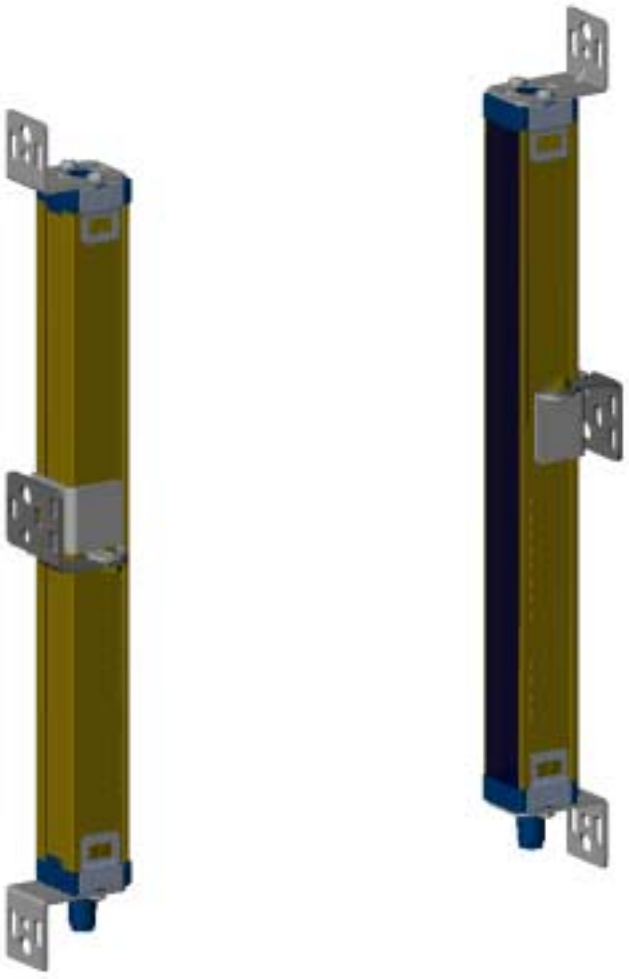
29. May 2001 No. ST2-015031A

Function Description

OMRON

Safety Light Curtain

F3SN



F3SN
Function Description

Index

1. Functions

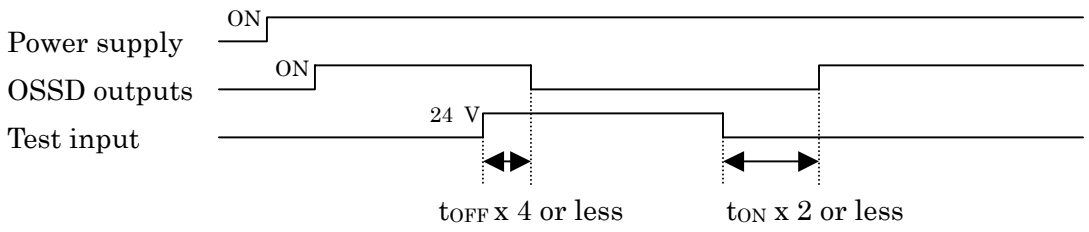
1.1. External test function

This function stops light emission of an emitter. It is available for checking if the F3SN can show the correct OSSD (Output Signal Switching Device) outputs state, and so on.

[Directions for use]

Applying a voltage of 24VDC (for PNP type) or 0 V (for NPN type) to the test input line of an emitter makes the emitter stop emitting.

Time chart (for PNP type in stable light reception state)



t_{OFF}: ON → OFF response time of OSSD outputs
t_{ON}: OFF → ON response time of OSSD outputs

1.2. Interlock function

1.2.1. Manual reset mode / Auto reset mode

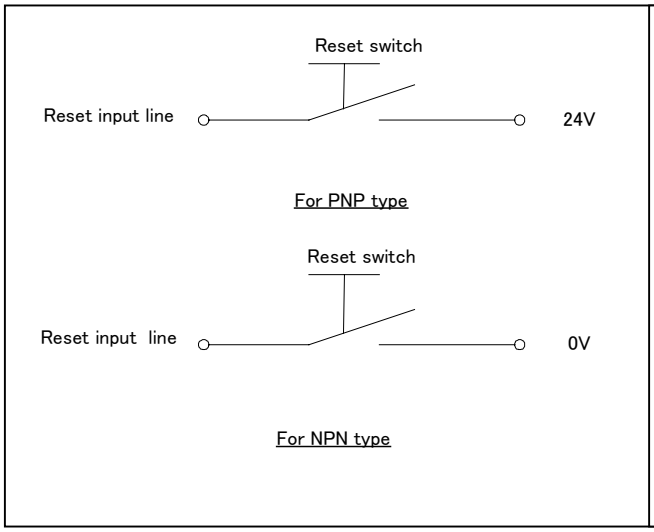
The manual reset mode activates the interlock function, and the auto reset mode inactivates it. These modes are wire selectable features of the F3SN.

When the F3SN is set as "Start interlock valid" and/or "Restart interlock valid" and the wiring corresponds to "Manual reset mode", the interlock function(s) are available. For the factory setting, both the start interlock and the restart interlock are set valid.

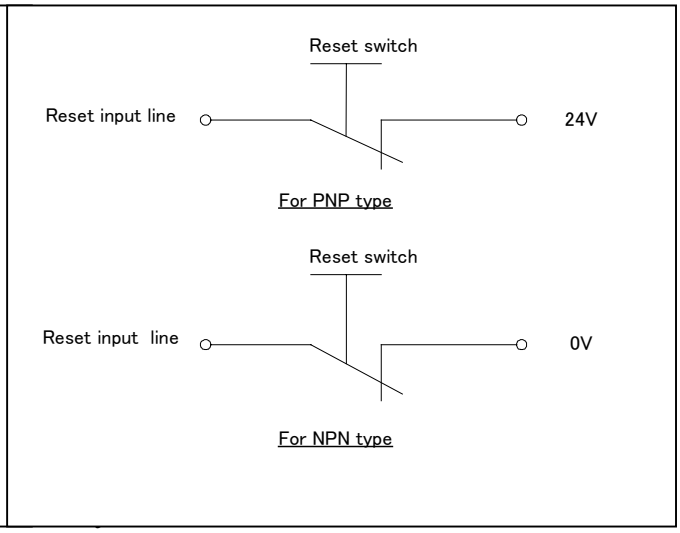
[Direction for wiring]

	Interlock selection input line	Reset input line
Manual reset mode	24 V (PNP) 0 V (NPN)	A push button (NO contact) which connects with 24V (PNP) or 0V (NPN). (Refer to the following diagram)
Auto reset mode	0 V (PNP) 24 V (NPN)	(1) When the lock-out reset is used, → A push button (NC contact) which connects with 24V (PNP) or 0V (NPN). (Refer to the following diagram) (2) When the lock-out reset is not used, → 24 V (PNP) or 0 V (NPN).

[Wiring example for Manual reset mode]



[Wiring example for Auto reset mode with lock-out reset]



lock-out condition (LED_A of the emitter blinks).

1.2.2. Start interlock

This function keeps OSSD outputs in the OFF-state, which means interlock condition, after power ON. Resetting during no interruption in the detection zone can release the interlock condition.

[Direction for use]

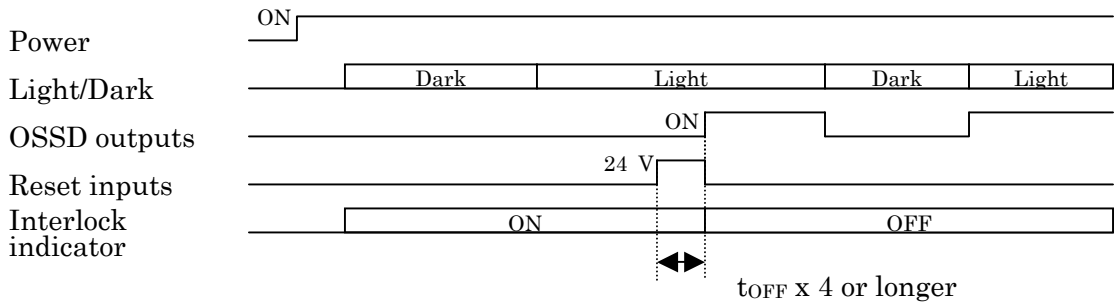
Activation of the interlock function needs the wiring of "Manual reset mode" for the interlock selection input line and the reset input line (Refer to 1.2.1).

It is possible to release the interlock by applying 24 V (for PNP type) or 0V (for NPN type) to the reset input and by making the line open subsequently.

[Application]

When you supply a machine with power at the start of work and you want to keep stopping it until the daily inspection is completed, this function is available.

Timing chart of the start interlock (PNP type)



- Restart interlock is assumed invalid.
- t_{OFF} : ON → OFF response time of the OSSD outputs

1.2.3. Restart interlock

This function keeps OSSD outputs in the OFF-state, which means interlock condition, after a beam is interrupted. Resetting during no interruption in the detection zone can release the interlock condition.

[Direction for use]

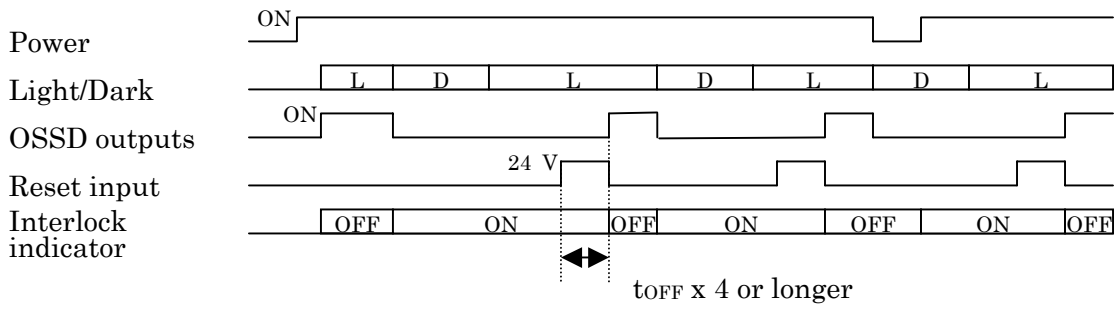
Activation of the interlock function needs the wiring of "Manual reset mode" for the interlock selection input line and the reset input line (Refer to 1.2.1).

It is possible to release the interlock by applying 24 V (for PNP type) or 0V (for NPN type) to the reset input line and by making the line open subsequently.

[Application]

When you want to keep stopping a machine until you confirm its safety and get ready to re-start it every time a beam is interrupted, this function is available.

Timing chart of the restart interlock (PNP type)



- Start interlock is assumed invalid.
- t_{OFF} : ON → OFF response time of the OSSD outputs

1.3. Blanking function

1.3.1. Fixed blanking

Fixed blanking function partly voids detection zone of a light curtain. Entrance of an object into the invalid detection zone does not change output status. When the fixed blanking function is valid, the blanking indicator is lit on a receiver.

[Direction for setting]

1) This function is set with the F39-MC11 setting console.
2) The fixed blanking function is made valid.
3) The blanked beams are selected.
   (There are two methods of the selection, teaching and manual.)

Note 1: When a blanked beam gets in the light reception state, the blanking function stops not only for the light reception beam but also for all beams automatically. After the power is restored, the fixed blanking function gets available with the previous setting.

Note 2: There is no limit for the number of fixed blanked beams.

Note 3: The fixed blanking function is set invalid when the F3SN is shipped.

Note 4: Series connection

The validity of the fixed blanking depends on the setting of the 1CH sensor, which is the closest to power supply. Regarding the selection of the blanked beams, the setting is applied to each channel sensor.

Therefore, when you want to select blanked beams only on 2CH sensor and 3CH sensor, please set as follows:

- 1CH sensor: Fixed blanking function = "Valid", and Blanked beam is not selected.
- 2CH, 3CH sensor Fixed blanking function = "Valid", and Blanked beam are selected.

Note 5: When the fixed blanking function is valid, the "Outermost beam monitoring mode" of the auxiliary output is not available.

1.3.2. Floating blanking

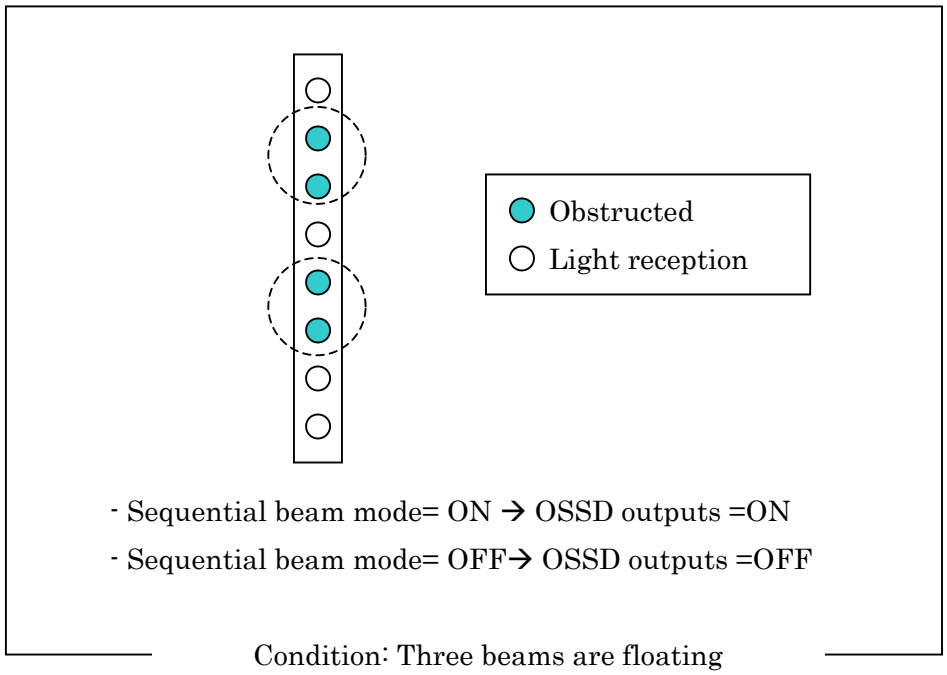
When more beams are interrupted than the specified number, the OSSD outputs go to the OFF-state. For example, if two beams are specified, the interruption of three or more beams is necessary to make OSSD outputs go to OFF-state. Up to three beams can be specified as floating. This function is used when there is a moving object in the detection zone that needs to be ignored. When the floating blanking function is valid, the blanking indicator is lit on a receiver.

There are two modes in the floating blanking function.

(1) Sequential beam mode

The mode ON: When the number of consecutive obstructed beams exceeds the specified number of floating beams, the OSSD outputs go to the OFF-state. It means that the object size in the detection zone must be large enough to obstruct the floating beams completely at the same time to make the OSSD outputs OFF. Even if there exist plural smaller objects in the detection zone, the OSSD outputs keeps in ON-state.

The mode OFF: When the total number of obstructed beams, which may not be consecutive, exceeds the specified number of floating beams, the OSSD outputs go to the OFF-state.

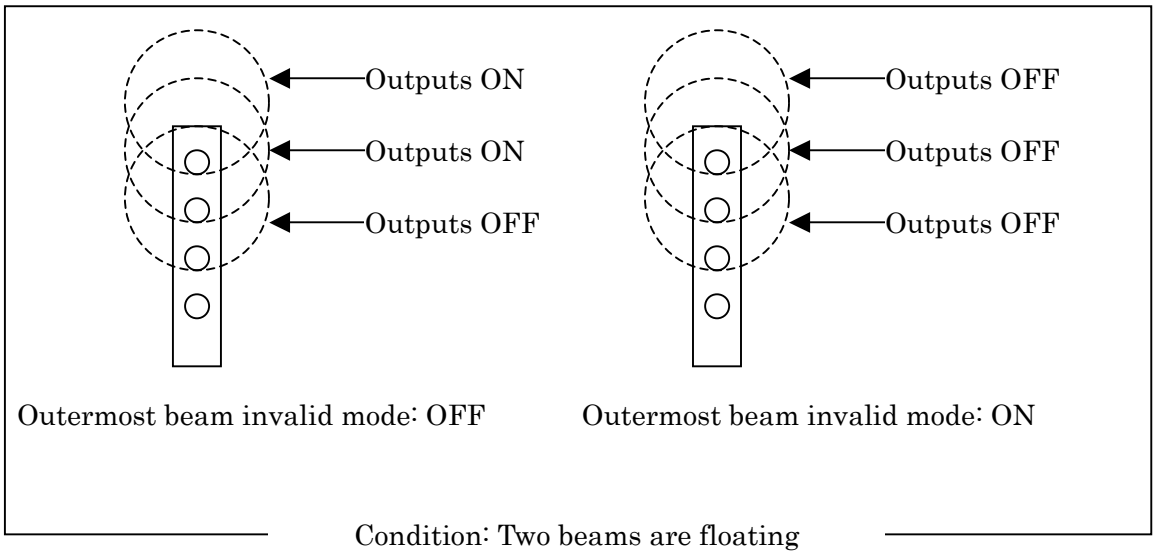


Condition: Three beams are floating

The sequential beam mode should be set ON when the ignored moving object is only one, and the mode should be set OFF when the objects are more than one, we recommend.

(2) Outermost beam invalid mode

The mode ON: The outermost beams are excluded from the floating blanking function. It means that interrupting either of outermost beams surely makes the OSSD outputs go to the OFF-state.



[Direction for setting]

1) This function is set with the F39-MC11 setting console.
2) The floating blanking function is made valid.
3) The number of floating beams is set as 1 to 3 or Clear.
4) The sequential beam mode is set as ON or OFF.
5) The outermost beam invalid mode is set as ON or OFF.

Note 1: Series connection

The validity of the floating blanking depends on the setting of the 1CH sensor, which is the closest to power supply. Regarding the number of the floating beams, the sequential beam mode, and the outermost beam invalid mode, the settings are applied to each channel sensor. (All relating to the floating blanking function are set invalid, OFF, or Clear when the F3SN is shipped.)

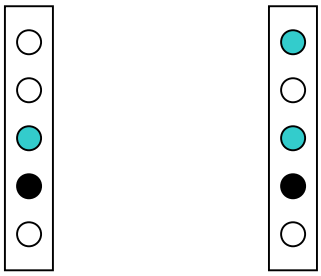
Note 2: When an outermost beam is blanked by the fixed blanking function, the outermost beam invalid mode cannot be available. Even if the mode is set ON, the obstruction of an outermost beam keeps OSSD outputs in the ON-state.

Note 3: Use of both the fixed blanking and the floating blanking

A blanked beam by the fixed blanking is not counted as an obstructed beam for the floating blanking even if the beam is actually obstructed.

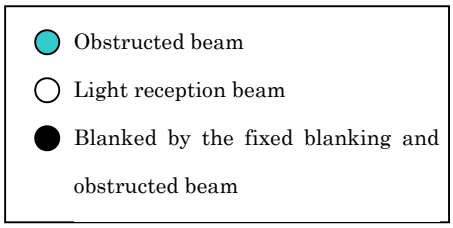
(a) In case of 1 beam floating & the sequential beam mode OFF

(Outputs OFF when two or more beams are obstructed in total)



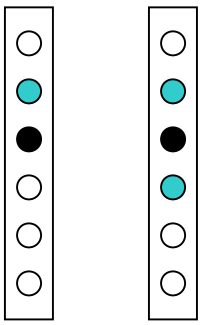
Outputs ON
Obstructed beam =1

Outputs OFF
Obstructed beam =2

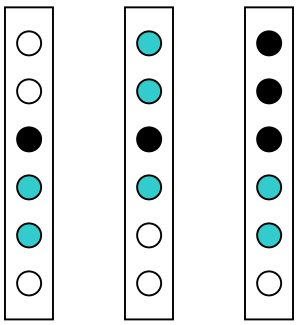


(b) In case of 1 beam floating & the sequential beam mode ON

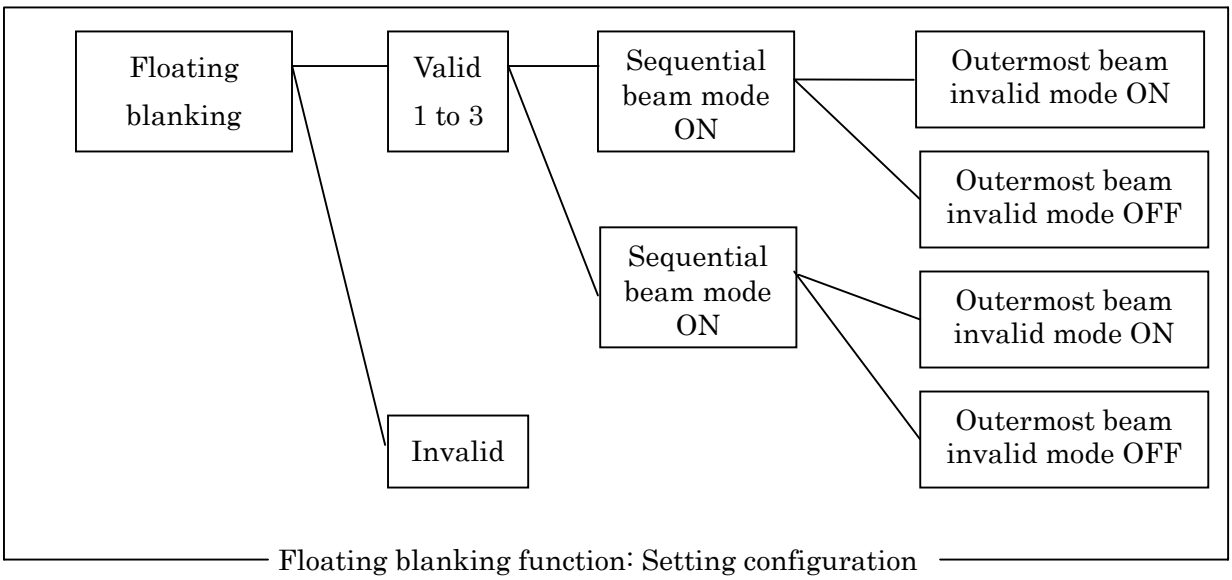
(Outputs OFF when consecutive two or more beams are obstructed)



Outputs ON
Consecutive obstructed beam=1



Outputs OFF
Consecutive obstructed beams=2



Floating blanking function: Setting configuration

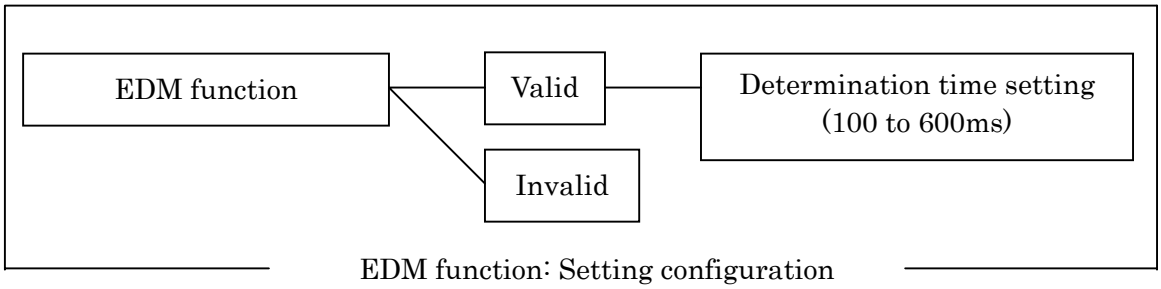
1.4. External device monitoring (EDM)

This function detects a failure of an external device such as a relay or contactor which controls a hazardous moving part of a machine. The welded contact or the like of the relay can be detected.

[Direction for use]

Connect the wires such that 24 VDC is applied to the EDM input of a receiver via the series connected NC contacts of external relays for PNP type. (For NPN type, 0 V is applied.)

If an NC contact does not react within 300 ms (the default time) after the OSSD outputs change over, the F3SN enters lockout condition.



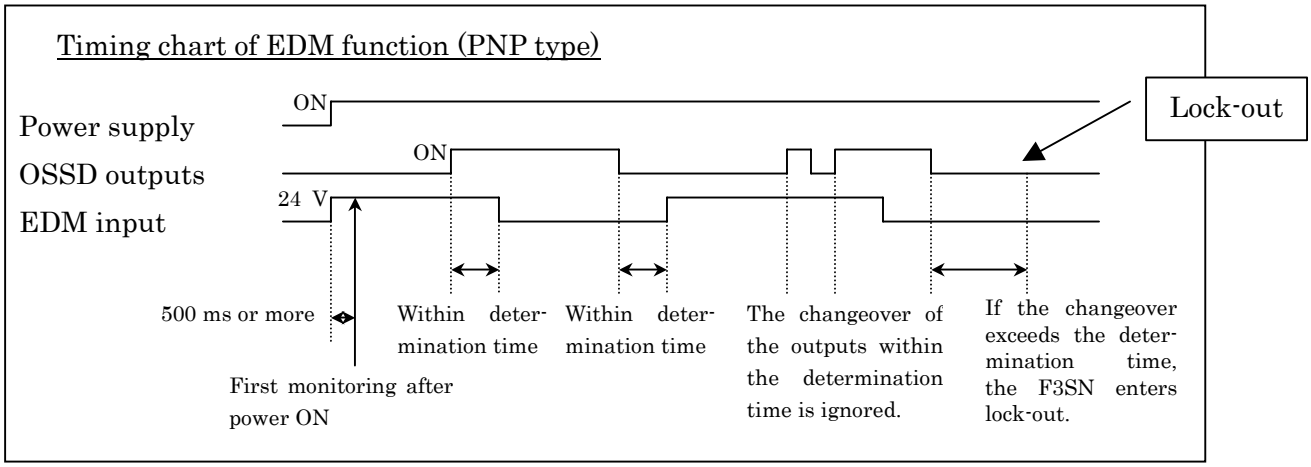
EDM function: Setting configuration

The determination time (allowed delay time) must be set longer than the response time and release time of the relay or contactor you will use.

Note 1: When the OSSD outputs change over within the determination time after their previous changeover, the F3SN does not enter the lock-out condition even if the logic at the EDM input does not change over.

Note 2: The logic at the EDM input is checked in min. 500 ms. after power ON. The peripheral circuit must be designed so as to meet this requirement.

Timing chart of EDM function (PNP type)



1.5. Auxiliary output function

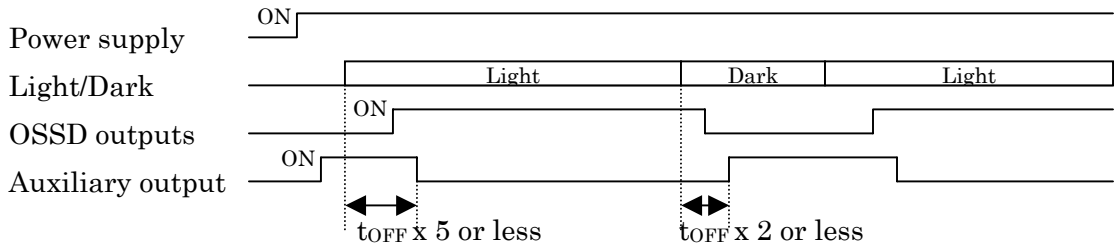
This function can be used for monitoring purpose by connecting with a device such as a PLC. The auxiliary output operation can be selected from the following seven operation modes by the F39-MC11 setting console.

1.5.1. Dark-ON output mode

When a beam is interrupted, the auxiliary output goes to the ON-state. This state is inverted from that of the OSSD outputs.

Response time OFF → ON : (ON → OFF response time of OSSD outputs) x 2
ON → OFF : (ON → OFF response time of OSSD outputs) x 5

Timing chart of the Dark-ON output mode



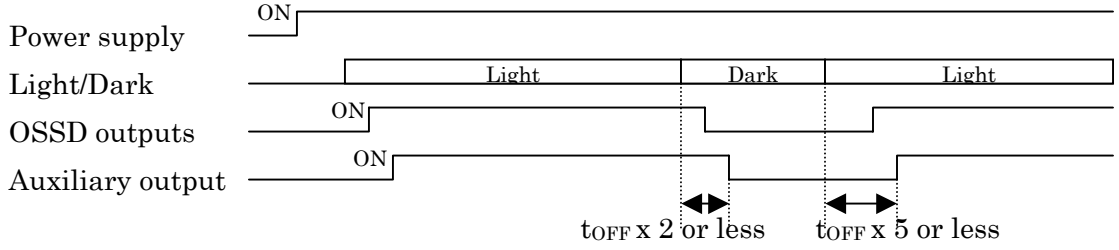
t_{OFF}: ON → OFF response time of OSSD outputs

1.5.2. Light-ON output mode

When all beams are in the light reception state, the auxiliary output goes to the ON-state. This state is the same as that of the OSSD outputs.

Response time OFF → ON : (ON → OFF response time of OSSD outputs) x 5
ON → OFF : (ON → OFF response time of OSSD outputs) x 2

Timing chart of the Light-ON output mode



t_{OFF}: ON → OFF response time of OSSD outputs

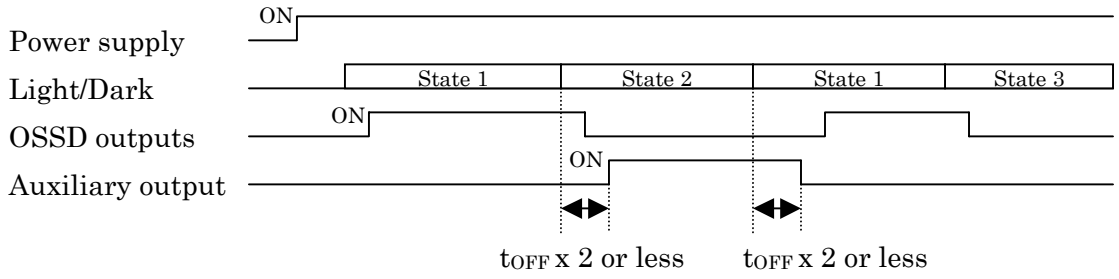
1.5.3. Outermost-beam monitoring mode

When only either outermost beam is interrupted, the auxiliary output goes to the ON-state. An object intruding into the detection zone or leaving out of the zone along beam array can be detected.

Response time OFF → ON : (ON → OFF response time of OSSD outputs) x 2
ON → OFF : (ON → OFF response time of OSSD outputs) x 2

Note 1.: When the fixed blanking function is used, the outermost-beam monitoring mode is not available.

Timing chart of the outermost-beam monitoring mode



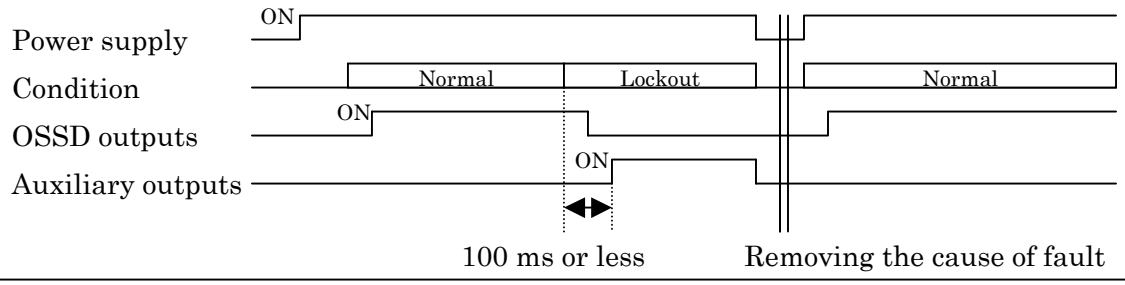
State 1: All beams; Light State 2: No. 1 beam; Dark, The others; Light
State 3: No. 1 and 2 beam; Dark, The others; Light
t_{OFF}: ON → OFF response time of OSSD outputs

1.5.4. Lockout mode

When the F3SN enters lockout condition, the auxiliary output goes to the ON-state.

Response time OFF → ON : Max. 100ms after the F3SN detects a fault.

Timing chart of the Lockout mode

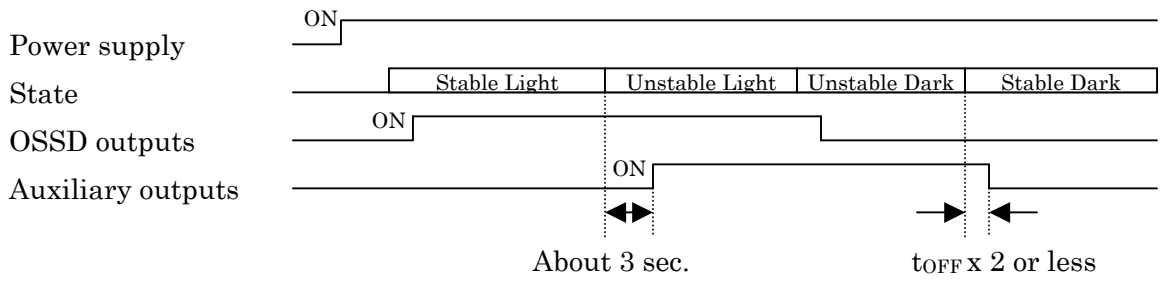


1.5.5. Light diagnosis mode

When unstable light reception state or unstable interruption state lasts for three seconds or longer, the auxiliary output goes to the ON-state. Monitoring the output by a PLC or the like makes it possible to detect the deterioration of optical performance caused by dirtiness on the lens surface, misalignment between the emitter and receiver, deterioration of an LED, and so on.

The "unstable state" means that the received light is in the range from OFF-threshold – 20 % to ON-threshold + 20%.

Timing chart of the Light diagnosis mode



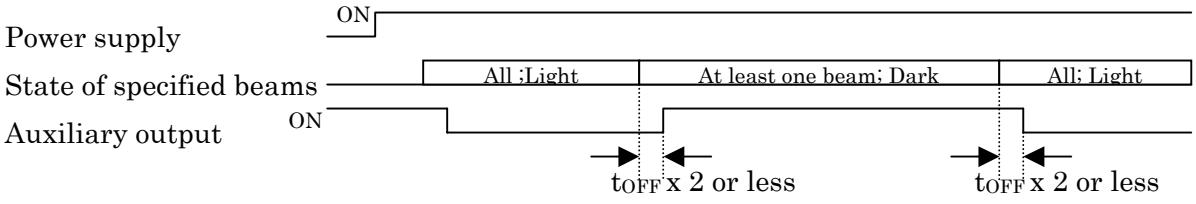
t_{OFF}: ON → OFF response time of OSSD outputs

1.5.6. Specified-beam mode

When any of specified beams is interrupted, the auxiliary output goes to the ON-state.

Response time OFF → ON : (ON → OFF response time of OSSD outputs) x 2
ON → OFF : (ON → OFF response time of OSSD outputs) x 2

Specified-beam mode



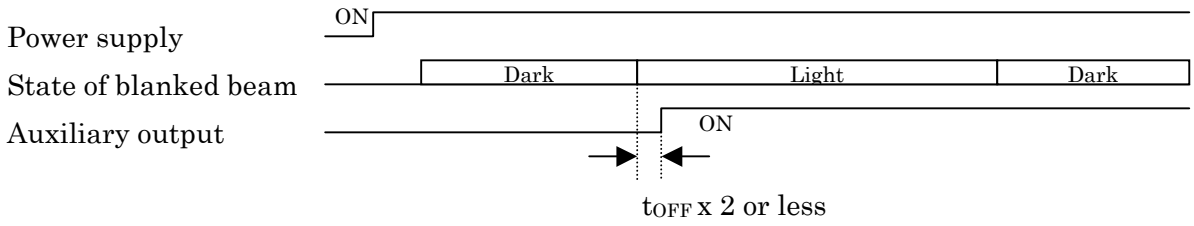
t_{OFF}: ON → OFF response time of OSSD outputs

1.5.7. Blanking monitoring mode

In case that the fixed blanking function is valid, the output goes to the ON-state when a blanked beam becomes light reception state.

Response time OFF → ON : (ON → OFF response time of OSSD outputs) x 2
ON → OFF : (ON → OFF response time of OSSD outputs) x 2

Timing chart of the blanking monitoring mode



t_{OFF}: ON → OFF response time of OSSD outputs

2. Function table

No.	Function name	Summary	Notes
1	External test	This function stops light emission of an emitter.	
2	Start interlock	After power ON, the OSSD outputs keep in the OFF-state even if no beam is interrupted. Resetting makes the OSSD outputs go to the ON-state when all beams are in light reception state.	Wiring for manual reset mode is necessary.
3	Restart interlock	Once a beam is interrupted, the OSSD outputs keep in the OFF-state even if all beams become free. Resetting makes the OSSD outputs go to the ON-state when all beams are in light reception state.	
4	Fixed blanking	This function makes detection capability of one or more beams invalid. Even if the specified beams are interrupted, the OSSD outputs keeps in the OFF-state.	
5	Floating blanking	When more beams are interrupted than the specified number, the OSSD outputs go to the OFF-state. Up to three beams can be specified as floating.	
6	EDM (External device monitoring)	This function detects a failure of an external device such as a relay or contactor. If the feedback signal from the external device is not correct, the F3SN enters lockout condition.	
7	Dark-ON output mode (Auxiliary output)	The ON/OFF-state is inverted from the OSSD outputs state. This mode is the default of the auxiliary output.	
8	Light-ON output mode (Auxiliary output)	The ON/OFF-state is the same as the OSSD outputs state.	
9	Outermost-beam monitoring mode (Auxiliary output)	When only either outermost beam is interrupted, the output goes to the ON-state.	
10	Lockout mode (Auxiliary output)	When the F3SN enters lockout condition, the output goes to the ON-state.	
11	Light diagnosis mode (Auxiliary output)	When unstable light reception state or unstable interrupted state lasts for three seconds or longer, the output goes to the ON-state.	
12	Specified-beam mode (Auxiliary output)	When any of specified beams is interrupted, the output goes to the ON-state.	
13	Blanking monitoring mode (Auxiliary output)	In case that the fixed blanking function is valid, the output goes to the ON-state when a blanked beam becomes light reception state.	

3. Revision history

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Just Fit,
Reliable,
and
Easy.

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