

U-shaped Micro-photosensor

PM-□25 / PM-□45 series

When Using for Safety Applications

(MEMO)

Thank you for purchasing a **PM-□25 / PM-□45** series U-shaped Micro photosensor with built-in amp.

Read this document carefully and thoroughly for the correct and optimum use of this product. Keep this document in a convenient place for quick reference.

This document contains “When Using for Safety Applications” related to the **PM-□25 / PM-□45** series when used as part of a safety system. Before using this device, be sure to read this document in addition to the documentation included with other devices used in the safety system.

This document is for the following persons who have received appropriate training and have knowledge of safety and photoelectric safety sensors.

- Those who are in charge of introduction of this device.
- Those who incorporate this device into systems or design them.
- Those who install and / or connect this device.
- Those who manage or perform operations at sites where this device is used.

Notes

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| <ol style="list-style-type: none">1) The contents of this document are subject to change without notice for future improvement.2) Every effort is made to produce this document. If you find any question, error, incorrect collating and / or missing page, please do not hesitate to contact our nearest local office to you: Panasonic Industry.3) This document (Japanese and English) is an original publication. |
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Contents

Chapter 1 Introduction	1-5
1.1 Safety Precautions Always observe	1-6
1.2 Handling Precautions	1-6
Chapter 2 Standards and Regulations	2-1
2.1 Standards and Regulatory Compliance	2-2
2.2 Safety Functions	2-2
2.3 Parameters related to safety (Parameters described in ISO13849-1) ..	2-2
2.4 Cautions when using in a ISO13849-1 Category 3 PLd system	2-4
Chapter 3 Maintenance	3-1
3.1 Daily Inspection	3-2
3.2 Regular (Bi-annual) Inspection	3-2
3.3 Inspection upon product replacement / installation	3-2
Chapter 4 Troubleshooting	4-1
4.1 Troubleshooting	4-2

Chapter 1 Introduction

1.1 Safety Precautions Always observe	1-6
1.2 Handling Precautions	1-6

1.1 Safety Precautions Always observe

The PM-□25 / PM-□45 conforms to the international standard ISO 13849-1 (Category 1, PLc) and can be used as a detection device to indirectly protect the human body.

This manual explains important rules that must be observed to prevent personal injury and property damage.

- **The hazards that may occur if the product is used incorrectly are described and classified by level of harm.**

 **WARNING Risk of death or serious injury.**

WARNING

- Do not use this product for an application where it directly detects the human body. Otherwise, there is a risk of death or serious injury.
- When the human body needs to be detected for safety application, use products that conform to the laws and standards related to human body detection for safety application in each country, such as OSHA, ANSI, and IEC.

1.2 Handling Precautions

- **In this manual, the following symbols are used to indicate safety information that must be observed.**



Indicates an action that must be taken.

Specifications

- Before using this device, be sure to confirm the standards / regulations applied in the relevant nation and region.
- Since parts or all of a human body may not be detected, use this product solely for indirect protection methods only.
- Objects within the deadband region or outside of the detection area, and transparent objects cannot be detected.

Usage environment

- Since the sensor is intended for use inside machines, no special countermeasures have been taken against extraneous light. Please take care that extraneous light is not directly incident on the beam receiving section.

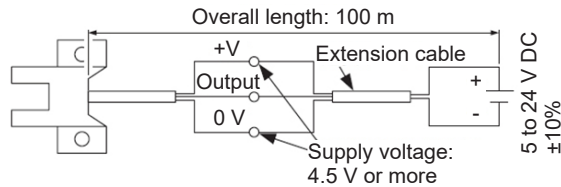
Power supply

- Be sure to use a SELV (Safety Extra Low Voltage) or a PELV (Protected Extra Low Voltage) power supply unit with this device.

Wiring

- All electrical wiring should conform to the regional electrical regulations and laws. The wiring should be done by engineer(s) having the special electrical knowledge.
- Power supply and output wires for connecting to this device should be 0.3 mm² or greater with a total length of less than 30 m.

- Cables that are 0.3 mm² or greater can be used for a length of up to 30 m, but since voltage will drop as the cable gets longer, ensure that the power supply voltage at the end of the sensor's included cable and at the terminal is within the rating.



- If there is a large surge generating equipment, such as, motor, solenoid, electromagnetic valve, etc., in the vicinity of the micro-photosensor, use a surge absorber on that equipment. Further, do not run the sensor cables along power lines and use a capacitor between +V and 0 V. Use the sensor after confirming that the surge has been eliminated.
- Do not use during the initial transient time (50 ms) after the power supply is switched on.

Operation

- In case this device does not perform properly, the operator should report this to the person in charge and stop the machine operation immediately. The machine must not be operated until correct performance of this device has been confirmed.

Maintenance and Inspection

- If the sensor is used in a place having excessive dust, periodically clean the emitting and receiving sections with a dry, soft cloth.

Other precautions

- This product has been developed / produced for industrial use only. This product must be disposed of using environmentally-friendly methods in accordance with applicable disposal and processing regulations of the country it is used in.

(MEMO)

Chapter 2 Regulations and Standards

- 2.1 Standards and Regulatory Compliance 2-2
- 2.2 Safety Functions 2-2
- 2.3 Parameters related to safety (Parameters described in ISO13849-1) ... 2-2
- 2.4 Cautions when using in a ISO13849-1 Category 3 PLd system 2-4

2.1 Regulations and Standards

This product complies with the following standards and regulations.

<Conformity Directives / Conforming Regulations>

EU Law: EMC Directive 2014/30/EU

British Legislation: EMC Regulations 2016/1091

<Applicable Standards>

EN IEC 60947-5-2

<International Standards>

ISO 13849-1: 2015(Category 1, PLc)

2.2 Safety Functions

This product has semiconductor output. Confirm the following before use.

- During detection (When using Dark-ON) : OUT1/OFF & OUT2/ON
- During non-detection (When using Light-ON) : OUT1/ON & OUT2/OFF

2.3 Parameters related to safety (Parameters described in ISO13849-1)

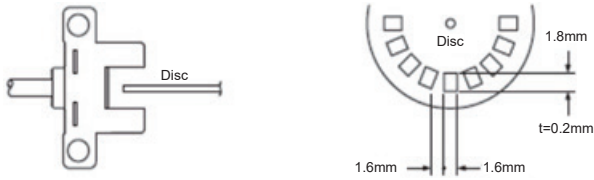
- Safety side: During detection (When using Dark-ON)

Name	NPN output type		PNP output type	
	OUT1	OUT2	OUT1	OUT2
Safety side: Output status	OFF	ON	OFF	ON
MTTFd	100 years			
DCavg	0			
CCF	75			
T1 (Proof Test Interval)	20 years			
Operating altitude	2,000 m or lower			
Response time	Under light received condition: 20 μ s or less Under light interrupted condition: 80 μ s or less (Maximum response frequency: 3 kHz) (Note 1)			
Ambient temperature (Note 2,3)	-25 to +55 °C (No dew condensation or icing allowed), Storage: -30 to +80 °C			

- Safety side: During non-detection (When using Light-ON)

Name	NPN output type		PNP output type	
	OUT1	OUT2	OUT1	OUT2
Safety side: Output status	ON	OFF	ON	OFF
MTTFd	100 years			
DCavg	0			
CCF	75			
T1 (Proof Test Interval)	20 years			
Operating altitude	2,000 m or lower			
Response time	Under light received condition: 20 μ s or less Under light interrupted condition: 80 μ s or less (Maximum response frequency: 3 kHz) (Note 1)			
Ambient temperature (Note 2,3)	-25 to +55 °C (No dew condensation or icing allowed), Storage: -30 to +80 °C			

Notes: 1) The response frequency is the value when the disc, given in the figure below, is rotated.



Notes: 2) In case the PM-25 series is used at an ambient temperature of $+50\text{ }^{\circ}\text{C}$, or more, make sure to mount it on a metal body.

Notes: 3) Note that the cable of PM-□25-R loses its flexibility when the ambient temperature decreases to about $-10\text{ }^{\circ}\text{C}$.

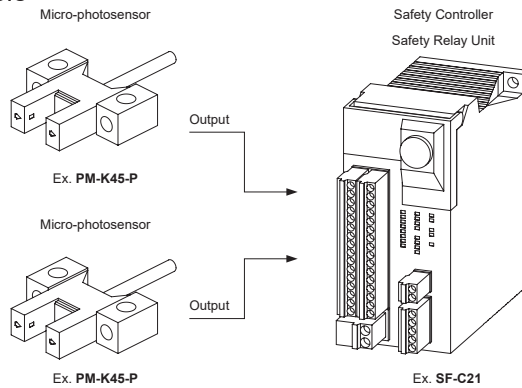
2.4 Cautions when using in a ISO13849-1 Category 3 PLd system

This product has been certified for use together with a Category 4 PLe safety controller / safety relay unit, which means it fulfills the requirements of Category 3 PLd. When using in this way, be sure to use two sensors in a sensor redundancy configuration.

To prevent loss of safety functionality due to accumulation of faults, build a control system with two redundant outputs which will stop the whole system when a discrepancy of output is detected.

Furthermore, before use, confirm that the calculated results of MTTFd and DCavg fulfill the requirements for Category 3, PLd.

■ Connection Example



⚠ WARNING

Do not use the two outputs of a single device as the two outputs for a redundant safety system. When using this product alone, the safety system it is used in may stop functioning if there is a sensor fault.

Chapter 3 Maintenance

3.1 Daily Inspection	3-2
3.2 Regular (Bi-annual) Inspection	3-2
3.3 Inspection upon product replacement / installation	3-2

3.1 Daily Inspection

WARNING

Before starting work, the worker should inspect the following items and verify that there are no abnormalities. Operating this device without performing the inspection or without removing the abnormal condition may cause death or serious injury.

Checklist (daily inspection)

Check column	Inspection item
<input type="checkbox"/>	The output of this product should operate correctly as follows. (When using Light-ON) Output is ON when light is detected, and OFF when dark is detected. (When using Dark-ON) Output is OFF when light is detected, and ON when dark is detected.
<input type="checkbox"/>	No objects are added that create ambient or reflected light
<input type="checkbox"/>	No damage to safety fences or protective structures

3.2 Regular (Bi-annual) Inspection

WARNING

Inspect the following items every 6 months and verify that there are no abnormalities. Operating this device without performing the inspection or without removing the abnormal condition may cause death or serious injury.

Checklist (periodic inspection)

Check column	Inspection item
<input type="checkbox"/>	The structure of the machine does not prevent any safety mechanisms from causing the machine to stop or to make an emergency stop.
<input type="checkbox"/>	No modification has been made in the machine control system that obstructs the safety mechanisms.
<input type="checkbox"/>	Wiring from this device has been performed correctly.
<input type="checkbox"/>	No screws or connectors related to the device are loose.
<input type="checkbox"/>	The current number of operation cycles (time) of parts (such as relays) with a limited service life is less than the number of service life cycles (time).

3.3 Inspection upon product replacement / installation

WARNING

Before starting work, the worker should inspect the following items and verify that there are no abnormalities. Operating this device without performing the inspection or without removing the abnormal condition may cause death or serious injury.

Inspection list (inspection upon product replacement / installation)

Check column	Inspection item
<input type="checkbox"/>	Output from the device can be detected correctly
<input type="checkbox"/>	Wiring from this device has been performed correctly.
<input type="checkbox"/>	No screws or connectors related to the device are loose.

Chapter 4 Troubleshooting

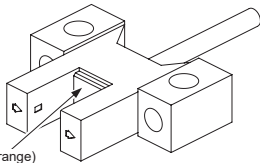
4.1 Troubleshooting	4-2
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4.1 Troubleshooting

Solutions to frequently encountered problems and errors are described below.

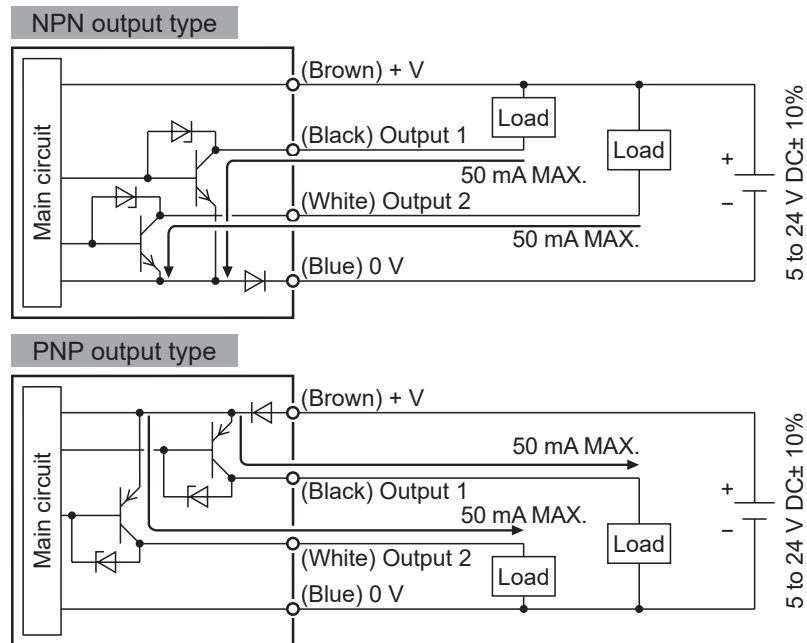
Symptom	Cause	Solution
Operation indicator (Note 1) is OFF.	Power is not supplied.	Check the supplied voltage of the power supply.
	There is a mistake in the wiring.	Check the wiring. (Note 2)
	Light is not being emitted.	The emitting element or circuit is damaged. In such a case, replace this product.
The output does not turn ON.	Something is wrong with the output circuit.	The output circuit is damaged. In such a case, replace this product.

(Note 1) Position of operation indicator



Operation indicator (Orange)

(Note 2) I/O circuit diagram



- Ensure to insulate the unused output wire.

Revision history	Revision date	Revision item
1st edition	December 2021	—
2nd edition	November 2023	Addition of note regarding UKCA
3rd edition	April 2024	Company name change

Panasonic Industry Co., Ltd.

1006, Oaza Kadoma, Kadoma-shi, Osaka 571-8506, Japan
<https://industry.panasonic.com/>

Please visit our website for inquiries and about our sales network.

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