IDEC

Think Automation and beyond...

SafetyOne®

FS1A Safety Controller

New FS1A-C21S (11 logics), introducing 4 new logics!

- ✓ **Safety circuit logics compliant with international standards**
- ✓ **ISO 13849-1 PLe**

International Standard Compliant | **Cost Saving** | **No Programming Required** | **Compact**

NEW

11 logics

FS1A-C21S

24 logics

FS1A-C11S

SafetyOne

NEW

Now available: the new FS1A-C21S safety controller with 11 logics, introducing 4 new logics.

FS1A-C21S
11 logics

FS1A-C11S
24 logics

International Standards Compliant

ISO13849-1 PLe

Complies with key safety standards!

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

ISO IEC EN
ANSI/RIA ANSI
SEMI NFPA

Programs are tested and approved!

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.**

*See separate catalog for FS1A-C11S circuit logics.

c UL us LISTED

TÜV CE

Cost Saving

Reduces overall cost. Simple wiring!

One **SafetyOne** can replace more than seven safety relay modules.

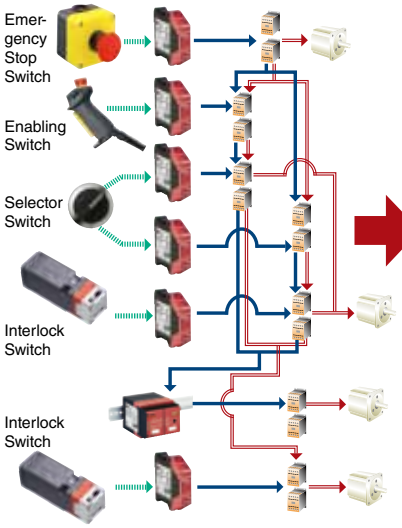
When configuring mode change system

When using safety modules

· 7 safety relay modules
· 14 safety contactors

Before

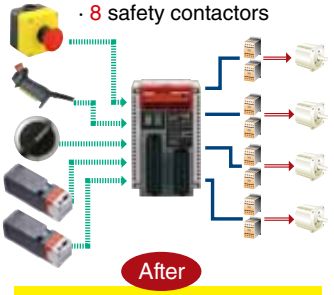
The system is complicated, and the interlocking of mode selector switch cannot be determined. Results in a risk of not satisfying the required safety performance.



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.

No Programming Required

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.

Before

- Safety PLC
- Programming tools
- Creating and debugging a program
- Third-party certification for programs (time and cost)

Safety PLC or Safety Controller

Software (programs, function blocks)

After

Logic selection only!

- Simple DIP switch selection
- No tools required
- No programming or debugging
- No certification-related work

FS1A Safety Controller

Building a safety system has never been so easy, cost effective, or worry-free!

FS1A-C21S Logic 201

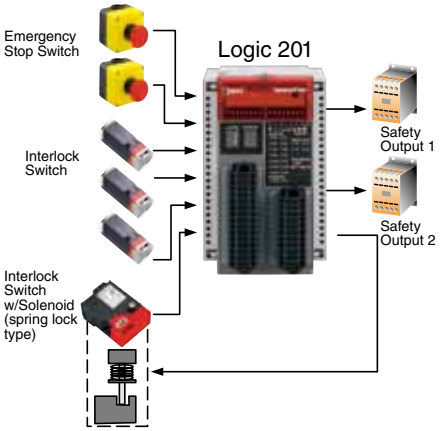
General-purpose logic for various apparatus

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

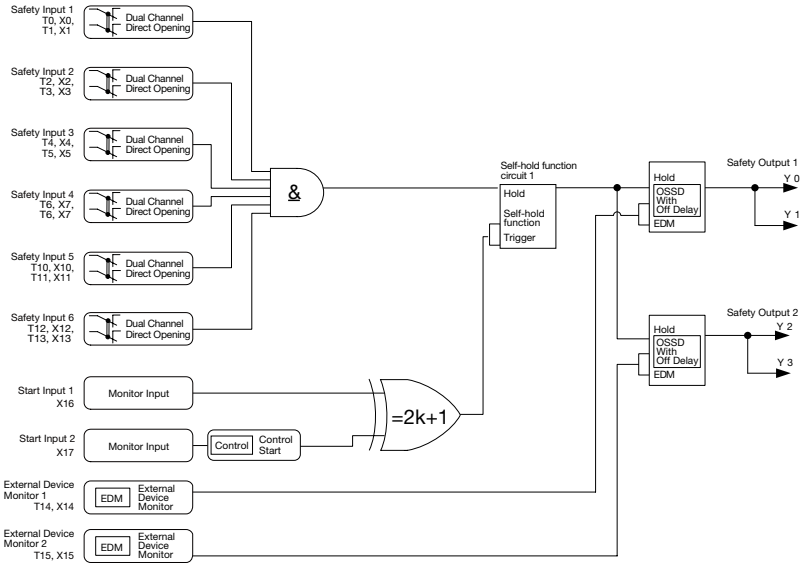
Category 4

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

FS1A-C21S Logic 22A

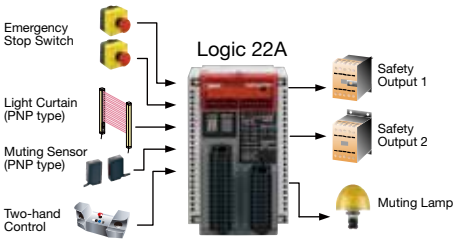
The logic for apparatus with a two-hand control device

Output Line: 2
2 dual safety outputs of different operations

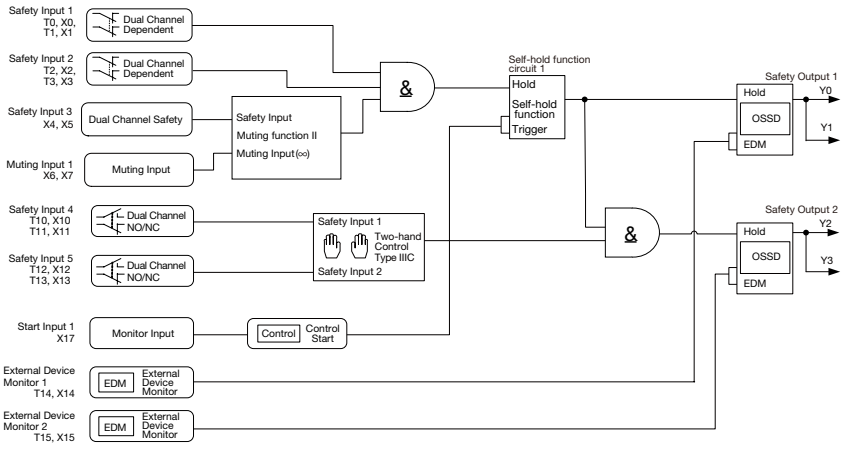
Category 4

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.

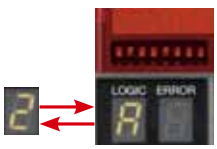
Wiring Example



Logic Chart



LED Display



FS1A-C21S Logic 22d

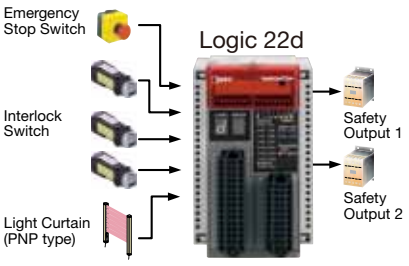
Partial stop logic for apparatus with openings

Output Line: 2
2 dual safety outputs of different operations

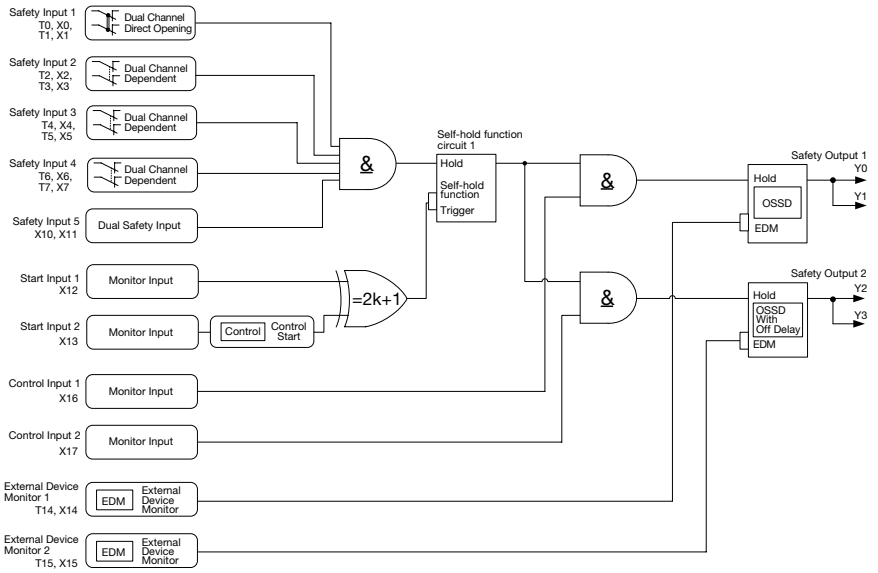
Category 4

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.

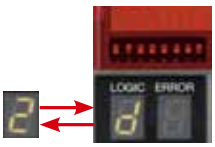
Wiring Example



Logic Chart



LED Display



FS1A-C21S Logic 24A

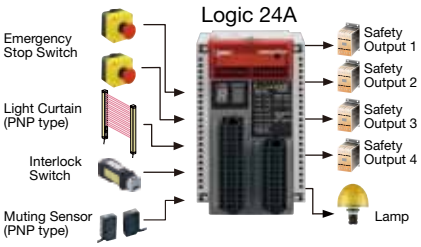
Muting function logic for apparatus with openings

Output Line: 4
4 single safety outputs of different operations

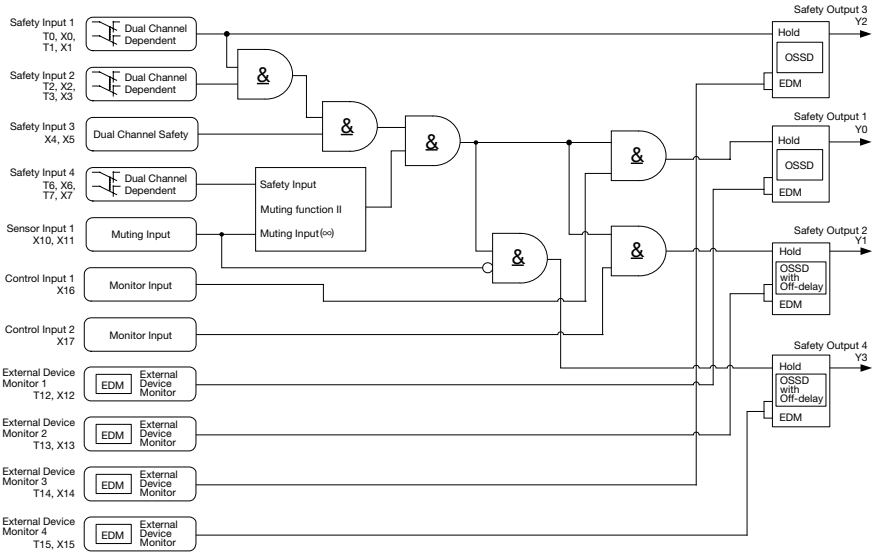
Category 3

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.

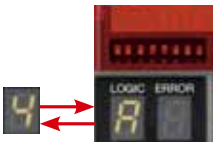
Wiring Example



Logic Chart



LED Display



FS1A-C21S Logic 24b

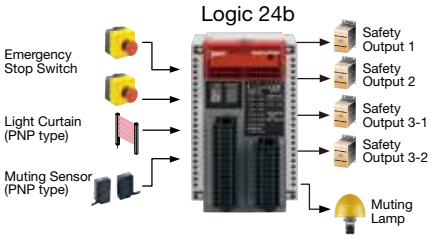
Muting function logic for apparatus with openings

Output Line: 4
4 single safety outputs of different operations

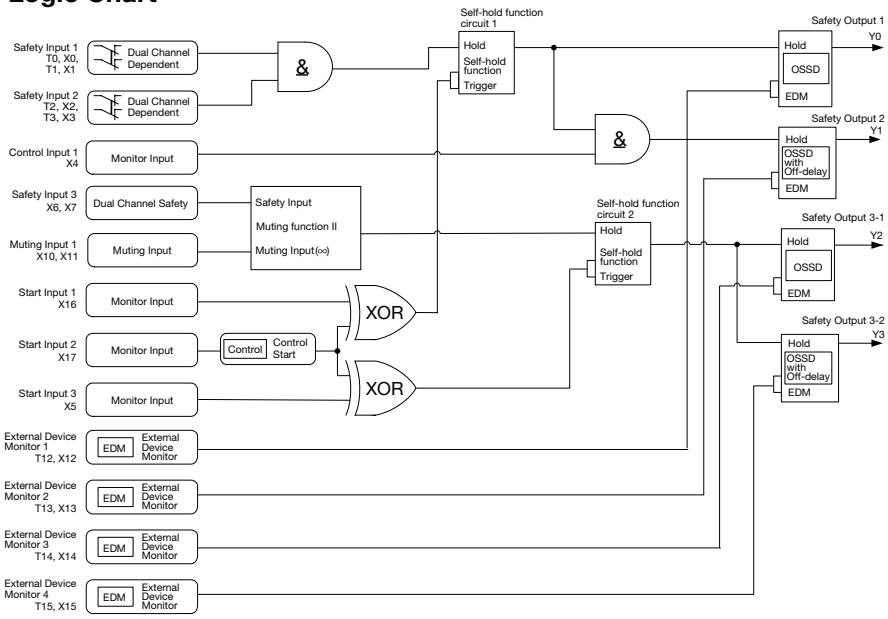
Category 3

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

FS1A-C21S Logic 24d

The logic constructing an OR circuit for various apparatus

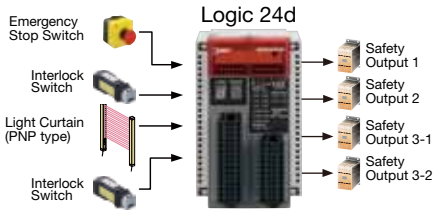
NEW

Output Line: 4
4 single safety outputs of different operations

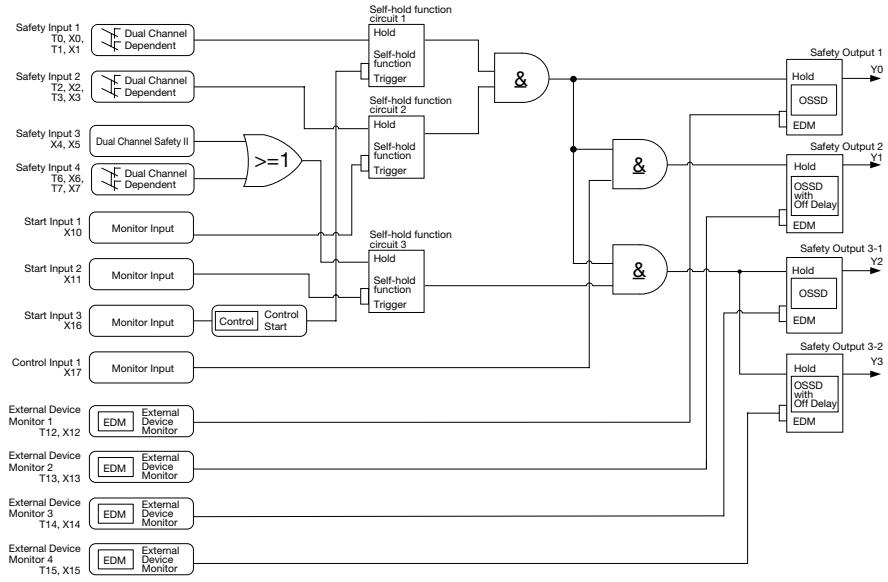
Category 3

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

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.

FS1A Series

Part no.	Version	When error is detected for safety input/output monitor	Muting lamp output	
			Connectable lamp specification	Disconnection function
FS1A-C01S	—	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 Safety Controller

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

- A safety circuit can be configured easily just by selecting a logic from 11 (FS1A-C21S) or 24 (FS1A-C11S) pre-programmed logics.
- Mode selection, partial/entire stop can be achieved just by selecting a logic.
- One SafetyOne module can connect with various safety inputs such as emergency stop switches and light curtains.
- The status of safety I/Os and the SafetyOne errors can be monitored.
- IEC 61508 safety integrity level 3, ISO 13849-1 performance level e,
  and category 4 compliant.

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Safety Controller

Product	No. of Logic	Ordering Part No.
SafetyOne	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.

TÜV/SÜD 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)

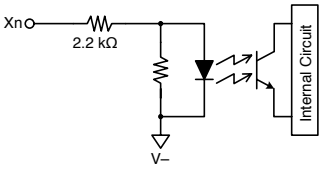
Rated Input Voltage	24V DC
Input ON Voltage	15.0 to 28.8V DC
Input OFF Voltage	Open or 0 to 5.0V DC
Number of Inputs	14
Input Current	10 mA per terminal (at the rated power voltage)
Input Signal	Sink input (for PNP output), Type 1 (IEC61131-2)

Wire

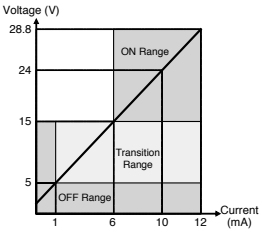
Cable Length (Note)	100m maximum (total wire length per input)
Allowable Wire Resistance	300Ω maximum

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

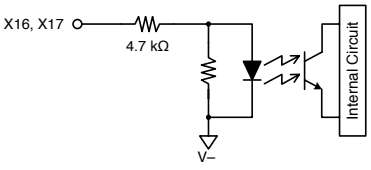


Start Input Specifications

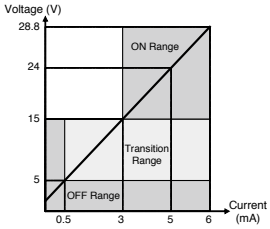
Rated Input Voltage	24V DC
Input ON Voltage	15.0 to 28.8V DC
Input OFF Voltage	Open or 0V to 5.0V DC
Number of Start Inputs	2 (X16, X17)
Input Current	5 mA per terminal (at the rated power voltage)
Input Signal	Sink input (PNP output), Type 1 (IEC61131-2)
Cable Length (Note)	100m maximum (total wire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



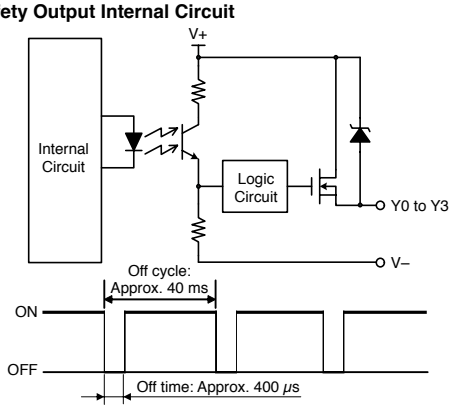
Safety Output Specifications

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.

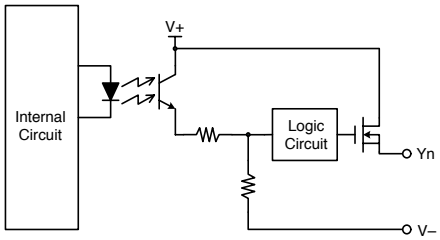
Monitor output and solenoid/lamp output do not generate outputs of off-check signals.

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.

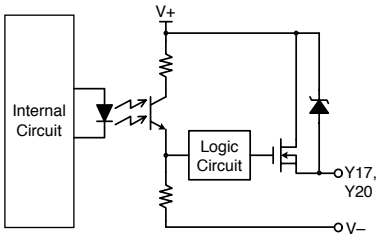
Do not use monitor output as a safety output, otherwise the system's safety cannot be assured when the SafetyOne or safety components fail.

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.

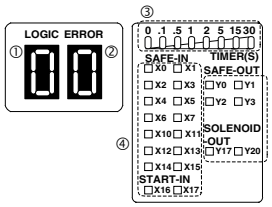
Solenoid/Lamp Output Internal Circuit



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)
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.

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 (5), b (6), C (7), or d (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.

Timer LED ③

LED	Status	Description
0	ON	No off-delay (safety outputs shut down immediately)
.1	ON	Off-delay timer 0.1s
.5	ON	Off-delay timer 0.5s
1	ON	Off-delay timer 1s
2	ON	Off-delay timer 2s
5	ON	Off-delay timer 5s
15	ON	Off-delay timer 15s
30	ON	Off-delay timer 30s
Each LED	Blink	Selected timer value (Configuration state)
Random	ON/Blink	Initializing (Initial state)
All LEDs	OFF	Timer value is not selected or the **SafetyOne** is in Stop state

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)

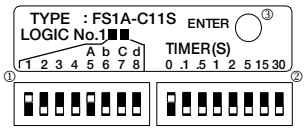
Output LED ⑤

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)

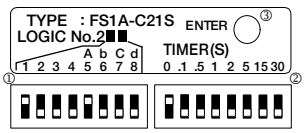
Configuration Switches

FS1A-C11S



①Logic Switch
②Timer Switch
③Enter button

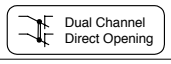
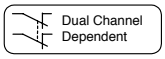
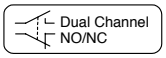
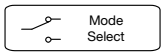
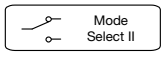
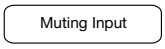
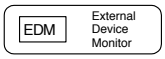
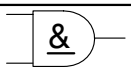
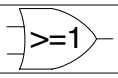
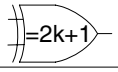
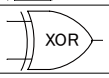
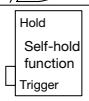
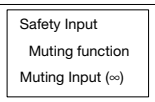
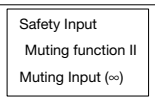
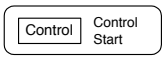
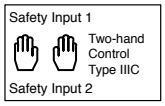
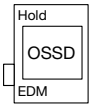
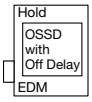
FS1A-C21S



①Logic Switch
②Timer Switch
③Enter button

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

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.

Specifications and other descriptions in this brochure are subject to change without notice.

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