INSTRUCTION MANUAL

Sensor Option

Safety Control Unit for Light Curtain

SF-C13

Thank you very much for using SUNX products. Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product. Kindly keep this manual in a convenient place for quick reference.

1 OUTLINE

- The **SF-C13** is an exclusive control unit for SUNX light curtain conforming to European / North American safety standards.
  This product is conforming to up to the control category 4 specified in EN 954-1.

2 SPECIFICATIONS

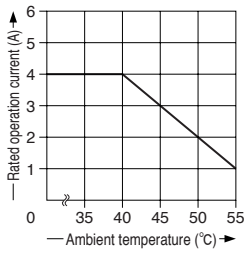
Item \ Model No.	SF-C13
Connectable input device	Light curtains manufactured by SUNX
Applicable standard	IEC 61496-1, UL 61496-1, JIS B 9704-1
Supply voltage	24V DC±10% Ripple P-P 10% or less
Safety output	NO contact×3
Rated operation voltage / current	30V DC/4A, 230V AC/4A, Resistance load (the contact protection for inductive load), Minute current: 10mA or more (at 24V DC)
Fuse	4A (slow-blow)
Contact material / contacts	AgSnO, Self cleaning, positively driven
Contact resistance (Initial value)	100mΩ or less
Mechanical lifetime	10,000,000 times or more (switching frequency 180 times/min.) (Note 1)
Electrical lifetime	100,000 times or more (switching frequency 20 times/min. at 230V AC/3A, resistive load) (Note 1)
Auxiliary output	Safety relay contact (NC contact)×1 (interlocked to safety output)
Rated operation voltage / current	24V DC/2A, Minute current: 10mA or more (at 24V DC)
Fuse	2A (slow-blow)
Semiconductor auxiliary output (AUX terminal)	PNP open-collector transistor ・Maximum source current: 60mA ・Applied voltage: same as supply voltage (between semiconductor auxiliary output and +V) ・Residual voltage: 2.3V or less (at 60mA source current) ・Leak current: 2mA or less
Output operation	Dark-ON
Fuse	Built-in electronic fuse, Breaking current: 0.5A or more, reset by power supply stop
Current consumption	100mA or less (without light curtain)
Application category	AC-15, DC-13 (IEC 60947-5-1)
Pick-up delay	80ms or less / 90ms or less (Auto reset / Manual reset)
Response time (Drop-out delay)	10ms or less
Excess voltage category	Ⅲ
Indicators: Power	Green LED (Lights up when power is supplied)
Indicators: Safety output	Green LED (lights up when the safety output is 'close')
Indicators: Interlock	Yellow LED (lights up when the safety output is 'open')
Indicators: Fault	Yellow LED (blinks when an error occurs) (Note 2)
Trailing edge switching function	Incorporated
Polarity selection function	Incorporated (selectable either plus or minus grounding by wiring process) Plus grounding: For NPN input type light curtain Minus grounding: For PNP input type light curtain
Environmental resistance: Protection	Enclosure: IP40, Terminal: IP20
Environmental resistance: Ambient temperature	-10 to +55℃ (No dew condensation or icing allowed), Storage: -25 to +70℃
Environmental resistance: Ambient humidity	30 to 85% RH, Storage: 30 to 95% RH
Environmental resistance: Vibration resistance	No malfunction when tested with 10 to 55Hz frequency, 0.35mm amplitude in X, Y and Z directions for twenty times each
Environmental resistance: Pollution degree	2
Connection terminal	Spring gauge terminal
Material	Enclosure: ABS
Weight	200g approx.

Notes: 1) The lifetime of the switch of relay depends on type of the load, frequency of switching or environment etc.
2) For details, refer to '**9 TROUBLESHOOTING**'.

3 INSTALLATION POSITION/DIRECTION/METHOD

- Use the 35mm width DIN rail to install the unit.
- The installation position/direction is not basically limited.
- Please fix this product with the optional DIN rail stopper (**MS-DIN-E**) after installing the product on to the 35mm width DIN rail.
- If two, or more, units are placed side by side, make sure to space them at least 5mm apart. In case they are mounted close to each other, lower the rated operation current of the safety output depending on the ambient temperature, refering the right graph.

〈Derating for mounting the units close to each other〉



4 FUNCTIONS

- **Trailing edge switching function**
  ・This function is to accept the input when the reset switch is pressed (contact 'close') and then released (contact 'open') at the manual start setting.
  An unexpected start-up due to the welded reset switch can be avoided.

5 SHORT-CIRCUIT PROTECTION

- The power supply unit of this equipment adopts the electronic fuse which do not require any replacement.
- When the electronic fuse is operated, turn off the power supply, and remove the cause of overcurrent before restarting the power supply for resetting.
- The electronic fuse is not suitable to use in which the equipment is operated continuously or daily. Note that operating the equipment continuously may not be unable to satisfy the specifications.

6 CAUTIONS

- In case this unit is connected to a product other than the connectable input devices, this unit doesn't meet the control category 4 specified in EN 954-1.
- Connect this product and the light curtain to a common power supply.
- Make sure that the power is off while wiring.
- Take care that wrong wiring will damage the product.
- Verify that the supply voltage variation is within the rating. Take care that if a voltage exceeding the rated range is applied, or if an AC power supply is directly connected, the unit may get burnt or damaged.
- The DC power supply unit must satisfy the conditions given below:
  1) Power supply unit authorized in the region where this device is to be used.
  2) Power supply unit conforming to EMC Directive and Low-voltage Directive (In case CE conformity is required.)
  3) Power supply unit conforming to the Low-voltage Directive and with an output of 100VA or less.
  4) The frame ground (F.G.) terminal must be connected to ground when using a commercially available switching regulator.
  5) Power supply unit with an output holding time of 20ms or more.
  6) Use an isolation transformer for the DC power supply unit.
  7) In case a surge is generated, take countermeasures such as connecting a surge absorber to the origin of the surge.
  8) Power supply unit corresponding to CLASS 2 (In case C-UL conformity is required.)
  <Additional information>
  As provided in IEC 60536 (CLASS: Protection against Electric Shook), this power supply should require no ground earth and satisfy the insulation distance called double insulation or reinforced insulation.
  (In case the power supply conforms to Low-voltage Directive and has an output of 100VA or less, it can be used as a suitable product.)
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.
- Avoid dust, dirt, and steam.
- Take care that the product does not come in direct contact with water, oil, grease, or organic solvents, such as, thinner, etc.
- The seal as shown in the drawing on the right is stuck to the engagement point of unit. When the seal is peeled off or broken, this equipment will not be certified as 'Safety equipment' and will not be covered by our guarantee.

Do not open!
If this seal is removed or damaged, the units are not recognized as safety product.
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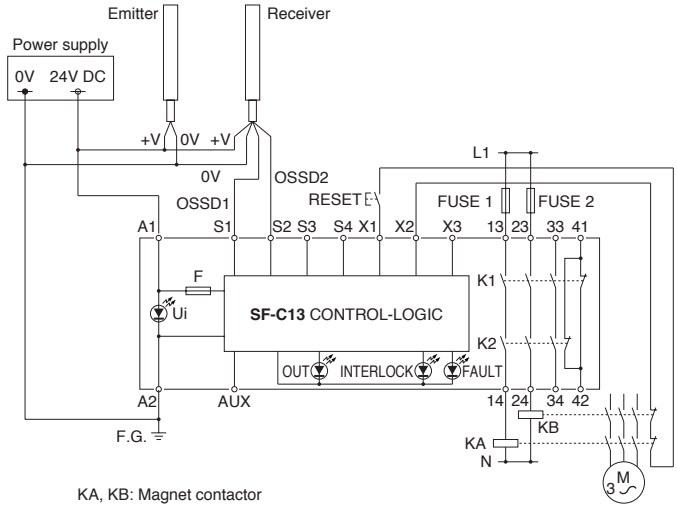
- Note that this equipment is applicable only in the control circuit grounded in accordance with IEC 60204-1 and JIS B 9960-1, or in the control circuit in which the insulation monitor unit (ground fault detection unit) is arranged.
- This unit is suitable for indoor use only.

7 I/O CIRCUIT DIAGRAM

- The following cables are recommended for power supply / output line and signal line.
  Solid wire: φ0.4 to φ1.2mm (AWG 26 to 16)
  Twisted wire: 0.3 to 1.25mm² (AWG 22 to 16)
  Standard stripped wire length: 11mm
- For wiring the light curtain, refer to the instruction manual enclosed with the light curtain.
- When connecting a product other than this product with the light curtain, arrange a terminal block separately.

<Wiring for the minus grounding (PNP setting)>

- The figure shown below is the case that this product is connected to a type 4 PNP output type light curtain. Connect the control output OSSD 1 and OSSD 2 of the light curtain to S1 and S2 respectively.

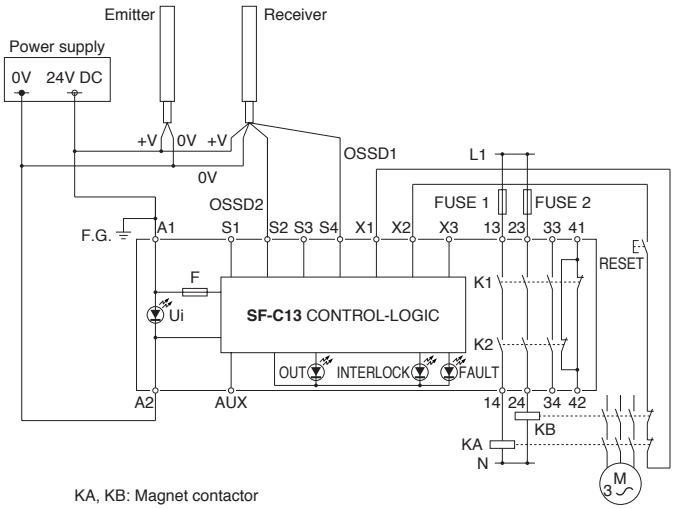


KA, KB: Magnet contactor

- In case of connecting a type 2 PNP output type light curtain, connect the control output (OSSD) to S1, and also put a jumper between S2 and S3.

<Wiring for the plus grounding (NPN setting)>

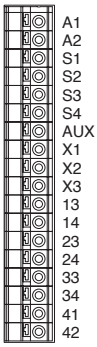
● The figure shown below is the case that this product is connected to a type 4 NPN output type light curtain. Connect the control output OSSD 1 and OSSD 2 of the light curtain to S4 and S2 respectively.



KA, KB: Magnet contactor

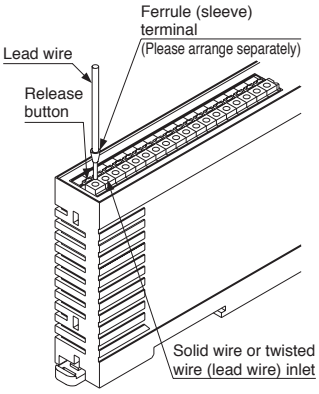
● In case of connecting a type 2 NPN output type light curtain, connect the control output (OSSD) to S4, and also put a jumper between S2 and S3.

● **Terminal arrangement diagram**



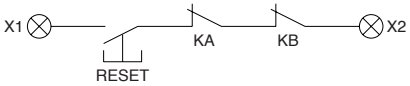
Terminal No.	Description
A1	24V DC
A2	0V
S1 to S4	Light curtain control output (OSSD) input terminal
AUX	Semiconductor auxiliary output
X1	Reset output terminal
X2	Reset input terminal (manual)
X3	Reset input terminal (automatic)
13-14, 23-24, 33-34	Safety output (NO contact × 3)
41-42	Auxiliary output (NC contact × 1)

- When connecting to the terminal, insert the solid wire or the twisted wire with a ferrule (sleeve) terminal as shown in the figure right (please arrange separately) to the innermost of the connecting hole. The wire is locked when it is properly inserted. However, do not to pull the wire with excessive force, as this can cause a cable break.
- When connecting the twisted wire (lead wire), without a ferrule (sleeve) terminal, insert the wire to the innermost of the connecting hole while pressing the release button.
- When releasing the solid wire or the twisted wire (lead wire), pull the wire while pressing the release button.
- The following solid wire and twisted wire (lead wire) are recommended.
  Solid wire: ϕ0.4 to ϕ1.2mm (AWG 26 to 16)
  Twisted wire (lead wire): 0.3 to 1.25mm^2 (AWG 22 to 16)
  Standard stripped wire length: 11mm



<Manual reset>

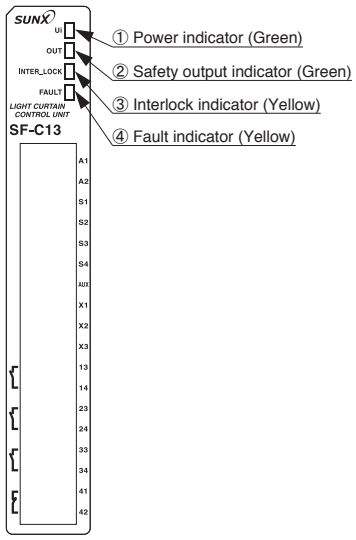
- In case of the manual reset, configure the back check circuit between X1 and X2. If KA and KB aren't needed to check, short-circuit KA and KB.
- Do not connect anything to X3.
- The control unit operates by the trailing operation of the external reset button.
- Two, or more, units cannot be controlled by an external reset button. Prepare the external reset button for unit by unit.



<Auto reset>

- In case of the auto reset, configure the back check circuit between X1 and X3. If KA and KB aren't needed to check, short-circuit between X1 and X3.
- Do not connect anything to X2.
- Avoid auto-reset of the system after emergency stop by using the other control circuit. (IEC/EN 60204-1 part 9.2.5.4.2 and 10.8.3)

8 FUNCTIONAL DESCRIPTION



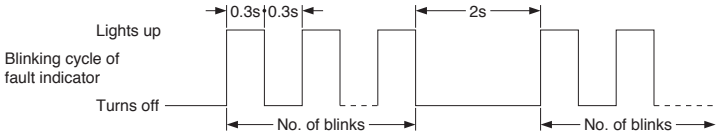
No.	Description	Function
①	Power indicator (Ui) (Green)	Lights up when the power is supplied.
②	Safety output indicator (OUT) (Green)	Lights up when the safety output is 'close'.
③	Interlock indicator (INTER_LOCK) (Yellow)	Lights up when the safety output is 'open'.
④	Fault indicator (FAULT) (Yellow)	Blinks when an error occurs. For details, refer to '**9 TROUBLESHOOTING**'.

9 TROUBLESHOOTING

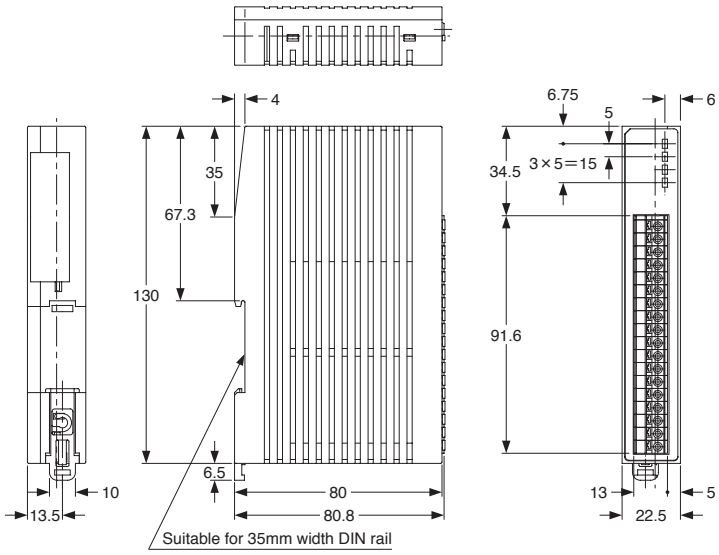
● The number of times the fault indicator (yellow) blinks indicates the type of error state, as follows.

Blinking	Description of error	Cause/Measure
2 times	Internal relay contact is weld	The contact was weld due to the lifetime of the relay. Replace this product by new one.
3 times	Reset mode error	Wiring of the terminal X1, X2 or X3 is not correct. Check if the wiring has been correctly done.
4 times or more	Influence of noise / power supply or internal circuit failure	Check the noise environment. Check the wiring, power supply voltage and voltage capacity.

● Make sure that this product and the light curtain are connected to the common power supply.
● When the sensor doesn't operate properly even if the measures described above are taken, contact our office.
● The blinking cycle of the fault indicator (yellow) is as follows. Check the number of times the indicator blinks after 2 sec. of the indicator 'off' period.



10 DIMENSIONS (Unit: mm)



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