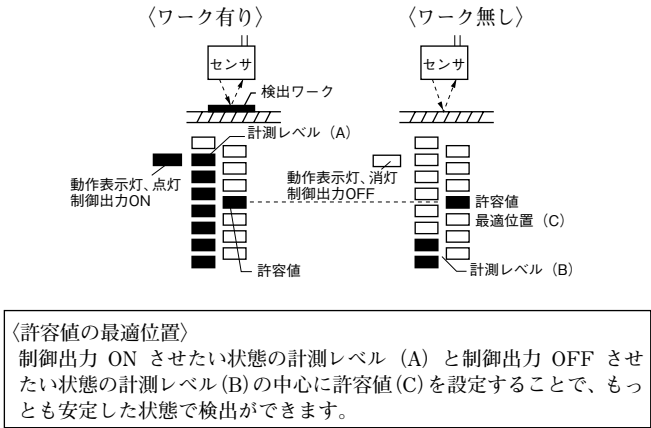


操 作	表 示 灯	ブザー
「セレクトボタン」 押下	「許容値表示灯（赤）」が移動する。	ブザーが1 回鳴る。

※許容値の最適位置



●RUNモード

- 外部信号 (バンク切換入力) によるバンクの選択を行います。
 - RGBにて投光、計測を行います。計測レベル、及び許容値を許容値表示灯に表示し、結果のON/OFFを出力します。
 - ファンクションスイッチにて各種機能の設定が可能です。（「各種機能の設定」参照）
 - 外部同期入力機能可以使用です。（「外部同期入力機能」参照）
- ◆バンクの選択 (バンク切換入力)
バンク切換入力 1 (黄色)、2 (緑色) を用いて外部よりバンクの選択ができます。選択されたバンクはバンク表示灯に表示します。

□ NPN タイプ (E3MC-A11) 時

指定バンク	バンク切換入力1	バンク切換入力2
1	OPEN	OPEN
2	OV	OPEN
3	OPEN	OV
4	OV	OV

□ PNP タイプ (E3MC-A41) 時

指定バンク	バンク切換入力1	バンク切換入力2
1	OPEN	OPEN
2	Vcc	OPEN
3	OPEN	Vcc
4	Vcc	Vcc

■各種機能の設定

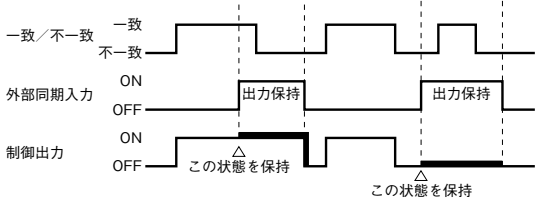
- ファンクションスイッチにて以下の設定が可能です。
ファンクションスイッチの設定はRUNモード、ADJUSTモードにて有効です。
- 色判別モード切換 (SW 1 C ↔ I)
C MODE : 色成分にて色判別を行います。ワークのパタツキが大きい場合に有効です。
I MODE : 受光量にて色判別を行います。C MODEに比べ微妙な色の判別が可能です。
- 応答時間切換 (SW 2 3ms ↔ 1ms)
3ms : 通常モードです。微妙な色を安定して検出できます。(応答時間 3ms以内)
1ms : 高速応答が必要な場合に使用してください。(応答時間 1ms以内)
- タイマ設定切換 (SW 3 — (OFF) ↔ TMR (ON))
— (OFF) : 通常モードです。(OFFディレイの設定なし)
TMR (ON) : 制御出力に対して、40msのOFFディレイタイマを設定します。
- 一致/不一致出力切換 (SW 4 = ↔ ≠)
= : 登録した色に一致した場合、出力ONします。
≠ : 登録した色に一致しなかった場合、出力ONします。

■外部同期入力機能

外部同期入力端子 (桃色) からの入力が、“OFF 状態”の時、計測結果を制御出力へ出力し、外部同期入力端子の入力が、“ON 状態”の時、制御出力は前の状態を保持します。外部同期入力は RUN モード、ADJUST モードにて有効です。

	NPN (E3MC-A11)	PNP (E3MC-A41)
外部同期入力ONの時	OVに接続	Vccに接続
外部同期入力OFFの時	OPENまたはVccに接続	OPENまたはOVに接続

〈色一致時ONの場合のタイムチャート〉

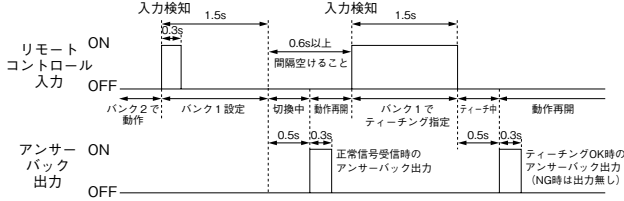


■リモートコントロール機能

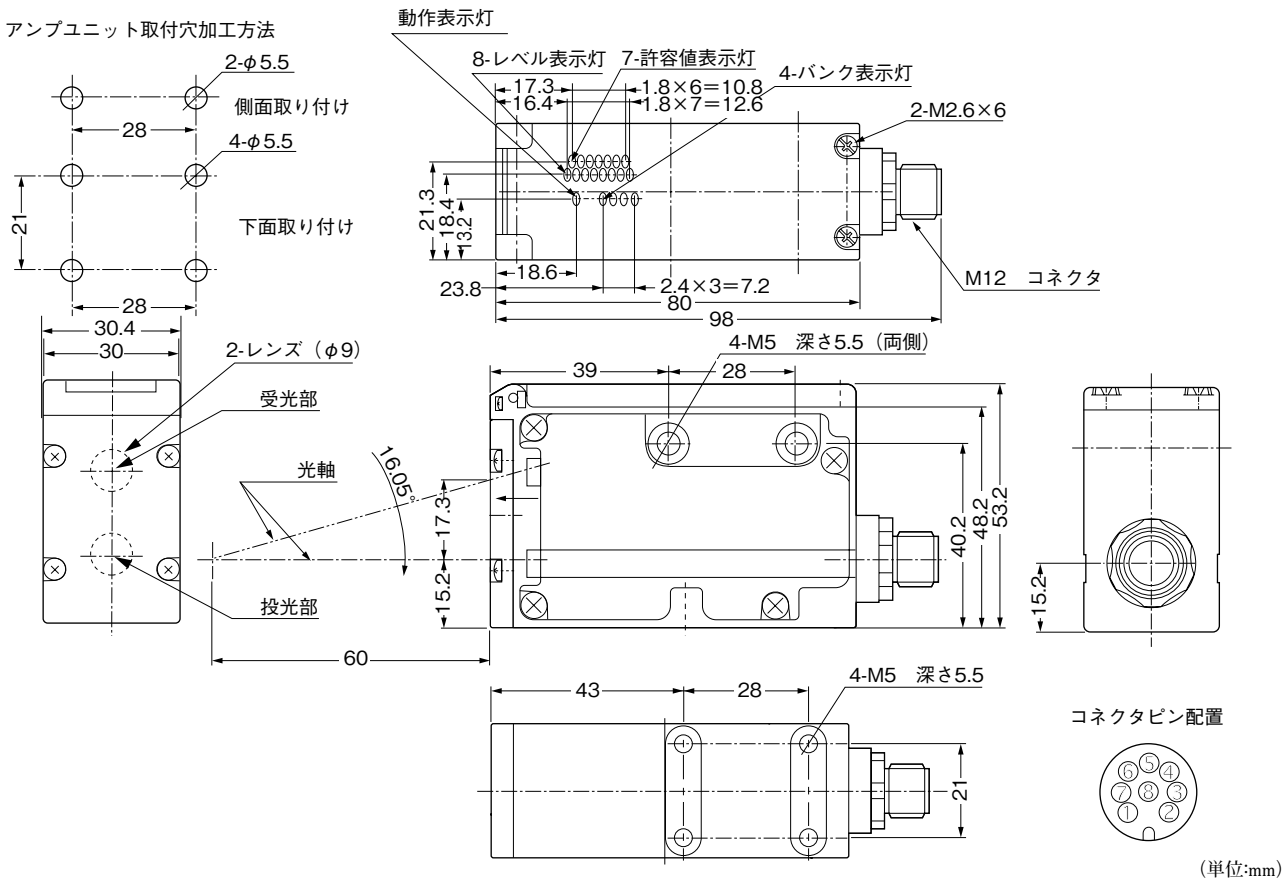
Bモード設定時に、ADJUST、RUNモードにて使用できます。リモートコントロール入力線に対して、以下の信号を入力することにより、E3MCのリモート操作が可能となります。（注：信号の各パルスの入力誤差は±100ms以内とし、連続で信号を送る場合、信号間は0.6s以上空けてください。）
正常に信号を受付けた場合のみ、アンサーバック出力が0.3s間出力されます。またティーチング信号のみ、メカスイッチなどの手入力でも操作可能です。

No.	E3MC-A	制御信号
1	バンク1を選択	ON 0.3s OFF
2	バンク2を選択	ON 0.6s OFF
3	バンク3を選択	ON 0.9s OFF
4	バンク4を選択	ON 1.2s OFF
5	選択バンクにティーチング	ON 1.5s OFF
6	許容値1を選択	ON 0.3s 0.3s 0.3s OFF
7	許容値2を選択	ON 0.3s 0.6s 0.3s OFF
8	許容値3を選択	ON 0.3s 0.9s 0.3s OFF
9	許容値4を選択	ON 0.3s 0.3s 0.6s OFF
10	許容値5を選択	ON 0.3s 0.6s 0.6s OFF
11	許容値6を選択	ON 0.3s 0.3s 0.9s OFF
12	許容値7を選択	ON 0.6s 0.3s 0.3s OFF

●タイミングチャート

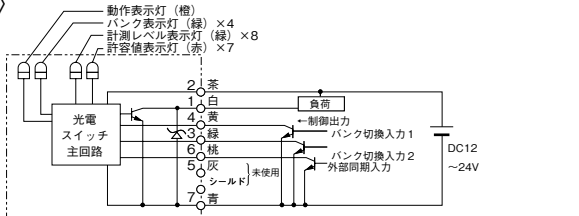


■外形寸法

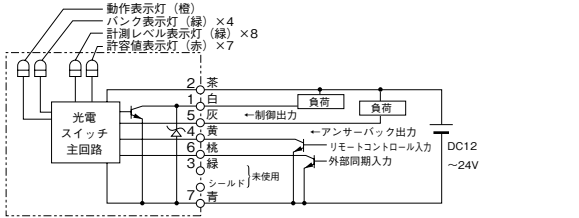


■出力段回路図

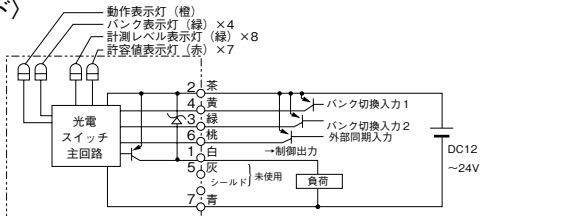
〈E3MC-A11 Aモード〉



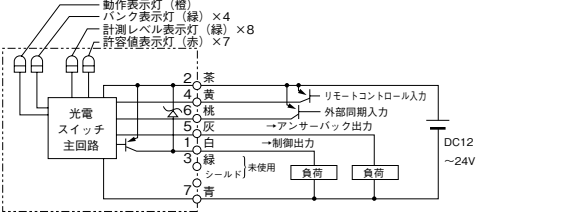
〈E3MC-A11 Bモード〉



〈E3MC-A41 Aモード〉



〈E3MC-A41 Bモード〉



ご使用に際してのご承諾事項

- 安全を確保する目的で直接的または間接的に人体を検出する用途に、本製品を使用しないでください。同用途には、当社センサカタログに掲載している安全センサをご使用ください。
- 下記用途に使用される場合、当社営業担当者までご相談のうえ仕様書などによりご確認いただくとともに、定格・性能に対し余裕を持った使い方や、万一故障があっても危険を最小にする安全回路などの安全対策を講じてください。
a) 屋外の用途、潜在的な化学的汚染あるいは電氣的妨害を被る用途またはカタログ、取扱説明書等に記載のない条件や環境での使用
b) 原子力制御設備、焼却設備、鉄道・航空・車両設備、医用機械、娯楽機械、安全装置、および行政機関や個別業界の規制に従う設備
c) 人命や財産に危険が及ぶうるシステム・機械・装置
d) ガス、水道、電気の供給システムや24時間連続運転システムなどの高い信頼性が必要な設備
e) その他、上記 a) ～ d) に準ずる、高度な安全性が必要とされる用途
* 上記は適合用途の条件の一部です。当社のベスト、総合カタログ・データシート等最新版のカタログ、マニュアルに記載の保証・免責事項の内容をよく読んでご使用ください。

オムロン株式会社 インダストリアルオートメーションビジネスカンパニー

●お問い合わせ先
カスタマサポートセンタ
フリーコール
携帯電話・PHSなどではご利用いただけませんので、その場合は下記電話番号へおかけください。
電話 055-982-5015 (通話料がかかります)
〔技術のお問い合わせ時間〕
■営業時間:8:00～21:00
■営業日:365日
■上記フリーコール以外のセンシング機器の技術窓口:
電話 055-982-5002 (通話料がかかります)
〔営業のお問い合わせ時間〕
■営業時間:9:00～12:00 / 13:00～17:30 (土・日・祝祭日は休業)
■営業日:土・日・祝祭日 / 春期・夏期・年末年始休暇を除く

●FAXによるお問い合わせは下記をご利用ください。
カスタマサポートセンタ お客様相談室 FAX 055-982-5051

●その他のお問い合わせ先
納期・価格・修理・サンプル・仕様書は貴社のお取引先、または貴社担当オムロン営業員にご相談ください。

© 2009年10月

OMRON

Model **E3MC-A**
LED Full-color 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 Europe B.V.
Wegalaan 67-69
2132 JD Hoofddorp,
The Netherlands
Manufacturer:
Omron Corporation,
Shiokoji Horikawa, Shimogyo-ku,
Kyoto 600-8530 JAPAN
Ayabe Factory
3-2 Narutani, Nakayama-cho,
Ayabe-shi, Kyoto 623-0105 JAPAN

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.



© OMRON Corporation 1997 All Rights Reserved.

(2/2)

PRECAUTIONS FOR SAFE USE

- (1) Do not use the Sensor in places with volatile liquids or inflammable gases.
- (2) If the Sensor or cable has lock mechanisms, be sure to lock the mechanisms securely before use.
- (3) Make sure that the actual load current does not exceed the rated load current.
- (4) The sensor may be damaged if the applied voltage exceeds the rated specification.

PRECAUTIONS FOR CORRECT USE

- (1) Do not use the Sensor in the following places.
 - Places with severe temperature changes.
 - Places with high humidity and where condensation may result.
 - Places with excessive vibration.
- (2) Wiring
 - Do not wire power lines or high-tension lines close to any line connected to the Sensor.
 - Make sure that the polarity of each terminal is correct.
- (3) Cleaning
 - Do not apply paint thinner to the Sensor.

■Precautions

1. Connections
Do not wire power lines or high-tension lines alongside lines of the Sensor in the same conduit, otherwise the Sensor may be damaged or malfunction due to induction. Be sure to wire the lines of the Sensor separately from power lines or high-tension lines or wire within an exclusive, shielded conduit.
2. Extension Cord
An extension cord can be used provided that the thickness and length of the wire are 0.3mm² min. and 100m max. respectively.
3. External Light Interference
Do not use the Sensor outdoors or in places where the Sensor is exposed to external light.
4. Power Supply
If a standard switching regulator is connected to the Sensor, be sure to ground the FG (frame ground) and G (ground) terminals of the switching regulator. The Sensor may malfunction due to switching noise that will be generated from the switching regulator if these terminals are not grounded.

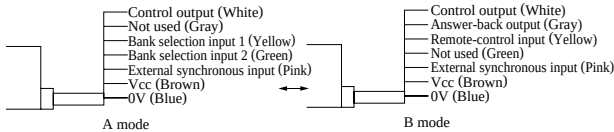
5. Water Resistance
Do not use the Sensor under the following conditions: Rain, underwater, or outdoors in general.
6. Operation Cover
Make sure to apply a screw tightening torque from 0.2 to 0.3N · m to mount the operation cover, otherwise the Sensor will not be water resistant.
7. Power On
The Sensor is ready to operate within 100ms after Sensor is turned on. If the Sensor and load are connected to separate power supplies, be sure to turn on the Sensor first. When using the Sensor for fine detection, warm-up the Sensor for approximately 15 minutes after the Sensor is turned on.
8. EEPROM Error
An EEPROM error may result if power supply to the Sensor fails or the Sensor is influenced by static noise. The operation and bank indicators will flash and the alarm will go off if there is an EEPROM error, in which case perform teaching and make tolerance level settings again.

■Ratings

Item	Model	E3MC-A□□
Light source	Red, green, and blue LEDs	
Sensing distance	60±10mm	
Spot size	12mm dia.	
Supply voltage	12 to 24 VDC±10% with 10%ripple (p-p) max.	
Current consumption	100mA max.	
Control output	E3MC-A11 : NPN open collector output E3MC-A41 : PNP open collector output Load current: 100mA max. (Residual voltage NPN output : 1.2V max, PNP output: 2.0V max.)	
Color discrimination mode	Mode C: RGB ratio detection (Standard mode) Mode I: RGB light quantity detection (selectable)	
Response time	Standard mode: 3ms max. High-speed mode: 1ms max. (selectable)	
Timer function	40ms OFF-delay timer (selectable)	
Output type	Conformity output: Output is ON when the detected color coincides with the teaching color. Non-conformity output: Output is ON when the detected color does not coincide with the teaching color. (selectable)	
External synchronous input	E3MC-A11 ON: 0 to 1V (short-circuit current: 1mA max.) OFF: Open or 5V to Vcc E3MC-A41 ON: 9V to Vcc(Vcc short-circuit current: 1.5mA max.) OFF: Open or 0 to 1V	
Bank selection	4 banks selectable with external input	
Remote-control function	B mode only	
Answer-back output (B mode only)	E3MC-A11 : NPN open collector output E3MC-A41 : PNP open collector output Load current: 100mA max. (Residual voltage NPN output : 1.2V max, PNP output: 2.0V max.)	
Indicator	Operation indicator: Orange LED Bank indicator: Green LED Tolerance level indicator: Red bar LED Detection level indicator: Green bar LED	
Protection circuit	Protection from reversed power supply connection and output short-circuit	
Ambient temperature	Operating: -20 to 55°C (without icing)	
Enclosure rating	IEC60529 IP66 (with protection cover attached)	
Casing material	Casing: Aluminum Cover: PES LENS:PMMA	

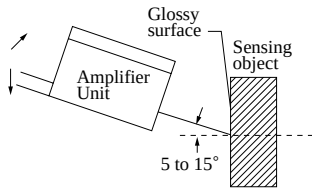
■Operation Procedure

1. Mount the Amplifier. (Refer to “Mounting Method” .)
2. Turn on the Sensor.
Normal mode (A mode) and external input/output mode (B mode) can be selected by supplying power to the sensor, as pressing the Select down button and TEACH button simultaneously. While changing mode or in the TEACH mode, the operation indicator tells in which mode the sensor is. (While changing mode, the indicator is ON only 3 seconds.)
A mode : the operation indicator OFF
B mode : the operation indicator ON
3. Make color and tolerance level settings. (Refer to “Settings” .) Make function settings with the function switch according to the operating condition. (Refer to “Function Settings” .)
4. Check that the mode selector is set to RUN, although the Sensor can be in stable operation even if the mode selector is set to ADJUST. If the Sensor is in ADJUST mode, however, The tolerance level might be changed by mistake while the Sensor is in operation.
External synchronous input is available if the Sensor is in RUN or ADJUST mode. (Refer to “External Synchronous Input” .)



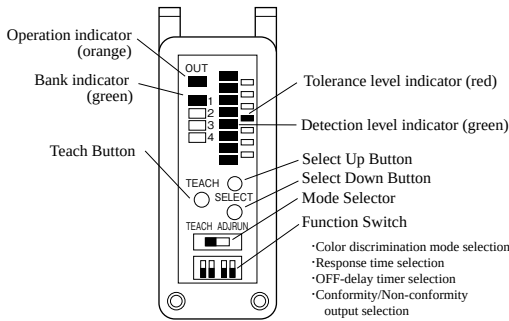
■Mounting Method

1. Mounting Amplifier
The casing can be attached to the Amplifier, in which case make sure not to apply a screw tightening torque exceeding 2.3 N · m to the casing or Amplifier.
2. Mounting Angle
If the Sensor does not detect metal or glossy objects accurately, change the mounting angle as shown in the following illustration. Then the Sensor will be in stable operation.



■Settings

●Nomenclature



●Function Switch

Refer to “Function Settings for details” .

	1	2	3	4
A	C	3ms	[TMR-OFF]	[conformity output]
B	I	1ms	TMR [TMR-ON]	[Non-conformity]

●Mode Setting Procedure

Make the following mode settings before using the Sensor.

Mode	Setting	Operation
TEACH mode Teach Adj Run	Bank Selection Press the Select Button to select the bank.	
TEACH mode Teach Adj Run	Sample color registration Press the Teach Button to register the color to be detected.	
ADJUST mode Teach Adj Run	Tolerance adjustment (*1) Press the Select Button and set the tolerance level while monitoring the tolerance level indicator.	
RUN mode Teach Adj Run	Detection Set the mode selector to RUN so that the Sensor will be in detection operation. The bank used for detection is specified with bank selection input.	

- (*1) Teaching automatically sets the tolerance level of the Sensor. The tolerance level is a range in which all detection colors are deemed to be identical to the sample color that has been registered. If the Sensor is not in stable detection operation, adjust the tolerance level of the Sensor in ADJUST mode. Refer to “Tolerance Adjustment” for details.

The specified bank of the Sensor in ADJUST mode will be the one specified with the Sensor in the previous mode.

●TEACH Mode

1. Select the bank
2. Register the color to be detected.

◆Bank Selection

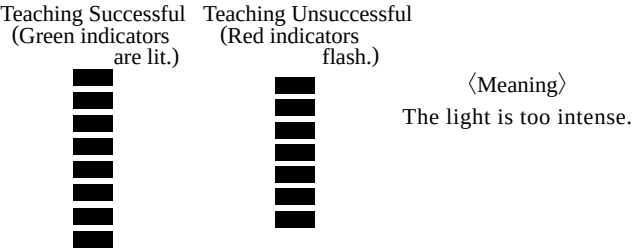
Use the Select Button to select the bank where the color to be detected is registered.

Operation	Indicator	Alarm
Press the Select Button.	The bank indicator of the selected bank is lit.	The alarm goes off once.

◆Sample Color Registration

Locate a sample object at the detection position and press the Teach Button, at which time the level indicator will indicate whether the teaching operation is successful or not. The tolerance level will be initialized at the time of sample color registration.

Operation	Indicator	Alarm
Press the Button. (teaching is successful)	The green detection level indicator is lit if teaching is successful.	The alarm goes off once when the Button is pressed.
Press the Button. (teaching is unsuccessful)	The tolerance level indicator (red) flashes. The indicator continue flashing until mode selection input, teaching input, and select Button input are ON.	The alarm goes off once when the Button is pressed and three times in synchronization with the tolerance level indicator flashing.



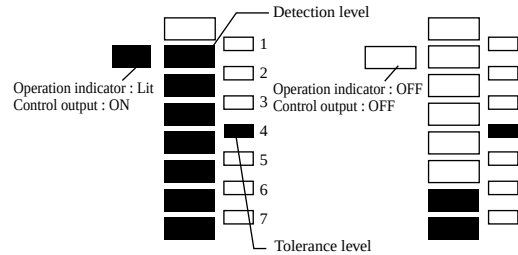
●ADJUST Mode

1. The following are possible with the Sensor in ADJUST mode.
The tolerance level can be set.
2. The Sensor performs object detection with red, green, and blue light, indicates the detection and tolerance levels with the level indicator, and has ON or OFF output as a result.
3. The Sensor allows a variety of function settings with the function switch. Refer to “Function Settings” .
4. External synchronous input is available to the Sensor in this mode. Refer to "External Synchronous Input".

◆Tolerance Adjustment

Refer to the following to fine-tune the tolerance level in seven ranges. The tolerance level can be fine-tuned while the Sensor is in detection operation and has control output (i.e., the tolerance level can be adjusted without interrupting the detection operation of the Sensor).

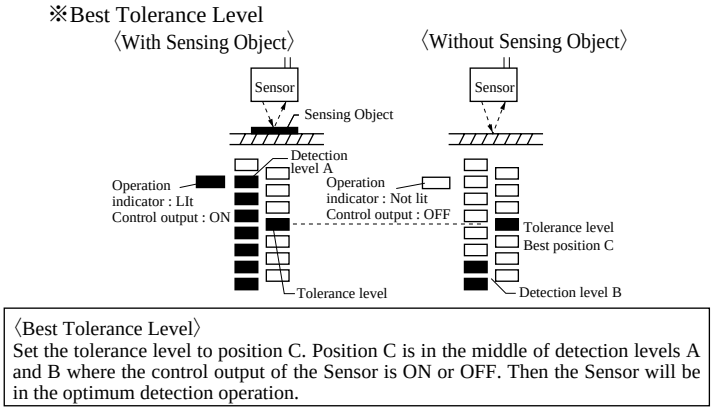
1. The detection level is indicated by the detection level indicator (green) and the tolerance level is indicated by the tolerance level indicator (red).



〈Detection Level and Tolerance Level〉
The closer the detectable color to the teaching color is, the more the number of lit LEDs of the detection level indicator is. The control output of the Sensor will be ON if the detection level exceeds the tolerance level and OFF if the detection level does not exceed the tolerance level. The settings shown in the above illustrations are used to obtain conformity output.

2. Change the tolerance level with the Select Button while monitoring the tolerance level indicator, and set the tolerance level to the best level.

Operation	Indicator	Alarm
Press the Select Button.	The tolerance level indicator (red) changes.	The alarm goes off once.



●RUN Mode

- The following are possible with the Sensor in Run mode.
The Sensor allows bank selection with external bank selection input.
- The Sensor performs object detection with red, green, and blue light, indicates the detection and tolerance levels with the level indicator, and has ON or OFF output as a result.
- The Sensor allows a variety of function settings with the function switch. Refer to “Function Settings”.
- External synchronous input is available to the Sensor in this mode. Refer to “External Synchronous Input”.

◆Bank Selection Input

Remote bank selection is possible with bank selection input 1 for yellow or 2 for green. The bank indicator will indicate the bank that has been selected.

□NPN (E3MC-A11)			□PNP (E3MC-A41)		
Specified bank	Bank Selection input 1	Bank Selection input 2	Specified bank	Bank Selection input 1	Bank Selection input 2
1	OPEN	OPEN	1	OPEN	OPEN
2	0V	OPEN	2	Vcc	OPEN
3	OPEN	0V	3	OPEN	Vcc
4	0V	0V	4	Vcc	Vcc

■Function Settings

The following settings are possible with the function switch if the Sensor is in RUN or ADJUST mode.

□Color Discrimination (Pin 1 Set to C or I)

C mode : Color discrimination is performed according to the tint even if the sensing distance is fluctuated.

I mode : Color discrimination is performed according to the received light quantity of R.G.B. This mode assures more delicate color discrimination than the C mode.

□Response Time (Pin 2 Set to 3 or 1ms)

3ms : The Sensor will be in stable operation to detect objects with subtle differences in color with a response time of 3ms maximum. Set pin 2 to 3ms for the Sensor in standard operation.

1ms : The Sensor will be in operation with a response time of 1ms max. Set pin 2 to 1ms if a high-speed response is required.

□Timer (Pin3 : Set to [TMR-OFF] or TMR[TMR-ON])

[TMR-OFF] : No OFF-delay time is set. Set pin 3 to [TMR-OFF] for the Sensor in usual operation.

TMR[TMR-ON] : A 40ms OFF-delay timer is set for control output.

□Conformity/Non-conformity Output (Pin 4 : Set to = or ≠)

=:Output is ON if the detectable color is in conformity with the registered color.

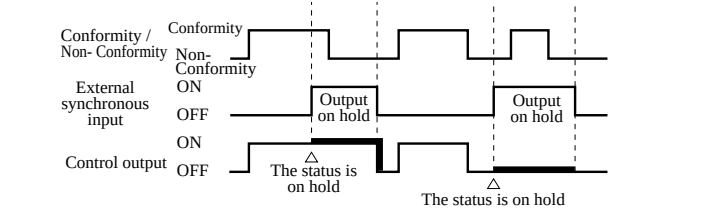
≠:Output is ON if the detectable color is not in conformity with the registered color.

■External Synchronous Input

The Sensor will have control output as a detection result if there is no input to the external synchronous input terminal (pink). The Sensor's control output will hold the previous status if there is an input signal to the external synchronous input terminal. External synchronous input is available to the Sensor in RUN or ADJUST mode.

	NPN (E3MC-A11)	PNP (E3MC-A41)
ON (Status on hold)	0V	Vcc
OFF (Result output)	OPEN or Vcc	OPEN or 0V

〈In case of Conformity output〉



■Remote control function

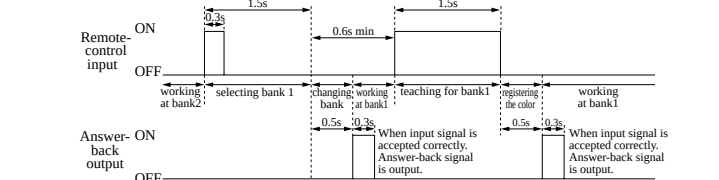
Remote control function is available with ADJUST mode or RUN mode in B mode. It is possible to operate the sensor by inputting the following signals to Remote control input cable. (Note : Tolerance of signal time is within $\pm 100\text{ms}$. When inputting some signals continuously, there must be not less than 0.6 seconds between signals.)

Only when the sensor accepts correct signal, answer-back signal is output for 0.3 seconds to answer-back output cable.

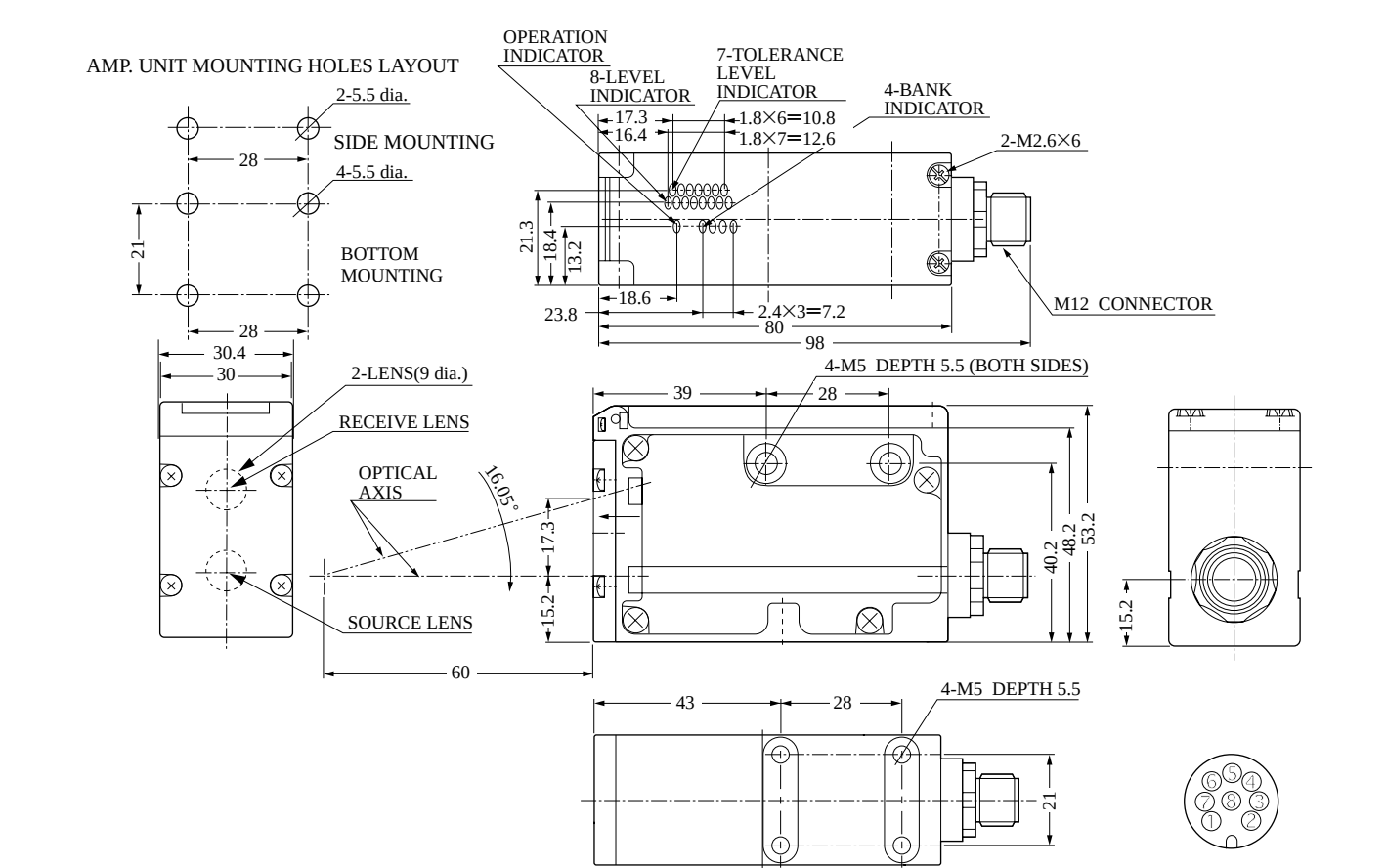
Only for the teaching function, signal input can be made by a mechanical switch.

No.	E3MC-A	Control Signal
1	Bank 1	ON OFF
2	Bank 2	ON OFF
3	Bank 3	ON OFF
4	Bank 4	ON OFF
5	Teaching	ON OFF
6	Tolerance 1	ON OFF
7	Tolerance 2	ON OFF
8	Tolerance 3	ON OFF
9	Tolerance 4	ON OFF
10	Tolerance 5	ON OFF
11	Tolerance 6	ON OFF
12	Tolerance 7	ON OFF

●Timing Chart



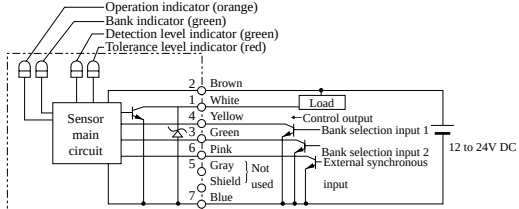
■Dimensions



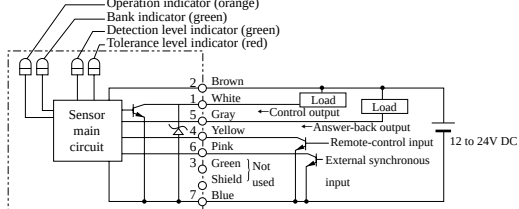
(Unit: mm)

■Output Circuit Diagram

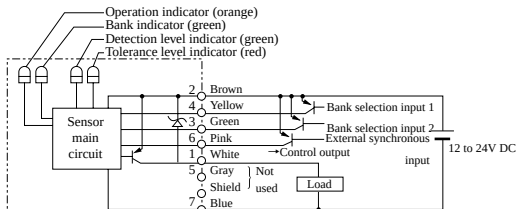
〈E3MC-A11 A mode〉



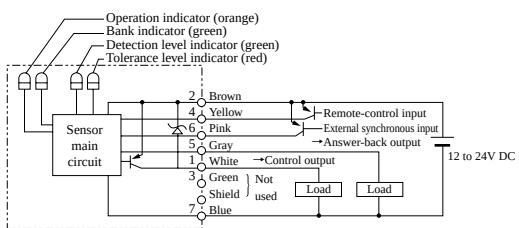
〈E3MC-A11 B mode〉



〈E3MC-A41 A mode〉



〈E3MC-A41 B mode〉



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.

- EUROPE
OMRON EUROPE B.V. Sensor Business Unit
Carl-Benz Str.4, D-71154 Nufringen Germany
Phone:49-7032-811-0 Fax: 49-7032-811-199
- NORTH AMERICA
OMRON ELECTRONICS LLC
One Commerce Drive Schaumburg,IL 60173-5302 U.S.A.
Phone:1-847-843-7900 Fax : 1-847-843-7787
- ASIA-PACIFIC
OMRON ASIA PACIFIC PTE. LTD.
No. 438A Alexandra Road #05-05-08(Lobby 2),
Alexandra Technopark, Singapore 119967
Phone : 65-6835-3011 Fax : 65-6835-2711
- CHINA
OMRON(CHINA) CO., LTD.
Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Phone : 86-21-5037-2222 Fax :86-21-5037-2200

OMRON Corporation

© OCT, 2009