	13
		514	I	L	L	I	I	I	I						
3	After the setting is completed, set the mode selector switch to RUN.														

Detection Level Indicators

The control output will turn ON if the detection level exceeds the threshold level. The detection level display will depend on the teaching method.

One-point Teaching

Two thresholds (i.e., above and below the mark) are set. The indicators show the degree of match with the mark.



Two-point teaching and Automatic Teaching

A threshold is set in the middle between the mark (first registration) and background (second registration). The indicators show the level of excess gain between the mark and the background.



Remote Control Function (Bank Selection, Mark Registration, Threshold Adjustment)

In RUN mode and ADJUST mode, remote operation can be performed by inputting the signals in the following table for the remote control input/answer-back output. There will be answer-back output for 0.3 s if the signal is correctly received. Only one-point teaching can also be operated with manual input. (Provide input for 1.5 s min.)

Timing Chart



*If consecutive signals are to be sent, allow an interval of at least 2.5 s after the signal is input, as in the figure above.

Example of Ladder Programming

Control signals can be created using the example of ladder programming shown in the following figure.



Control Signals								
No.	Control signal	Function						
1	ON OFF	Bank 1 selection (Operation indicator OFF in TEACH mode)						
2	ON 0FF 0.6 s	Bank 2 selection (Operation indicator lit in TEACH mode)						
3	ON 0.9 s	Automatic teaching						
4	ON 0FF 0FF	Two-point teaching (first and second)						
5	ON1.5 s	One-point teaching (input of 1.5 s min. also possible)						
6	ON OFF	Threshold 1 selection						
7	ON 0.3 \$ 0.6 \$ 0.3 \$ 0.6 \$ 0.7 \$ 0.6 \$ 0.7 \$ 0.6 \$ 0.7 \$ \$ 0.7 \$ \$ 0.7 \$ \$ \$ 0.7 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Threshold 3 selection						
8	0.3 s 0.9 s 0.9 s	Threshold 5 selection						
9	ON OFF	Threshold 7 selection						
10	ON 0.6 \$ 0.6 \$ 0.6 \$	Threshold 9 selection						
11	ON OFF	Threshold 11 selection						
12	ON 0.6 \$ 0.3 \$ 0.3 \$ OFF	Threshold 13 selection						

Note: Set input error of each signal pulse to within ± 0.1 s

E3S-CR62/67

Sensitivity Adjustment

The Sensor and reflector can be moved horizontally and vertically to set them in the center of the illumination area of the red incident light indicator, allowing the operator to check whether the green stability indicator lamp is lit.

Sensing object	Detection state	Sensitivity adjuster	Indicator status		Adjustment procedure
Transparent bottle or glass plate	No sensing object	Min. Max.	ON Stability (green)	ON Light (red)	Turn the sensitivity adjuster from minimum to maximum and set it at a point where the incident light stabilizes.
Opaque object	Sensing object or no sensing object	Min. Max.	ON Stability (green)	ON Light (red)	If the object is larger than the lens diameter, set the sensitivity control to the maximum setting. If the object is the same size or smaller, turn the sensitivity control from minimum to maximum and set it at point where the incident light stabilizes.

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