

型E3X-NT

通用示教型光纤放大器

使用说明书

感谢您选择欧姆龙产品。
以下主要记载在安装和使用本产品过程中需注意事项。
使用本产品前，请仔细阅读本说明书，充分了解产品。
为了您的方便，请妥善保管好本说明书。

1106508-7C

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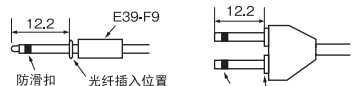
规格 / 性能 放大器单元

项目	通用型		多功能型	
	型E3X-NT11 (NPN输出)	型E3X-NT21 (NPN输出)	型E3X-NT41 (PNP输出)	型E3X-NT51 (PNP输出)
光源	红色LED			
电源电压	DC12~24V±10%、波动(p-p) 10%以下			
消费电流	50mA 以下			
响应时间	500μs以下 (在额定检测距离方面)			
控制输出	集电极开路 最大100mA (30V以下) 残留电压 1V以下			
计时功能	无	OFF 延迟	固定40ms※1	
远程示教输入	无	ON时: 0V 短路电流 1mA以下 OFF时: 开放式或9V以上 (最大输入电压24V) 应答时间: 0.5ms 以下		
指示灯	动作指示灯(橙色LED)、安定指示灯(绿色LED)			
示教确认功能	示教指示灯(红色/绿色LED)、蜂鸣器			
保护回路	电源逆接保护、输出短路保护			
使用周围温度	动作时: -25~55℃(不能有结冰、结露现象)			
外壳材料	外壳: 聚对苯二甲酸丁二醇酯(PBT) 保护罩: 聚酯(PC)			

※. 1拨动切换开关, 可以解除OFF延迟功能。

E3X-NT的光纤和放大器单元使用的是拨杆锁定方式。插入和拔出光纤请按照如下描述操作。

- 1) 光纤的插入
插入光纤时听到“咔嚓”声, 然后按下拨动杆。通过进行这样的操作可以固定光纤。
在使用光纤切割器(E39-F4)切割光纤之后, 将光纤插入指示记号。
- 2) 光纤的拔出
向上拨动拨杆至解除状态。当处在解除状态时, 光纤可以被拔出。
(为了不损坏光纤, 在拔出光纤前请确认拨杆是否已经处在解除状态。)
- 3) 光纤的锁定和释放
请在-10~+40℃范围内执行。
- 4) 在每一根光纤的顶端(除自由切割型外)都有一个表示确认插入位置的标记。
如果光纤正好插入这个位置时可以用到它。



(4) 放大器单元安装支架的安装

·使用DIN导轨

- 安装**
- 1) 将放大器前部的开槽处插入DIN导轨, 使之接合。
 - 2) 将后部开槽处插入DIN导轨。
- (注) 请先接合前部开槽处(图中①), 否则会引起机械强度的衰退。
- 拆卸**
- 向前推出导轨(图中③) 然后向上提起前部开槽处(图中④)。

·使用专用安装支架侧面的安装

- 1) 在放大器上固定专用安装支架。
- 2) 使用M3螺丝安装。
- 3) 使用直径最大6mm的平垫圈。

(5) 其他的注意点

- 1) 光学光纤是由甲基丙烯酸(酯)树脂组成的。请不要在有有机溶剂和其它有害物质环境下使用。
- 2) 请不要将受光表面直接暴露在外光线下等。同时也不要不要在室外使用。
- 3) 虽然产品的防水等级为IP67, 在有水滴和灰尘的条件下检出距离会缩短。
- 4) 光电开关导线和动力线或电力线装在同一配管中使用时, 会受到干扰, 有误动作甚至被损坏。原则上传感器导线必须单独放置或者被屏蔽。
- 5) 延长导线必须使用截面积0.3mm²以上、长度100m以下导线。
- 6) 电源
当使用市场上销售的开关整流器时, 请将FG(Frame Ground)端子接地和G端子接地。否则, 会由于电源的开关噪音引起故障。
- 7) 电源开启后的操作
从接通电源到传感器可正常进行检出的时间是100ms, 所以请在通电100ms后再使用。负载和传感器接不同电源时, 一定要先接通传感器的电源。
- 8) E² PROM书写错误
示教时(包括直到无工件示教的初期动作水平修正结束为止)由于切断电源及静电等产品的干扰而产生记入错误的情况下(蜂鸣器, 示教指示灯: 红/绿灯同时闪烁, 动作指示灯、稳定指示灯闪烁), 请以主机的按钮重新进行示教。
*记忆错误的情况与示教错误不同, 示教指示灯红/绿灯同时闪烁, 稳定指示等也出现闪烁。
- 9) 出荷时放大器单元已经设置为最大灵敏度状态, 因此它们能在最大灵敏度状态下直接使用而不需要更改设定。

操作顺序

- 1) 安装放大器单元。(参照“正确使用方法”)
- 2) 将光纤插入放大器单元, 在检出距离内设定光纤。(参照“正确使用方法”)
- 3) 打开电源。
- 4) 灵敏度调整请按照灵敏度调整顺序进行设定。(参照“■灵敏度调整”)
- 5) 当需要使用OFF延迟计时器功能时, 请使用动作切换开关进行设定。(E3X-NT21/E3X-NT51)
- 6) 确认模式设定切换开关设定在 [RUN] 侧。
- 7) 设定动作模式请用动作模式选择开关。

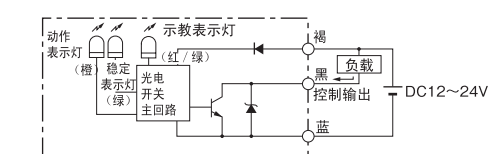
无工件示教、工件有/无示教、最大灵敏度设定

请参考下表使用最合适的灵敏度设定方法

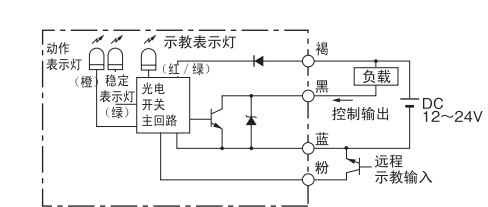
灵敏度设定方法	代表性的使用方法	物体的影响
最大灵敏度设定	·完全遮光检测工件的有无 ·无背景物体状态下检测工作	无
无工件示教	·工件停止无法示教时 ·仅背景物示教, 要检测明亮的工作以及黑色系工件时。	无论那种示教都可以去除背景物体的影响
有无工件的示教	·检测微小差别·识别颜色 ·背景物体反射不稳定时 ·工件的凹凸检测	无

输出段回路图

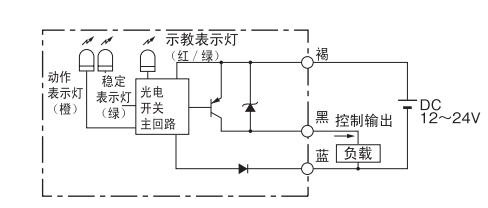
●E3X-NT11



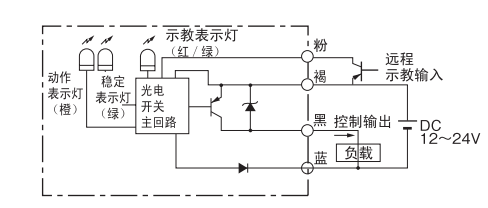
●E3X-NT21



●E3X-NT41



●E3X-NT51



灵敏度调整

●最大灵敏度设定

1. 在检测距离内设定光纤。
2. 将模式设定切换开关设定在 [TEACH] 侧。
3. 超级闪烁功能启动, 对合光轴使投光器光纤前段指示灯亮。(光轴偏移时指示灯闪烁, 且有蜂鸣声)
4. 按动示教按钮(3秒以上)。
示教指示灯…红→绿
蜂鸣器(内置)…亮红灯1次, 亮绿灯时连续发声, 不按示教按钮时蜂鸣声停止。
5. 将模式设定切换开关设定在 [RUN] 侧。
最大灵敏度设定结束。
示教指示灯…熄灯
(注) 设定最大灵敏度时, 与光纤的设定距离及入光/遮光无关, 是自动进行灵敏度设定的。
6. 请用动作模式切换开关(L.ON/D.ON)设定所希望的逻辑输出。

●无工件示教

1. 把模式设定切换开关拨到 [TEACH] 侧。
2. 无工件状态下按下示教键。(0.5~2.5秒)
这时有无工件并不要紧。
示教指示灯…红色灯亮
蜂鸣器(内置)…蜂鸣音(1次)
3. 把模式切换开关拨到 [RUN] 侧。
无工件示教设定完成。
示教指示灯…红色灯亮→绿色灯亮(1秒后自动熄灭)

- (注1) 考虑到工件前后摇晃及颜色偏差, 对前5个工件的光量进行抽样。用入光量最低的工件和背景的中间值重新设定动作程度。
(注2) 无工件示教设定到RUN模式后, 最初(第一个)工件出来, 动作程度确定后约要60ms。

●工件有/无示教

1. 把模式设定切换开关拨到 [TEACH] 侧。
2. 把工件放到所设定位置, 按示教键(一次)。
示教指示灯…红色灯亮
蜂鸣器(内置)…蜂鸣音(1次)
3. 移动工件, 按一下示教键(2次)。
示教OK时: 示教指示灯…红色灯亮→绿色灯亮
蜂鸣器(内置)…蜂鸣音(1次)
示教NG时: 示教指示灯…红色灯亮→红色灯亮
蜂鸣器(内置)…蜂鸣音(3次) → 再次变更工件的位置和设定距离以1~4的顺序重新设定。
4. 把模式设定切换开关拨到 [RUN] 侧, 工件有/无示教完成。
示教指示灯…绿色灯亮→灯灭

安全上的注意

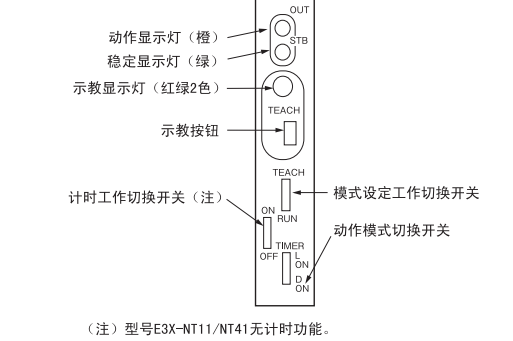
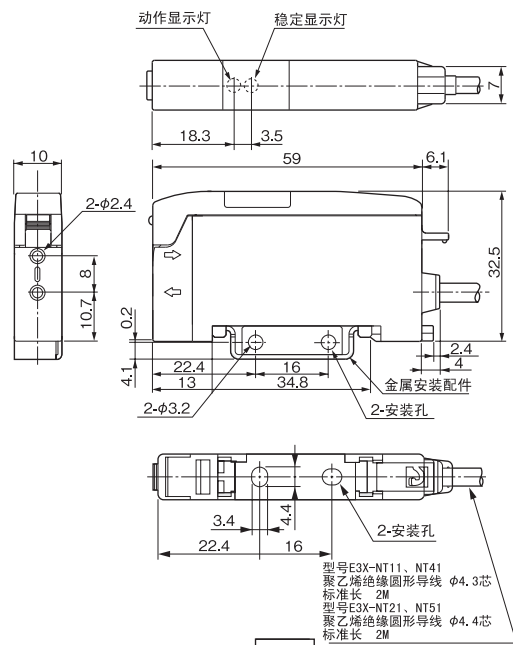
●警告表示的意思

注意 如果不正确使用的话, 有可能引起轻伤、中等程度的伤害还有可能带来同样重大的物质损害。

●警告表示

注意 不可将传感器连接交流电源, 有爆裂的危险。

外形尺寸图



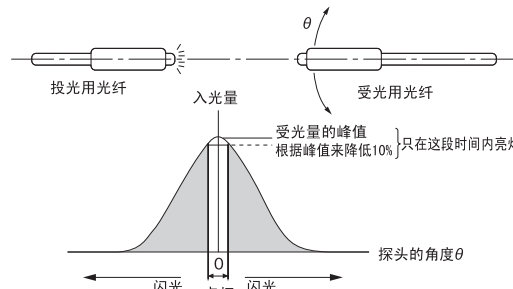
远程示教功能

与基本的[●灵敏度设定]相同, 无需按动示教按钮, 根据远程示教设定输入信号即可进行示教。

1. 请把模式设定切换开关设置到 [RUN] 侧。
2. 在远程示教输入时, 请满足下图所示的信号条件。

① 当无法进行远程示教时, 请切断粉色导线的末端, 并将其连接在电源的+V上。
② 从远程示教输入设定后约1秒时, 开始进入可检测状态。

对合光轴 (闪烁功能)



如果将模式切换开关设定为 [TEACH] 模式的话, 即可启动闪烁功能。在对合光轴时, 光纤探头的轴偏移的情况下, 如果受光量的峰值减少10%以上的话, 闪烁功能就会启动工作。(投光闪亮, 同时蜂鸣器发出蜂鸣) 因为根据光纤探头进行光轴对合, 可记录下受光量的峰值, 所以请在投光用光纤前端亮灯时使用。
还有, 在对照光轴之前和对照过程中, 如按动示教按钮, 即可启动闪烁功能。

使用时的承诺事项

使用于下列用途时, 与本公司营业担当者商谈之后, 根据规格书等确认的同时, 对额定值性能方面请想出有充裕度的使用方法和采取即使万一出现故障也能使危险降低到最小的安全回路等的安全对策。

- 1) 屋外的用途、潜在化学污染或者受到电气的妨害的用途或者在商品目录、使用说明书中没有记载的条件及环境下使用。
- 2) 原子力控制设备、焚烧设备、铁道·航空·车辆设备、医用机械、娱乐机械、安全装置及行政机关及根据个别业界的规定的制造的设备。
- 3) 可能危及生命、财产的系统·机械·装置。
- 4) 煤气、水道、电气的供给系统及24小时连续运转系统等需要高信赖性的设备。
- 5) 其他, 以上述的1)~4)为基准, 需要高度安全性的用途。

*上述内容是适用条件的一部分。仔细阅读本公司的综合商品目录、数据表等最新版商品目录、手册中记载的保证负责事项的内容后再使用。

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OMRON

Model **E3X-NT**

OPTICAL FIBER PHOTOELECTRIC SENSOR

INSTRUCTION SHEET

Thank you for selecting OMRON product. This sheet primarily describes precautions required in installing and operating the product. Before operating the product, read the sheet thoroughly to acquire sufficient knowledge of the product. For your convenience, keep the sheet at your disposal.

TRACEABILITY INFORMATION:
 Representative in EU: OMRON Corporation, Shiohori Horikawa, Shimogyo-ku, Kyoto 600-8530 JAPAN
 Manufacturer: OMRON Corporation, Shanghai Factory, No. 789 Jinji Road, Jinqiao Export Processing District, Pudong New Area, Shanghai, 201206 CHINA

The following notice applies only to products that carry the CE mark:
 Notice: This is a class A product. In residential areas it may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.

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PRECAUTIONS FOR SAFE USE

Be sure to follow safety precautions below for added safety.

- Do not use the sensor under environment with explosive or ignition gas.
- Never disassemble, repair nor tamper with the product.
- Keep the supply voltage within the specified range.
- Do not use the sensor over the rated values.

PRECAUTIONS FOR CORRECT USE

(1) Mounting of fiber unit

● Mounting of a head part

Fiber unit	Clamping torque
M3 screw M4 screw	0.78N · m max.
M6 screw 6 dia. cylinder 6 dia. teflon	1.0N · m max.
2 dia. cylinder 3 dia. cylinder 5 dia. teflon	0.29N · m max.

Clamping torque of the screw should be less than 0.29N · m

● Bending the fiber unit

When bending the fiber unit, keep a bending radius over 25mm. The sensing distance will be reduced if the radius is smaller than 25mm. (When bending the fiber unit of type E32-D51/T51, keep a bending radius over 35mm)

E32-T11, T21, D11 and D21 can be used over 4mm bending radius.

Near the ends of the fiber unit, leave a straight part over 20mm. (Exception: E32-T11, T21, D11 and D21.)

● Bending the stainless steel tube

When bending the stainless steel tube, keep a bending radius over 10mm. The sensing distance reduces if the radius is smaller than the 25mm.

Do not keep the fiber pulled by a force over 29N. (E32-T22, -T24, -D24, -D32, -D33, are 9.8N max.)

(2) Handling E39-F4 cutting tool

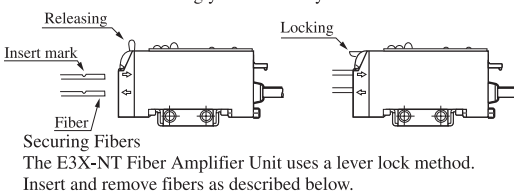
The fiber E32-TC and E32-DC can be cut with the aid of cutting tool type E39-F4. Cut the fiber to your desired length.

● Cutting the Fiber To cut 2.2-mm dia. Fiber Optic Cable

- Insert a fiber optic cable into a hole of the Fiber Cutter. Pull the cable through the hole to the desired length.
- Push the blade down in one stroke to cut off the cable.
- To cut another cable, use a different hole than before to assure blade sharpness. Otherwise, the sensing distance may be reduced because of the rough surface of the cut fiber optic cable produced by the dulled cutting tool blade.
- Insert the fiber optic cable again into the end hole of the Fiber Cutter. (Refer to the following figure.) To inscribe a clear and properly located insertion mark on the fiber optic cable, insert the fiber optic cable securely to the bottom of the hole, and push down the Fiber Cutter securely.
- The fiber optic cable must be inserted so that the insertion mark is located at the surface of the amp unit. Otherwise, the sensing distance may be reduced.

(3) Connection of amplifier unit and fiber unit

Insert the fiber unit into the amplifier unit securely. Sensing characteristics are strongly influenced by connection secureness.



RATINGS / PERFORMANCE AMPLIFIER UNIT

Item	Model	
	General-purpose type	Multi-function type
Light source	Red LED	
Supply voltage	DC12 to 24±10%, ripple (p-p) below 10%	
Current consumption	Max. 50mA	
Response time	Max. 500µs	
Control output	Open collector 30V DC MAX. 100mA residual voltage below 1V	
Timer function	N.A.	OFF delay timer fixed as 40ms (*1)
External teaching function	N.A.	When turning on: 0V Short-circuit current Max 1mA When turning off: open or more than 9V (Maximum input voltage: 24V) Response time: Max 0.5ms
Indicators	Operation indicator (orange LED), Stability indicator (green LED)	
Teaching check function	2-color indicator (red/green LED), buzzer	
Protective circuit	Reverse connection protection, Output short-circuit protection	
Ambient operating temperature	-25 to 55°C (no freezing)	
Housing material	Housing: Polybutylene terephthalate (PBT) Cover: Polycarbonate (PC)	

*1 OFF delay timer function can be turned off with selector switch.

- Inserting Fibers**
Insert the fiber and then secure it by pushing down the lever until it snaps into place. After cutting the fiber with a fiber cutter (E39-F4), insert the fiber up to the indicator mark.
- Removing Fibers**
Pull up the lock lever to releasing position. When the lock is released, the fiber can be pulled out. (In order to not to damage the fiber, check to be sure that the lock is released before pulling the fiber out.)
- Locking and Releasing Fibers**
Carry out the operations within a temperature range of -10 to 40°C.
- Notes**
The tip of each fiber except for free cut types have a depth indicator to confirm the insert position. Use it if the fiber is precisely inserted to this position.

(4) Mounting of the amplifier unit <Using the DIN rail> Mounting

- Engage the front slot of the amplifier into the DIN rail.
- Push the back slot into the DIN rail.
Note: Engage the front slot ① first, otherwise it may cause deterioration of mechanical strength.

Removal
Push forward ③ and raise the front slot ④.

(5) Others

- The E32-TC and E32-DC optical fibers consist of methacrylate resin. Do not use them near organic solvents and other adverse matters.
- Do not expose the receiving surface direct to external interference light, etc. Do not use the unit outdoors, either.
- Though the degree of protection E32-T24, and -D24 are constructed as IP67, the detecting distance will decrease with the addition of dropping of water of dust.
- There are some cases where the photoelectric switch cable is unavoidably laid in a tube or duct together with a high tension or power line. This causes an induction, possibly resulting in malfunction or damage. In principal, the cable should be separately laid or shielded.
- To extend the cable, use a wire of 0.3mm² or more. However do not extend it more than 100m.
- Power source.
When employing a commercially available switching regulator, ground the frame ground terminal (FG) and ground terminal (G). Otherwise, malfunction may result from switching noise at the power source.
- Operation after the power is turned on.
The E3X-N will begin sensing no later than 100ms after the power is turned on. If the load and the E3X-N operate on different power supply, the E3X-N must always be turned on first. When power is on, operation indicator lightens an instant, however output does not turn on.
- E²PROM write errors
If a write error (buzzer, teaching indicator: red/green flashing simultaneously, output and stability indicators: flashing) occurs during teaching (including anytime up to the completion of teaching), initial operation level compensation for Non-work sensitivity setting (due to a power failure or noise from static electricity, execute the teaching again using the button on the main unit.
*If a write error occurs, in contrast to a teaching error, the teaching indicator flashes red and green simultaneously and the stability indicator flashes.
- The units are set for the maximum sensitivity at the time of shipping, so they can be used for maximum sensitivity without changing the setting.

OPERATION PROCEDURE

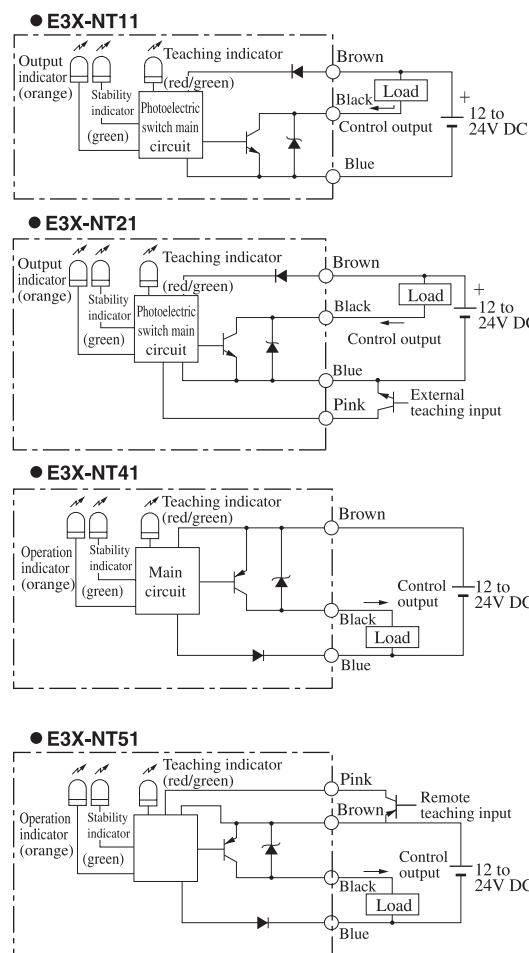
- Mount the amplifier unit. (refer to "NOTICE")
- Insert the fiber unit into the amplifier unit and place the fiber unit within the sensing distance. (refer to "NOTICE")
- Turn on the power supply.
- Adjust the sensitivity. (refer to "SENSITIVITY ADJUSTMENT")
- When using OFF delay timer function, set with the timer selector switch. (E3X-NT21/E3X-NT51)
- Confirm that the mode selector switch is set to "RUN".
- Set operating mode with the operating mode selector switch.

PROPER USAGE OF THE MAXIMUM SENSITIVITY SETTING, NON-WORK SENSITIVITY SETTING, AND SENSITIVITY SETTING.

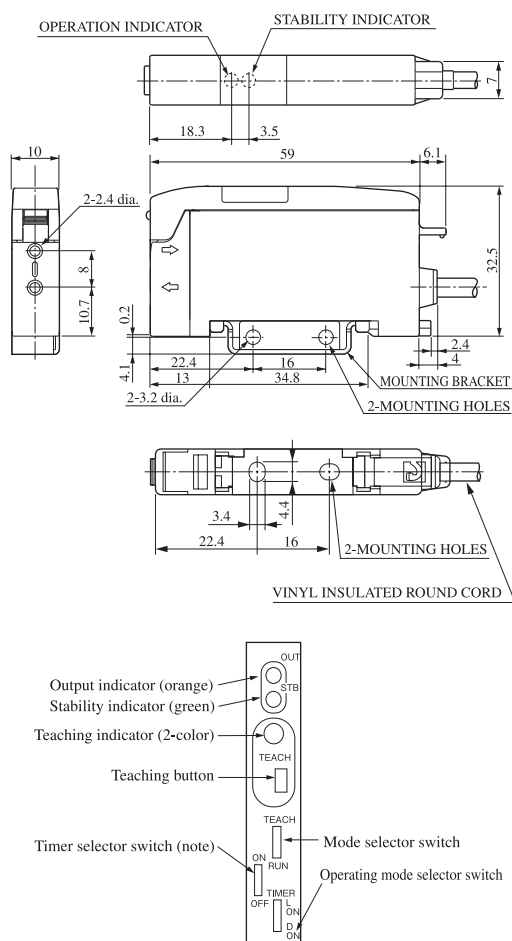
Refer to the following table for the optimum sensitivity setting method.

Sensitivity Setting Method	Representative Uses
Maximum sensitivity setting	· Detection of workpiece in total darkness. · Detection of workpiece with no background objects.
Non-work sensitivity setting	· When teaching cannot be executed using a workpiece. · Detection of light or dark workpiece, teaching with only background objects. With either of these types of teaching, the influence of background objects can be eliminated.
Sensitivity setting	· Minute differences. · Color distinctions. · When the reflection of background objects is unstable. · Detection of irregularities.

OUTPUT STAGE CIRCUIT DIAGRAM



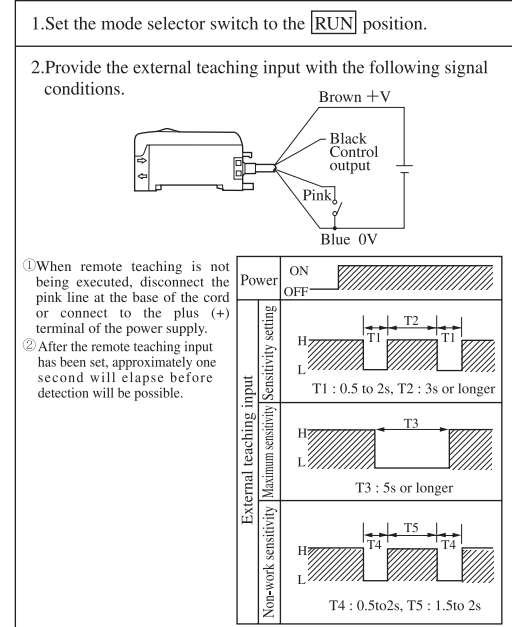
OUTLINE DRAWING



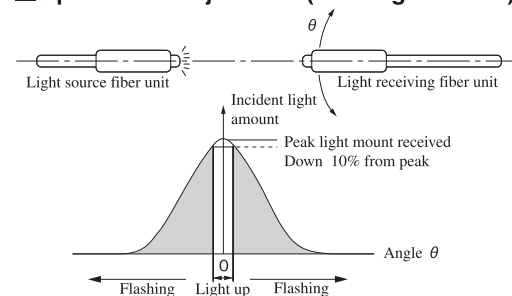
(Note) These functions are not available with the E3X-NT11/E3X-NT41

External teaching function

This function is basically the same as the sensitivity adjustment. Instead of pressing the teaching button, however, the external teaching setting input signal is used for teaching.



Optical axis adjustment (flashing function)



Set the mode switch to TEACH. If the optical axis of the fiber head is out of alignment, the flashing function will operate when the amount of light received is within by 10% or more from the peak value. (A buzzer will sound simultaneously with the flashing.) If the optical axis is out of alignment, the peak value of the light received will be saved in memory by matching the fiber head with the optical axis, so carry out the operation when the end of the light source fiber is lit. The flashing function will not operate if the teaching button is pressed before or during aligning of the optical axis.

Suitability for Use

THE PRODUCTS CONTAINED IN THIS SHEET ARE NOT SAFETY RATED. THEY ARE NOT DESIGNED OR RATED FOR ENSURING SAFETY OF PERSONS, AND SHOULD NOT BE RELIED UPON AS A SAFETY COMPONENT OR PROTECTIVE DEVICE FOR SUCH PURPOSES. Please refer to separate catalogs for OMRON's safety rated products.

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of the products in the customer's application or use of the product.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used. Know and observe all prohibitions of use applicable to this product.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM. See also Product catalog for Warranty and Limitation of Liability.

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PRECAUTIONS FOR SAFETY NOTE

- Meaning of Signal Words**
CAUTION Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.
- Alert statements**
CAUTION
 Do not connect sensor to AC power supply. Risk of explosion.