

A Safety Measure for Hazardous Operations That Does Not Lower Productivity

- Two functions support two types of application:
 - Auto switching: For applications where operators work together with machines
 - Manual switching: For applications with limited operations
- External indicator outputs enable indicating the switching status of two safety input devices.
- Auxiliary outputs enable monitoring of safety inputs, safety outputs, and errors.
- Detailed LED indications enable easy diagnosis.
- Logical AND connection allows complicated applications in combination with other G9SX-series Units.
- Certification for compliance with IEC/EN 61508 (SIL3), IEC/EN 62061 (SIL3) and EN ISO13849-1 (PLe/Safety Category 4).



Be sure to read the *Safety Precautions* on page 45.



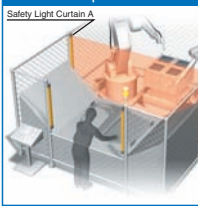
For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

G9SX-GS

Application Examples

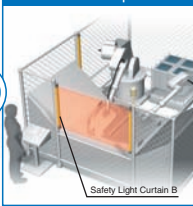
Auto Switching Function

When the operator inserts the workpiece...



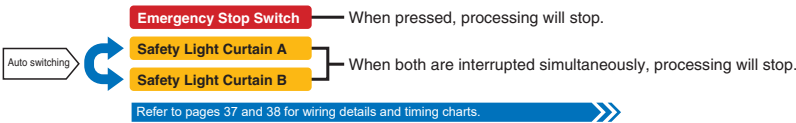
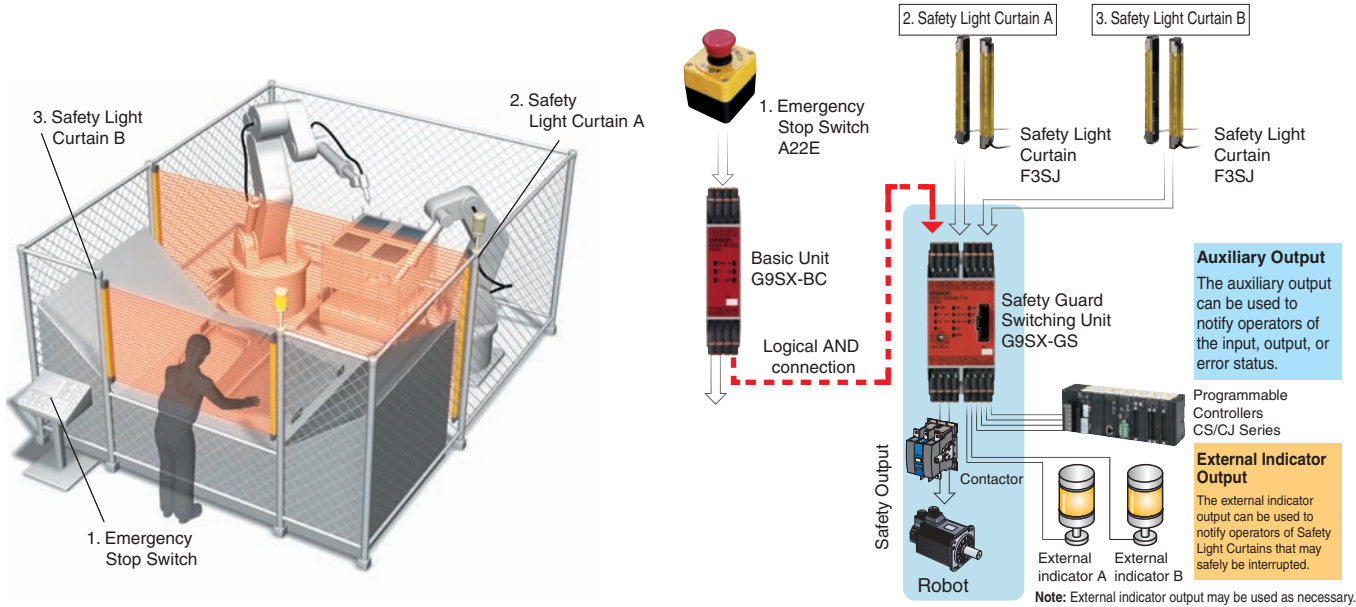
- Safety Light Curtain A monitors the robot.
- The robot can continue to operate as long as it does not interrupt Safety Light Curtain A.

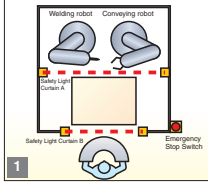
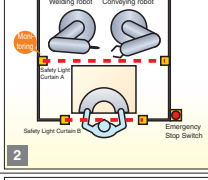
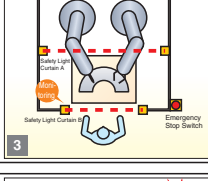
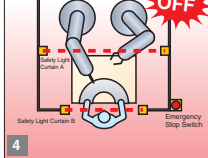
While the robot processes the workpiece...



- Safety Light Curtain B monitors the operator.
- The robot can continue to operate as long as the operator does not interrupt Safety Light Curtain B.

Note: If the operator is able to completely enter the zone inside Safety Light Curtain B, a presence detection device, such as a Safety Mat, is necessary as an additional safety measure.



	Working condition	External indicator	G9SX-GS			
			Safety input	Safety output	Monitor output	External indicator
Normal operation	 1	 OK to work	Safety input A  Safety input B 	 Safety output	 Input A monitor  Input B monitor	 Indicator A Indicator B
	 2	 OK to work	Safety input A  Safety input B 	 Safety output	 Input A monitor  Input B monitor	 Indicator A Indicator B
	 3	 Not OK to work	Safety input A  Safety input B 	 Safety output	 Input A monitor  Input B monitor	 Indicator A Indicator B
Hazardous condition	 4	 Not OK to work	Safety input A  Safety input B 	 Safety output	 Input A monitor  Input B monitor	 Indicator A Indicator B

Manual Switching Function

During normal operation...

- The Door Switch monitors the opening and closing of the door during normal operation.
- The machine is able to operate while the door is closed.

Door Switch

During maintenance...

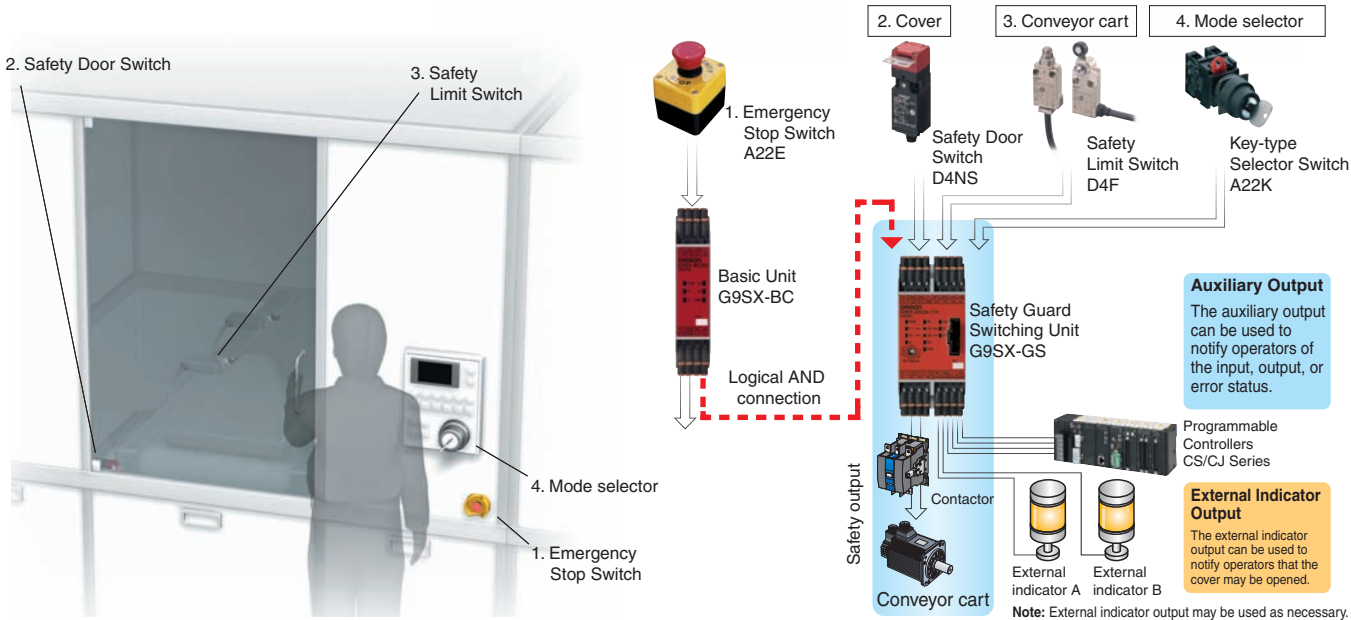
- The Limit Switch monitors the conveyor cart position during maintenance.
- The machine is able to operate while the conveyor cart is in a specified area.

Limit Switch

Manual switching

Normal operation

Maintenance



Normal operating mode

Emergency Stop Switch — When pressed, processing will stop.

Cover — When the cover is opened, processing will stop.

Conveyor cart — Processing will continue regardless of the conveyor cart position.

Maintenance mode

Emergency Stop Switch — When pressed, processing will stop.

Cover — Processing will continue regardless of whether the cover is opened or closed.

Conveyor cart — When the conveyor cart moves away from its safe position, processing will stop.

Refer to pages 39 to 41 for wiring details and timing charts.

	Working condition	External indicator	G9SX-GS				External indicator
			Safety input	Safety output	Mode selector	Monitor output	
Normal operation	1	Not OK to open	Safety input A Disabled	ON	Normal operating mode	OFF Input A monitor ON Input B monitor	Indicator A Indicator B
	2	OK to open	Safety input A ON	ON	Maintenance mode	ON Input A monitor OFF Input B monitor	Indicator A Indicator B
Maintenance	3	OK to open	Safety input A ON	ON	Maintenance mode	ON Input A monitor OFF Input B monitor	Indicator A Indicator B
	4	OK to open	Safety input A OFF	OFF	Maintenance mode	OFF Input A monitor OFF Input B monitor	Indicator A Indicator B

G9SX-GS

Model Number Structure

Model Number Legend

Note: Please see "Ordering Information" below for the actual models that can be ordered.

G9SX-□□□□-□□□-□□
1 2 3 4 5 6

1. Functions

GS: Safety Guard Switching Unit
EX: Expansion Unit

2. Output Configuration (Instantaneous Safety Outputs)

0: None
2: 2 outputs
4: 4 outputs

3. Output Configuration (OFF-delayed Safety Outputs)

0: None
2: 2 outputs
4: 4 outputs

4. Output Configuration (Auxiliary Outputs)

1: 1 output
6: 6 outputs

5. Max. OFF-delay Time

Safety Guard Switching Unit
T15: 15 s
Expansion Unit
No indicator: No OFF delay
T: OFF delay

6. Terminal Block Type

RT: Screw terminals
RC: Spring-cage terminals

Ordering Information

List of Models

Safety Guard Switching Unit

Safety outputs *3		Auxiliary outputs *4	Logical AND connection		Max. OFF-delay time *1	Rated voltage	Terminal block type	Model
Instantaneous	OFF-delayed *2		Inputs	Outputs				
2 (semiconductor)	2 (semiconductor)	6 (semiconductor)	1 (semiconductor)	1 (semiconductor)	15 s	24 VDC	Screw terminals	G9SX-GS226-T15-RT
							Spring-cage terminals	G9SX-GS226-T15-RC

*1. The OFF-delay time can be set in 16 steps as follows:

T15: 0, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 1, 1.5, 2, 3, 4, 5, 7, 10, or 15 s

*2. The OFF-delayed output becomes an instantaneous output by setting the OFF-delay time to 0 s.

*3. P channel MOS-FET output

*4. PNP transistor output (except for the external indicator outputs, which are P channel MOS-FET outputs)

Expansion Unit

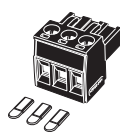
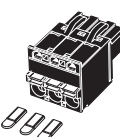
Safety outputs		Auxiliary outputs *1	OFF-delay time	Rated voltage	Terminal block type	Model
Instantaneous	OFF-delayed					
4 PST-NO (contact)	---	1 (semiconductor)	---	24 VDC	Screw terminals	G9SX-EX401-RT
					Spring-cage terminals	G9SX-EX401-RC
---	4 PST-NO (contact)		*2		Screw terminals	G9SX-EX041-T-RT
					Spring-cage terminals	G9SX-EX041-T-RC

*1. PNP transistor output

*2. The OFF-delay time is synchronized to the OFF-delay time setting in the connected Unit (G9SX-GS226-T15-□).

Accessories

Terminal Block

Appearance *	Specifications	Applicable units	Model	Remarks
	Terminal Block with screw terminals (4-pin)	G9SX-GS G9SX-EX-□	Y9S-04T1B-02A	Two Terminal Blocks (black) with screw terminals, and a set of six code marks to prevent erroneous insertion.
	Terminal Block with spring-cage terminals (4-pin)	G9SX-GS G9SX-EX-□	Y9S-04C1B-02A	Two Terminal Blocks (black) with spring-cage terminals, and a set of six code marks to prevent erroneous insertion.

Note: The G9SX main unit comes with a terminal block as standard equipment. The accessories shown here can be ordered as a replacement.

* The illustrations show 3-pin types

Specifications

Ratings

Power Input

Item	Model	G9SX-GS226-T15-□	G9SX-EX-□
Rated supply voltage		24 VDC	
Operating voltage range		-15% to 10% of rated supply voltage	
Rated power consumption *1		5 W max.	2 W max.

*1. Power consumption of loads not included.

Inputs

Item	Model	G9SX-GS226-T15-□
Safety inputs		Operating voltage: 20.4 VDC to 26.4 VDC, Internal impedance: Approx. 2.8 kΩ *2
Mode selector input		
Feedback/reset input		

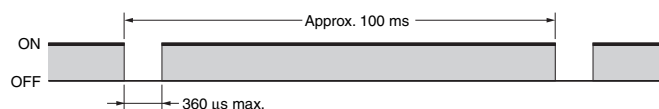
*2. Provide a current equal to or higher than that of the minimum applicable load of the connected input control device.

Outputs

Item	Model	G9SX-GS226-T15-□
Instantaneous safety outputs *3 OFF-delayed safety outputs *4		P channel MOS-FET outputs Load current: 0.8 A DC max./output *5, 6
Auxiliary outputs (for input, output, and error monitoring)		PNP transistor output Load current: 100 mA DC max.
External indicator outputs		P channel MOS-FET outputs Connectable indicators - Incandescent lamp: 24 VDC, 3 to 7 W - LED lamp: 10 to 300 mA DC/output

*3. While safety outputs are in the ON state, the following signal sequence is output continuously for diagnosis.

When using the safety outputs as input signals to control devices (i.e. Programmable Controllers), consider the OFF pulse shown below.



*4. When the safety inputs of G9SX are restored during off-delay time, G9SX will operate as below depending on the reset mode.

- Auto reset mode: Outputs turn off after off-delay time, then immediately turns on.
- Manual reset mode: Outputs turn off after off-delay time, then turn on when reset input is given.

*5. The following derating is required when Units are mounted side-by-side.

G9SX-GS226-T15-□: 0.4 A max. load current/output

*6. The following derating is required when inductive load is connected to safety outputs.

- IEC/EN60947-5-1 DC-13: 0.8 A
- UL508 Pilot Duty: 0.5 A

Expansion Unit

Item	Model	G9SX-EX-□
Rated load		250 VAC, 3 A / 30 VDC, 3 A (resistive load)
Rated carry current		3 A
Maximum switching voltage		250 VAC, 125 VDC

Characteristics

Item		Model	G9SX-GS226-T15-□	G9SX-EX-□
Overvoltage category (IEC/EN 60664-1)			II	II (Safety relay outputs 13 to 43 and 14 to 44: III)
Operating time (OFF to ON state) *1			50 ms max. (Safety input: ON) *2 100 ms max. (Logical AND connection input: ON) *3	30 ms max. *4
Response time (ON to OFF state) *1			15 ms max.	10 ms max. *4
Allowable switching time for mode selector input *5 *7			450 ms max.	---
Response time for switching operating modes *6 *7			50 ms max.	---
ON-state residual voltage			3.0 V max. for safety outputs, auxiliary outputs, and external indicator outputs	
OFF-state leakage current			0.1 mA max. for safety outputs and auxiliary outputs, 1 mA max. for external indicator outputs	
Maximum wiring length of safety input and logical AND input			100 m max. (External connection impedance: 100 Ω max. and 10 nF max.)	
Reset input time (Reset button pressing time)			100 ms min.	
Accuracy of OFF-delay time *8			Within ± 5% of the set value	
Insulation resistance	Between logical AND connection terminals, and power supply input terminals and other input and output terminals connected together	20 MΩ min. (at 100 VDC)	---	
	Between all terminals connected together and DIN track		100 MΩ min. (at 500 VDC)	
Dielectric strength	Between logical AND connection terminals, and power supply input terminals and other input and output terminals connected together	500 VAC for 1 min	---	
	Between all terminals connected together and DIN track		1,200 VAC for 1 min	
	Between different poles of outputs	---	2,200 VAC for 1 min	
	Between safety relay outputs connected together and other terminals connected together			
Vibration resistance			Frequency: 10 to 55 to 10 Hz, 0.375-mm single amplitude (0.75-mm double amplitude)	
Shock resistance	Destruction	300 m/s ²		
	Malfunction	100 m/s ²		
Durability	Electrical	---	100,000 cycles min. (rated load, switching frequency: 1,800 cycles/hour)	
	Mechanical	---	5,000,000 cycles min. (switching frequency: 7,200 cycles/hour)	
Ambient operating temperature			-10 to 55°C (with no icing or condensation)	
Ambient operating humidity			25% to 85%	
Terminal tightening torque *9			0.5 N·m	
Weight			Approx. 240 g	Approx. 165 g

*1. When two or more Units are connected by logical AND, the operating time and response time are the sum total of the operating times and response times, respectively, of all the Units connected by logical AND.

*2. Represents the operating time when the safety input turns ON with all other conditions set.

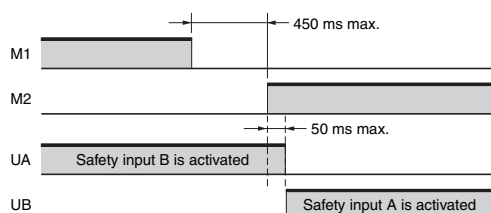
*3. Represents the operating time when the logical AND input turns ON with all other conditions set.

*4. This does not include the operating time or response time of Safety Guard Switching Units that are connected.

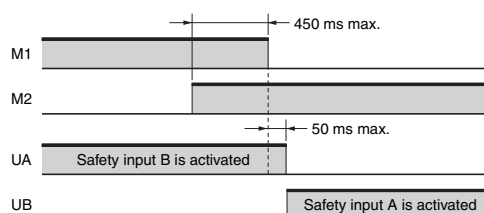
*5. This is the allowable switching time for the operating mode selector. If switching takes more than 450 ms, the G9SX-GS□ will detect an error.

*6. This is the time required for the safety input to actually switch to an activated condition after the mode selector input is switched.

(When M2 turns ON after M1 turns OFF)



(When M1 turns OFF after M2 turns ON)



*7. Only when the G9SX-GS□ is used with manual switching.

*8. This does not include the operating time or response time of internal relays in the G9SX-EX-□.

*9. For the G9SX-□-RT (with screw terminals) only.

Logical AND Connection

Note: Please see *Ordering Information* below for the actual models that can be ordered.

Item	Model	G9SX-GS226-T15-□	G9SX-EX-□
Number of Units connected per logical AND output		4 Units max.	---
Total number of Units connected by logical AND *1		20 Units max.	---
Number of Units connected in series by logical AND		5 Units max.	---
Max. number of Expansion Units connected *2		---	5 Units max.
Maximum cable length for logical AND input		100 m max.	---

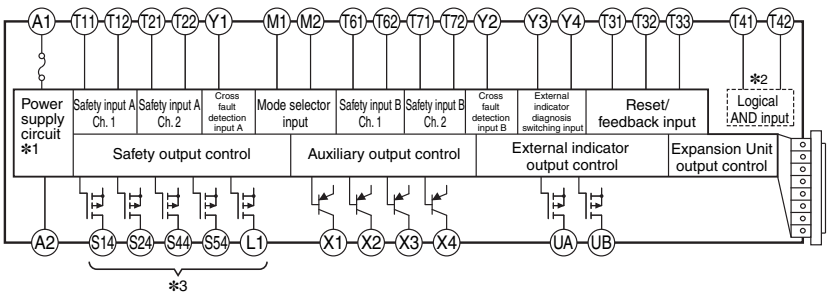
*1. The number of G9SX-EX401-□ Expansion Units or G9SX-EX041-T-□ Expansion Units (OFF-delayed Model) not included.

*2. G9SX-EX401-□ Expansion Units and G9SX-EX041-T-□ Expansion Units (OFF-delayed Model) can be mixed.

Connections

Internal Connection

G9SX-GS226-T15□ (Safety Guard Switching Unit)



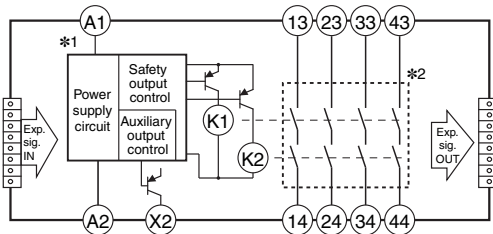
*1. Internal power supply circuit is not isolated.

*2. Logical AND input is isolated.

*3. Outputs S14 to S54 and L1 are internally redundant.

G9SX-EX401-□/G9SX-EX041-T-□

(Expansion Unit/Expansion Unit with OFF Delay)



*1. Internal power supply circuit is not isolated.

*2. Relay outputs are isolated.

Wiring of Inputs and Outputs

Signal name	Terminal name	Description of operation	Wiring	
Power supply input	A1, A2	The power supply input terminals for the G9SX-GS□. Connect the power source to the A1 and A2 terminals.	Connect the power supply plus (24 VDC) to the A1 terminal. Connect the power supply minus (GND) to the A2 terminal.	
Safety input A, channel 1	T11, T12	Using Auto Switching: For the safety output to go to the ON state, both channels 1 and 2 of safety input A must be in the ON state, channels 1 and 2 of safety input B must be in the ON state. Using Manual Switching: For the safety output to go to the ON state when safety input A is activated, both channels 1 and 2 of safety input A must be in the ON state (for maintenance mode). For the safety output to go to the ON state when safety input B is activated, both channels 1 and 2 of safety input B must be in the ON state (for normal operating mode).	Using 1 safety input channel	
Safety input A, channel 2	T21, T22		Using 2 safety input channels (cross fault detection OFF)	
			Using 2 safety input channels (cross fault detection ON)	
Safety input B, channel 1	T61, T62		Using 1 safety input channel	
Safety input B, channel 2	T71, T72		Using 2 safety input channels (cross fault detection OFF)	
			Using 2 safety input channels (cross fault detection ON)	
Feedback/reset input	T31, T32, T33	For the safety output to go to the ON state, the ON state signal must be input to T33. Otherwise the safety outputs cannot be in the ON state.	Auto reset	
		For the safety output to go to the ON state, the signal input to T32 must change from the OFF state to the ON state, and then to the OFF state. Otherwise the safety outputs cannot be in the ON state.	Manual reset	
Logical AND connection input	T41, T42	A logical AND connection means that one Unit (Unit A) outputs a safety signal "a" to a subsequent Unit (Unit B) and Unit B calculates the logical AND of "a" and safety signal "b." In the example shown at the right, the logical AND connection results in a safety output of "a AND b" for Unit B. Connect L1 of Unit A and T41 of Unit B to the power supply negative terminal (GND) of Unit A and T42 of Unit B. For the safety output to go to the ON state in the subsequent Unit, its logical AND connection preset switch must be set to AND (enabled) and the HIGH state signal must be input to T41 of the subsequent Unit.		
Mode selector input	M1, M2	When manual switching is selected, the SPST-NO/ SPST-NC input enables the input of either safety input A or safety input B. The relationship of the safety input enable state and the mode selector input is as follows: M1 = ON, M2 = OFF: Safety input B is enabled (normal operating mode) M1 = OFF, M2 = ON: Safety input A is enabled (maintenance mode)		
Cross fault detection inputs	Y1, Y2	Selects the mode for the failure detecting (cross fault detecting) function for the safety inputs of G9SX-GS□ corresponding to the connection of the cross fault detection input.	Keep Y1 open when using T11 and T21 (wiring to enable cross fault detection). Keep Y2 open when using T61 and T71 (wiring to enable cross fault detection). Connect Y1 to 24 VDC when not using T11 and T21 (wiring to disable cross fault detection, or when connecting safety sensors). Connect Y2 to 24 VDC when not using T61 and T71 (wiring to disable cross fault detection, or when connecting safety sensors).	
External indicator diagnosis switching inputs	Y3, Y4	Enables or disables error detection for the external indicator outputs of the G9SX-GS□.	Keep Y3 open when detecting errors for UA. Keep Y4 open when detecting errors for UB. Connect Y3 to 24 VDC when not detecting errors for UA. Connect Y4 to 24 VDC when not detecting errors for UB.	

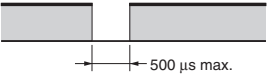
Signal name	Terminal name	Description of operation	Wiring
Instantaneous safety outputs	S14, S24	Turns ON/OFF according to the state of the safety inputs, feedback/reset input, and logical AND connection input. During OFF-delay state, the instantaneous safety outputs cannot turn ON.	Keep these outputs open when not used.
OFF-delayed safety outputs	S44, S54	OFF-delayed safety outputs. The OFF-delay time is set by the OFF-delay preset switch. When the delay time is set to zero, these outputs can be used as instantaneous safety outputs.	Keep these outputs open when not used.
Logical AND connection output	L1	Outputs a signal of the same logic as the instantaneous safety outputs.	Keep this output open when not used.
Auxiliary monitor output	X1	Outputs a signal of the same logic as the instantaneous safety outputs	Keep this output open when not used.
Auxiliary error output	X2	Outputs when the error indicator is lit or blinking.	Keep this output open when not used.
Auxiliary monitor outputs	X3, X4	X3 outputs a signal that is synchronized with and has the same logic as the input state of safety input A. X4 outputs a signal that is synchronized with and has the same logic as the input state of safety input B.	Keep these outputs open when not used.
External indicator outputs	UA, UB	Outputs the disabled state of the safety input. UA outputs a signal that is synchronized and has the same logic as the disabled state of safety input A. UB outputs a signal that is synchronized and has the same logic as the disabled state of safety input B.	Keep these outputs open when not used.

Connecting Safety Sensors and G9SX-GS□

1. To input the control output from safety sensors to the G9SX-GS□, the Y1 terminal must be connected to 24 VDC when the control output is connected to channel A. Likewise, the Y2 terminal must be connected to 24 VDC when the control output is connected to channel B. The G9SX-GS□ will detect a connection error if these terminals are not connected to 24 VDC.
2. In many cases, safety sensor outputs include an OFF-shot pulse for self diagnosis.

The following condition of test pulse is applicable as safety inputs for the G9SX.

- OFF-shot pulse width of the sensor, during the ON-state: 500 μs max.



Functions

Auto Switching Function

The following table shows the relationship between the safety inputs and safety outputs of the G9SX-GS□ when auto switching is selected.

Safety input A	ON	ON	OFF	OFF
Safety input B	ON	OFF	ON	OFF
Safety output	ON	ON	ON	OFF

- Note:** 1. If the logical AND connection input is enabled, it must be ON as a necessary condition for the above table.
2. Select either auto reset or manual reset for the reset mode, depending on the operation of the application.

Manual Switching Function

As shown in the following table, the relationship between the safety inputs and safety outputs of the G9SX-GS□ depends on the setting of the connected mode selector when manual switching is selected.

Mode Selector = Normal Operating Mode (M1 = ON, M2 = OFF)

Safety input A	ON	ON	OFF	OFF
Safety input B	ON	OFF	ON	OFF
Safety output	ON	OFF	ON	OFF

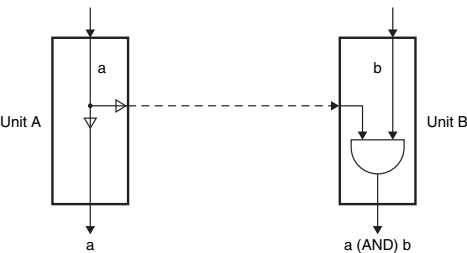
Mode Selector = Maintenance Mode (M1 = OFF, M2 = ON)

Safety input A	ON	ON	OFF	OFF
Safety input B	ON	OFF	ON	OFF
Safety output	ON	ON	OFF	OFF

- Note:** 1. If the logical AND connection input is enabled, it must be ON as a necessary condition for the above table.
2. Select either auto reset or manual reset for the reset mode, depending on the operation of the application.

Logical AND Connection

The logical AND connection means that one Unit (Unit A) outputs a safety signal “a” to a subsequent Unit (Unit B) and Unit B calculates the logical AND between safety signal “a” and safety signal “b.” In the example shown below, the logical AND connection results in a safety output of “a AND b” for Unit B.



External Indicator Outputs

The operator can be notified of two safety input states (enabled/disabled) by connecting external indicator outputs UA and UB to indicators. External indicator outputs UA and UB turn ON when safety inputs A and B, respectively, are disabled, and turn OFF when safety inputs A and B, respectively, are enabled. If error monitor output X2 turns ON, UA and UB will both turn OFF.

Auto Switching Selected

External indicator output	Description of operation	Output ON condition
UA	Safety input A is disabled.	Safety input B is ON.
UB	Safety input B is disabled.	Safety input A is ON.

Manual Switching Selected

External indicator output	Description of operation	Output ON condition
UA	Safety input A is disabled.	Mode selector switch must be set to normal operating mode.
UB	Safety input B is disabled.	Mode selector switch must be set to maintenance mode.

Note: Fault of external indicators can be detected. (Refer to page 32.)

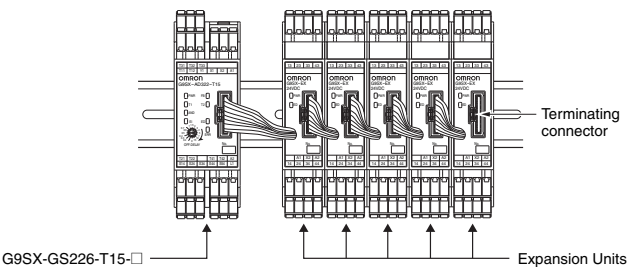
Auxiliary Outputs

Auxiliary outputs X1 to X4 can be used to notify the operator of input, output, and error states, as shown in the following table.

Terminal name	Signal name	Output ON condition
X1	Auxiliary monitor output	X1 is ON when the instantaneous safety output is ON.
X2	Auxiliary error output	X2 is ON when the error LED is lit or flashing.
X3	Input A monitor	X3 is ON when safety input A is ON.
X4	Input B monitor	X4 is ON when safety input B is ON.

Connecting Expansion Units

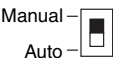
- The G9SX-EX and G9SX-EX-T Expansion Units can be connected to the G9SX-GS226-T15-□ to increase the number of safety outputs.
- A maximum of five Expansion Units can be connected to one G9SX-GS226-T15-□. This may be a combination of the G9SX-EX Instantaneous Expansion Unit and the G9SX-EX-T OFF-delayed Expansion Unit.
- Remove the terminating connector from the receptacle on the G9SX-GS226-T15-□ and insert the Expansion Unit cable connector into the receptacle. Insert the terminating connector into the receptacle on the Expansion Unit at the very end (rightmost).
- When Expansion Units are connected to the G9SX-GS226-T15-□, make sure that power is supplied to every Expansion Unit. (Refer to the following diagram for actual Expansion Unit connections.)



Setting Procedure

1.Switching Function

Auto or manual switching is set by using the Switching Function setting switch on the bottom of the G9SX-GS. Set the switch to *Auto* for auto switching and *Manual* for manual switching.

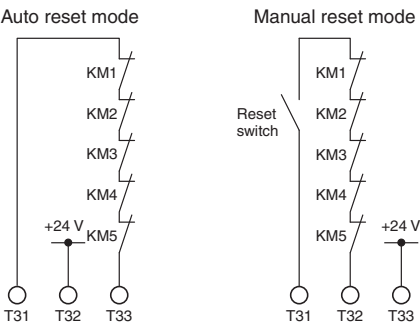


For manual switching, connect the mode selector as shown in the following table.

Switching function	Mode selector connection
Auto switching	
Manual switching	M1 ON, M2 OFF: Normal operating mode M1 OFF, M2 ON: Maintenance mode

2.Reset Mode

Set the reset mode using feedback/reset input terminals T31, T32, and T33. Auto reset mode is selected when terminal T32 is shorted to 24 V and manual reset mode is selected when terminal T33 is shorted to 24 V.



3.Cross Fault Detection

When connecting a Door Switch or other safety input device, you can use Y1 or Y2 to switch the cross fault detection setting. When Y1 is open, short-circuit failures are detected between safety inputs T11-T12 and T21-T22. When Y2 is open, short-circuit failures are detected between safety inputs T61-T62 and T71-T72. When a cross fault is detected, the following will occur.

1. The safety outputs and logical AND output will be locked out.
2. The LED error indicator will light.
3. The error output (auxiliary output) will turn ON.

When a safety sensor, such as a Safety Light Curtain, is connected to safety input A, connect Y1 to 24 V. When a safety sensor is connected to safety input B, connect Y2 to 24 V. If they are not connected to 24 V, the G9SX-GS will detect an error.

Cross fault detection	Equivalent safety category	Safety input A	Safety input B
OFF	Using 1 safety input channel		
	Using 2 safety input channels		
ON			

4.Diagnostic Checks of External Indicators

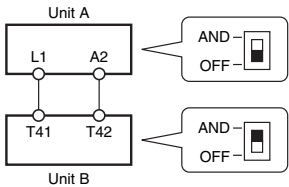
Diagnostic checks of external indicators connected to external indicator outputs UA and UB can be switched with Y3 and Y4, respectively. Enabling the diagnostic check makes it possible to detect indicator burnout or wiring errors. If there is no indicator connected to external indicator output UA, connect Y3 to 24 V. If there is no indicator connected to external indicator output UB, connect Y4 to 24 V. If they are not connected to 24 V, the G9SX-GS will detect an error.

External indicator output	Diagnostic check enabled	Diagnostic check disabled
UA		
UB		

Note: Diagnostic checks cannot be made for LED indicators. Disable the diagnostic check if using LED indicators.

5.Setting Logical AND Connection

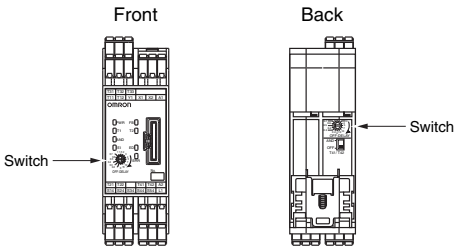
When connecting two or more Units using a logical AND connection, set the logical AND connection preset switch on the Unit that is on the input side to AND. The default setting of the logical AND connection preset switch is set to OFF.



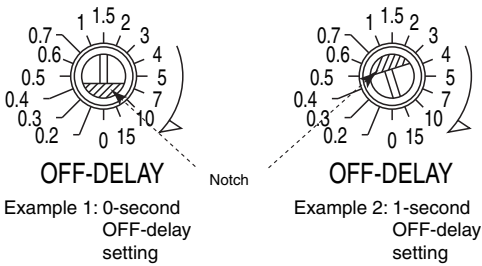
- Note:**
1. A setting error will occur and Unit B will lock out if the logical AND setting switch on Unit B is set to OFF.
 2. Set the logical AND setting switch on Unit A to OFF, otherwise the Unit A output will not turn ON.

6.Setting the OFF-delay Time

The OFF-delay preset time is set from the OFF-delay time preset switch (1 each on the front and back of the Unit). Normal operation will only occur if both switches are identically set. An error will occur if the switches are not identically set. The default setting of the OFF-delay time preset switch is set to 0 s.



Refer to the following illustration for details on setting switch positions.
G9SX-GS226-T15-



LED Indicators

Marking	Color	Name	G9SX-GS	G9SX-EX	G9SX-EX-T	Function	Reference
PWR	Green	Power supply indicator	○	○	○	Lit while power is supplied.	*
T1	Orange	Safety input A, channel 1 indicator	○	---	---	Lit while a HIGH state signal is input to T12. Blinks when an error relating to safety input A channel 1 occurs.	
T2	Orange	Safety input A, channel 2 indicator	○	---	---	Lit while a HIGH state signal is input to T22. Blinks when an error relating to safety input A channel 2 occurs.	
T6	Orange	Safety input B, channel 1 indicator	○	---	---	Lit while a HIGH state signal is input to T62. Blinks when an error relating to safety input B channel 1 occurs.	
T7	Orange	Safety input B, channel 2 indicator	○	---	---	Lit while a HIGH state signal is input to T72. Blinks when an error relating to safety input B channel 2 occurs.	
FB	Orange	Feedback/reset input indicator	○	---	---	Lit in the following cases: • With automatic reset while a HIGH state signal is input to T33. • With manual reset while a HIGH state signal is input to T32. Blinks when an error relating to feedback/reset input occurs.	
AND	Orange	Logical AND input indicator	○	---	---	Lit while a HIGH state signal is input to T41. Blinks when an error relating to logical AND connection input occurs.	
EI	Orange	Safety output indicator	○	○	---	Lit while the Instantaneous safety outputs (S14, S24) are in the ON-state. Blinks when an error relating to the instantaneous safety output occurs.	
ED	Orange	OFF-delayed safety output indicator	○	---	○	Lit while OFF-delayed safety outputs (S44, S54) are in the ON-state. Blinks when an error relating to OFF-delayed safety output occurs.	
UA	Orange	Safety input A disabled state indicator	○	---	---	Lit while the input of safety input A (T12, T22) is disabled. Blinks when an error relating to the external indicator (UA) occurs.	
UB	Orange	Safety input B disabled state indicator	○	---	---	Lit while the input of safety input B (T62, T72) is disabled. Blinks when an error relating to the external indicator (UB) occurs.	
ERR	Red	Error indicator	○	○	○	Lights or blinks when an error occurs.	

* Refer to "Fault Detection" on the next page for details.

Settings Indication (at Power ON)

Settings for the G9SX-GS□ can be checked by the orange indicators for approx. 3 seconds after the power is turned ON. During this settings indication period, the ERR indicator will light, however the auxiliary error output will remain OFF

Indicator	Item	Setting position	Indicator status	Setting mode	Setting status
T1	Cross fault detection mode for safety input A	Y1 terminal	Lit	Enabled	Y1 = open
			Not lit	Disabled	Y1 = 24 VDC
T6	Cross fault detection mode for safety input B	Y2 terminal	Lit	Enabled	Y2 = open
			Not lit	Disabled	Y2 = 24 VDC
FB	Reset mode	T33 or T32 terminal	Lit	Manual reset mode	T33 = 24 VDC
			Not lit	Auto reset mode	T32 = 24 VDC
AND	Logical AND connection input mode	Logical AND connection preset switch	Lit	Enabled	"AND"
			Not lit	Disabled	"OFF"
UA, UB	Switching Function	Switching Function setting switch	Lit	Manual switching	"Manual"
			Not lit	Auto switching	"Auto"

Fault Detection

When the G9SX-GS□ detects a fault, the ERR indicator and/or other indicators light or blink to inform the user about the fault. Check and take necessary measures referring to the following table, and then re-supply power to the G9SX-GS□.

Safety Guard Switching Unit

ERR indicator	Other indicator	Fault	Expected causes of the fault	Check points and measures to take
 Blinks	---	Fault due to electro-magnetic disturbance or of internal circuits.	1) Excessive electromagnetic disturbance 2) Failure of the internal circuit	1) Check the disturbance level around the G9SX-GS□ and the related system. 2) Replace with a new product.
 Lights	 T1 blinks	Fault involved with safety input A, channel 1	1) Failure involving the wiring of safety input A channel 1 2) Incorrect setting of cross fault detection input 3) Failure of the circuit of safety input A channel 1	1) Check the wiring to T11 and T12. 2) Check the wiring to Y1. 3) Replace with a new product.
	 T2 blinks	Fault involved with safety input A, channel 2	1) Failure involving the wiring of safety input A channel 2 2) Incorrect setting of cross fault detection input 3) Failure of the circuit of safety input A channel 2	1) Check the wiring to T21 and T22. 2) Check the wiring to Y1. 3) Replace with a new product.
	 T6 blinks	Fault involved with safety input B, channel 1	1) Failure involving the wiring of safety input B channel 1 2) Incorrect setting of cross fault detection input 3) Failure of the circuit of safety input B channel 1	1) Check the wiring to T61 and T62. 2) Check the wiring to Y2. 3) Replace with a new product.
	 T7 blinks	Fault involved with safety input B, channel 2	1) Failure involving the wiring of safety input B channel 2 2) Incorrect setting of cross fault detection input 3) Failure of the circuit of safety input B channel 2	1) Check the wiring to T71 and T72. 2) Check the wiring to Y2. 3) Replace with a new product.
	 FB blinks	Faults involved with feedback/reset input	1) Failures involving the wiring of feedback/reset input. 2) Failures of the circuit of feedback/reset input	1) Check the wiring to T31, T32 and T33. 2) Replace with a new product.
		Fault in Expansion Unit	1) Improper feedback signals from Expansion Unit 2) Abnormal supply voltage to Expansion Unit 3) Failure of the circuit of safety relay contact outputs	1) Check the connecting cable of Expansion Unit and the connection of the terminating connector 2) Check the supply voltage to Expansion Unit. Note: Make sure that all Expansion units' PWR indicators are lit. 3) Replace the Expansion Unit with a new one.
	 EI blinks	Fault involved with instantaneous safety outputs or logical AND connection outputs	1) Failure involving the wiring of instantaneous safety outputs 2) Failure of the circuit of Instantaneous safety outputs 3) Failure involving the wiring of the logical AND connection output 4) Failure of the circuit of the logical AND connection output 5) Impermissible high ambient temperature	1) Check the wiring to S14 and S24. 2) Replace with a new product. 3) Check the wiring to L1. 4) Replace with a new product. 5) Check the ambient temperature and spacing around the G9SX-GS□.
	 ED blinks	Fault involved with OFF-delayed safety outputs	1) Failure involving the wiring of OFF-delayed safety relay contact outputs 2) Incorrect set values for OFF-delay time 3) Failure of the circuit of OFF-delayed safety relay contact outputs 4) Impermissible high ambient temperature	1) Check the wiring to S44 and S54. 2) Confirm the set values of the OFF-delay time preset switches on the front and back of the Unit. 3) Replace with a new product. 4) Check the ambient temperature and spacing around the G9SX-GS□.

ERR indicator	Other indicator	Fault	Expected causes of the fault	Check points and measures to take
● Lights	AND blinks 	Fault involved with logical AND connection input	1) Failure involving the wiring of the logical AND connection input 2) Incorrect setting for the logical AND connection input 3) Failure of the circuit of the logical AND connection input	1) Check the wiring to T41 and T42. Note: Make sure that the wiring length for the T41, T42 terminal is less than 100 meters. Note: Make sure that the logical AND connection signal is branched for less than 4 units. 2) Confirm the set value of the logical AND connection preset switch. 3) Replace with a new product.
	UA blinks 	Fault involved with the external indicator output (UA)	1) Failure involving the wiring of the external indicator output 2) Failure involving the wiring of the external indicator diagnosis switching input 3) Failure of the circuit of the external indicator output 4) Failure of the external indicator	1) Check the wiring to UA. 2) Check the wiring to Y3. Note: When no indicator is connected, or an LED indicator is connected, connect Y3 to 24 V. 3) Replace with a new product. 4) Replace the connected external indicator.
	UB blinks 	Fault involved with the external indicator output (UB)	1) Failure involving the wiring of the external indicator output 2) Failure involving the wiring of the external indicator diagnosis switching input 3) Failure of the circuit of the external indicator output 4) Failure of the external indicator	1) Check the wiring to UB. 2) Check the wiring to Y4. Note: When no indicator is connected, or an LED indicator is connected, connect Y4 to 24 V. 3) Replace with a new product. 4) Replace the connected external indicator.
	UA and UB alternately blink 	Fault involved with the Switching Function	1) Failure involving the setting of the Switching Function setting switch 2) Failure involving the wiring of the mode selector input 3) Failure involving the circuit of the mode selector input 4) Failure involving the mode selector switching time	1) Check the setting of the Switching Function setting switch. 2) Check the wiring to M1 and M2. 3) Replace with a new product. 4) Check the signal switching time of the mode selector input (M1, M2).
	All indicators except PWR blink 	Supply voltage outside the rated value	1) Supply voltage outside the rated value	1) Check the supply voltage to the Units.

When indicators other than the ERR indicator blink, check and take necessary actions referring to the following table.

ERR indicator	Other indicators	Fault	Expected cause of the fault	Check points and measures to take
○ Off	T1	Safety input A mismatch	The input status between safety input A channel 1 and safety input A channel 2 is different, due to contact failure or a short circuit of safety input device(s) or a wiring fault.	Check the wiring from safety input devices to the G9SX-GS□. Or check the input sequence of safety input devices. After removing the fault, turn both safety input A channels 1 and 2 to the OFF state.
	T2			
	T6	Safety input B mismatch	The input status between safety input B channel 1 and safety input B channel 2 is different, due to contact failure or a short circuit of safety input device(s) or a wiring fault.	Check the wiring from safety input devices to the G9SX-GS□. Or check the input sequence of safety input devices. After removing the fault, turn both safety input B channels 1 and 2 to the OFF state.
	T7			

(Expansion Unit)

ERR indicator	Other indicators	Fault	Expected cause of the faults	Check points and measures to take
● Lights	---	Fault involved with safety relay outputs of Expansion Units	1) Welding of relay contacts 2) Failure of the internal circuit	Replace with a new product.

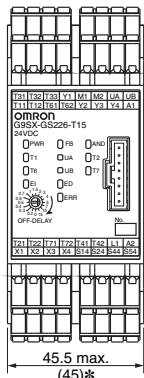
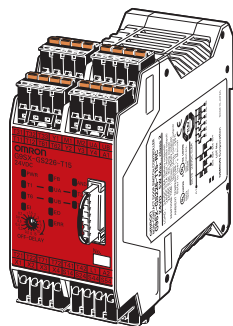
G9SX-GS

Dimensions and Terminal Arrangement

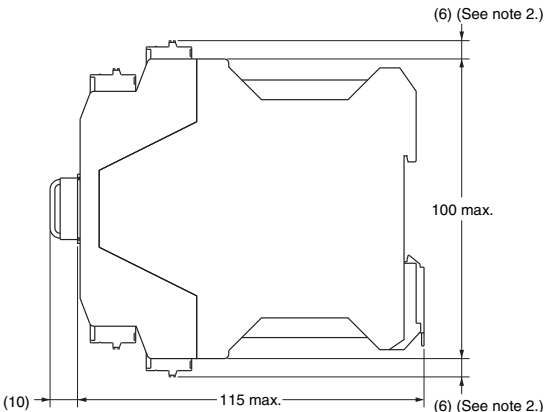
(Unit: mm)

Safety Guard Switching Unit

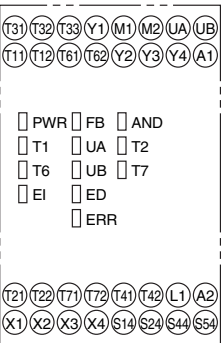
G9SX-GS226-T15-□



* Typical dimension



Terminal arrangement



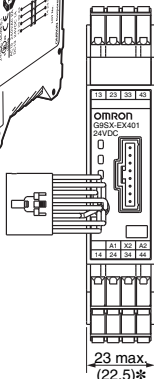
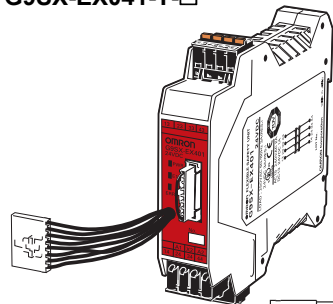
Note: 1. Above outline drawing is for -RC terminal type.
2. For -RC terminal type only.

Expansion Unit

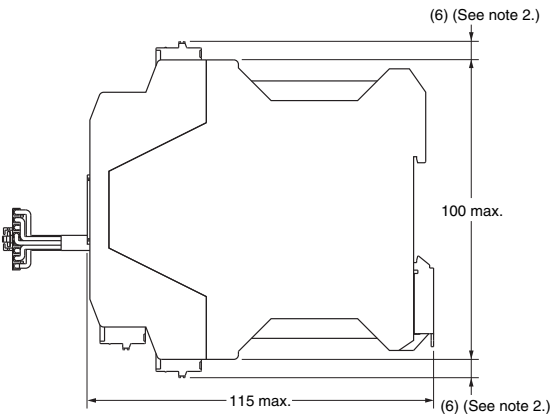
G9SX-EX401-□

Expansion Unit (OFF-delayed Model)

G9SX-EX041-T-□

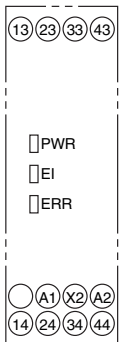


* Typical dimension

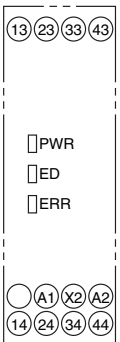


Terminal arrangement

G9SX-EX401-□
(Expansion Unit)



G9SX-EX041-T-□
(Expansion Unit with OFF Delay)



Note: 1. Above outline drawing is for -RC terminal type.
2. For -RC terminal type only.

Application Examples

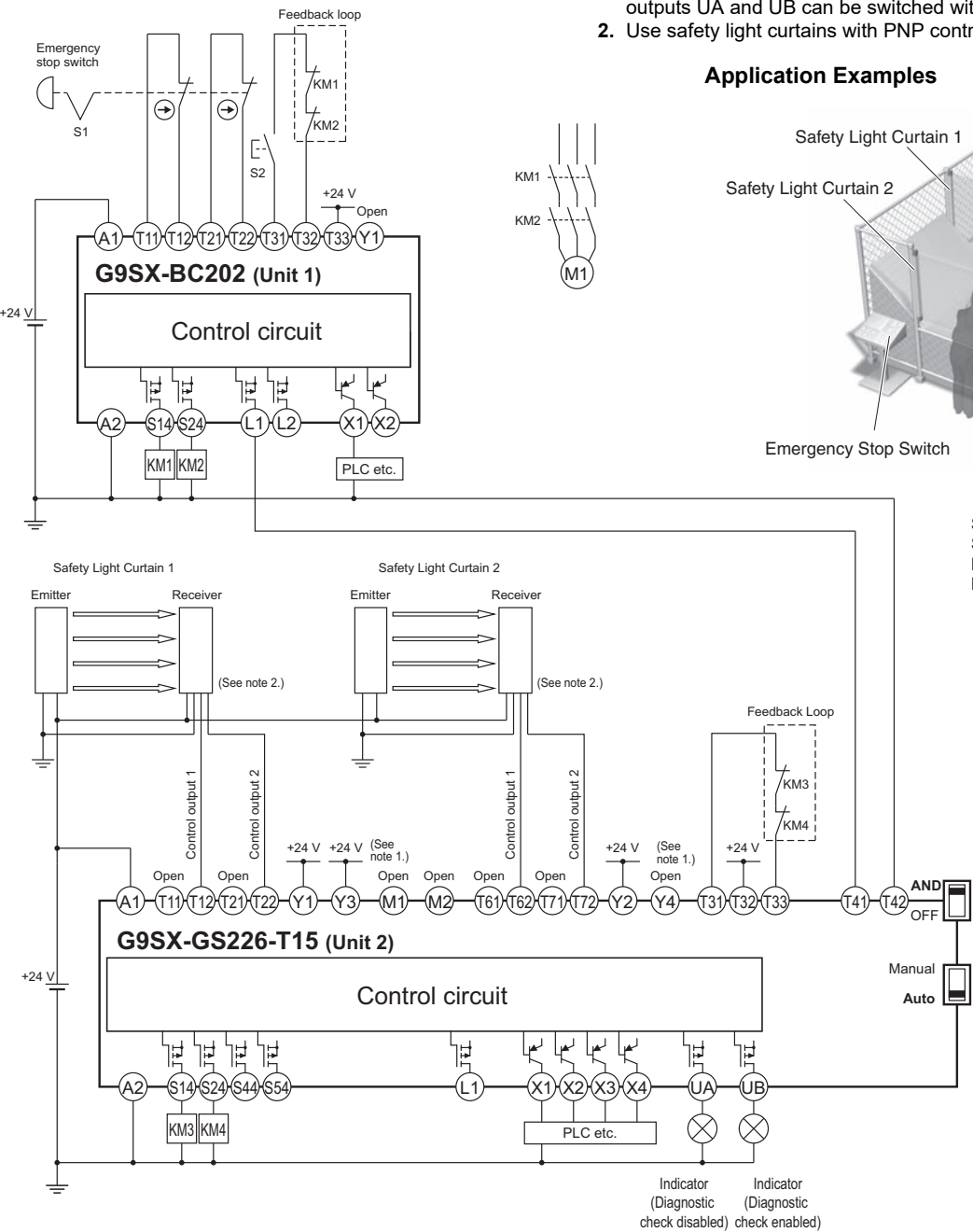
Highest achievable PL/ safety category	Model	Stop category	Reset
PLe/4 equivalent	Emergency Stop Switch A165E/A22E Flexible Safety Unit G9SX-BC202 Safety Light Curtain F3SJ-B/F3SJ-E/F3SJ-A Flexible Safety Unit G9SX-GS226-T15	M1, M2: 0	Emergency Stop: Manual Safety Light Curtain: Auto

Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

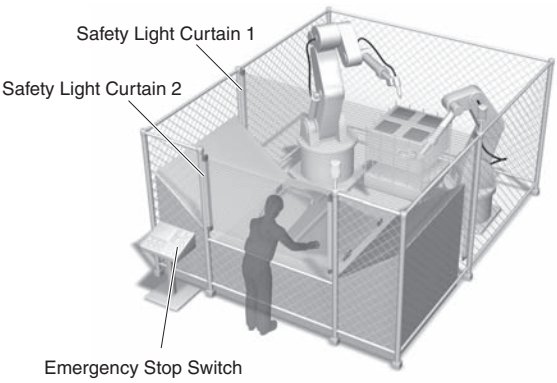
● Application Overview 1

- When the emergency stop switch S1 is pressed.
 - The power supply to the motor M1 and M2 is turned OFF immediately when the emergency stop switch S1 is pressed.
 - The power supply to the motor M1 is kept OFF until the reset switch S2 is pressed while the emergency stop switch S1 is released.
 - The power supply to the motor M2 is kept OFF until one of the safety light curtains 1 and 2 is unblocked and the reset switch S2 is pressed while the emergency stop switch S1 is released.
- When the operator and robot block the beams at the same time.
 - The power supply to the motor M2 is turned OFF immediately when both beams are blocked. (The power supply to the motor M1 is kept ON.)
 - The power supply to the motor M2 is kept OFF until one of the safety light curtains 1 and 2 is unblocked.

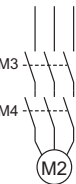
- Note:** 1. Diagnostic checks of the external indicators connected to external indicator outputs UA and UB can be switched with Y3 and Y4, respectively.
2. Use safety light curtains with PNP control outputs.



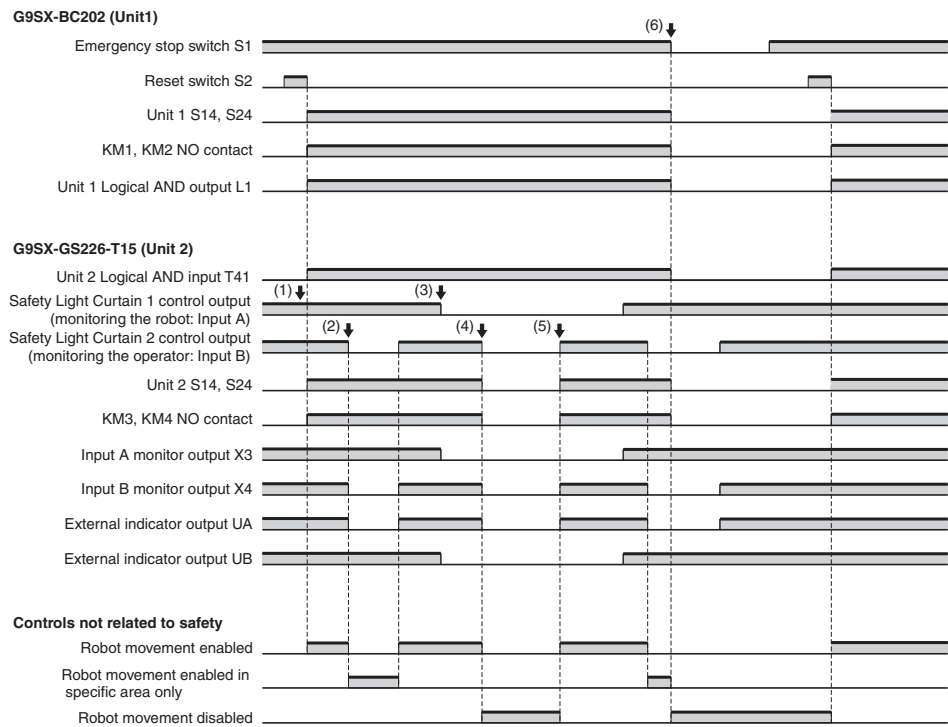
Application Examples



S1: Emergency stop switch
S2: Reset switch
KM1 to KM4: Magnetic contactors
M1 and M2: Motors



Timing Chart 1



- (1) Prior to operation start
- (2) Operator inserts workpiece
- (3) Robot processes workpiece
- (4) Both operator and robot enter the coordinated area: Only Unit 2 stops.
- (5) Unit 2 restarts.
- (6) Emergency stop switch pressed: All units stop.

Highest achievable PL/ safety category	Model	Stop category	Reset
PL _e /4 equivalent	Emergency Stop Switch A165E/A22E Flexible Safety Unit G9SX-BC202 Safety Limit Switch D4B-N/D4N/D4F Guard Lock Safety-door Switch D4NS/D4GS-N/D4BS Safety Key Selector Switch A22TK Flexible Safety Unit G9SX-GS226-T15	M1, M2: 0	Manual

Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

● Application Overview 2

1. Normal operating mode (When the mode M1 of the G9SX-GS is turned ON.)

Normal operating mode (M1 = ON, M2 = OFF) is selected on the selector switch S7. The enabling switch S3 and S4 for detecting the conveyor cart position are disabled.

1-1. When the emergency stop switch S1 is pressed.

- The power supply to the motor M1 and M2 is turned OFF immediately when the emergency stop switch S1 is pressed.
- The power supply to the motor M1 is kept OFF until the reset switch S2 is pressed while the emergency stop switch S1 is released.
- The power supply to the motor M2 is kept OFF until the reset switch S2 and S8 are pressed while the guard is closed and the emergency stop switch S1 is released.

1-2. When the guard is opened (the emergency stop switch S1 is released).

- The power supply to the motor M2 is turned OFF immediately when the S5 and S6 detect that the guard is opened. (The power supply to the motor M1 is kept ON.)
- The power supply to the motor M2 is kept OFF until the guard is closed and the reset switch S8 is pressed.

2. Maintenance mode (When the mode M2 of the G9SX-GS is turned ON.)

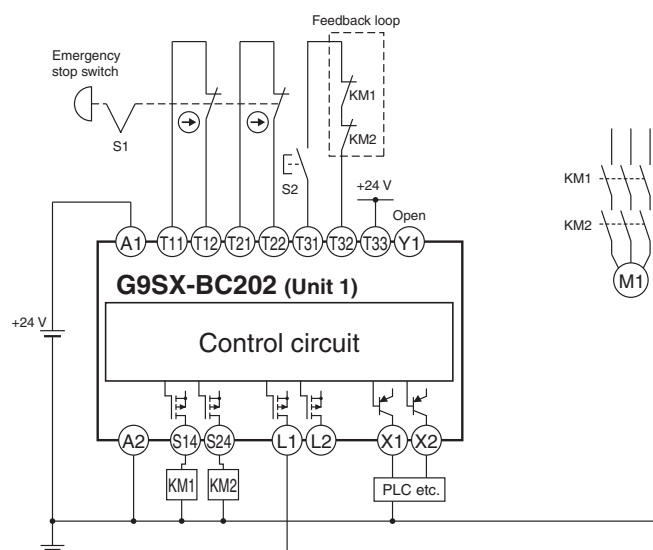
Maintenance mode (M1 = OFF, M2 = ON) is selected on the selector switch S7. The S5 to detect the opening and closing of the guard is disabled.

2-1. When the emergency stop switch S1 is pressed.

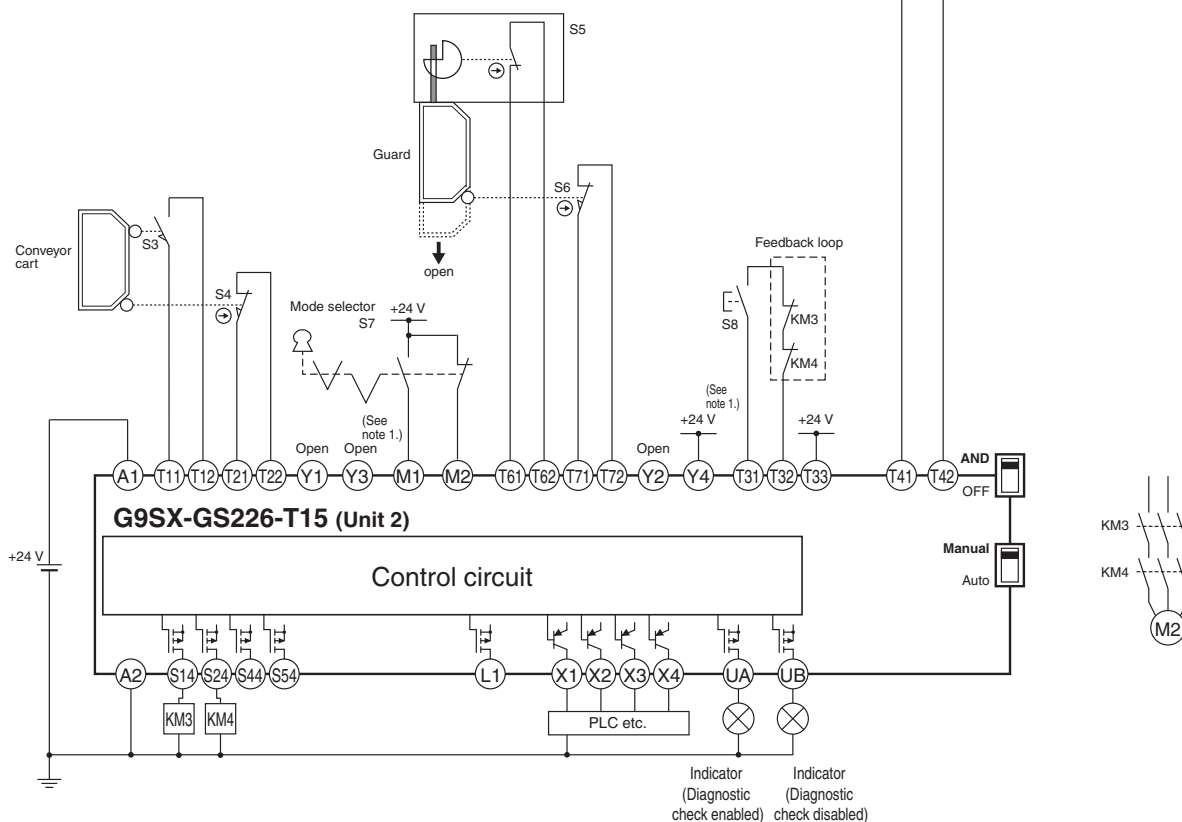
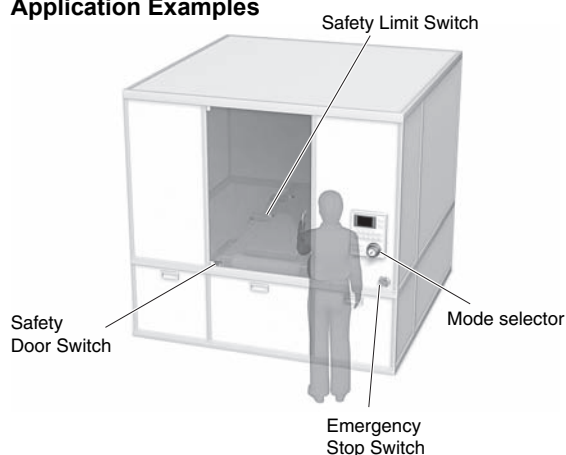
- The power supply to the motor M1 and M2 is turned OFF immediately when the emergency stop switch S1 is pressed.
- The power supply to the motor M1 is kept OFF until the reset switch S2 is pressed while the emergency stop switch S1 is released.
- The power supply to the motor M2 is kept OFF until the reset switch S2 and S8 are pressed while the conveyor cart is at the safety position and safety limit switch S3 and S4 are turned ON and the emergency stop switch S1 is released.

2-2. When the conveyor cart moves away from its safe position (the emergency stop switch S1 is released).

- The power supply to the motor M2 is turned OFF after the conveyor cart moving away from the safety position and the safety limit switch S3 and S4 being turned OFF. (The power supply to the motor M1 is kept ON.)
- The power supply to the motor M2 is kept OFF until the reset switch S8 is pressed after the conveyor cart returning to the safety position and the safety limit switch S3 and S4 being turned ON.



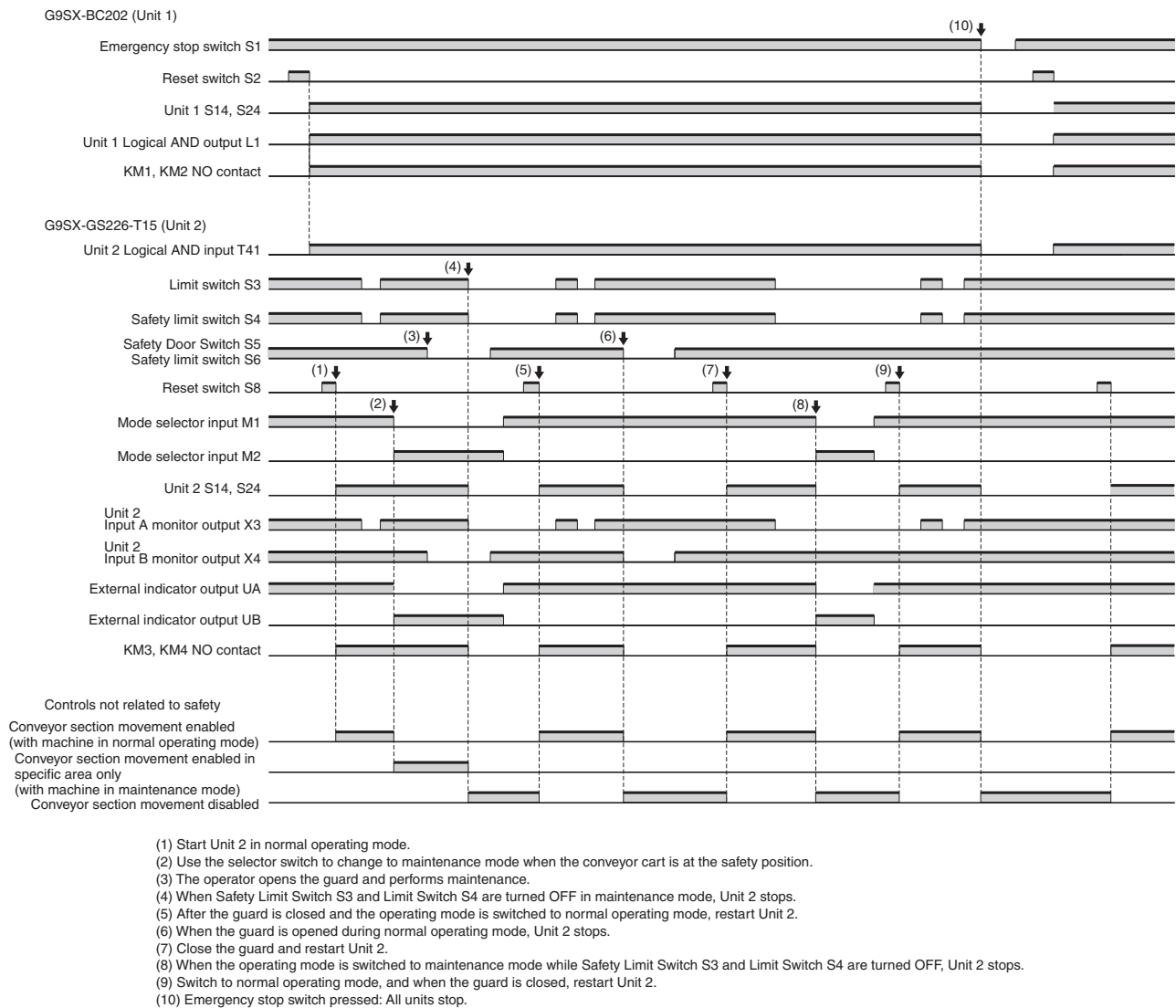
Application Examples



- S1: Emergency Stop Switch
- S2, S8: Reset Switches
- S3: Limit Switch
- S4, S6: Safety Limit Switches
- S5: Safety Door Switch
- S7: Safety Key Selector Switch
- KM1 to KM4: Magnetic Contactors
- M1 and M2: Motors

Note: Diagnostic checks for the external indicators connected to external indicator outputs UA and UB can be switched with Y3 and Y4, respectively.

Timing Chart 2



Note: 1. In this example, press reset switch S2, confirm that Unit 1 has started operating, then press reset switch S8.
 2. To use the set value of the mode selector for control, use external indicator output UA for control and external indicator output UB for the operator's indication. In this case, disable the diagnostic check of the external indicator output UA.

Highest achievable PL/ safety category	Model	Stop category	Reset
PLe/4 equivalent	Emergency Stop Switch A165E/A22E Flexible Safety Unit G9SX-BC202 Safety Limit Switch D4B-N/D4N/D4F Guard Lock Safety-door Switch D4NS/D4GS-N/D4BS Safety Key Selector Switch A22TK Flexible Safety Unit G9SX-GS226-T15 Flexible Safety Unit G9SX-AD322-T15	M1, M2, M3: 0	Manual

Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

● Application Overview 3

1. When the emergency stop switch S1 is pressed.

- The power supply to the motor M1, M2, and M3 is turned OFF immediately when the emergency stop switch S1 is pressed.
- The power supply to the motor M1 is kept OFF until the reset switch S2 is pressed while the emergency stop switch S1 is released.
- The power supply to the motor M2 is kept OFF until the reset switch S2 and S8 are pressed while the guard 1 is closed and the emergency stop switch S1 is released.
- The power supply to the motor M3 is kept OFF until the reset switch S2 and S11 are pressed while the guard 2 is closed and the emergency stop switch S1 is released.

2. When the guard 2 is opened (the emergency stop switch S1 is released).

- The power supply to the motor M3 is turned OFF immediately when the S9 and S10 detect that the guard 2 is opened. (The power supply to the motor M1 and M2 is kept ON.)
- The power supply to the motor M3 is kept OFF until the guard 2 is closed and the reset switch S11 is pressed.

3-1. Normal operating mode (When the mode M1 of the G9SX-GS is turned ON.)

Normal operating mode (M1 = ON, M2 = OFF) is selected on the selector switch S7. The safety limit switch S3 and S4 to detect the conveyor cart position are disabled.

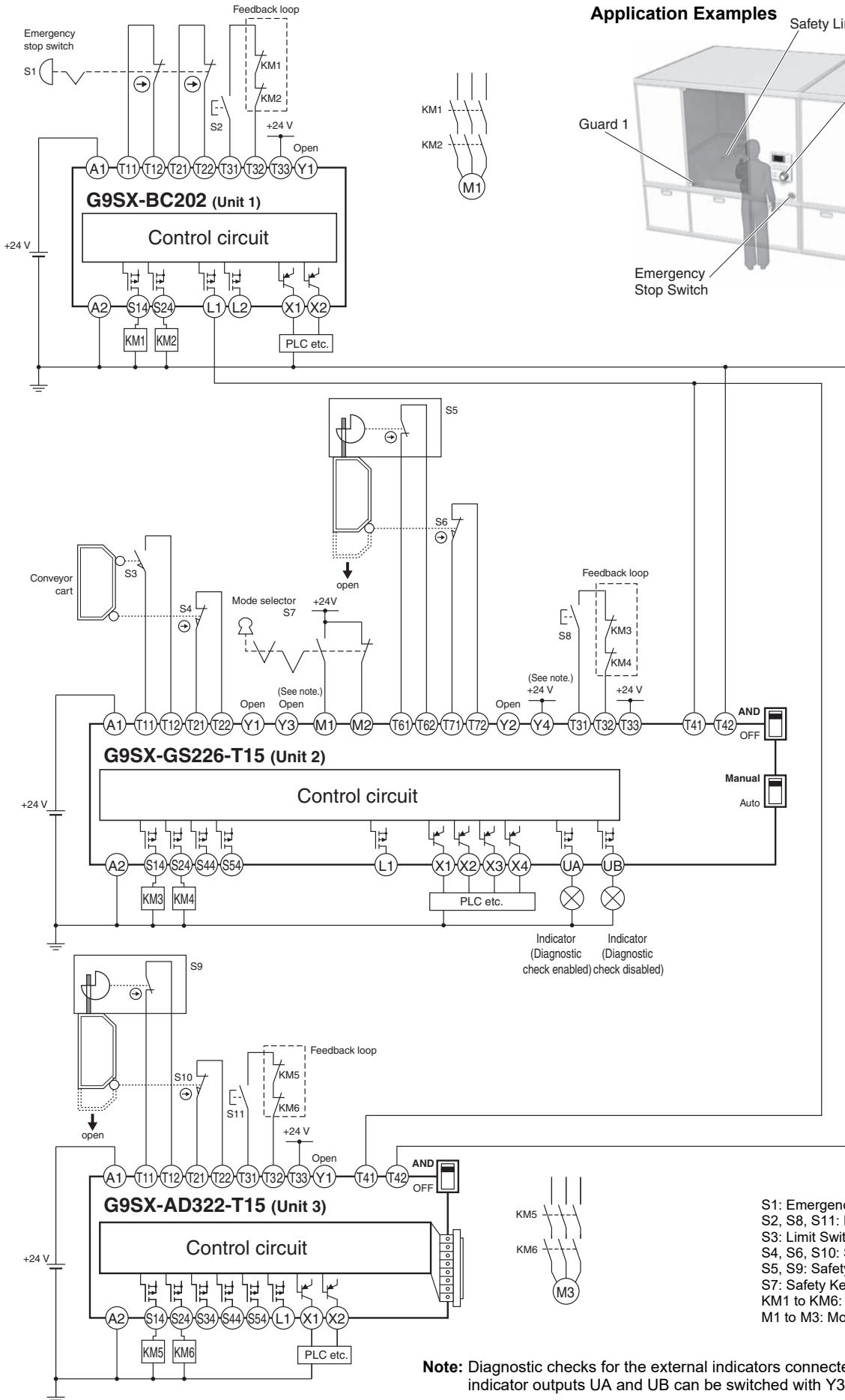
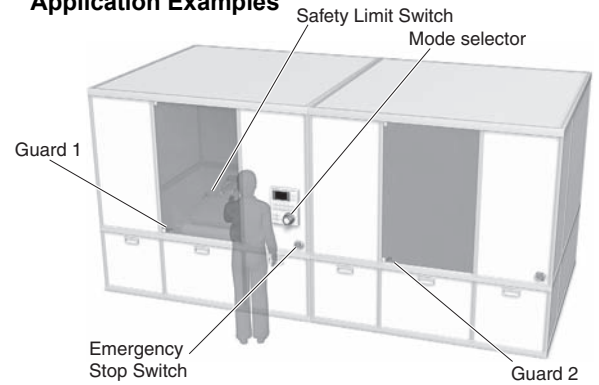
- The power supply to the motor M2 is turned OFF immediately when the S5 and S6 detect that the guard 1 is opened. (The power supply to the motor M1 and M3 is kept ON.)
- The power supply to the motor M2 is kept OFF until the guard 1 is closed and the reset switch S8 is pressed.

3-2. Maintenance mode (When the mode M2 of the G9SX-GS is turned ON.)

Maintenance mode (M1 = OFF, M2 = ON) is selected on the selector switch S7. The S5 and S6 to detect the opening and closing of the guard 1 are disabled.

- The power supply to the motor M2 is turned OFF after the conveyor cart moving away from the safety position and the safety limit switch S3 and S4 being turned OFF. (The power supply to the motor M1 and M3 is kept ON.)
- The power supply to the motor M2 is kept OFF until the reset switch S8 is pressed after the conveyor cart returning to the safety position and the safety limit switch S3 and S4 being turned ON.

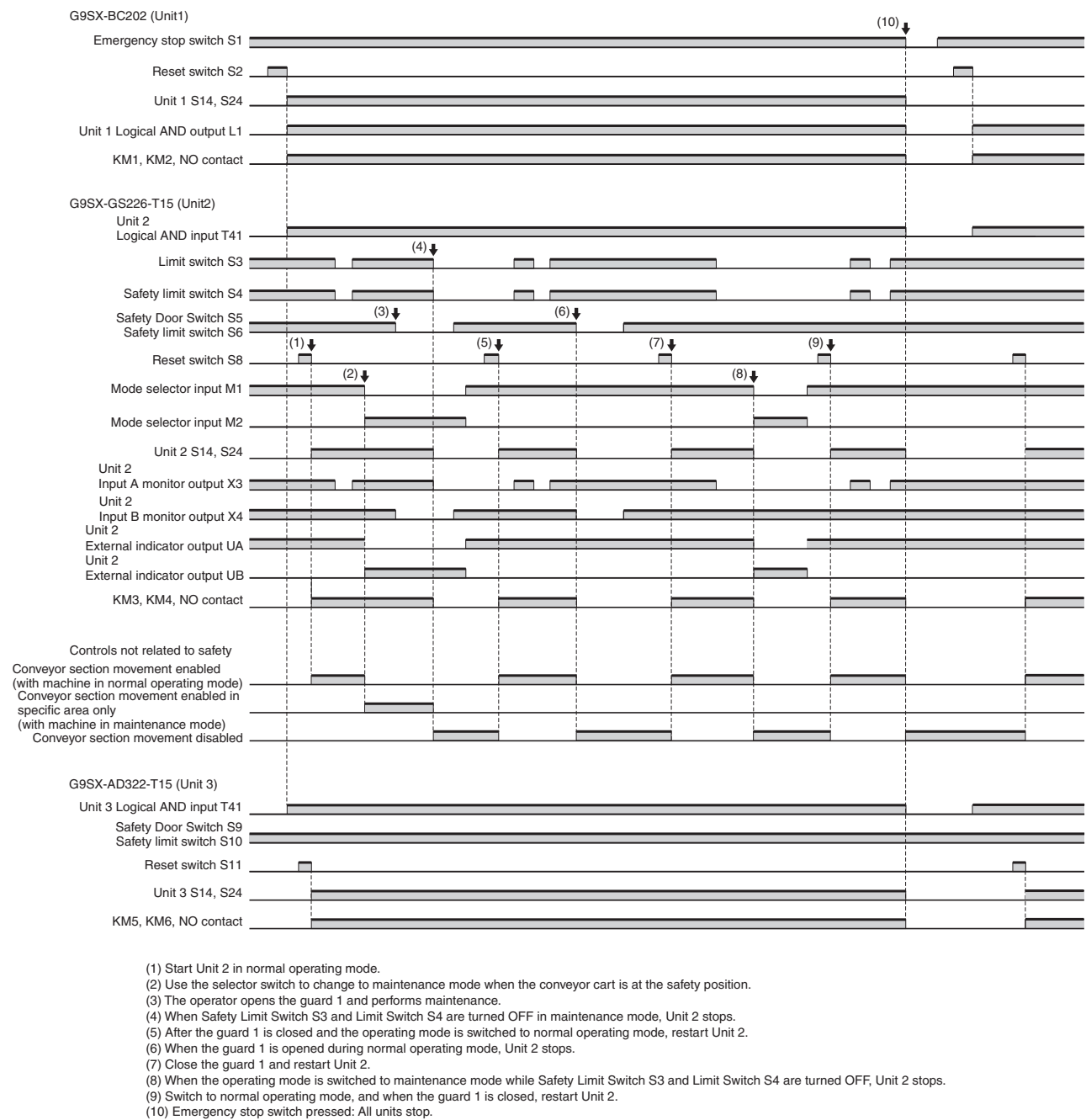
Application Examples



- S1: Emergency Stop Switch
- S2, S8, S11: Reset Switches
- S3: Limit Switch
- S4, S6, S10: Safety Limit Switches
- S5, S9: Safety Door Switches
- S7: Safety Key Selector Switch
- KM1 to KM6: Magnetic Contactors
- M1 to M3: Motors

Note: Diagnostic checks for the external indicators connected to external indicator outputs UA and UB can be switched with Y3 and Y4 respectively.

Timing Chart 3



Note: 1. In this example, press reset switch S2, confirm that Unit 1 has started operating, then press reset switch S8 and S11.
2. To use the set value of the mode selector for control, use external indicator output UA for control and external indicator output UB for the operator's indication. In this case, disable the diagnostic check of the external indicator output UA.