Safety Controller

FS1A Series

No programming required. Configuration complete by turning on a logic switch.

c UL us LISTED TÜV CE

• See website for details on approvals and standards.

	Model	Features	Page
	FS1A-C11S	24 logic patterns	E-153
	FS1A-C21S	11 logic patterns	E-153

Complies with key safety standards!

ISO13849-1 PLe

Complies with key safety standards!

The SafetyOne satisfies:	
IEC61508	SIL3
ISO13849-1	Performance level e Category 4

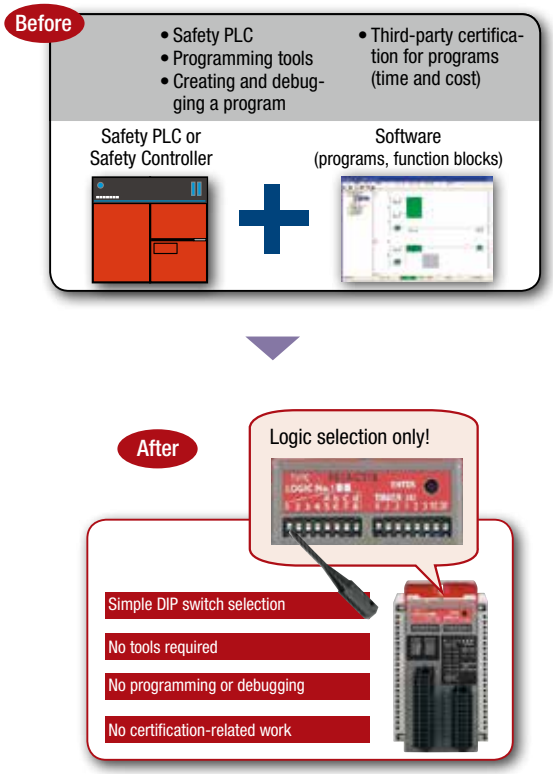
Applicable standards	
ISO	13849-1, 13851
IEC	61508, 62061, 61496-1, 61131-2, 61000-6-2, 61000-6-4, 61326-3-1
EN	13849-1, 62061, 61496-1, 61131-2, 61000-6-2, 61000-6-4, 61326-3-1
UL	UL508, CSA22.2No.142

• The SafetyOne satisfies the requirements of SIL3 (IEC61508), performance level e (ISO 13849-1), and safety category 3 or 4 (EN 954-1)

With 11 (FS1A-C21S) or 24 (FS1A-C11S) pre-programmed safety circuit logics in a compact housing, the FS1A SafetyOne safety controller allows you to build a safety circuit by just sliding a DIP switch. Because the programs are tested and approved for compliance with key safety standards, labor, cost, and time for safety system certification can be reduced greatly.

Selecting a logic—that's all you need!

SafetyOne lets you configure a system without any programming. Just select one logic from 11 (FS1A-C21S) or 24 (FS1A-C11S) to configure a safety system.



Reduces overall cost. Simple wiring!

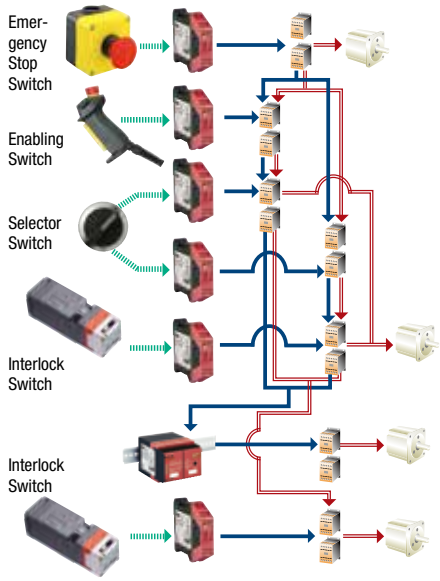
One SafetyOne can replace more than seven safety relay modules.

When using safety modules

- 7 safety relay modules
- 14 safety contactors

Before

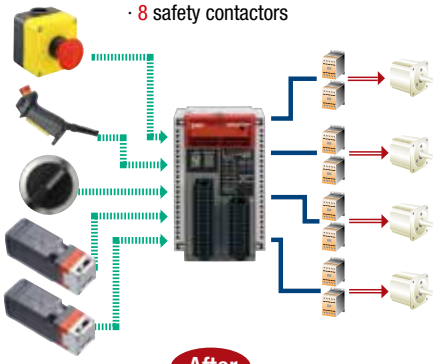
The system is complicated, and the interlocking of mode selector switch cannot be determined. Results in a risk of not satisfying the required safety performance.



When using SafetyOne

(FS1A-C11S, logic 104)

· One FS1A
· 8 safety contactors



After

The system and wiring are much simpler, and the required safety level is satisfied.

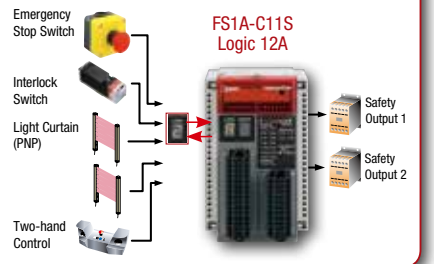
Large functionality in a compact housing!

Small & Compact

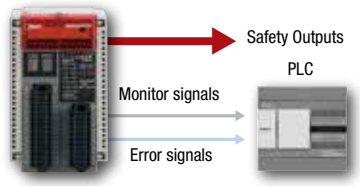
ALL-IN-ONE

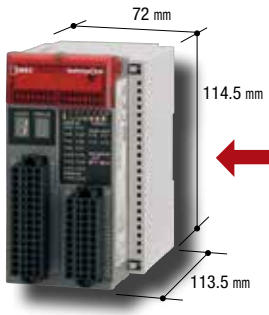
Replaces more than five safety relay modules

Two-hand Control

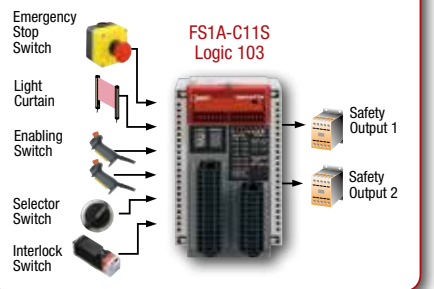


Monitor Output

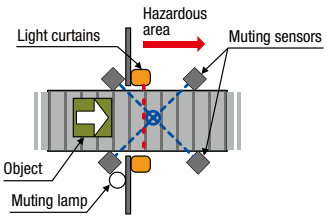




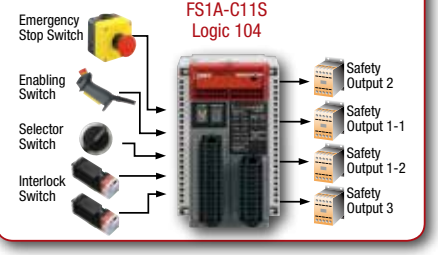
Mode selection



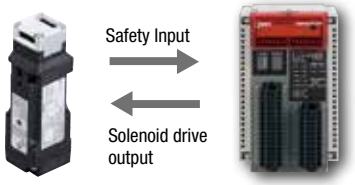
Muting function of light curtains



Four safety output lines



Solenoid drive output



Safety Controller

FS1A

Product	No. of Logic	Ordering Part No.
	11	FS1A-C21S
	24	FS1A-C11S

Minimum order quantity: 1

Standard Accessories

Input connector (FS9Z-CN01)..... 1 pc
Output connector (FS9Z-CN02)..... 1 pc
Marked cable tie (FS9Z-MT01)..... 3 pcs
Setting tool ..... 1 pc
English instruction sheet..... 1 pc
Japanese instruction sheet ..... 1 pc

Optional Parts (sold separately)

Product	Ordering Part No.	Package Quantity	Note
Input Connector 	FS9Z-CN01	1	
Output Connector 	FS9Z-CN02	1	
Connecting Tool 	FS9Z-SD01	1	
Marked Cable Tie 	FS9Z-MT01PN10	10	Used to lock the protective cover of the FS1A.
DIN Rail 	BAA1000PN10	10	Aluminum, 1m 35mm wide
End Clip 	BNL6PN10	10	

- For details, see the user's manual.
- See H-071 for DIN rail products.

TÜV approval:
IEC61508 Part1-4, ISO13849-1, IEC/EN62061, IEC/EN61131-2
IEC61326-3-1

UL:
UL508, CSA C22.2 No.142

Applicable standards:
IEC/EN61496-1, IEC/EN61000-6-2, IEC/EN61000-6-4, ISO13851

Specifications

Operating Environment

Part No.	FS1A-C11S	FS1A-C21S
Safety Circuit	Logic selection	
Version	—	Ver. 2
Operating Temperature	–10 to +55°C (no freezing)	
Operating Humidity	10 to 95% RH (no condensation)	
Storage Temperature	–40 to +70°C (no freezing)	
Storage Humidity	10 to 95% RH (no condensation)	
Pollution Degree	2 (IEC/EN60664-1)	
Degree of Protection	IP20 (IEC/EN60529)	
Corrosion Immunity	Free from corrosive gases	
Altitude	Operation: 0 to 2000m, Transport: 0 to 3000m	
Vibration Resistance	Vibration: 5 to 8.4 Hz, amplitude 3.5 mm 8.4 to 150 Hz Acceleration: 9.8 m/s^2 (2 hours each on three mutually perpendicular axes) (IEC/EN60028-2-6) Bump: Acceleration 98 m/s^2, 16 ms (1000 times each on three mutually perpendicular axes) (IEC/EN60028-2-29)	
Shock Resistance	147 m/s^2, 11ms (3 shocks each on three mutually perpendicular axes (IEC/EN 60028-2-27)	
Connector Insertion/ Removal Durability	50 times maximum	
Configuration Switch Durability	100 operations maximum per pole	
Enter Button Durability	1000 operations maximum	
Housing Material	Modified-polyphenyleneether (m-PPE)	
Weight (approx.)	330g	

Electric Characteristics

Rated Voltage	24V DC
Allowable Voltage Range	20.4 to 28.8V DC
Maximum Power Consumption	48W (at the rated power voltage, when all I/Os are ON) (incl. output load)
Allowable Momentary Power Interruption	10 ms minimum (at the rated power voltage)
Response Time	ON–OFF: 40 ms maximum (Note 1) 50 ms maximum (Note 1) 100 ms maximum (Note 2) OFF–ON: 100 ms maximum (Note 3)
Start-up Time (Note 4)	6 sec maximum
Dielectric Strength	Between live part and FE terminal: 500V AC, 1 minute Between housing and FE terminal: 500V AC, 1 minute
Insulation Resistance	Between live part and FE terminal: 10 MΩ minimum (500V DC megger) Between housing and FE terminal: 10 MΩ minimum (500V DC megger)
Impulse Noise Immunity (noise simulator)	Power terminal: ±1 kV 50 ns, 1µs (direct connection) I/O terminal: ±2kV 50 ns, 1µs (coupling adapter)
Inrush Current	25A maximum
Effect of Incorrect Wiring	Reverse polarity: No operation, no damage Improper voltage: Permanent damage may occur

Note 1: The time to shut off safety outputs after inputs are turned off or input monitor error is detected (when off-delay timer is set to 0s).
FS1A-C21S logic 22b, 22C: 50ms maximum

Note 2: Time to shut off safety outputs after an error (except input monitor error) or a configuration change of logic or timer is detected (not depending on the off-delay timer value)

Note 3: Auto start—Time to turn on safety outputs after safe inputs are turned on
Manual start—Time to turn on safety outputs after start inputs are turned on
Control start—Time to turn on safety outputs after the start inputs are turned off-on-off (maintain ON for 0.1 to 5s)

Note 4: Time to change to Run state after power supply is turned on.

Safety Input Specifications

Drive Terminals

(T0, T1, T2, T3, T4, T5, T6, T7, T10, T11, T12, T13, T14, T15)

Rated Drive Voltage	Power supply voltage
Minimum Drive Voltage	Power supply voltage – 2.0V
Number of Drive Terminals	14
Maximum Drive Current	20 mA per terminal (28.8V DC) (Note)

Note: Drive terminals of safety inputs send safety confirmation signals (pulse signals) for the diagnosis of safety components and input circuits. Wiring and diagnosis function change depending on the selected logic. See user's manual "Chapter 5 Logic." Basic specifications remain the same.

Receive Terminals

(X0, X1, X2, X3, X4, X5, X6, X7, X10, X11, X12, X13, X14, X15)

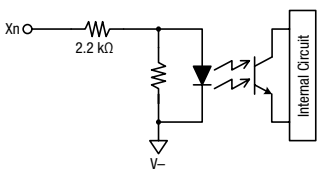
Rated Input Voltage	24V DC
Input ON Voltage	15.0 to 28.8V DC
Input OFF Voltage	Open or 0 to 5.0V DC
Number of Inputs	14
Input Current	10 mA per terminal (at the rated power voltage)
Input Signal	Sink input (for PNP output), Type 1 (IEC61131-2)

Wire

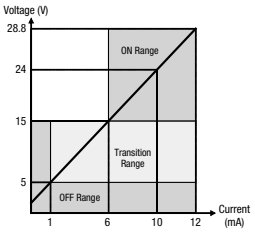
Cable Length (Note)	100m maximum (total wire length per input)
Allowable Wire Resistance	300Ω maximum

Note: When wiring between the SafetyOne and a component is 30m or more, use shielded cable to ensure electromagnetic immunity.

• **Receive Terminal Internal Circuit**



• **Receive Terminal Operating Range**

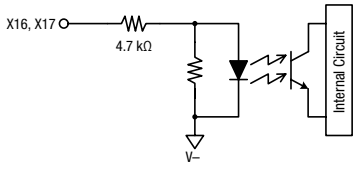


Start Input Specifications

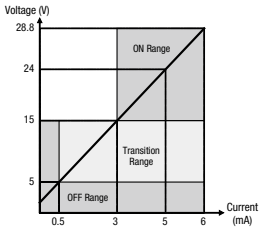
Rated Input Voltage	24V DC
Input ON Voltage	15.0 to 28.8V DC
Input OFF Voltage	Open or 0V to 5.0V DC
Number of Start Inputs	2 (X16, X17)
Input Current	5 mA per terminal (at the rated power voltage)
Input Signal	Sink input (PNP output), Type 1 (IEC61131-2)
Cable Length (Note)	100m maximum (total wire length per input)
Allowable Wire Resistance	300Ω maximum

Note: When wiring between the SafetyOne and a component is 30m or more, use shielded cable to ensure electromagnetic immunity.

• **Start Input Internal Circuit**



• **Start Input Operation Range**



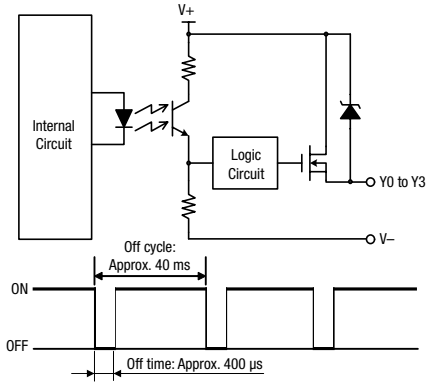
Safety Output Specifications

Output Type		Source output (N channel MOSFET)
Rated Output Voltage		Power supply voltage
Minimum Output Voltage		Power supply voltage – 2.0V
Number of Safety Outputs		4 (Y0, Y1, Y2, Y3)
Maximum Output Current	1 output	500 mA maximum
	Total	1A maximum
Leakage Current		0.1 mA maximum
Allowable Inductive Load (Note 1)		L/R = 25 ms
Allowable Capacitive Load		1 µF maximum
Cable Length (Note 2)		100m maximum (total length per output)

Note 1: When connecting an inductive load, connect a protection element such as a diode.

Note 2: When wiring between the SafetyOne and a component is 30m or more, use shielded cable to ensure electromagnetic immunity.

• **Safety Output Internal Circuit**



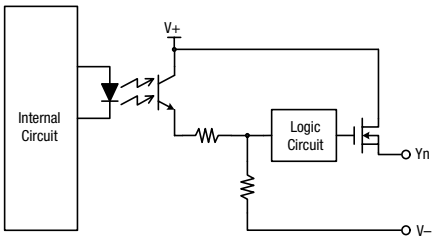
The safety outputs of the SafetyOne are solid state outputs. When the output is on, off-check signals are generated at regular intervals. The operating characteristics of the safety output change depending on the selected logic. For details, see user's manual "Chapter 5 Logic." The basic specifications remain the same. Note that off-check signals may cause reaction of some safety components depending on their response speed.
Monitor output and solenoid/lamp output do not generate outputs of off-check signals.

Monitor Output Specifications

Output Type		Source output (N channel MOSFET)
Rated Output Voltage		Power supply voltage
Minimum Output Voltage		Power supply voltage – 2.0V
Number of Monitor Outputs		11 (Y4, Y5, Y6, Y7, Y10, Y11, Y12, Y13, Y14, Y15, Y16)
Maximum Output Current	1 output	20 mA maximum
	Total	220 mA maximum
Leakage Current		0.1 mA maximum
Cable Length (Note)		100m maximum (total length per output)

Note: When wiring between the SafetyOne and a component is 30m or more, use shielded cable to ensure electromagnetic immunity.

• **Monitor Output Internal Circuit**



The operating characteristics of the monitor output change depending on the selected logic. For details, see user's manual "Chapter 5 Logic." The basic specifications remain the same.
Do not use monitor output as a safety output, otherwise the system's safety cannot be assured when the SafetyOne or safety components fail.

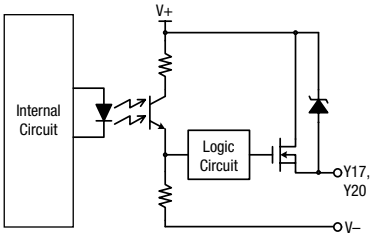
Solenoid/Lamp Output Specifications

Output Type		Source output (N channel MOSFET)
Rated Output Voltage		Power supply voltage
Minimum Output Voltage		Power supply voltage – 2.0V
No. of Solenoid/Lamp Outputs		2 (Y17, Y20)
Maximum Output Current	1 output	500 mA maximum
	Total	500 mA maximum
Leakage Current		0.1 mA maximum
Allowable Inductive Load (Note 1)		L/R = 25 ms
Cable Length (Note 2)		100m maximum (total length per output)

Note 1: When connecting an inductive load, connect a protection element such as a diode.

Note 2: When wiring between the SafetyOne and a component is 30m or more, use shielded cable to ensure electromagnetic immunity.

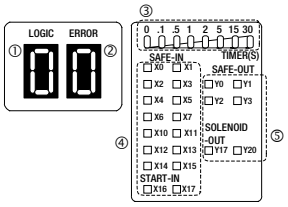
Solenoid/Lamp Output Internal Circuit



The selected operating characteristics of solenoid/lamp output change depending on the selected logic. For details, see user's manual "Chapter 5 Logic." The basic specifications remain the same. Do not use solenoid/lamp output as a safety output, otherwise the system's safety cannot be assured when the SafetyOne or safety components fail.

LEDs

① Logic LED (green)
② Error LED (red)
③ Timer LED (green)
④ Input LED (orange)
⑤ Output LED (orange)



Logic LED ①

LED	Status	Description
1, 2, 3, 4, 5, 6, 7, 8, A, b, C, d	ON	The selected logic is in Run or Protection state (Ex. Logic 14A: 4→A→4→A→4→...)
	Blink	The selected logic is in Configuration state (Ex. Logic 14A: 4→A→OFF→4→A→OFF→4→...)
E	Blink	The selected logic has Configuration error (logic not selected, or multiple logics are selected)
Random	ON/Blink	Initializing (Initial state)
OFF	OFF	Error (Stop state)

Correct: Selecting one from 1 to 8
Selecting one from 1 to 4, and one from A, b, C, or d (from 5 to 8).
Wrong: Selecting three or more logics from 1 to 8
Selecting two or more logics from 1 to 4
Selecting two or more logics from A, b, C, or d (from 5 to 8)

Error LED ②

LED	Status	Description
1	ON	Input monitor error (Protection state)
2	ON	Wiring error at safety input or an error in safety input circuits (Stop state)
3	ON	Wiring error at start input or an error in start input circuit (Stop state)
4	ON	Wiring error at safety output or an error in safety output circuit (Stop state)
5	ON	Muting lamp error (disconnection) (FS1A-C11S: logic 11d only)
6	ON	Power supply error or internal power supply circuit error (Stop state)
7	ON	Internal error, power supply error, or internal power supply circuit error (Stop state)
9	ON	EMC disturbance (Stop state)
C	ON	Configuration procedure is in progress (Configuration state)
	Blink	Configuration is valid (Note) (Configuration state)
Random	ON/Blink	Initializing (Initial state)
OFF	OFF	Normal operation (Run state)

Note: Blinks for 1 to 5 seconds after the enter button is pressed. Releasing the button during blinking activates the setting. The blinking LED becomes ON if the button is pressed for more than 5 seconds, and the setting becomes invalid even after the button is released.

Input LED ④

SAFE-IN (X0 … X15), START-IN (X16, X17)

LED	Status	Description
X0 to X15	ON	Input ON
	OFF	Input OFF, or SafetyOne is in the Stop or Configuration state
	Blink	Input monitor error (Blink input number the error occurred, error number is displayed at Error LED)
X16, X17	ON	Input ON
	OFF	Input OFF, or SafetyOne is in the Stop or Configuration state
	Blink	Input monitor error (Blink input number the error occurred, error number is displayed at Error LED)

Output LED ⑤

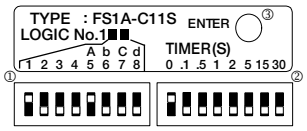
SAFE-OUT (Y0 … Y3), SOLENOID-OUT (Y17, Y20)

LED	Status	Description
Y0 to Y3	ON	Output ON
	OFF	Output OFF, or SafetyOne is in the Stop or Configuration state
	Blink	During OFF-delay timer operation, or output monitor error (Blink output number the error occurred, error number is displayed in Error LED display)
Y17, Y20	ON	Output ON
	OFF	Output OFF, or SafetyOne is in the Stop or Configuration state
	Blink	Output monitor error (Blink output number the error occurred, error number is displayed at Error LED display)

Configuration Switches

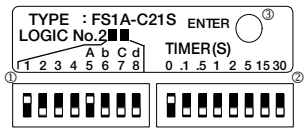
Logic Switch ①

FS1A-C11S



①Logic Switch
②Timer Switch
③Enter button

FS1A-C21S



①Logic Switch
②Timer Switch
③Enter button

For details, see user's manual "Chapter 2 Logic Number".

Timer Switch ②

Eight DIP switches are provided for selecting an off-delay timer value, by moving a switch upward. Only one timer switch can be selected.

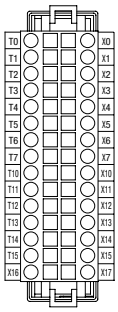
Switch No.	Timer Value	Description
1	0	No off-delay (safety outputs shut down immediately)
2	.1	Off-delay timer 0.1s
3	.5	Off-delay timer 0.5s
4	1	Off-delay timer 1s
5	2	Off-delay timer 2s
6	5	Off-delay timer 5s
7	15	Off-delay timer 15s
8	30	Off-delay timer 30s

Enter Button ③

The enter button is used to activate the configuration of logic and timer switches. Error LED will blink for 1 to 5 seconds after pressing the enter button. Releasing the button during blinking activates the setting. The blinking LED becomes ON if the button is pressed for more than 5 seconds, and the setting becomes invalid even after the button is released. For setting the switches and enter button, use the setting tool supplied with the SafetyOne.

Connector Specifications

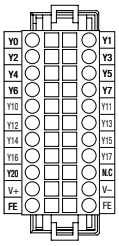
Input Connector



Applicable connector
- Spring clamp (30-pin)
  FS9Z-CN01 (IDEC)
  2-1871940-5
  (Tyco Electronics)
- Crimp (30-pin)
  2-1871946-5
  (Tyco Electronics)

Terminal	No.	Description
T0	A1	Safety input drive terminal 0
T1	A2	Safety input drive terminal 1
T2	A3	Safety input drive terminal 2
T3	A4	Safety input drive terminal 3
T4	A5	Safety input drive terminal 4
T5	A6	Safety input drive terminal 5
T6	A7	Safety input drive terminal 6
T7	A8	Safety input drive terminal 7
T10	A9	Safety input drive terminal 10
T11	A10	Safety input drive terminal 11
T12	A11	Safety input drive terminal 12
T13	A12	Safety input drive terminal 13
T14	A13	Safety input drive terminal 14
T15	A14	Safety input drive terminal 15
X16	A15	Start input terminal 16
X0	B1	Safety input receive terminal 0
X1	B2	Safety input receive terminal 1
X2	B3	Safety input receive terminal 2
X3	B4	Safety input receive terminal 3
X4	B5	Safety input receive terminal 4
X5	B6	Safety input receive terminal 5
X6	B7	Safety input receive terminal 6
X7	B8	Safety input receive terminal 7
X10	B9	Safety input receive terminal 10
X11	B10	Safety input receive terminal 11
X12	B11	Safety input receive terminal 12
X13	B12	Safety input receive terminal 13
X14	B13	Safety input receive terminal 14
X15	B14	Safety input receive terminal 15
X17	B15	Start input terminal 17

Output Connector

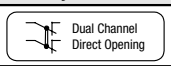
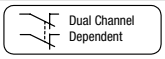
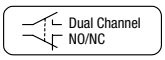
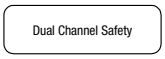
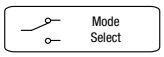
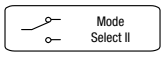
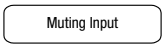
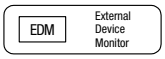
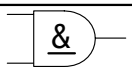
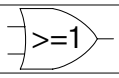
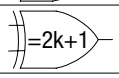
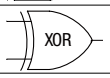
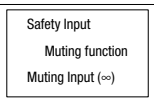
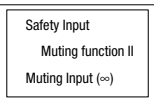
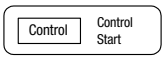
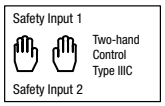
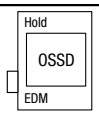
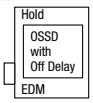


Applicable connector
- Spring clamp (22-pin)
  FS9Z-CN02 (IDEC)
  2-1871940-1
  (Tyco Electronics)
- Crimp (22-pin)
  2-1871946-1
  (Tyco Electronics)

Terminal	No.	Description
Y0	A1	Safety output terminal 0
Y2	A2	Safety output terminal 2
Y4	A3	Monitor output terminal 4
Y6	A4	Monitor output terminal 6
Y10	A5	Monitor output terminal 10
Y12	A6	Monitor output terminal 12
Y14	A7	Monitor output terminal 14
Y16	A8	Monitor output terminal 16
Y20	A9	Solenoid/lamp output terminal 20
V+	A10	24V DC power terminal
FE	A11	Functional ground terminal
Y1	B1	Safety output terminal 1
Y3	B2	Safety output terminal 3
Y5	B3	Monitor output terminal 5
Y7	B4	Monitor output terminal 7
Y11	B5	Monitor output terminal 11
Y13	B6	Monitor output terminal 13
Y15	B7	Monitor output terminal 15
Y17	B8	Solenoid/lamp output terminal 17
NC	B9	Blank terminal
V–	B10	0V DC power terminal
FE	B11	Functional ground terminal

Note: For the specifications of crimp connector, contact Tyco Electronics.

Logic Functions

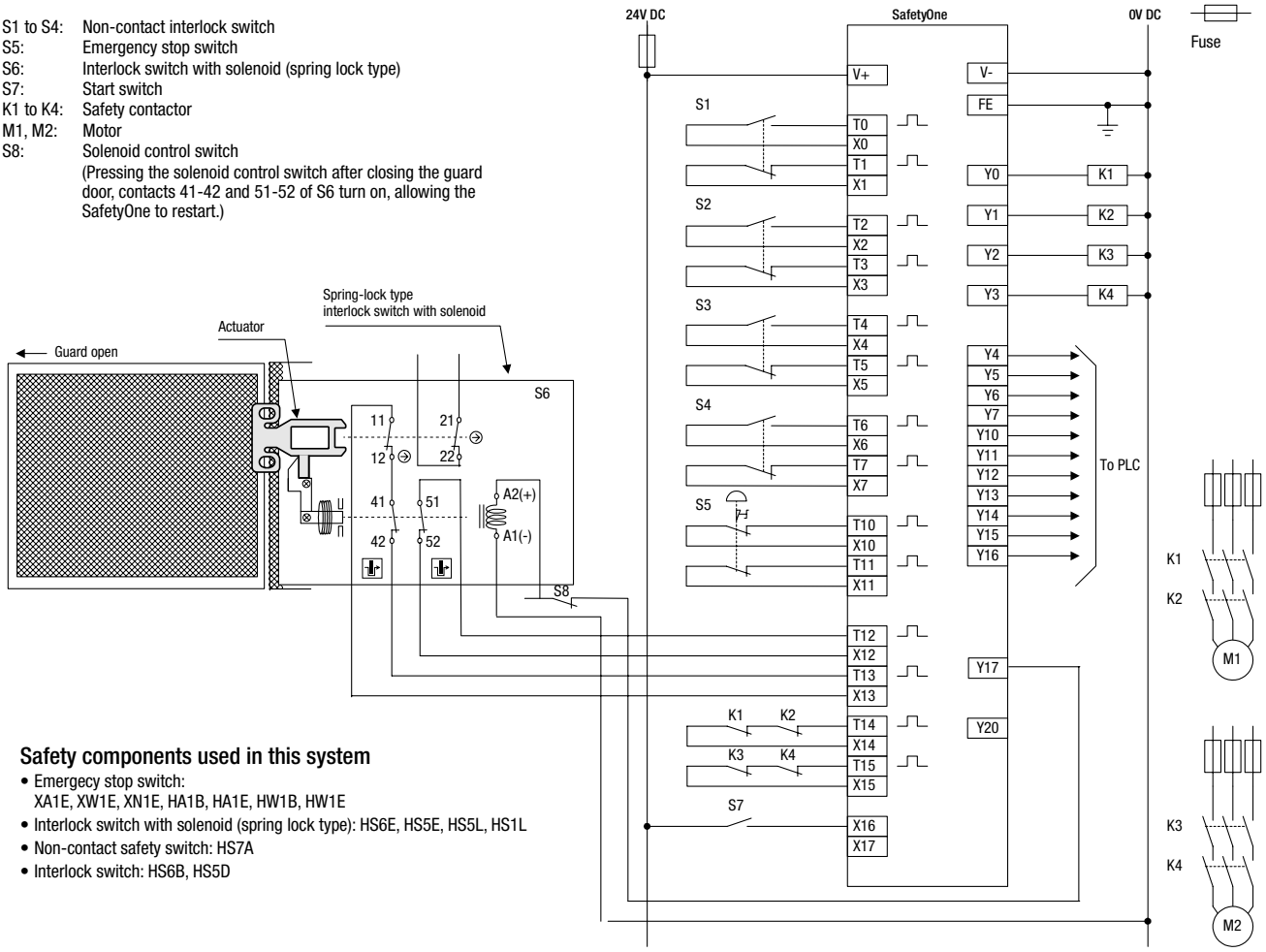
Type	Function	Symbol	Description
Input Function	Dual channel direct opening input		For connecting safety components with dual channel direct opening action mechanism, such as emergency stop switches and interlock switches.
	Dual channel dependent input		For connecting safety components with dual channel dependent action mechanism, such as enabling switches.
	Dual channel NO/NC Input		For connecting safety components with dual channel NO/NC mechanism, such as non-contact interlock switches.
	Dual channel safety input		For connecting safety components with dual channel solid state output (PNP output), such as light curtains or safety laser scanners, or emergency stop switches or safety switches.
	Dual channel safety input II		For connecting safety components with dual channel solid state output (PNP output), such as light curtains or safety laser scanners, or safety components with dual channel dependent functions such as enable switches.
	Mode select input		For connecting components with mode select function, such as mode selector switches.
	Mode select input II		For connecting components with mode select function, such as mode selector switches. When the switching of input is within 3 seconds, the function's output remains unchanged.
	Muting input		For connecting components such as muting sensors and limit switches.
	Monitor input		For connecting switches or sensors for start input.
	External device monitor input		For monitoring external devices controlled by the SafetyOne. External devices are diagnosed for errors by connecting a NC contact, such as contactor or safety relay.
Logic Operation Function	AND		Logical multiplication (AND) of multiple inputs.
	OR		Logical addition (OR) of multiple inputs.
	XOR		Exclusive logical addition (XOR) of multiple inputs. Error is detected with 2 or more inputs.
	XOR II		Exclusive logical addition (XOR) of multiple inputs.
	Self-hold		Self-holding of input.
	Muting		Adds muting function to the connected safety components.
	Muting II		Adds muting function to the connected safety components. ∞ shows that muting time is infinite.
	Control start		Adds operation confirmation function to the connected start input devices.
	Two-hand control		Adds two-hand control input function. Type III C.
Output Function	Safety output		For controlling the safety output.
	Safety output with timer		For controlling the safety output with an off-delay timer.

• For details, see the user's manual.

Wiring Example (Logic 11b)

When connecting four non-contact interlock switches, an emergency stop switch, and a spring-lock type interlock switch with solenoid

S1 to S4: Non-contact interlock switch
S5: Emergency stop switch
S6: Interlock switch with solenoid (spring lock type)
S7: Start switch
K1 to K4: Safety contactor
M1, M2: Motor
S8: Solenoid control switch
(Pressing the solenoid control switch after closing the guard door, contacts 41-42 and 51-52 of S6 turn on, allowing the SafetyOne to restart.)



Safety components used in this system

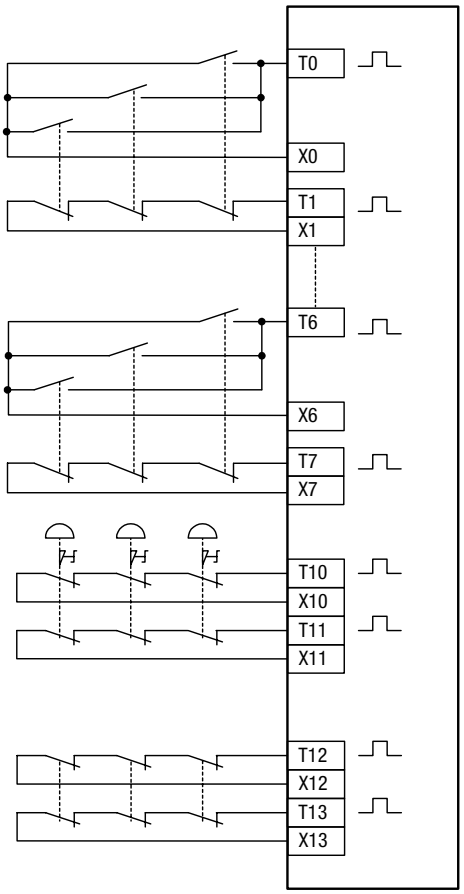
- Emergecy stop switch:
  XA1E, XW1E, XN1E, HA1B, HA1E, HW1B, HW1E
- Interlock switch with solenoid (spring lock type): HS6E, HS5E, HS5L, HS1L
- Non-contact safety switch: HS7A
- Interlock switch: HS6B, HS5D

- Wiring may differ according to input functions. See manual for details.
- The safety category may differ according to the connection method of input/output. See manual for details.

Marking for Lock Monitoring

By satifsying the requirements shown in EN ISO/ISO14119:2013, the number of contacts needed to construct safety circuits can be reduced/

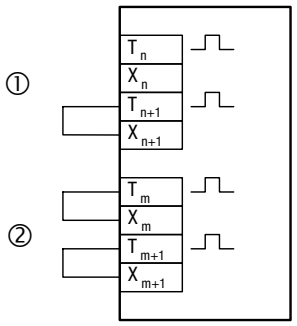
When connecting multiple devices in series



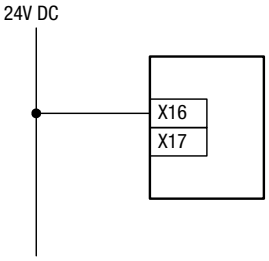
Note: Safety characteristics may differ according to the connection method of the device.

When some safety inputs are not used

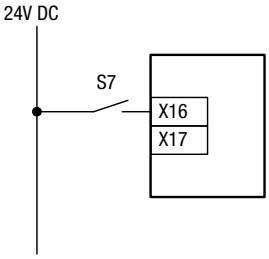
- When there is an unused safety input from S1 to S4, open the receive terminal (T_n) and drive terminal (X_n) suitable for the unused safety input, and provide a short circuit connection between the receive terminal (T_{n+1}) and drive terminal (X_{n+1}). (n=0,2,4,6) (See ①)
- When there is an unused safety input for S5 or S6, provide a short-circuit connection between the receive terminal and drive terminal suitable for the unused safety input. (See ②)



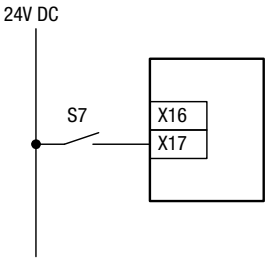
When not using the start switch
(auto start)



When not detecting the welding of the start switch
(manual start)



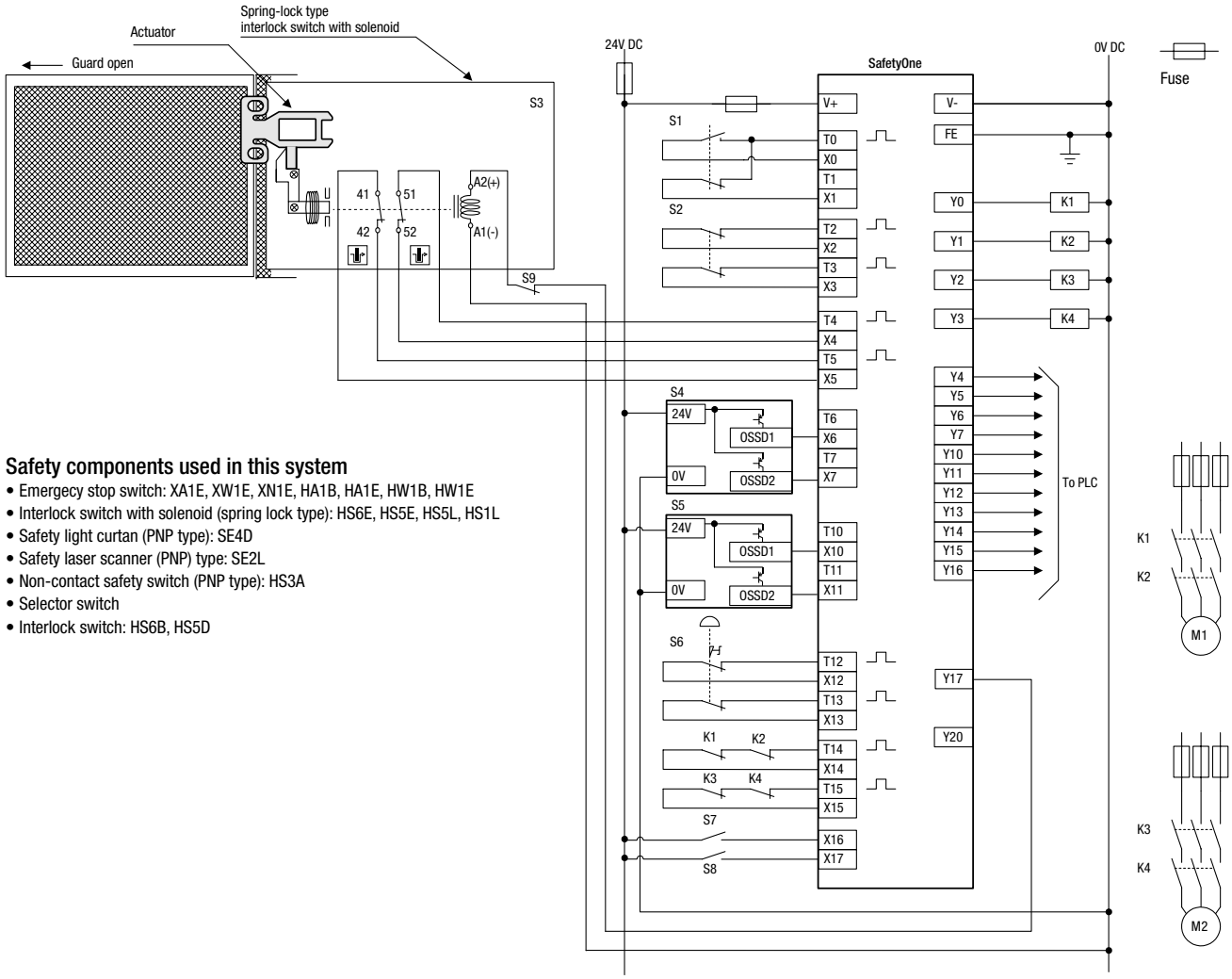
When detecting the welding of the start switch
(control start)



Wiring Example (Logic 13b)

When connecting a selector switch, an enabling switch, an interlock switch with solenoid with spring lock type, two safety light curtains, and an emergency stop switch.

S1: Selector switch
S2: Enabling switch
S3: Interlock switch with solenoid (spring lock type)
S4, S5: Safety light curtain
S6 Emergency stop switch
S7, S8: Start switch
S9, S10: Solenoid control switch
(Pressing the solenoid control switch after closing the guard door, contacts 41-42 and 51-52 of S3 turns on, allowing the SafetyOne to restart.)
K1 to K4: Safety contactor
M1, M2: Motor



Safety components used in this system

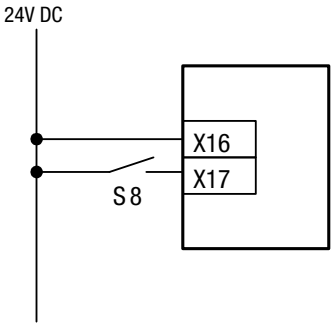
- Emergecy stop switch: XA1E, XW1E, XN1E, HA1B, HA1E, HW1B, HW1E
- Interlock switch with solenoid (spring lock type): HS6E, HS5E, HS5L, HS1L
- Safety light curtan (PNP type): SE4D
- Safety laser scanner (PNP) type: SE2L
- Non-contact safety switch (PNP type): HS3A
- Selector switch
- Interlock switch: HS6B, HS5D

- Wiring may differ according to input functions. See manual for details.
- The safety category may differ according to the connection method of input/output. See manual for details.

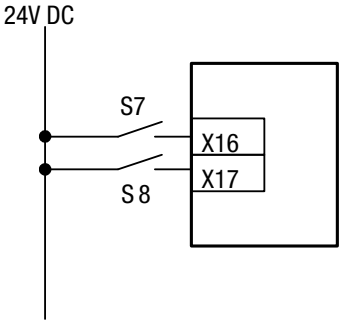
Marking for Lock Monitoring

By satifsying the requirements shown in EN ISO/ISO14119:2013, the number of contacts needed to construct safety circuits can be reduced/

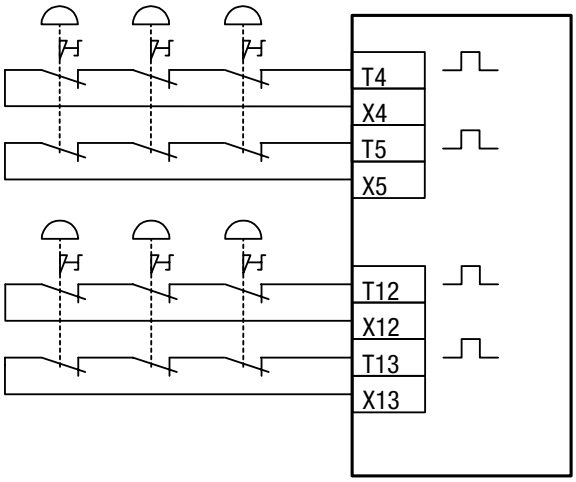
When not using the S7 start switch (auto start)



When using the S7 start switch (manual start)



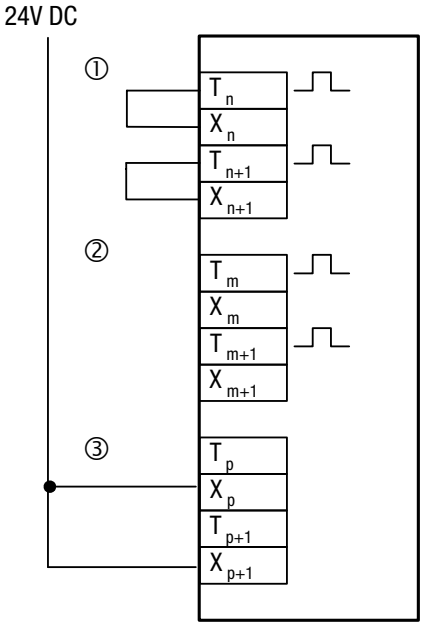
When connecting multiple emergency stop switches in series



Note: Safety characteristics may differ according to the connection method of the device.

When some safety inputs are not used

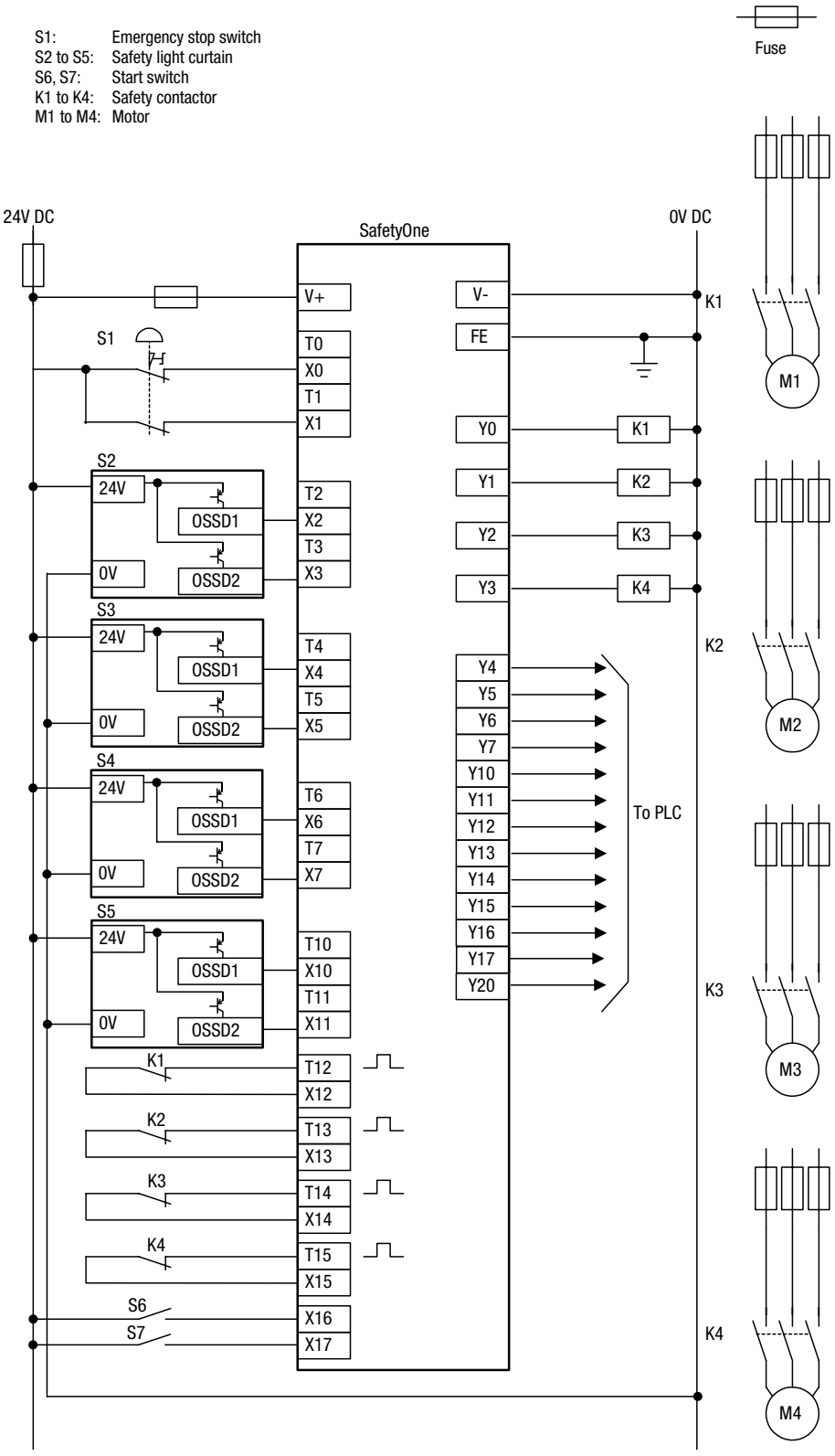
- When there is an unused safety input for S5 or S6, provide a short-circuit connection between the receive terminal and drive terminal suitable for the unused safety input. (See ①)
- When only one safety input is used for S4 or S5, open the receive terminal suitable for the the other unused safety input. (See ②)
- When both safety inputs are unsed for S4 or S5, provide 24V DC (V+) and short-circuit connection between the receive terminals to at least either one of the safety inputs. (See ③)



Wiring Example (Logic 105)

When connecting an emergency stop switch and four safety light curtains.

S1: Emergency stop switch
S2 to S5: Safety light curtain
S6, S7: Start switch
K1 to K4: Safety contactor
M1 to M4: Motor

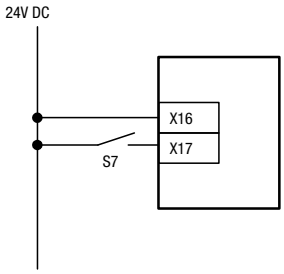


Safety components used in this system

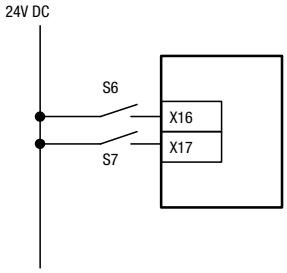
- Emergecy stop switch: XA1E, XW1E, XN1E, HA1B, HA1E, HW1B, HW1E
- Interlock switch with solenoid (spring lock type): HS6E, HS5E, HS5L, HS1L
- Safety light curtan (PNP type): SE4D
- Safety laser scanner (PNP) type: SE1L
- Non-contact safety switch (PNP type): HS3A
- Interlock switch: HS6B, HS5D

- Wiring may differ according to input functions. See manual for details.
- The safety category may differ according to the connection method of input/output. See manual for details.

When not using the S6 start switch (auto start)

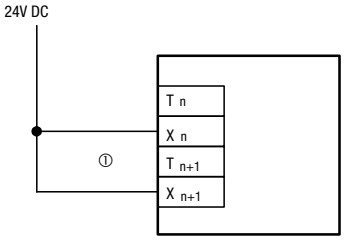


When using the S6 start switch (manual start)



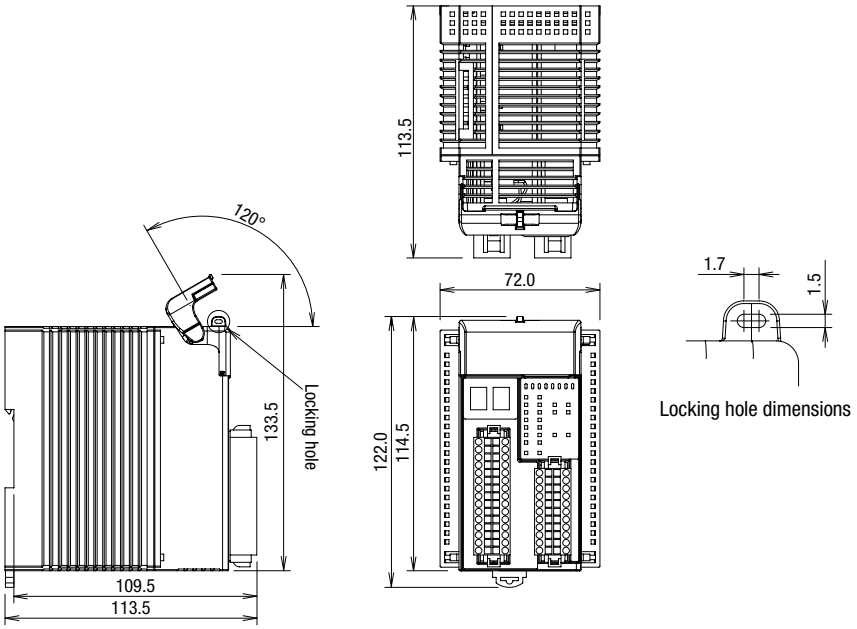
When some safety inputs are not used

- When there is an unused safety input for S1 to S5, provide 24V DC (V+) and short-circuit connection to the receive terminal suitable for the unused safety input. (See ①)



Dimensions

Dimensions in mm.



Locking hole dimensions

Specification difference between FS1A-C21S (Ver. 2.0 or above) and earlier series

1. When an error is detected, the monitor output of safety input/output turns off but does not flicker such as the FS1A-C11S.
2. LED lights can be used for the muting lamp output of FS1A-C21S (ver 2.0 or above) but does not have a disconnect detect function such as FS1A-C21S, FS1A-C11S and FS1A-C01S (discontinued).

FS1A Series

Part no.	Version	When error is detected for safety input/ output monitor	Muting lamp output	
			Connectable lamp specification	Disconnection function
FS1A-C01S (discontinued)	—	Flicker	Incandescent	Available
FS1A-C11S	—	Flicker	Incandescent	Available
FS1A-C21S	Ver. 1	Flicker	Incandescent	Available
FS1A-C21S	Ver. 2	Off	Incandescent/LED	Not available

Note: The version can be checked from the part no. "FS1A-C21S (∗)" on the nameplate of the product.
(∗) : (1) Ver.1, (2) Ver. 2.0

FS1A-C11S logic selection chart 1

Part No.		Interlock/Emergency Stop Switch	Enabling/Grip Switch	Mode Selection	Light Curtain	Muting	NO/NC Contact Inputs	Two-hand Control	Output 1 Line	Output put 2 Lines	Output 4 Lines
FS1A-C11S											
Logic Type	Logic No.										
The logic for various apparatus	101	●	●							●	
The logic for apparatus with openings	11A	●			●					●	
The logic for apparatus with NO/NC contact inputs	11b	●					●			●	
The logic for apparatus with openings	11C	●			●					●	
Muting function logic for apparatus with openings	11d	●			●	●				●	
Partial stop logic for apparatus with openings	102	●			●					●	
The logic for apparatus with a two-hand control device	12A	●			●			●		●	
The logic constructing an OR circuit for various apparatus	12b	●	●							●	
The logic constructing an OR circuit for apparatus with openings	12C	●			●					●	
Partial control logic for apparatus with openings	12d	●	●		●					●	
Partial stop logic applicable for selection of active safety input devices	103	●	●	●	●					●	
The logic applicable for selection of active safety input devices	13A	●	●	●						●	
The logic constructing an OR circuit applicable for selection of active safety input devices	13b	●	●	●	●					●	
Partial stop logic applicable for selection of active safety input devices	13C	●	●	●	●					●	
The logic applicable for selection of active safety input devices	13d	●	●	●	●					●	
Partial stop logic applicable for selection of active safety input devices	104	●	●	●							●
Partial stop logic applicable for selection of active safety input devices	14A	●	●	●							●
Partial stop logic applicable for selection of active safety input devices	14b	●	●	●							●
Partial stop logic applicable for selection of active safety input devices	14C	●	●	●							●
Partial stop logic applicable for selection of active safety input devices for apparatus with openings	14d	●	●	●	●						●
Partial stop logic for apparatus with openings	105	●			●						●
Partial stop logic for apparatus with openings	106	●			●						●
Partial stop logic for various apparatus	107	●									●
Partial stop logic applicable for selection of active safety input devices in apparatus with openings	108	●	●	●	●						●

FS1A-C11S Logic 101

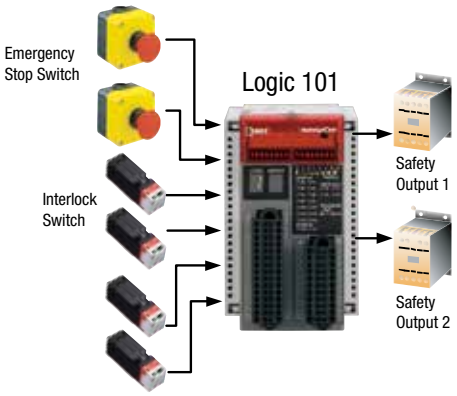
The logic for various apparatus

Output Line: 2
2 dual safety outputs of different operations

Maximum Category
4

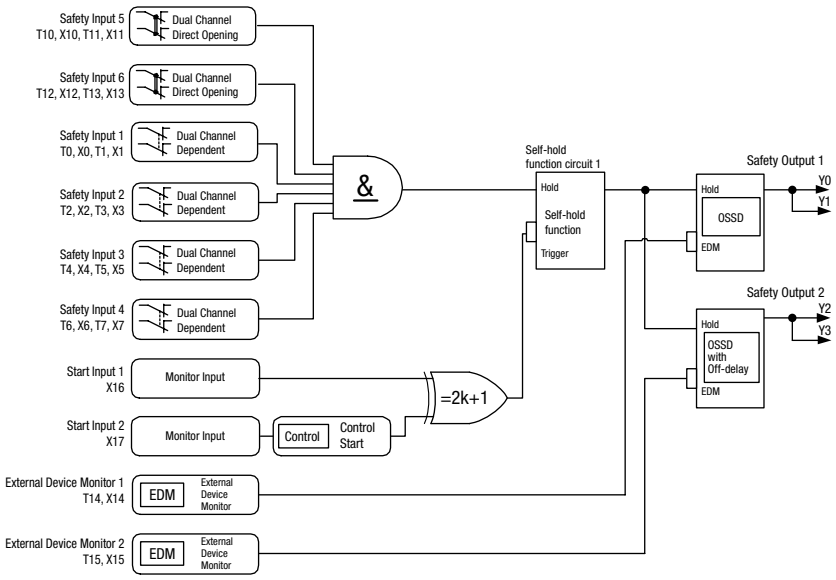
Logic 101 is used for safeguarding measures of machine tools and robots. Safety outputs are dual channel outputs. It can be used with two dual direct-opening components and for dual channel dependent inputs. Safety output 2 has an off-delay timer.

• Wiring Example



• DIP Switch and LED Display

• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 11A

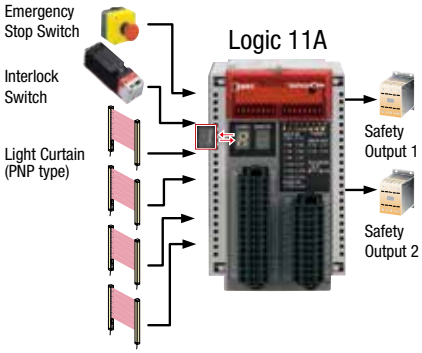
The logic for apparatus with openings

Output Line: 2
2 dual safety outputs of different operations

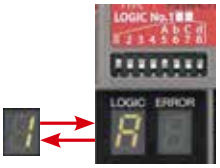
Maximum Category
4

Logic 11A is used for safeguarding measures of machine tools and robots, which use safety equipment such as light curtains with dual solid state outputs. Safety outputs are dual channel outputs. Two dual channel direct opening inputs and four dual channel safety inputs can be connected. Safety output 2 has an off-delay timer.

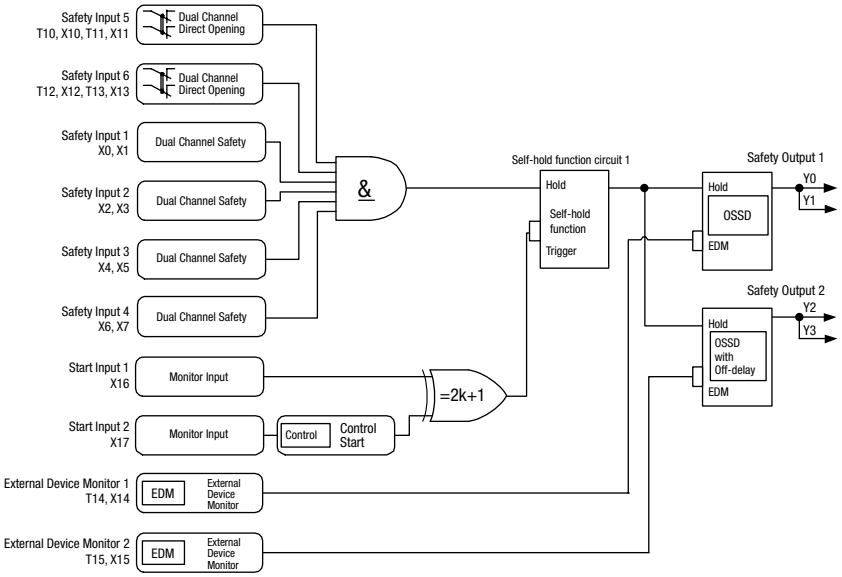
• Wiring Example



• DIP Switch and LED Display



• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 11b

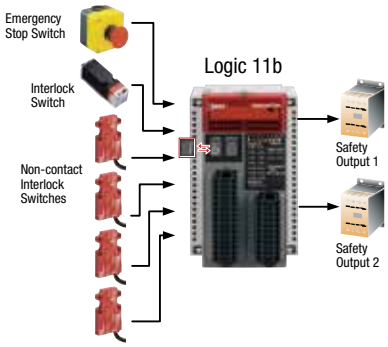
The logic for apparatus with NO/NC contact inputs

Output Line: 2
2 dual safety outputs of different operations

Maximum Category
4

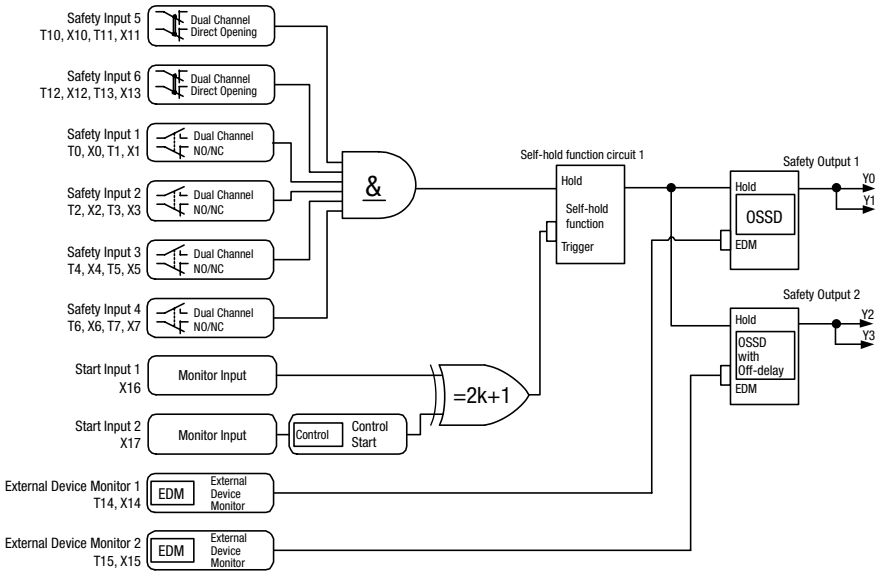
Logic 11b is used for safeguarding measures of semiconductor manufacturing equipment and food packing machine which use dual channel NO/NC contact equipment. Safety outputs are dual channel outputs. Two dual channel direct opening inputs and four dual channel NO/NC inputs can be connected. Safety output 2 has an off-delay timer.

• Wiring Example



• DIP Switch and LED Display

• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 11C

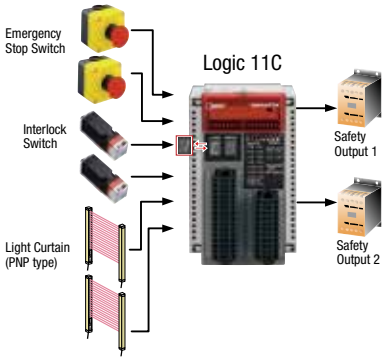
The logic for apparatus with openings

Output Line: 2
2 dual safety outputs of different operations

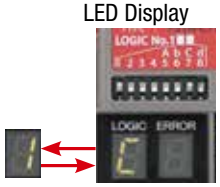
Maximum Category
4

Logic 11C is used for safeguarding measures of machine tools and robots, which use safety equipment such as light curtains with dual solid state outputs. Safety outputs are dual channel outputs. Four dual channel direct opening inputs, and two dual channel safety inputs can be connected. Safety output 2 has an off-delay timer.

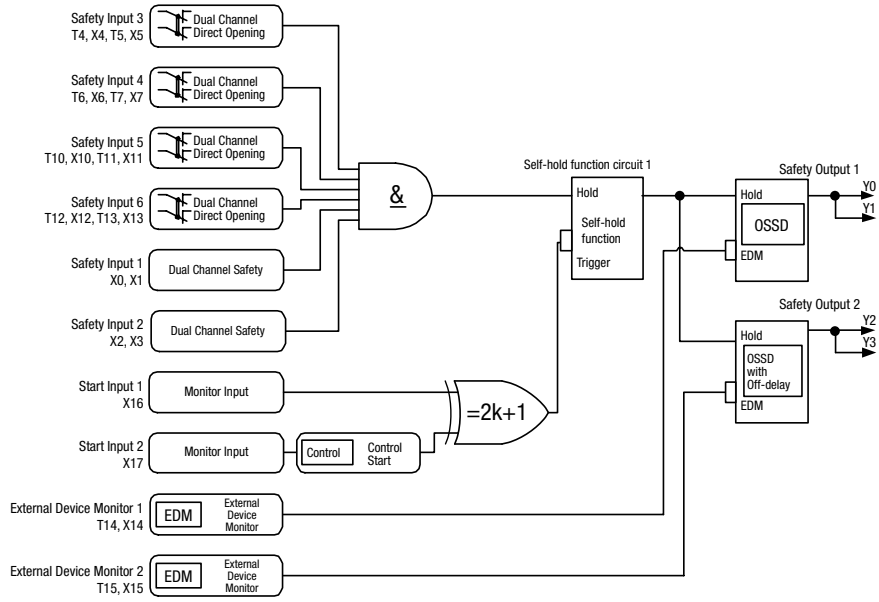
• Wiring Example



• DIP Switch and LED Display



• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 11d

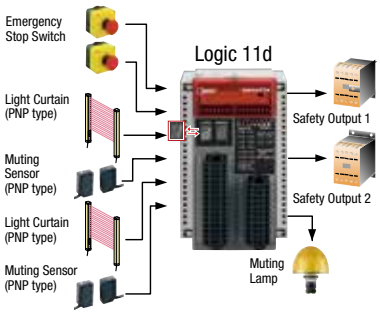
Muting function logic for apparatus with openings

Output Line: 2
2 dual safety outputs of different operations

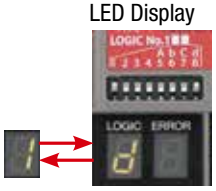
Maximum Category 4

Logic 11d is used for safeguarding measures of robots and conveyor lines, which uses safety equipment such as light curtains with dual solid state outputs, and also equipment that outputs muting signals for safety equipment. Safety outputs are dual channel outputs. Two dual channel direct opening inputs, two dual channel safety inputs, two muting signals (muting sensor or limit switch) (two signals = one muting point) can be connected. Safety output 2 has an off-delay timer.

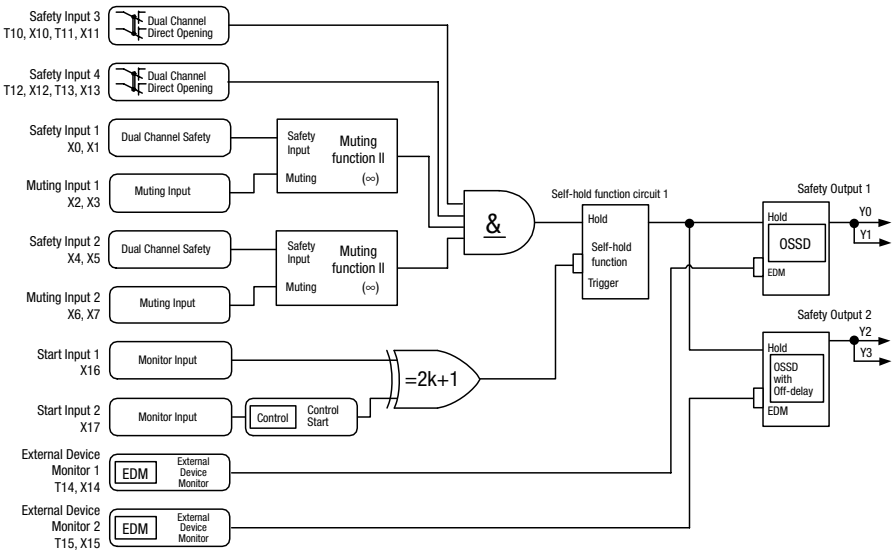
• Wiring Example



• DIP Switch and LED Display



• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 102

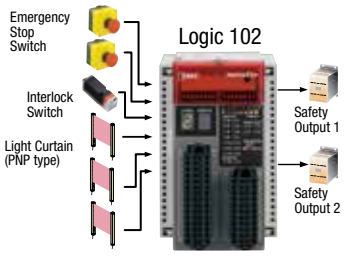
Partial stop logic for apparatus with openings

Output Line: 2
2 dual safety outputs of different operations

Maximum Category 4

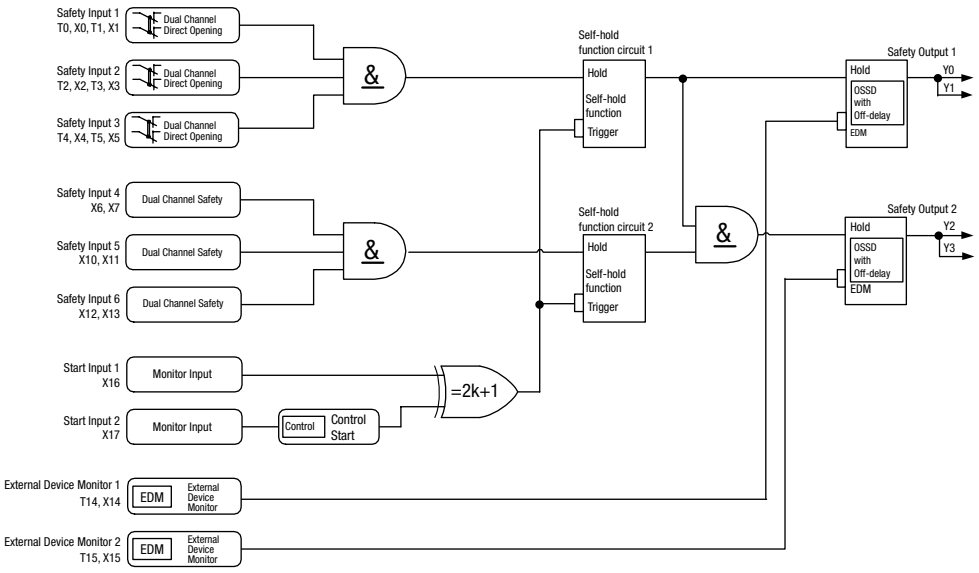
Logic 102 is used for safeguarding measures of machine tools and robots, which use safety equipment such as light curtains with dual solid state outputs. Safety outputs are dual channel outputs. Three dual channel direct opening inputs and three dual safety inputs can be connected.

• Wiring Example



• DIP Switch and LED Display

• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 12b

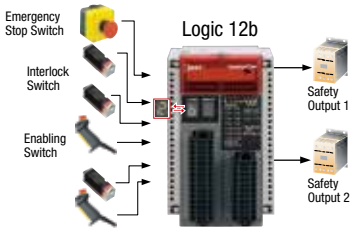
The logic constructing an OR circuit for various apparatus

Output Line: 2
2 dual safety outputs of different operations

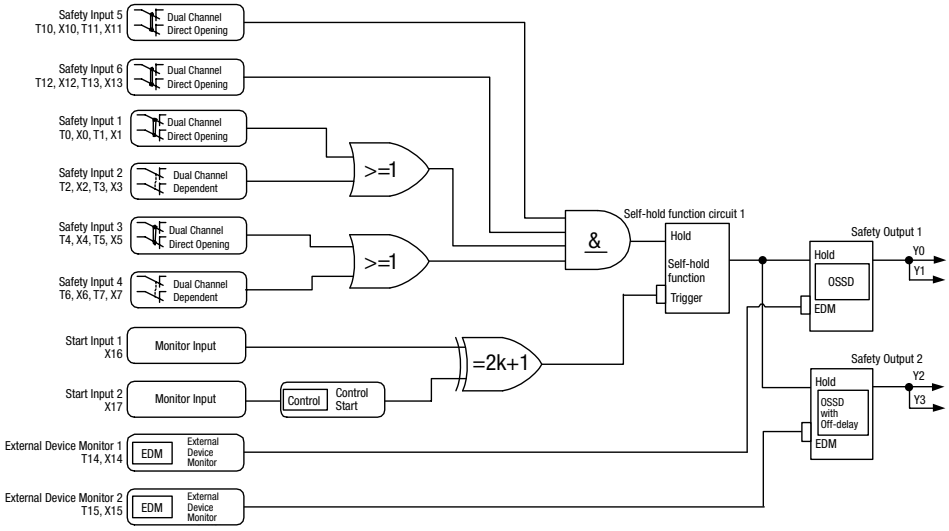
Maximum Category 4

Logic 12b is used for safeguarding measures of machine tools and robots, when an OR circuit is configured. Safety outputs are dual channel outputs. Four dual channel direct opening inputs and two dual channel dependent inputs can be connected. Safety output 2 has an off-delay timer.

• Wiring Example



• Logic Chart



• DIP Switch and LED Display

• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 12C

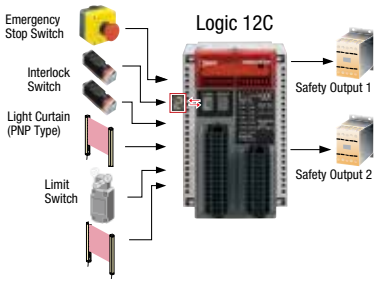
The logic constructing an OR circuit for apparatus with openings

Output Line: 2
2 dual safety outputs of different operations

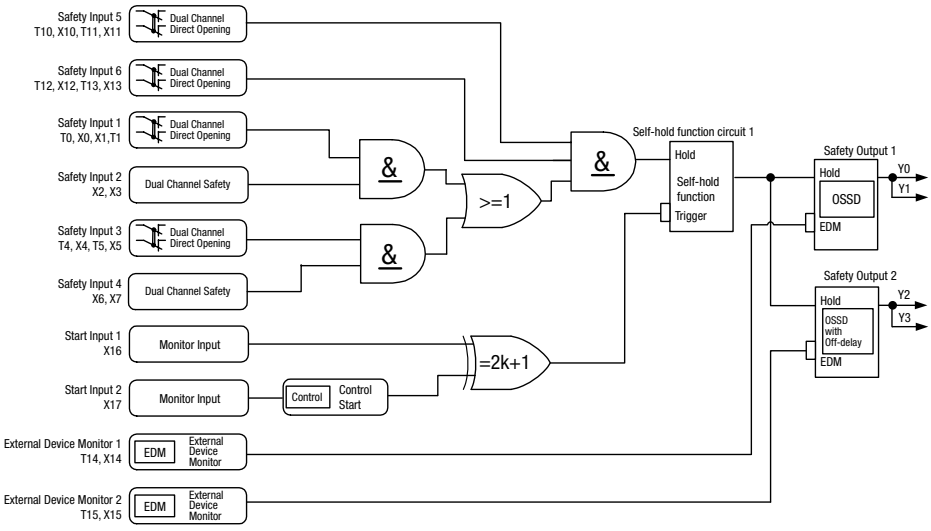
Maximum Category 4

Logic 12C is used for safeguarding measures of machine tools and robots which use safety equipment with dual channel solid state outputs, when configuring OR circuit. Safety outputs are dual channel outputs. Four dual channel direct opening inputs and two dual channel safety inputs can be connected. Safety output 2 has an off-delay timer.

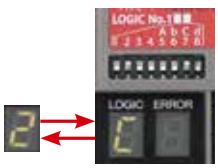
• Wiring Example



• Logic Chart



• DIP Switch and LED Display



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 12d

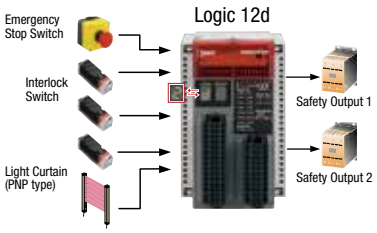
Partial control logic for apparatus with openings

Output Line: 2
2 dual safety outputs of different operations

Maximum Category
4

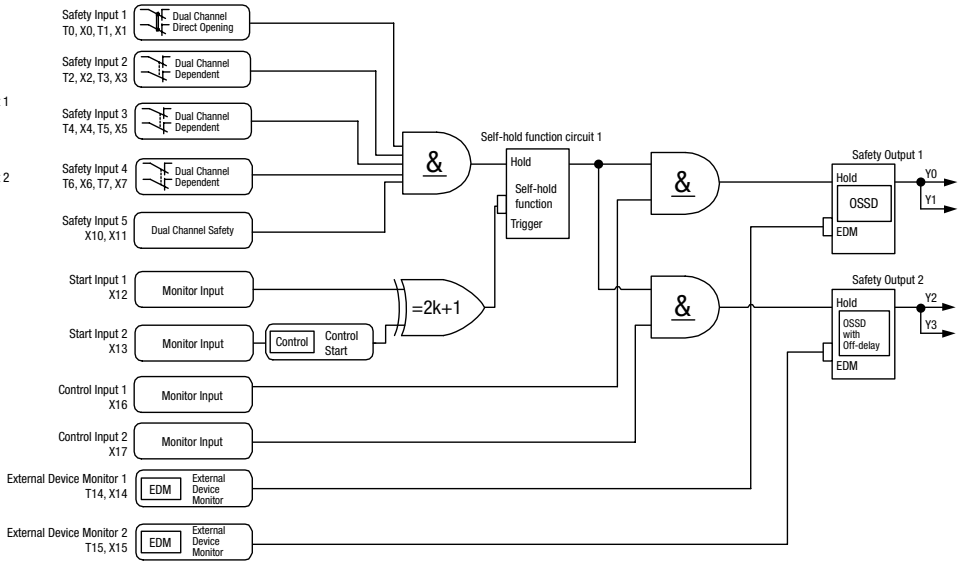
Logic 12d is used for safeguarding measures of machine tools and robots which use safety equipment with dual channel solid state outputs, when configuring partial control. Safety outputs are dual channel outputs. One dual channel direct opening input, one dual channel safety input, and three dual channel dependent inputs can be connected. Safety output 2 has an off-delay timer.

• Wiring Example



• DIP Switch and LED Display

• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 103

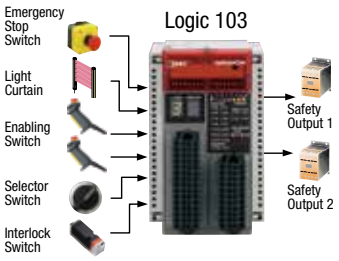
Partial stop logic applicable for selection of active safety input devices

Output Line: 2
2 dual safety outputs of different operations

Maximum Category
4

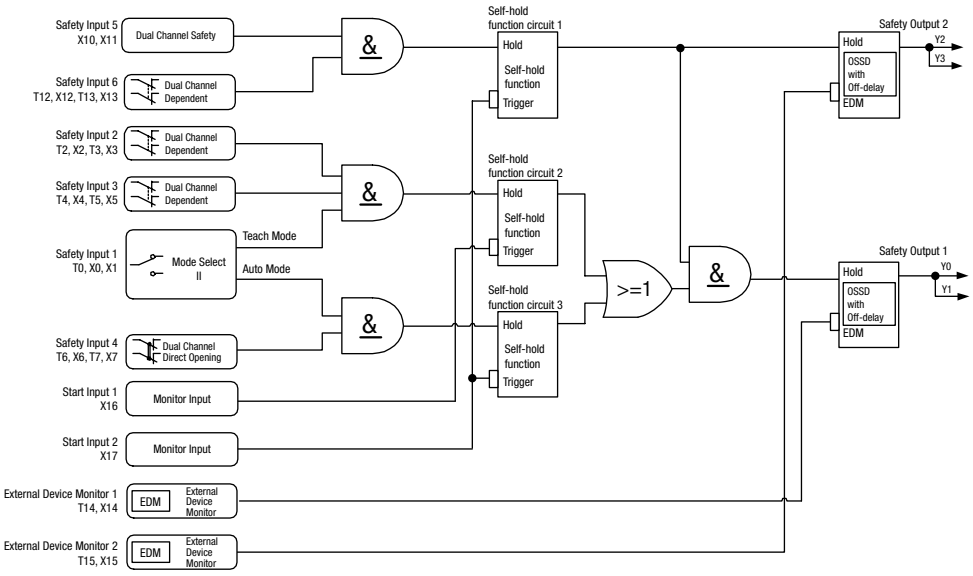
In machine tools and robots, a hazard source is isolated by a guard in automatic operation. In human-attended operation such as teaching and maintenance, the operator has to work inside a hazardous area. Logic 103 is used to configure a system in which teach or auto mode can be selected using a selector switch. Safety outputs are dual channel outputs. One dual channel direct opening input, one mode select input, three dual channel dependent inputs, and one dual channel safety input can be connected.

• Wiring Example



• DIP Switch and LED Display

• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 13A

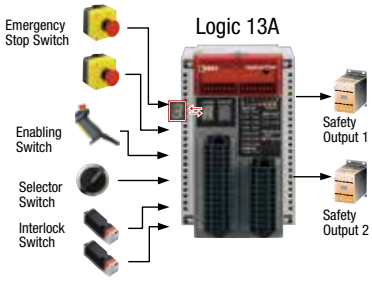
The logic applicable for selection of active safety input devices

Output Line: 2
2 dual safety outputs of different operations

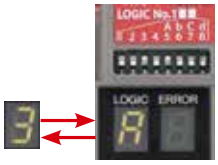
Maximum Category
4

In machine tools and robots, a hazard source is isolated by a guard in automatic operation. In human-attended operation such as teaching and maintenance, the operator has to work inside a hazardous area. Logic 13A is used to configure a system in which teach or auto mode can be selected using a selector switch. Safety outputs are dual channel outputs. Two dual channel direct opening input, one mode select input, and three dual channel dependent inputs can be connected. Safety output 2 has an off-delay timer.

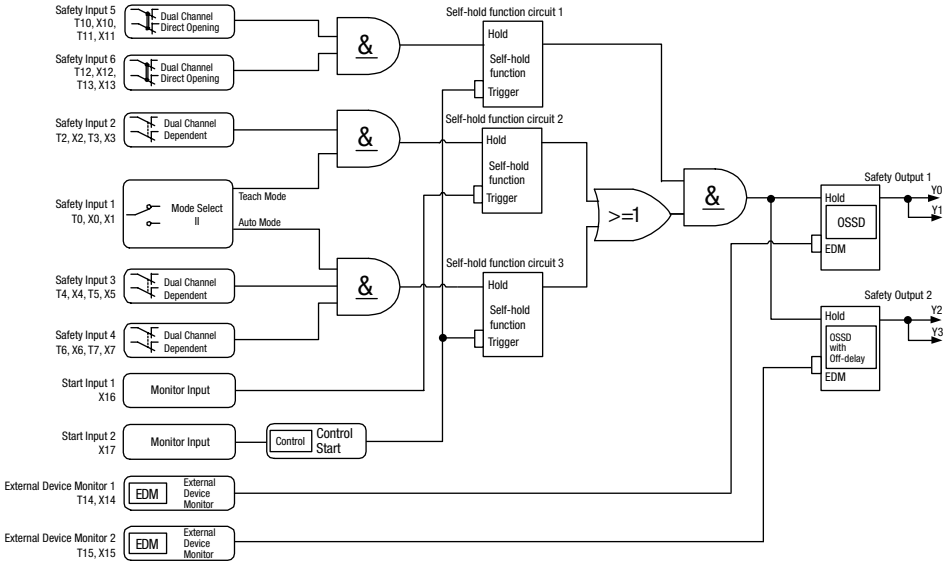
• Wiring Example



• DIP Switch and LED Display



• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 13b

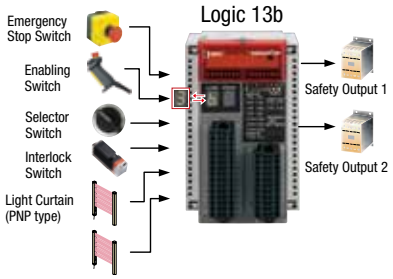
The logic constructing an OR circuit applicable for selection of active safety input devices

Output Line: 2
2 dual safety outputs of different operations

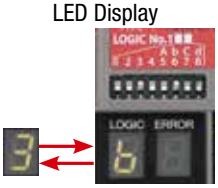
Maximum Category
4

In machine tools and robots, a hazard source is isolated by a guard in automatic operation. In human-attended operation such as teaching and maintenance, the operator has to work inside a hazardous area. Logic 13b is used to configure a system in which teach or auto mode can be selected using a selector switch. Safety outputs are dual channel outputs. OR circuit can be configured in auto mode. Two dual channel direct opening input, one mode select input, one dual channel dependent input, and two dual channel safety inputs can be connected. Safety output 2 has an off-delay timer.

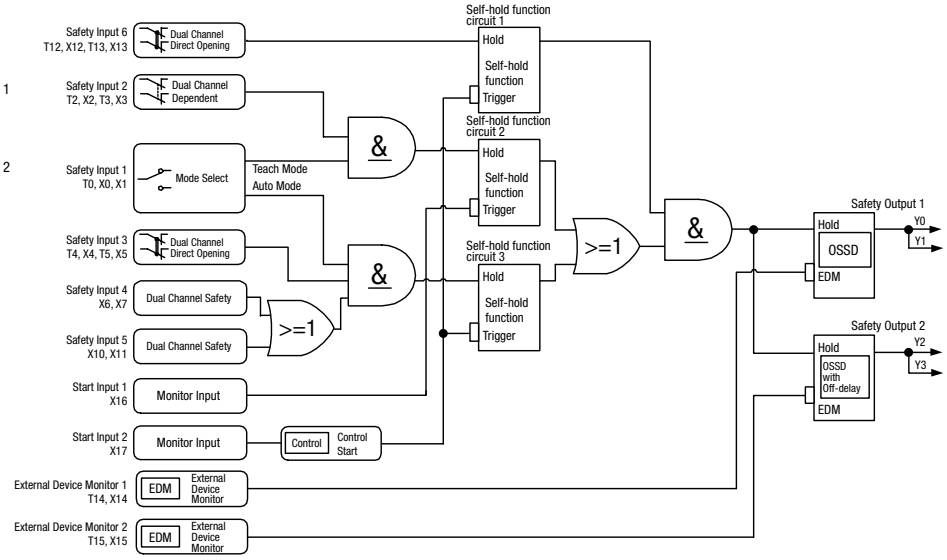
• Wiring Example



• DIP Switch and LED Display



• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 13C

Partial stop logic applicable for selection of active safety input devices

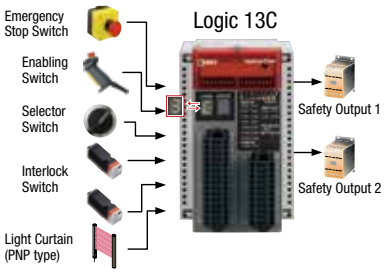
Output Line: 2
2 dual safety outputs of different operations

Maximum Category
4

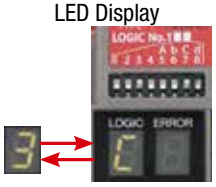
In machine tools and robots, a hazard source is isolated by a guard in automatic operation. In human-attended operation such as teaching and maintenance, the operator has to work inside a hazardous area. Logic 13C is used to configure a system in which teach or auto mode can be selected using a selector switch. Safety outputs are dual channel outputs. Three dual channel direct opening inputs, one mode select input, one dual channel dependent input, one dual channel safety input can be connected. Safety output 2 has an off-delay timer.

APEM
Switches & Pilot Lights
Control Boxes
Emergency Stop Switches
Enabling Switches
Safety Products
Explosion Proof
Terminal Blocks
Relays & Sockets
Circuit Protectors
Power Supplies
LED Illumination
Controllers
Operator Interfaces
Sensors
AUTO-ID

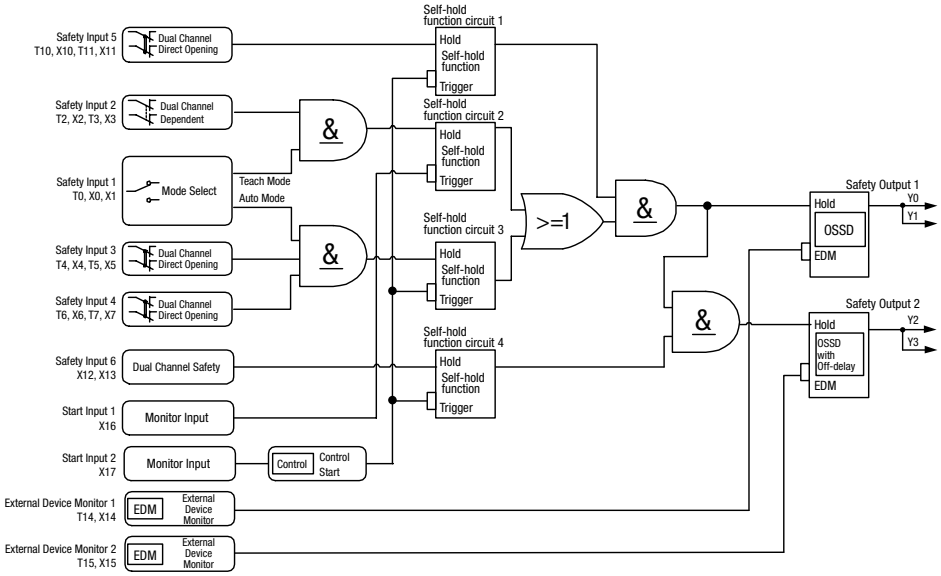
• Wiring Example



• DIP Switch and LED Display



• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 13d

The logic applicable for selection of active safety input devices

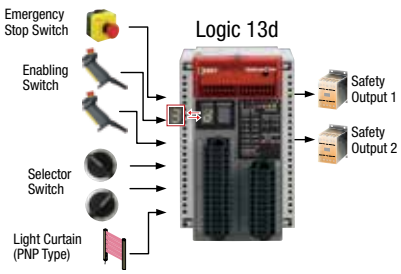
Output Line: 2
2 dual safety outputs of different operations

Maximum Category
4

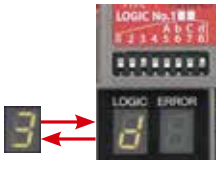
In machine tools and robots, a hazard source is isolated by a guard in automatic operation. In human-attended operation such as teaching and maintenance, the operator has to work inside a hazardous area. Logic 13d is used to configure a system in which teach or auto mode can be selected using a selector switch, and to select teach 1 or teach 2 within teach mode. Safety outputs are dual channel outputs. One dual channel direct opening input, one mode select input, two dual channel dependent inputs, and one dual channel safety input can be connected. Safety output 2 has an off-delay timer.

Interlock Switches
Non-contact Interlock Switches
Safety Laser Scanners
Safety Light Curtains
Safety Modules
FS1A
RF1V
RF2
HR2S
HR1S

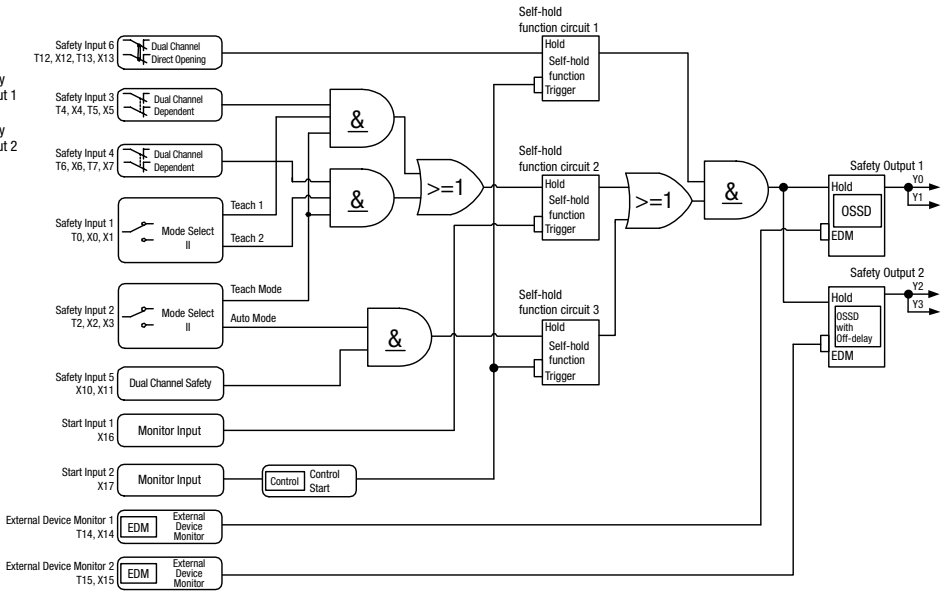
• Wiring Example



• DIP Switch and LED Display



• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 104

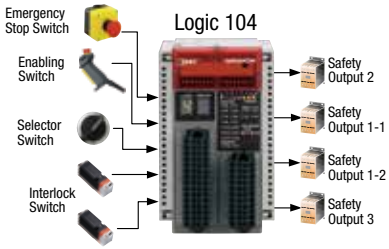
Partial stop logic applicable for selection of active safety input devices

Output Line: 4
4 single safety outputs of different operations

Maximum Category 3

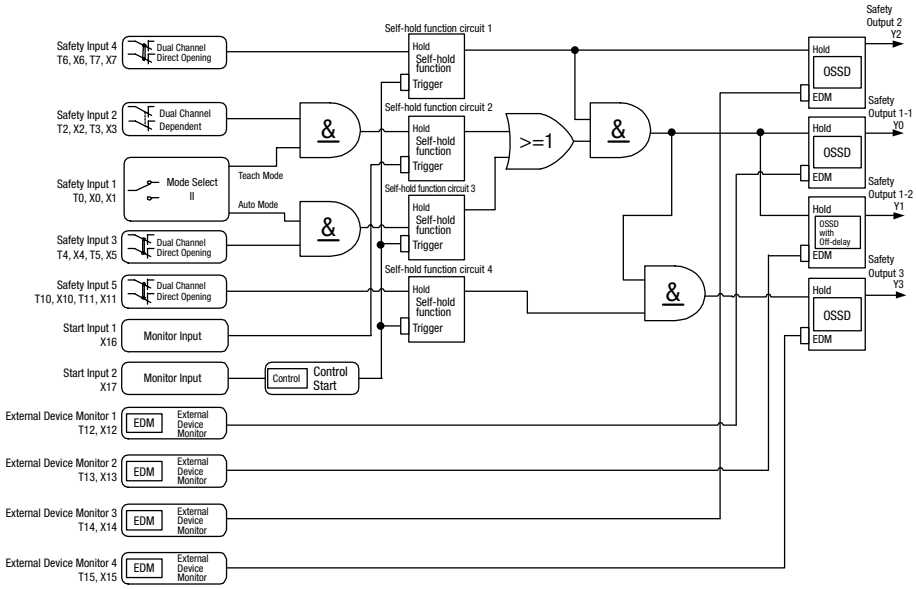
In machine tools and robots, a hazard source is isolated by a guard in automatic operation. In human-attended operation such as teaching and maintenance, the operator has to work inside a hazardous area. Logic 104 is used to configure a system in which teach or auto mode can be selected using a selector switch. Safety outputs are single output. Three dual channel direct opening inputs, one mode select input, and one dual channel dependent input can be connected. Safety output 1-2 has an off-delay timer.

• Wiring Example



• DIP Switch and LED Display

• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 14A

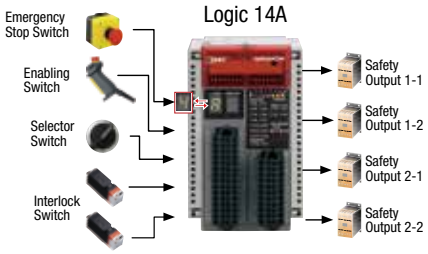
Partial stop logic applicable for selection of active safety input devices

Output Line: 4
4 single safety outputs of different operations

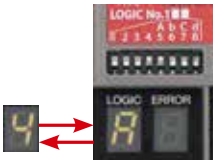
Maximum Category 3

In machine tools and robots, a hazard source is isolated by a guard in automatic operation. In human-attended operation such as teaching and maintenance, the operator has to work inside a hazardous area. Logic 14A is used to configure a system in which teach or auto mode can be selected using a selector switch. Safety outputs are single output. Three dual channel direct opening inputs, one mode select input, and one dual channel dependent input can be connected. Safety outputs 1-2 and 2-2 have off-delay timers.

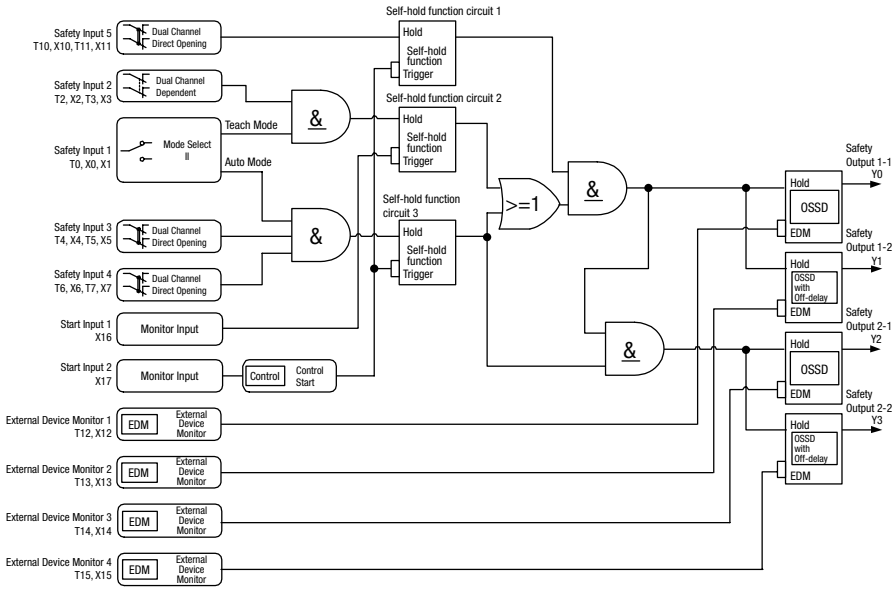
• Wiring Example



• DIP Switch and LED Display



• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 14b

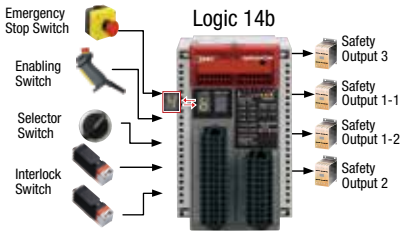
Partial stop logic applicable for selection of active safety input devices

Output Line: 4
4 single safety outputs of different operations

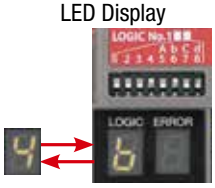
Maximum Category 3

In machine tools and robots, a hazard source is isolated by a guard in automatic operation. In human-attended operation such as teaching and maintenance, the operator has to work inside a hazardous area. Logic 14b is used to configure a system in which teach or auto mode can be selected using a selector switch. Safety outputs are single output. Three dual channel direct opening inputs, one mode select input, and one dual channel dependent input can be connected. Safety output 1-2 has an off-delay timer.

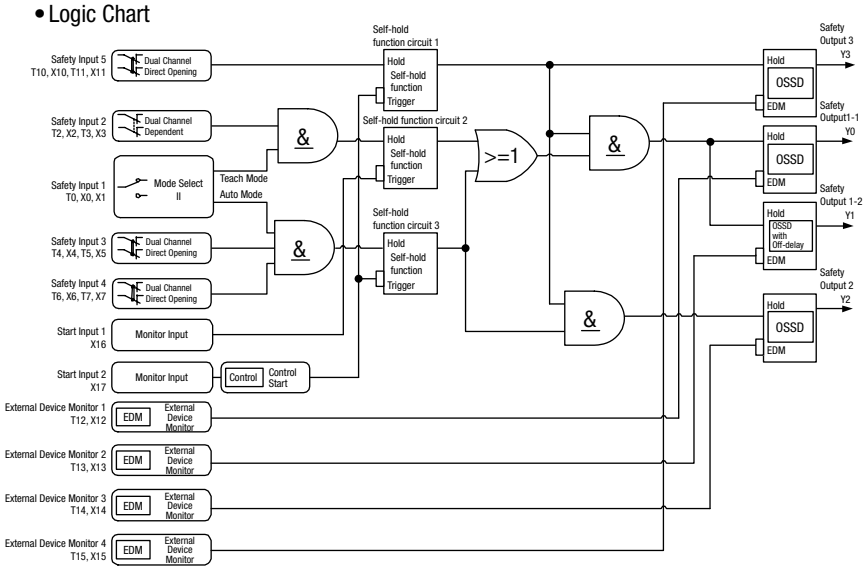
• Wiring Example



• DIP Switch and LED Display



• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 14C

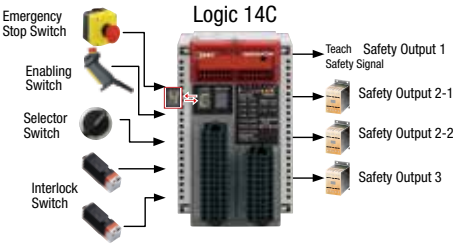
Partial stop logic applicable for selection of active safety input devices

Output Line: 4
4 single safety outputs of different operations

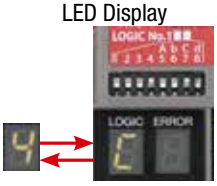
Maximum Category 3

In machine tools and robots, a hazard source is isolated by a guard in automatic operation. In human-attended operation such as teaching and maintenance, the operator has to work inside a hazardous area. Logic 14C is used to configure a system in which teach or auto mode can be selected using a selector switch. Safety outputs are single output. Three dual channel direct opening inputs, one mode select input, and one dual channel dependent input can be connected. Safety output 2-2 has an off-delay timer.

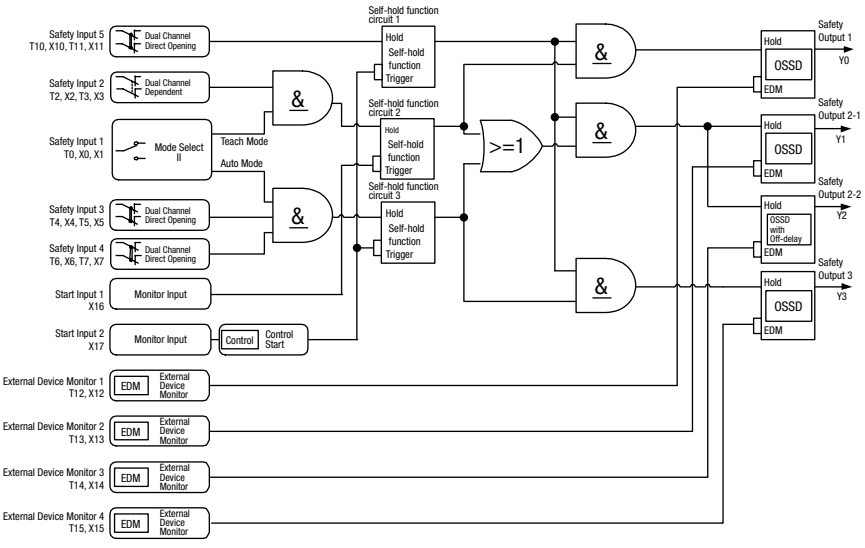
• Wiring Example



• DIP Switch and LED Display



• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 14d

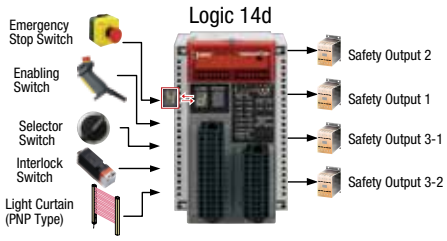
Partial stop logic applicable for selection of active safety input devices for apparatus with openings

Output Line: 4
4 single safety outputs of different operations

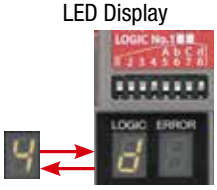
Maximum Category 3

In machine tools and robots, a hazard source is isolated by a guard in automatic operation. In human-attended operation such as teaching and maintenance, the operator has to work inside a hazardous area. Logic 14d is used to configure a system in which teach or auto mode can be selected using a selector switch. Safety outputs are single output. Two dual channel direct opening input, one mode select input, one dual channel dependent input and one dual channel safety input can be connected. Safety output 2 and 3-2 have off-delay timer.

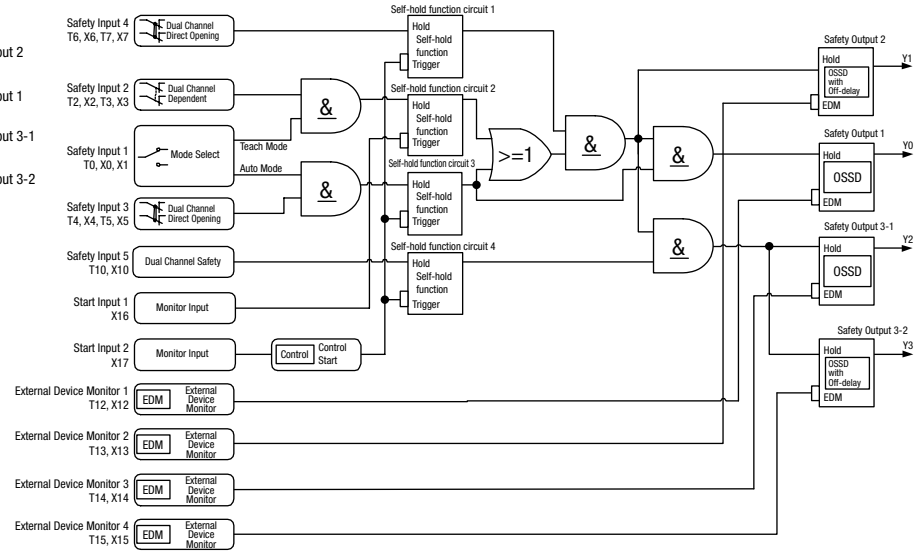
• Wiring Example



• DIP Switch and LED Display



• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 105

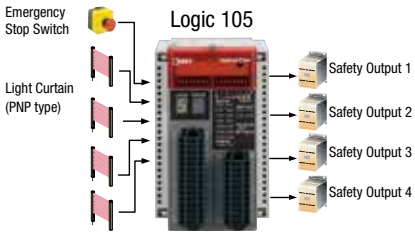
Partial stop logic for apparatus with openings

Output Line: 4
4 single safety outputs of different operations

Maximum Category 3

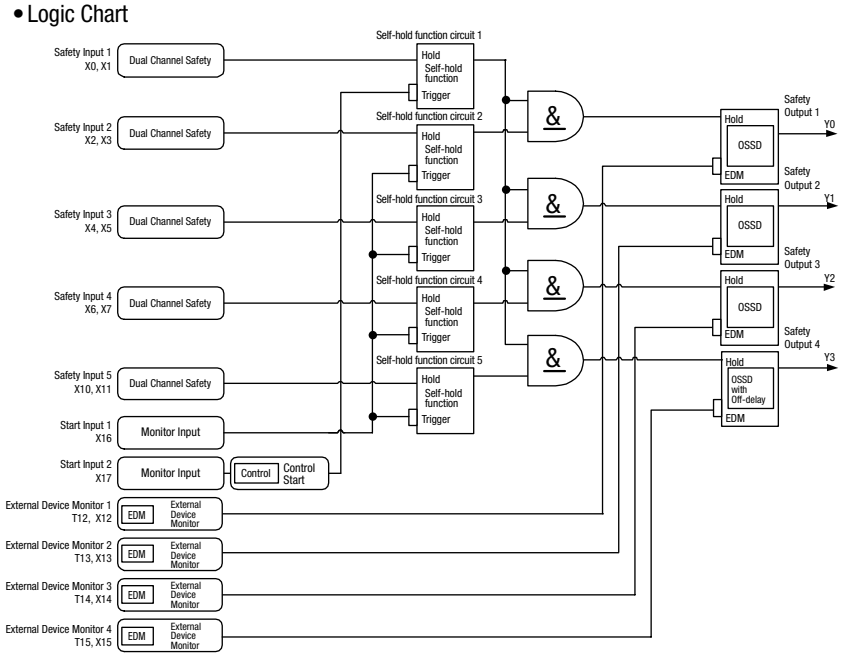
Logic 105 is used for safeguarding measures of machine tools and robots, which use safety equipment such as light curtains with dual solid state outputs. Safety outputs are single output. Five dual channel safety inputs can be connected. Safety output 4 has an off-delay timer.

• Wiring Example



• DIP Switch and LED Display

• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 106

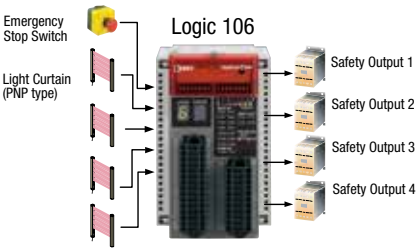
Partial stop logic for apparatus with openings

Output Line: 4
4 single safety outputs of different operations

Maximum Category 3

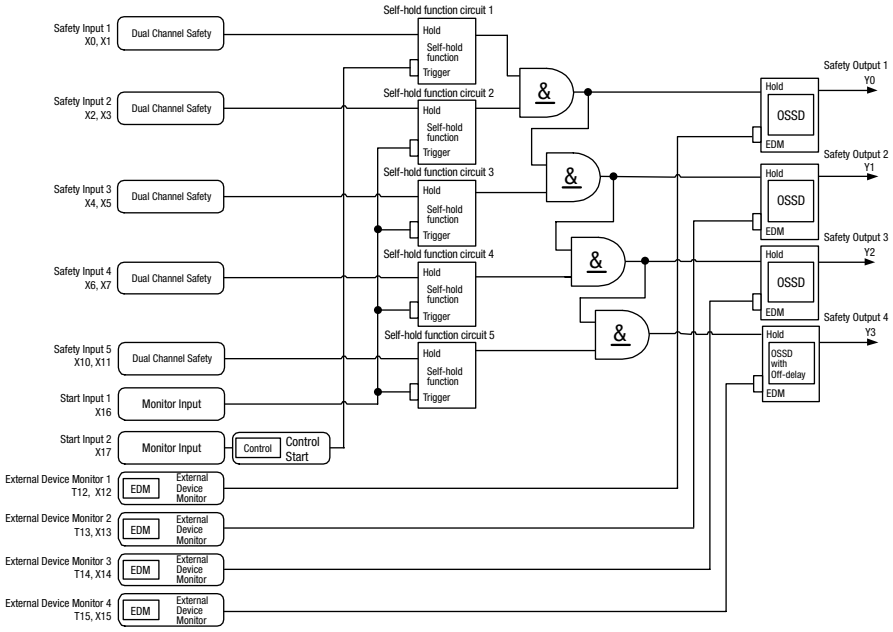
Logic 106 is used for safeguarding measures of machine tools and robots, which use safety equipment such as light curtains with dual solid state outputs. Safety outputs are single output. Five dual channel safety inputs can be connected. Safety output 4 has an off-delay timer.

• Wiring Example



• DIP Switch and LED Display

• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 107

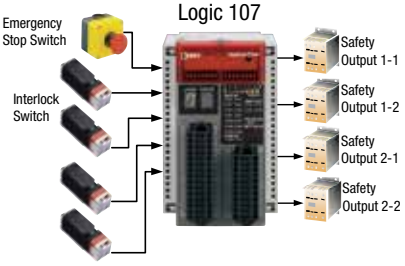
Partial stop logic for various apparatus

Output Line: 4
4 single safety outputs of different operations

Maximum Category 3

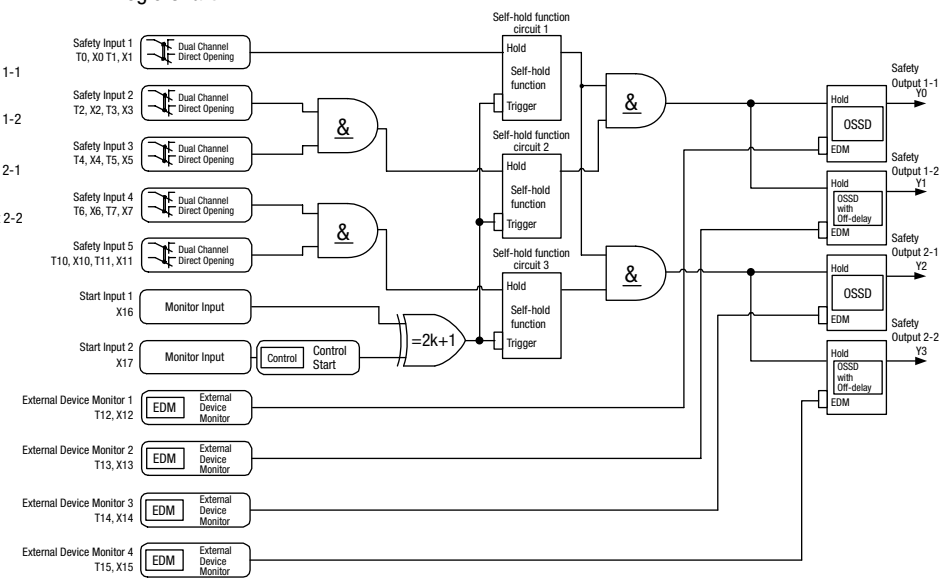
Logic 107 is used for safeguarding measures of machine tools and robots. Safety outputs are single output. Five dual channel direct opening inputs can be connected. Safety outputs 1-2 and 2-2 have off-delay timers.

• Wiring Example



• DIP Switch and LED Display

• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C11S Logic 108

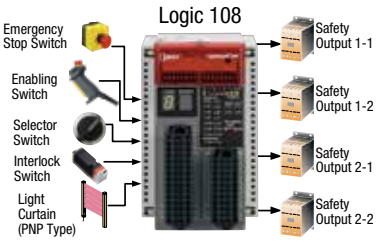
Partial stop logic applicable for selection of active safety input devices in apparatus with openings

Output Line: 4
4 single safety outputs of different operations

Maximum Category
3

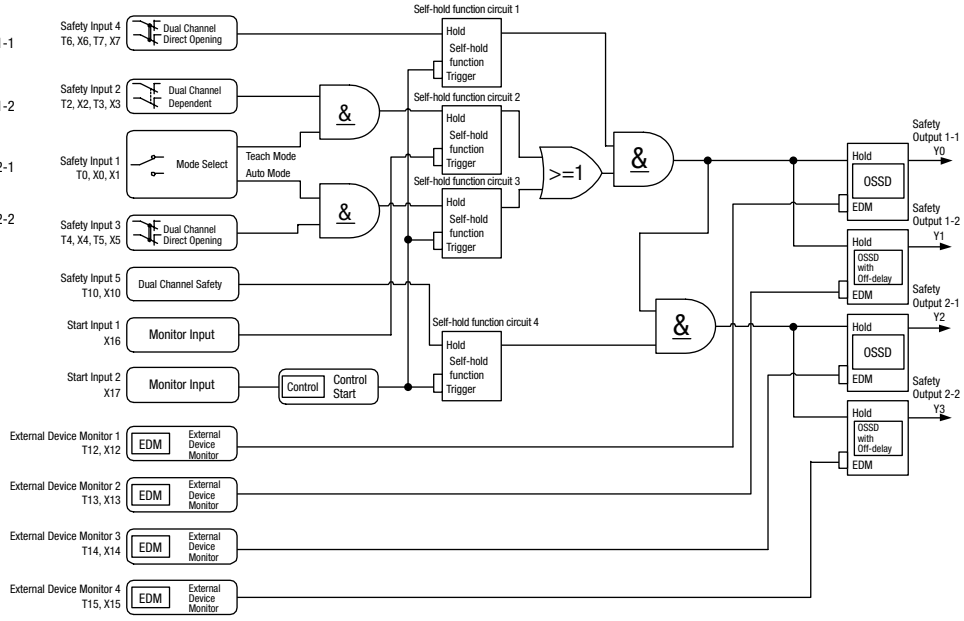
In machine tools and robots, a hazard source is isolated by a guard in automatic operation. In human-attended operation such as teaching and maintenance, the operator has to work inside a hazardous area. Logic 108 is used to configure a system in which teach or auto mode can be selected using a selector switch. Safety output is single output. Two dual channel direct opening input, one mode select input, one dual channel dependent input, and one dual channel safety input can be connected. Safety outputs 1-2 and 2-2 have off-delay timers.

• Wiring Example



• DIP Switch and LED Display

• Logic Chart



• Be sure to check the standards of the equipment before use.

FS1A-C21S logic selection chart 2

Part No.		Interlock/Emergency Stop Switch	Enabling/Grip Switch	Mode Selection	Light Curtain Safety Laser Scanner	Muting	NO/NC Contact Inputs	Two-hand Control	Output 1 Line	Output put 2 Lines	Output 4 Lines
FS1A-C11S											
Logic Type	Logic No.										
The logic for various apparatus	201	●							●		
The logic for apparatus with a two-hand control device	22A	●	●		●	●		●		●	
The logic for apparatus with openings	22b	●	●		●					●	
The logic for apparatus with openings	22C	●	●		●					●	
Partial control logic for apparatus with openings	22d	●	●		●					●	
Partial stop logic for apparatus with openings	23C	●	●	●						●	
Muting function logic for apparatus with openings	24A	●	●		●	●					●
Muting function logic for apparatus with openings	24b	●	●		●	●					●
The logic constructing an OR circuit for apparatus with openings	24C	●	●	●	●						●
The logic constructing an OR circuit applicable for selection of active safety input devices	24d	●	●		●						●
Partial stop logic for various apparatus	208	●					●			●	

• Logic No. 21A, 21b, 21C, 21d, 202, 203, 23A, 23b, 23d, 204, 205, 206, 207 are optional logics. For software version 1.00, Logic No. 21A, 21b, 21C, 21d, 202, 203, 23A, 23b, 23C, 23d, 204, 24C, 24d, 205, 206, 207, 208 are optional logics.

FS1A-C21S Logic 201

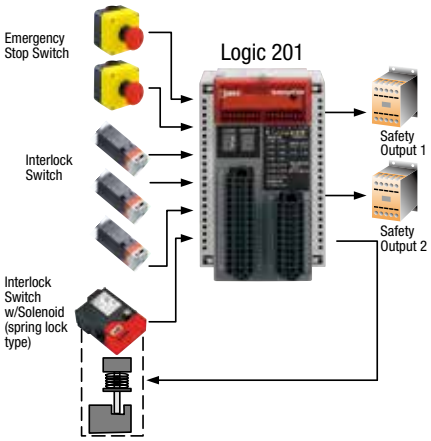
General-purpose logic for various apparatus

Output Line: 1
2 dual safety outputs of the same operation

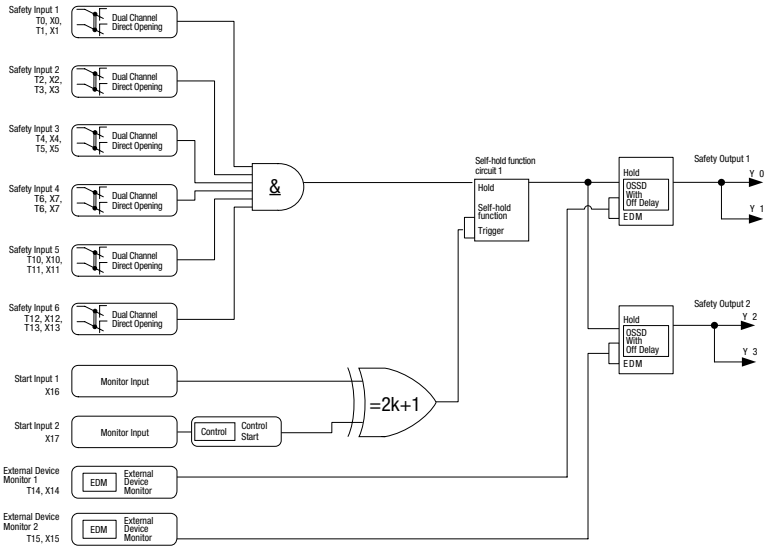
Maximum Category 4

Logic 201 is used for safeguarding measures of machine tools and robots.
It can be used with dual direct-opening components such as emergency stop switches and interlock switches.

• Wiring Example



• Logic Chart



• LED Display

• Be sure to check the standards of the equipment before use.

FS1A-C21S Logic 22A

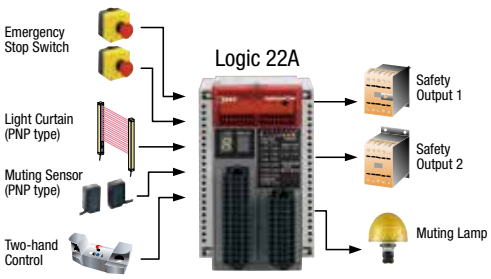
The logic for apparatus with a two-hand control device

Output Line: 2
2 dual safety outputs of different operations

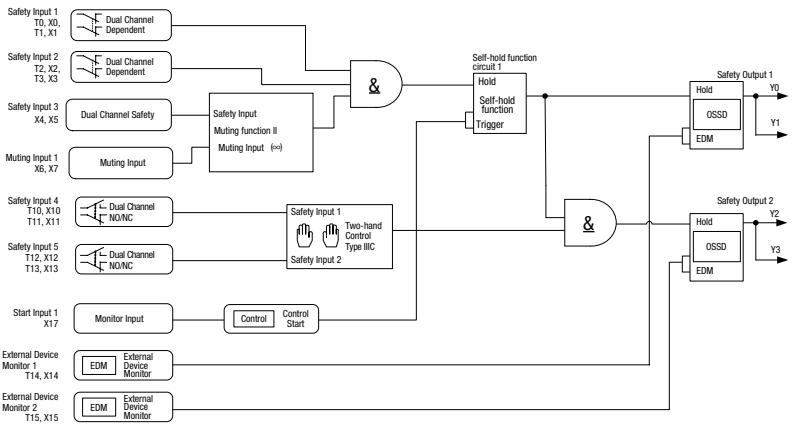
Maximum Category 4

Logic 22A is used for safeguarding measures of machine tools that use two-hand control (two safety inputs = one point). Safety outputs are dual channel outputs. Safety light curtain can be used and muting is available. Two dual channel dependent inputs can be connected.

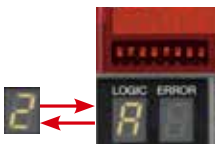
• Wiring Example



• Logic Chart



• LED Display



• Be sure to check the standards of the equipment before use.

FS1A-C21S Logic 22b

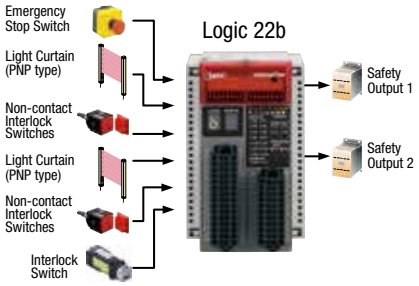
The logic for apparatus with openings

Output Line: 2
2 dual safety outputs of different operations

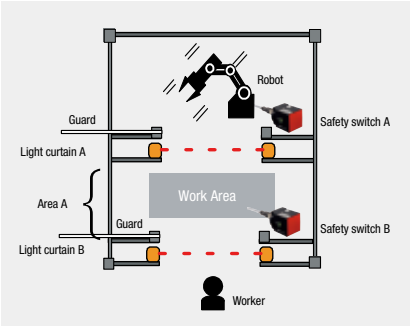
Maximum Category 4

Logic 22b is used for two sets of dual channel interlock.
It can be used with dual direct-opening components such as emergency stop switches and interlock switches.

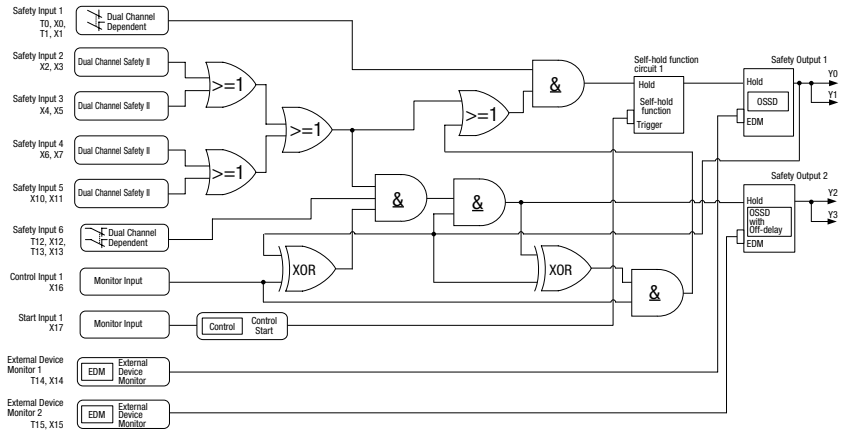
• Wiring Example



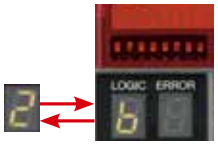
• Application Example



• Logic Chart (Software version 2.00 or above)



• LED Display



• Be sure to check the standards of the equipment before use.

FS1A-C21S Logic 22C

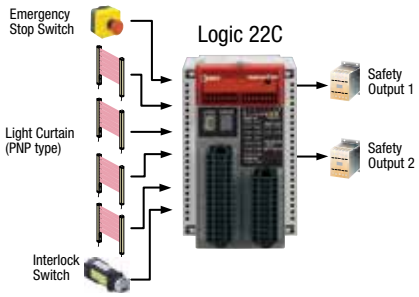
The logic for apparatus with openings

Output Line: 2
2 dual safety outputs of different operations

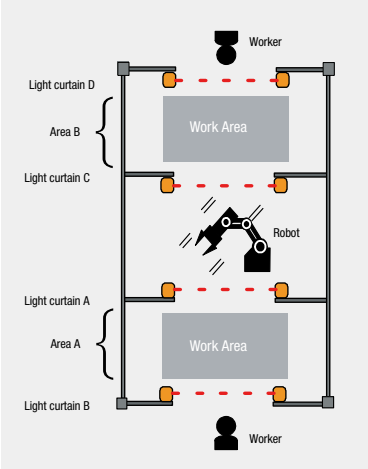
Maximum Category 4

Logic 22C is used for applications with up to four openings.
It can be used with dual direct-opening components such as emergency stop switches and interlock switches.

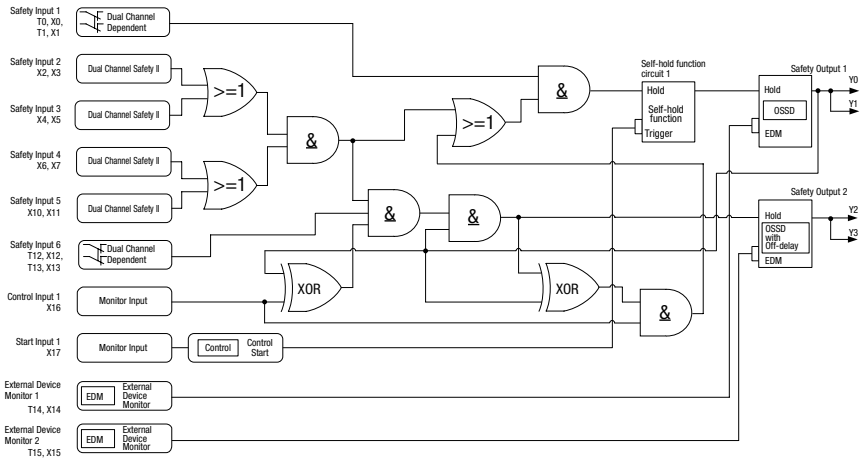
• Wiring Example



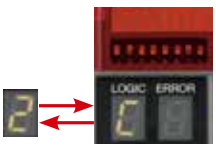
• Application Example



• Logic Chart (Software version 2.00 or above)



• LED Display



• Be sure to check the standards of the equipment before use.

FS1A-C21S Logic 22d

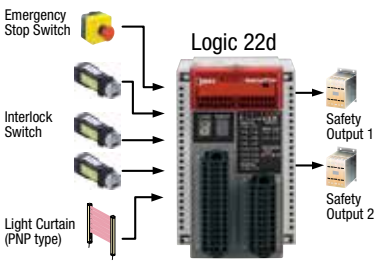
Partial stop logic for apparatus with openings

Output Line: 2
2 dual safety outputs of different operations

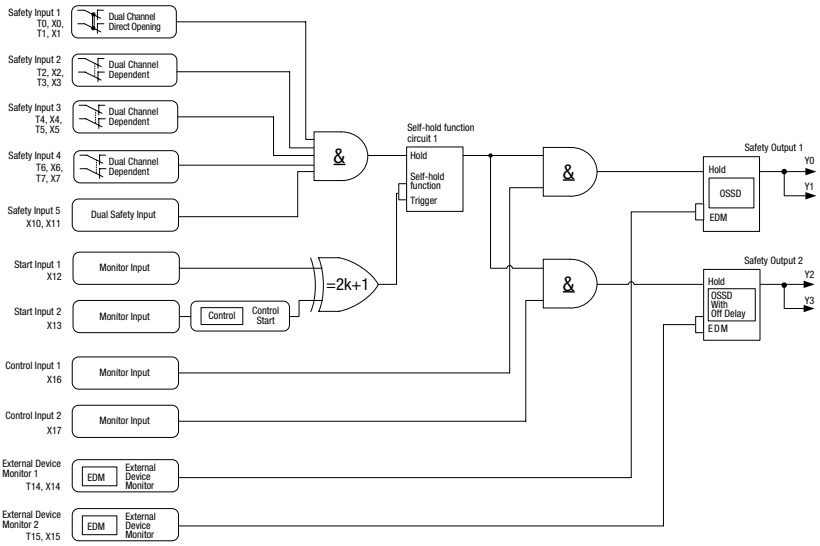
Maximum Category 4

Logic 22d is used for safeguarding measures of machine tools and robots which use one emergency stop switch, three interlock switches, and one safety light curtain when contiguring partial control. Safety outputs are dual channel outputs. Safety output 2 has an off-delay timer.

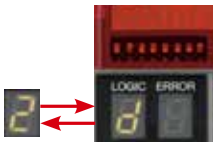
• Wiring Example



• Logic Chart



• LED Display



• Be sure to check the standards of the equipment before use.

FS1A-C21S Logic 23C

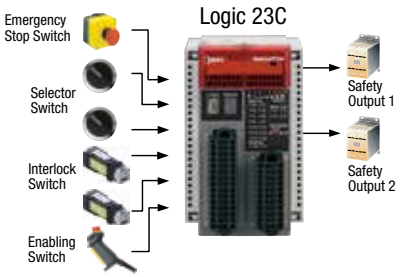
The logic applicable for selection of active safety input devices

Output Line: 2
2 dual safety outputs of different operations

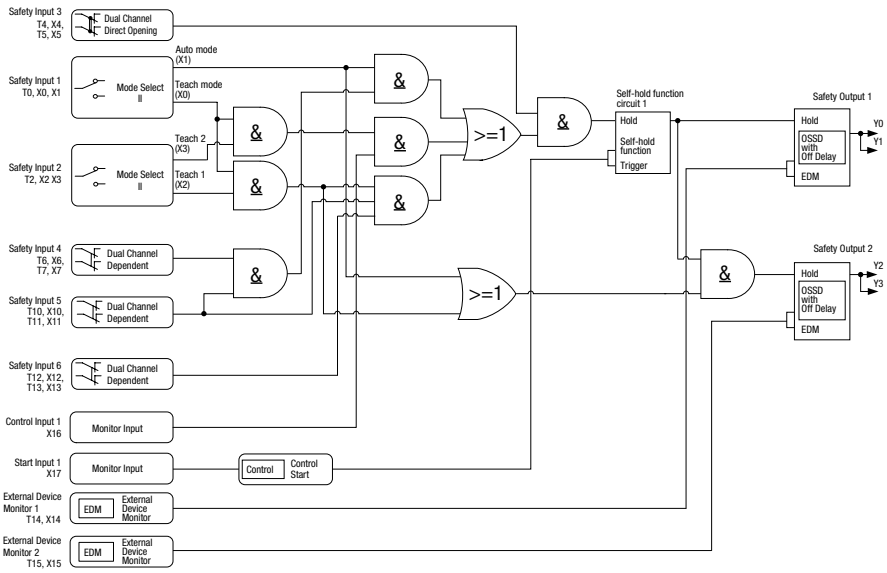
Maximum Category 4

Logic 23C is used in machine tools which have auto mode and two different maintenance modes.
Safety outputs are dual channel outputs.

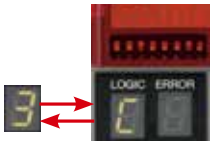
• Wiring Example



• Logic Chart



• LED Display



• Be sure to check the standards of the equipment before use.

FS1A-C21S Logic 24A

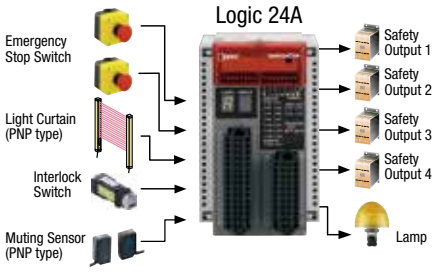
Muting function logic for apparatus with openings

Output Line: 4
4 single safety outputs of different operations

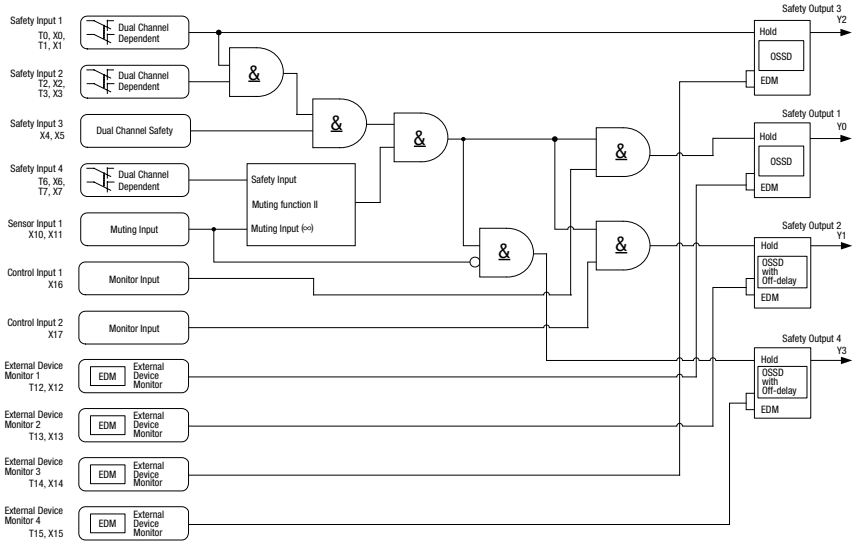
Maximum Category 3

Logic 24A is used to shut down devices step by step depending on the safety conditions of the door and openings.
Safety output has four single safety outputs.

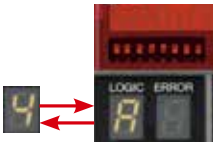
• Wiring Example



• Logic Chart



• LED Display



• Be sure to check the standards of the equipment before use.

FS1A-C21S Logic 24b

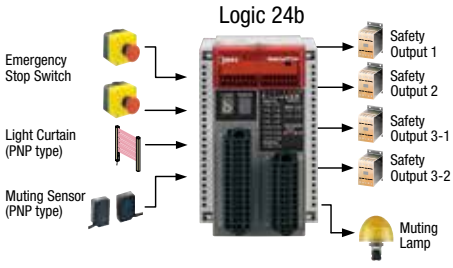
Muting function logic for apparatus with openings

Output Line: 4
4 single safety outputs of different operations

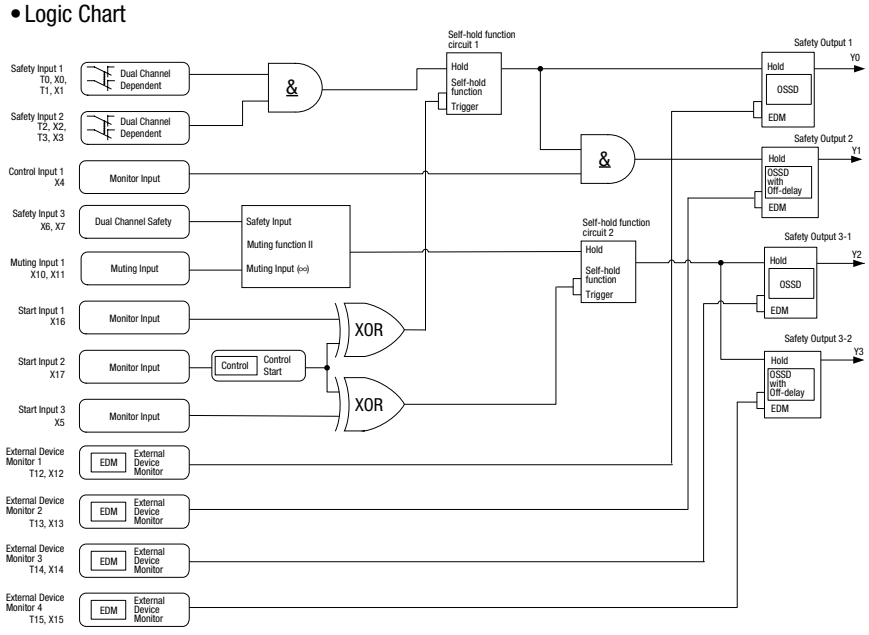
Maximum Category 3

Logic 24b is used to shut down devices step by step depending on the safety conditions of the door and openings.
Muting function logic on safety light curtains. Safety output has four single safety outputs.

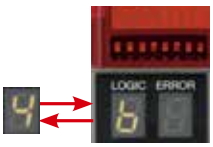
• Wiring Example



• Logic Chart



• LED Display



• Be sure to check the standards of the equipment before use.

FS1A-C21S Logic 24C

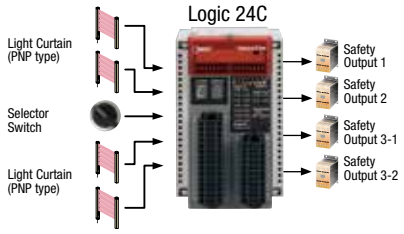
The logic applicable for selection of active safety input devices

Output Line: 4
4 single safety outputs of different operations

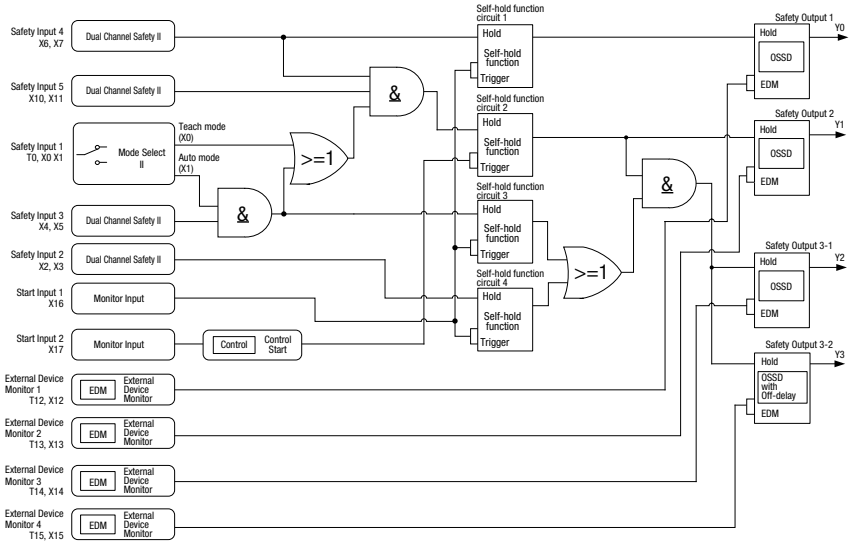
Maximum Category
3

Logic 24C is the mode selection logic used in safety equipment such as light curtains with solid state output.
Safety output has four single safety outputs.

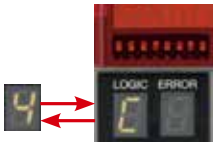
• Wiring Example



• Logic Chart



• LED Display



• Be sure to check the standards of the equipment before use.

FS1A-C21S Logic 24d

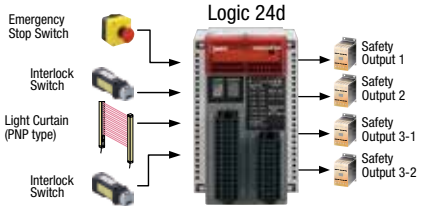
The logic constructing an OR circuit for various apparatus

Output Line: 4
4 single safety outputs of different operations

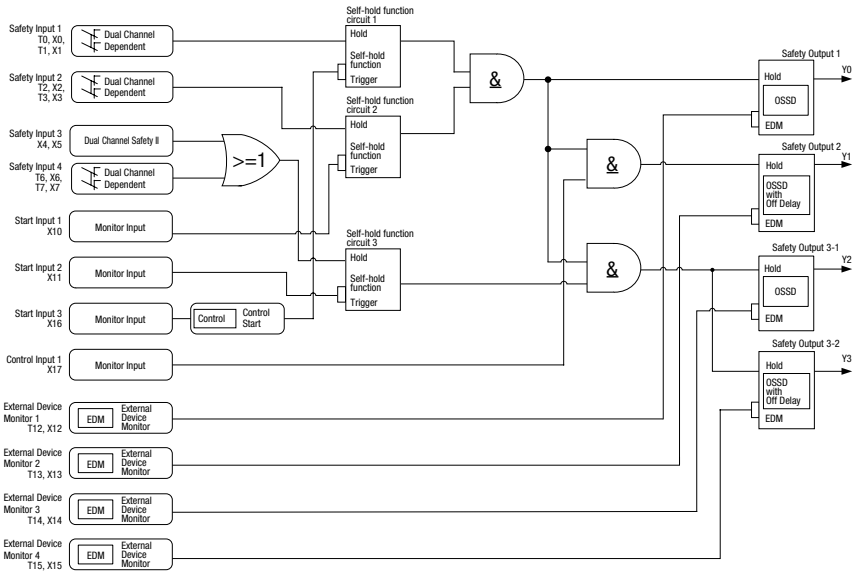
Maximum Category
3

Logic 24d is used to configure an OR circuit using a safety light curtain and safety switch. Safety output has four single safety outputs.

• Wiring Example



• Logic Chart



• LED Display

• Be sure to check the standards of the equipment before use.

⚠ Safety Precautions

1. Do not disassemble, repair, or modify the SafetyOne, otherwise the safety characteristics of the SafetyOne are impaired. Turn off the power to the SafetyOne before installation, removal, wiring, maintenance, or inspection of the SafetyOne. Failure to do so may cause electrical shocks or fire hazard.
2. Before operating the SafetyOne, read the instruction sheet and the user's manual carefully, and ensure that the environment conforms to the requirements of the SafetyOne specifications. If the SafetyOne is operated in an environment that exceeds the specifications, the safety characteristics of the SafetyOne are impaired.
3. The installation, wiring, configuration, and operation of the SafetyOne must be performed by safety experts only. Safety experts are personnel who have necessary qualifications authorizing them to perform designing, installation, operation, maintenance, and disposal of the SafetyOne. Persons without technical expertise of safety products must not use the SafetyOne.
4. The SafetyOne must be subjected to a regular test which proves that all functions of the SafetyOne satisfy the required standard.
5. Perform operational checks on the SafetyOne periodically.
6. Install the SafetyOne according to the instruction sheet and the user's manual. Improper installation may cause failure of the SafetyOne.
7. Do not use the monitor outputs or solenoid/lamp outputs as safety outputs, otherwise the system safety is impaired in case the SafetyOne or connected components fail.
8. Do not use the start input and the external device monitor input as safety inputs, otherwise the system safety is impaired in case the SafetyOne or connected components fail.
9. Use the SafetyOne in compliance with laws and regulations of the country or region where the SafetyOne is used.
10. Use safety inputs and safety outputs in circuit configurations which conform to safety requirements and applications.
11. Calculate the respective safety distances, while taking into consideration the response time of the SafetyOne and safety components connected to the SafetyOne.
12. Separate the SafetyOne from components and wires which do not satisfy Class 2 circuit requirements.
13. Safety performance differs depending on system configurations.
14. Use a power supply that meets the following required specifications completely:
15. Ground the V– line (0V DC) for ground diagnosis.
16. After setting a new configuration or modifying a configuration, check each input and output function.
17. Implement protective measures so that personal other than safety responsible persons operating the SafetyOne do not modify the configuration.
18. The SafetyOne is designed for installation within an enclosure. Do not install the SafetyOne outside an enclosure. Install the SafetyOne in an enclosure of IP54 or higher protection.
19. Install the SafetyOne in environments specified in the catalog, instruction sheet, and user's manual. If the SafetyOne is used in places where the SafetyOne is subjected to high temperature, high humidity, condensation, corrosive gases, excessive vibrations, or excessive shocks, failure such as electrical shocks, fire hazard, or malfunction may result.
20. Use the SafetyOne in an environment of pollution degree 2. (IEC 60664-1).
21. Do not drop the SafetyOne during transportation, otherwise damage or malfunction may result.
22. Prevent metal fragments and pieces of wire from dropping inside the SafetyOne housing. Put a cover on the SafetyOne during installation and wiring. Ingress of such fragments and chips may cause fire hazard, damage or malfunction.Install the SafetyOne so that there is adequate distance from the walls, heat generating devices or peripherals, taking into consideration spacing requirements for maintenance and ventilation.
23. Install the SafetyOne on 35mm DIN rails with BNL6 end clips (sold separately) on both sides of the SafetyOne.
24. Wire to the connectors with proper cables or ferrules.
25. Ground the FE terminal to assure electromagnetic compatibility.
26. Use a common 0V DC line when different power supplies are used for the SafetyOne and other components (ex. light curtain).
27. Separate the input and output wiring from power lines.
28. When overcurrent flows into output terminals, the protective function turns off the output. However, when overcurrent status lasts long, internal protective elements will fuse. To protect the internal elements, insert fuses of double the rated value to each terminal.
29. Use the fuse compliant with IEC60127 requirements on the power line of the SafetyOne. (Required for equipment incorporating the SafetyOne for the use in Europe.)
30. When disposing of the SafetyOne, do so according to the regulations of the country or region.
31. Ensure to install the start switch outside the hazardous area, from where the operator of the start switch can confirm that no one is inside the hazardous area, when starting the operation of safety system.

For instruction sheet and user's manual, see http://www.idec.com/.

Operating Instructions

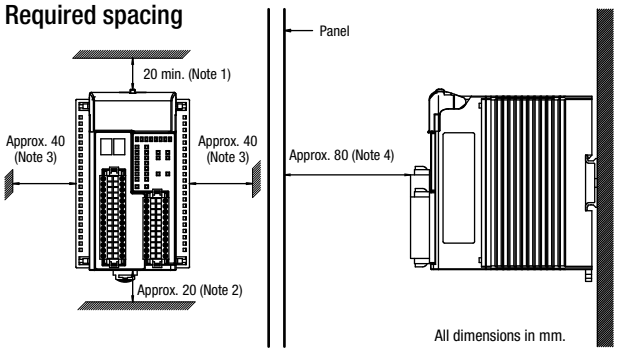
Installation Location

Install the SafetyOne in an IP54 enclosure such as a control panel, and make sure that the operating condition satisfies the specifications of the SafetyOne. Do not use the SafetyOne in an environment described below, or where the operating conditions exceed the limit of the SafetyOne. Otherwise electric shock, fire hazard, damage, or malfunction can be caused.

- Near an inductive device or heat source
- Where excessive dust, dirt, salt, or iron powder is present
- Where the SafetyOne is exposed to vibration or shock

For maintenance and ventilation, provide space around the SafetyOne as shown in the figure below, so that sufficient distance is kept from other components, heat source, or panel surface. Ensure to use the SafetyOne in the environment of operating temperature –10 to +55°C.

Required spacing



Note 1: For opening/closing of protective cover.
Note 2: For installation/removal of the SafetyOne on the DIN rail, and ventilation.
Note 3: For heat generating equipment such as safety relays.
Note 4: For wiring of input and output connectors

Direction

Install the SafetyOne vertically as shown in Figure 1. Do not install in other directions (Figure 2).

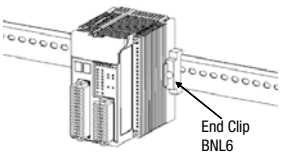


Figure 1. Correct Mounting Direction

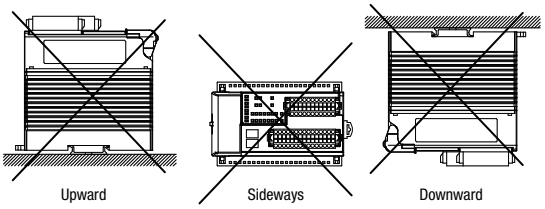


Figure 2. Incorrect Mounting Directions

Installing on DIN Rails

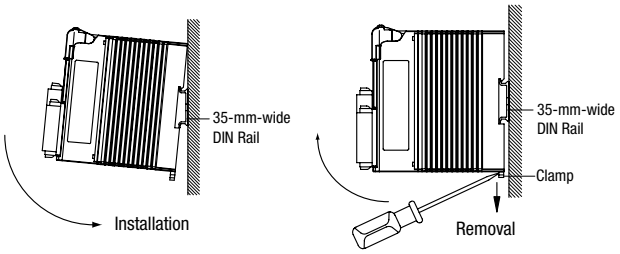
Use 35mm-wide DIN rails for installing the SafetyOne.
Applicable DIN rails: BAA1000 (IDEC)

- Installing

1. Fasten the DIN rail to a panel.
2. Pull out the clamp from the SafetyOne module, and put the groove of the module on the DIN rail. Press the module towards the DIN rail and push in the clamp as shown below.
3. Use BNL6 end clips on both sides of the SafetyOne to prevent the module from moving sideways.

- Removal

1. Insert the tip of a flat screwdriver into the latch.
2. Pull down the latch until the latch clicks.
3. Pull out the SafetyOne lightly, and remove from the DIN rail.

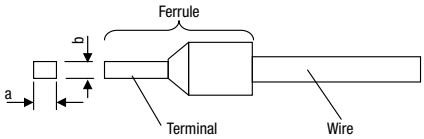


Wiring

For wiring the SafetyOne, spring clamp (supplied with the SafetyOne) or crimp connector can be used. For crimp type connector, contact Tyco Electronics AMP.
Push the connector into the SafetyOne until the latches click. For removal, make sure to press down the latches completely before removing the connector, otherwise the connector and wires may be damaged.

Applicable Wire and Ferrule Size(spring clamp type)

AWG#18 to 24 (recommended wire: UL1007)
Strip length 7.0 ±0.3mm.
When using a ferrule for wiring, select a ferrule which satisfies the terminal specifications shown below.



a: 1.02 to 1.21 mm
b: 0.95 to 1.21 mm
Applicable wire: AWG#24 (recommended: UL1007)

Wiring to Spring Clamp Connector

When wiring to a connector, make sure that the connector is removed from the SafetyOne, otherwise the connector and the SafetyOne may be damaged. For wiring, use the connecting tool FS9Z-SD01. When rewiring, use wire of the same type and size.

Wiring Using the Connecting Tool

1. Insert the connecting tool completely into the tool slot in the connector at an angle.

2. Insert a wire into the wire slot. When using a stranded wire, twist the wire beforehand so that the wire does not become loose.

3. While the wire is inserted, remove the connecting tool. Wiring is complete. Pull the wire lightly to confirm whether it is clamped securely.

4. To remove the wire, press down the spring using the connecting tool and pull out the wire.

Using a Screwdriver

When using a screwdriver for wiring, use a screwdriver 2.4mm wide maximum at the tip. Pay extra attention when using a screwdriver, so that the connector is not damaged.

1. Insert the screwdriver into the tool slot on the connector at an angle, and press down so as to pry open the spring. Do not apply excessive force when inserting the screwdriver, otherwise the connector will be damaged. Do not insert the screwdriver into the wire slot.
2. While the screwdriver is inserted, insert a wire into the wire slot. When using stranded wire, twist the wire beforehand so that the wire does not become loose.
3. While the wire is inserted remove the screwdriver. Wiring is complete. Pull the wire lightly to confirm whether it is clamped securely.
4. To remove the wire, press down the spring using the screwdriver and pull out the wire.