Flexible Safety Unit

- Logical AND functions adds flexibility to I/O expansion
- Facilitates partial or complete control system setup.
- Solid-state outputs (excluding Expansion Units).
- Detailed LED indications enable easy diagnosis.
- TÜV Product Service certification for compliance with IEC/EN61508 (SIL3) and EN954-1 (Cat. 4).
- Approved by UL and CSA.
- New unit joins the Series with the following two additional features:
  - OFF-delay time of up to 150 seconds
     (The OFF-delay output also complies with Cat. 4.)
  - Two logical AND connection inputs

Specifications

Ratings

Power Input

	G9SX-AD322-□/ADA222-□	G9SX-BC202-□	G9SX-EX-□
Rated supply voltage	24 VDC		
Operating voltage range	-15% to 10% of rated supply voltage		
Rated power consumption*	4 W max.	3 W max.	2 W max.

*Power consumption of loads not included.

Inputs

	G9SX-AD322-□/ADA222-□	G9SX-BC202-□
Safety input	Operating voltage: 20.4 VDC to 26.4 VDC, internal impedance: approx. 2.8 kW	
Feedback/reset input		

Outputs

	G9SX-AD322-□/ADA222-□	G9SX-BC202-□
Instantaneous safety output *1 OFF-delayed safety output *1	P channel MOS FET transistor output Load current: Using 2 outputs or less: 1 A DC max. *2 Using 3 outputs or more: 0.8 A DC max.	P channel MOS FET transistor output Load current: Using 1 output: 1 A DC max. *2 Using 2 outputs: 0.8 A DC max.
Auxiliary output	PNP transistor output Load current: 100 mA max.	

*1. 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.

*2. The following derating is required when Units are mounted side-by-side.
G9SX-AD322-□/G9SX-ADA222-□/G9SX-BC202-□: 0.4 A max. load current

ON
OFF
Approx. 100 ms
360 µs max.
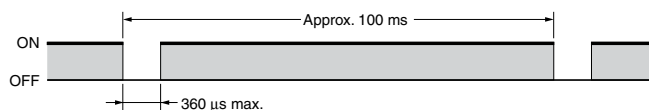
Expansion Unit Ratings

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

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Specifications (continued)

Characteristics

		G9SX-AD322-☐/ADA222-☐	G9SX-BC202-☐	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) (See note 1.)		50 ms max. (Safety input: ON) (See note 2.) 100 ms max. (Logical AND connection input: ON) (See note 3.)	50 ms max. (Safety input: ON)	30 ms max. (See note 4.)
Response Time (ON to OFF state) (See note 1.)		15 ms		10 ms max. (See note 4.)
ON-state residual voltage		3.0 V max. (safety output, auxiliary output)		
OFF-state leakage current		0.1 mA max. (safety output, auxiliary output)		
Maximum wiring length of safety input and logic 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 (See note 5.)		Within ±5% of the set value	—	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. (by 100 VDC)	—	—
	Between all terminals connected together and DIN track		20 mΩ min. (at 100 VDC)	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		500 VAC for 1 min.	1,200 VAC for 1 min.
	Between different poles of outputs	—	—	
	Between safety relay outputs connected together and other terminals connected together			2,200 VAC for 1 min.
Vibration resistance		Frequency: 10 to 55 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 (See note 6.)		0.5 N·m		
Weight		Approx. 200 g	Approx. 125 g	Approx. 165 g

Notes:

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 Advanced Units that are connected.

5. This does not include the operating time or response time of internal relays in the G9SX-EX-☐.

6. For the G9SX-☐-RT (with screw terminals) only.

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Specifications (continued)

Logical AND Connection

|	G9SX-AD322-□/ADA222-□	G9SX-BC202-□	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.		---

Note: See Logical AND Connection Combinations below for details.
*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.
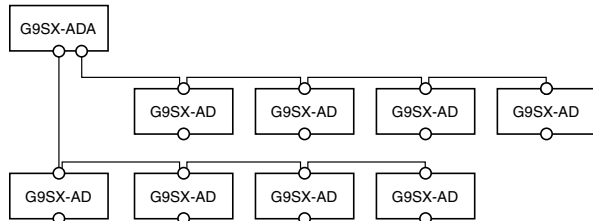
Logical AND Connection Combinations

1. One logical AND connection output from an Advanced Unit G9SX-AD can be logical AND connected to up to four Advanced Units.
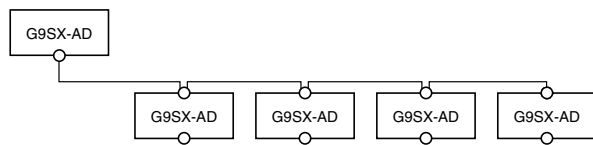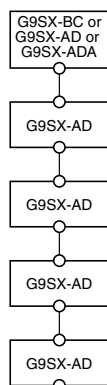

2. Two logical AND outputs from a Basic Unit G9SX-BC can be logical AND connected to up to eight Advanced Units.
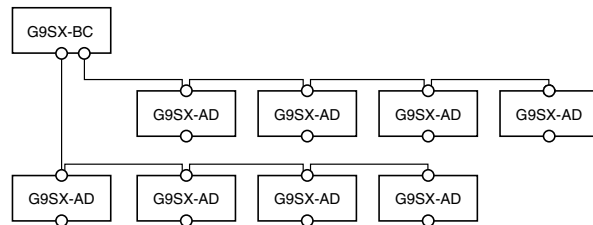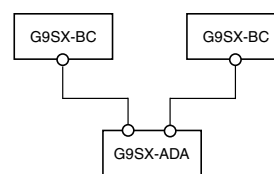

3. Two logical AND outputs from an Advanced Unit G9SX-ADA can be logical AND connected to up to eight Advanced Units.
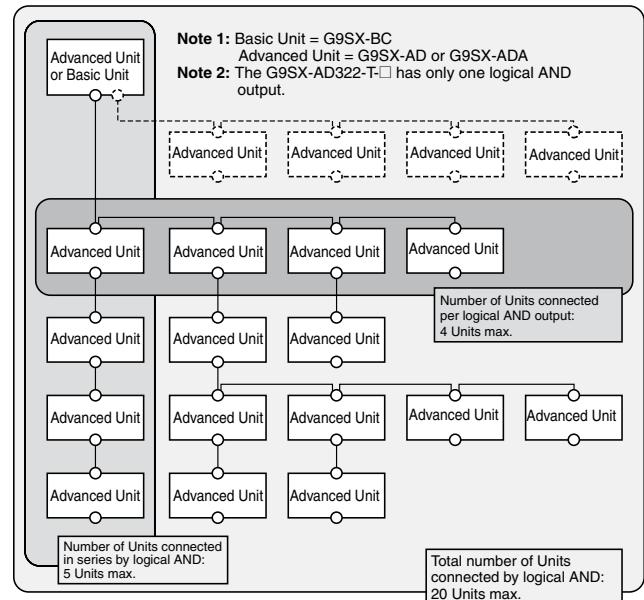

4. Any Advanced Unit with logical AND input can be logical AND connected to Advanced Units on up to five tiers.

5. Two logical AND connection outputs, each from different Advanced/Basic Units, can be logical AND connected to a single G9SX-ADA Unit.
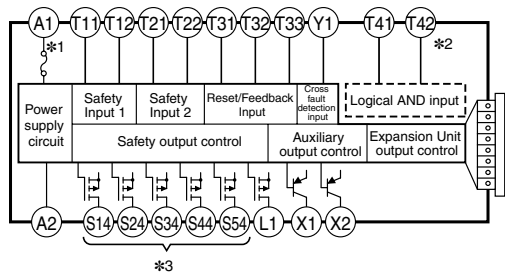

6. The largest possible system configuration contains a total of 20 Advanced and Basic Units. In this configuration, each Advanced Unit can have up to five Expansion Units.


Note 1: Basic Unit = G9SX-BC
Advanced Unit = G9SX-AD or G9SX-ADA
Note 2: The G9SX-AD322-T-□ has only one logical AND output.

Number of Units connected per logical AND output: 4 Units max.

Number of Units connected in series by logical AND: 5 Units max.

Total number of Units connected by logical AND: 20 Units max.

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Wiring

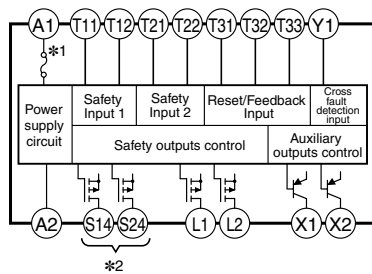## Internal Connection

G9SX-AD322-□ (Advanced Unit)

*1. Internal power supply circuit is not isolated.
*2. Logical AND input is isolated.
*3. Outputs S14 to S54 are internally redundant.
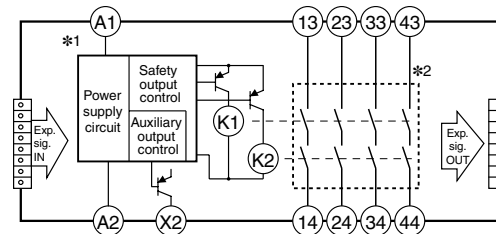
G9SX-ADA222-□ (Advanced Unit)
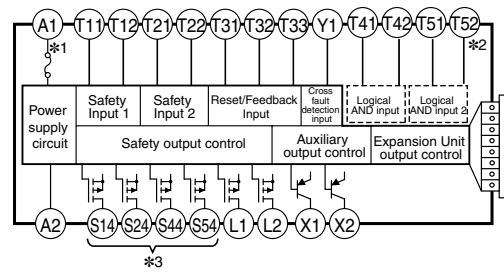
*1. Internal power supply circuit is not isolated.
*2. Logical AND inputs are isolated.
*3. Outputs S14 to S54 are internally redundant.

G9SX-BC202-□ (Basic Unit)

*1. Internal power supply circuit is not isolated.
*2. Outputs S14 and S24 are internally redundant.

G9SX-EX401-□/G9SX-EX041-T-□ (Expansion Unit / Expansion Unit OFF-delayed model)
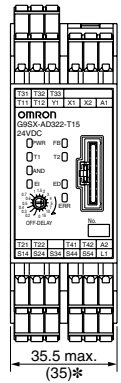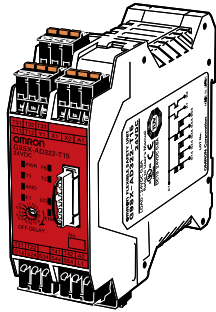

*1. Internal power supply circuit is not isolated.
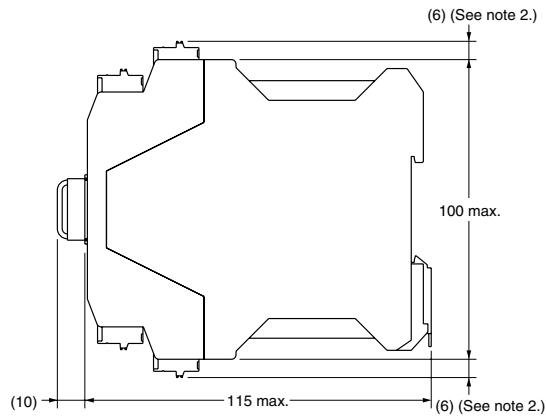*2. Relay outputs are isolated.

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Dimensions (mm)

Advanced Unit

G9SX-AD322-☐

(6) (See note 2.)

100 max.

35.5 max.
(35)✻

(10) 115 max. (6) (See note 2.)

✻ Typical dimension

Terminal arrangement

T31 T32 T33
T11 T12 Y1 X1 X2 A1

PWR☐ ☐FB
T1☐ ☐T2
AND☐
EI☐ ☐ED
☐ERR

T21 T22 ◯ T41 T42 A2
S14 S24 S34 S44 S54 L1

Advanced Unit

G9SX-ADA222-☐

(6) (See note 2.)

100 max.

35.5 max.
(35)✻

(10) 115 max. (6) (See note 2.)

✻ Typical dimension

Terminal arrangement

T31 T32 T33 T51 T52 ◯
T11 T12 Y1 X1 X2 A1

PWR☐ ☐FB
T1☐ ☐T2
AND1☐ ☐AND2
EI☐ ☐ED
☐ERR

T21 T22 ◯ T41 T42 A2
S14 S24 S44 S54 L1 L2

Basic Unit

G9SX-BC202-☐

(6) (See note 2.)

100 max.

23 max.
(22.5)✻

115 max. (6) (See note 2.)

✻ Typical dimension

Terminal arrangement

T31 T32 T33 Y1
T11 T12 X1 A1

PWR☐ ☐FB
T1☐ ☐T2
EI☐ ☐ERR

T21 T22 X2 A2
S14 S24 L1 L2
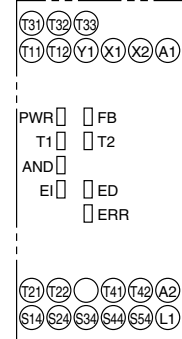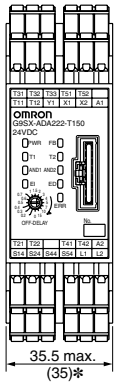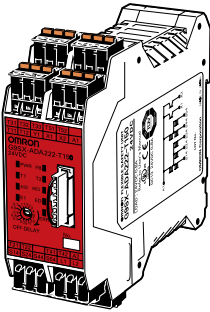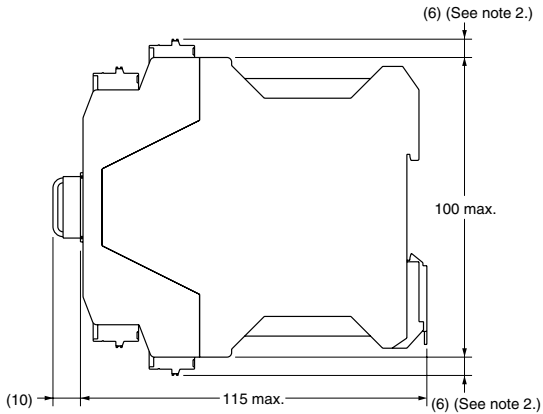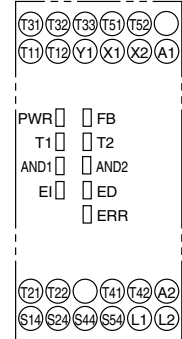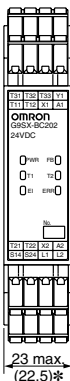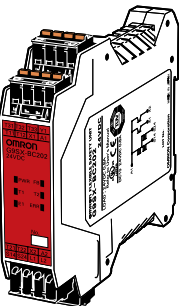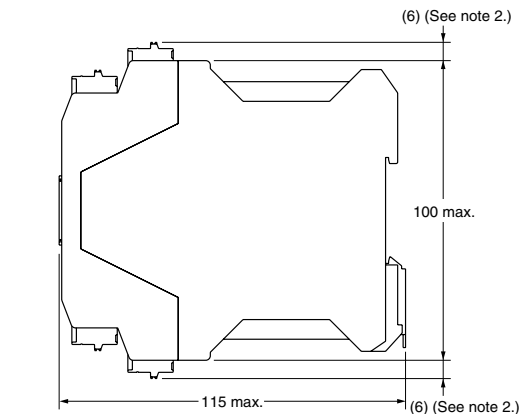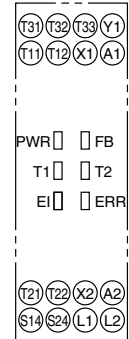
Notes:
1. Above outline drawing is for -RC terminal type.
2. For -RC terminal type only.

Dimensions (continued)

(mm)

Expansion Unit
G9SX-EX401-▢
Expansion Unit (OFF-delayed Model)
G9SX-EX041-T-▢
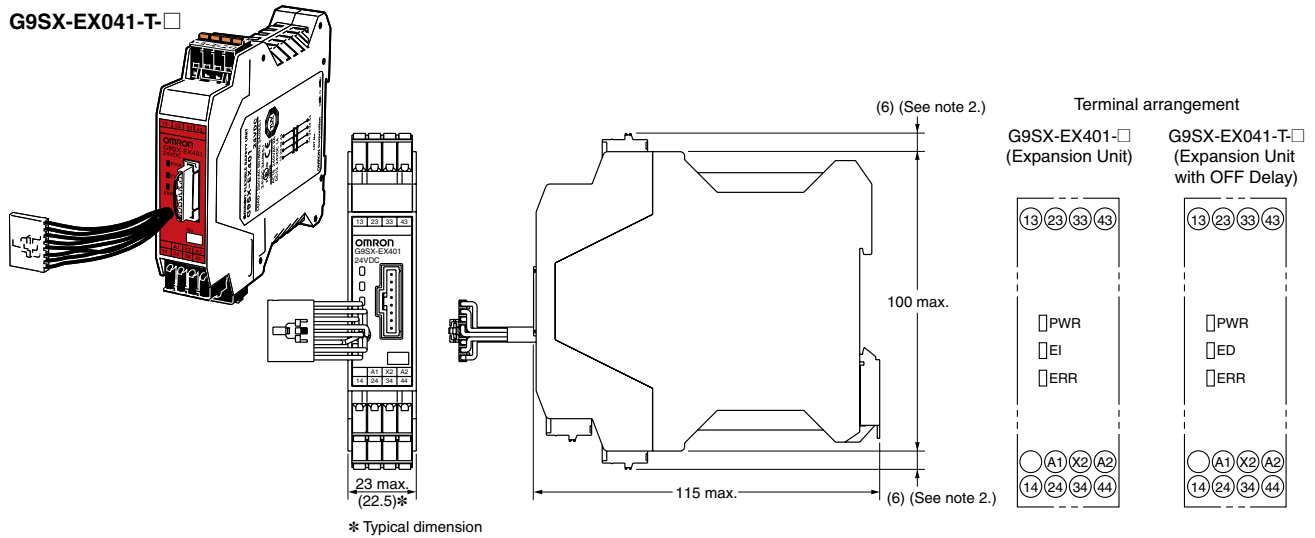
(6) (See note 2.)

Terminal arrangement

G9SX-EX401-▢
(Expansion Unit)

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

⑬㉓㉝㊸

⬜PWR
⬜EI
⬜ERR

○A1 X2 A2
⑭㉔㉞㊹

⑬㉓㉝㊸

⬜PWR
⬜ED
⬜ERR

○A1 X2 A2
⑭㉔㉞㊹

100 max.

115 max.

(6) (See note 2.)

23 max.
(22.5)✳

✳ Typical dimension

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

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Applications

G9SX-AD322-T15
(24 VDC) (2-channel Safety Sensor / Auto Reset)

Timing chart

F3SJ-A: Safety sensor
KM1 to KM4: Contactor
M1, M2: 3-phase motor
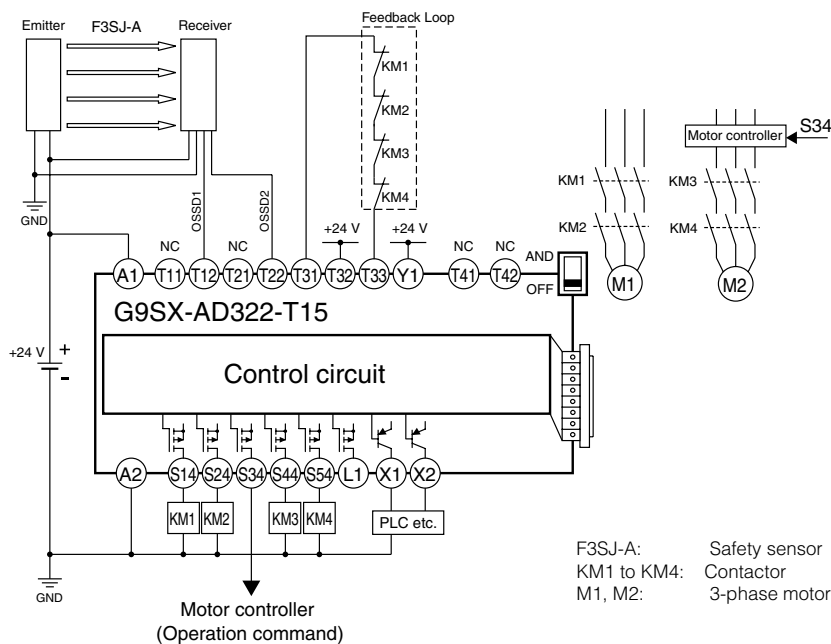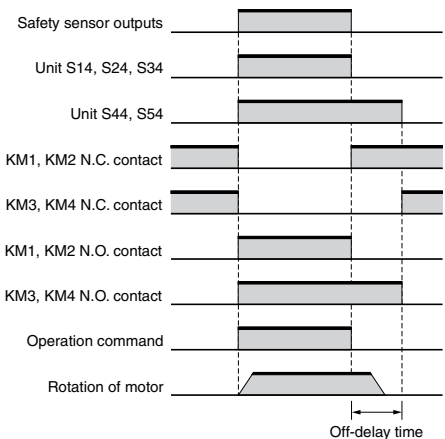
Notes:
1. This example corresponds to category 4.
2. For further information of settings and wiring, refer to the catalog or instruction manual of the connected sensor.
3. Use safety sensors with PNP outputs.

Applications (continued)

G9SX-AD322-T15 (24 VDC) + G9SX-EX041-T

(24 VDC) (Guard Lock Safety Door Switch (Mechanical Lock), (2-channel Safety Limit Switch Inputs / Manual Reset)
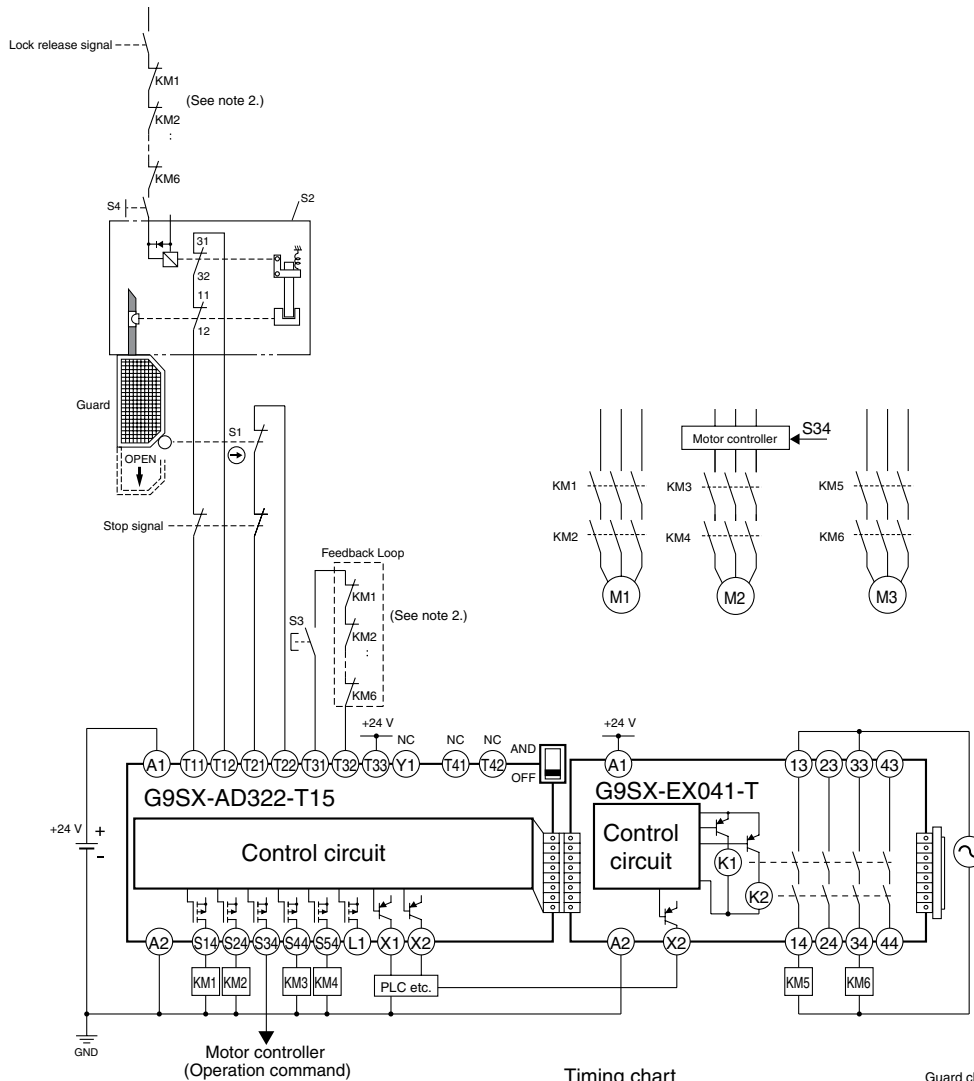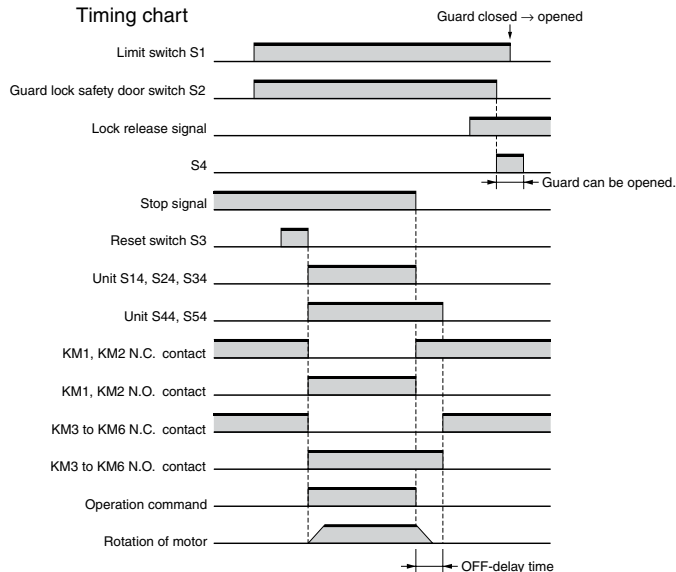
S1:   Safety limit switch
S2:   Guard lock safety door switch
S3:   Reset switch
S4:   Lock release switch
KM1 to KM6: Contactor
M1 to M3:   3-phase motor

Notes:
1. This example corresponds to category 4.
2. Connect the N.C. contacts of contactors KM1, KM2,
   KM3, KM4, KM5, and KM6 in series.

Timing chart

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Applications (continued)

G9SX-BC202 (24 VDC) (2-channel Emergency Stop Switch Input/Manual Reset)
+ G9SX-AD322-T15 (24 VDC) (2-channel Safety Limit Switch Input/Auto Reset)
+ G9SX-AD322-T15 (24 VDC) (2-channel Safety Limit Switch Input/Auto Reset)
+ G9SX-ADA222-T150 (24 VDC) (2-channel Safety Limit Switch Input/Auto Reset)

S1: Emergency stop switch
S2: Reset switch
S3, S5, S7: Safety limit switch
S4, S6, S8: Limit switch
KM1 to KM8: Contactor
M1 to M4: 3-phase motor

Note: This example corresponds to category 4.
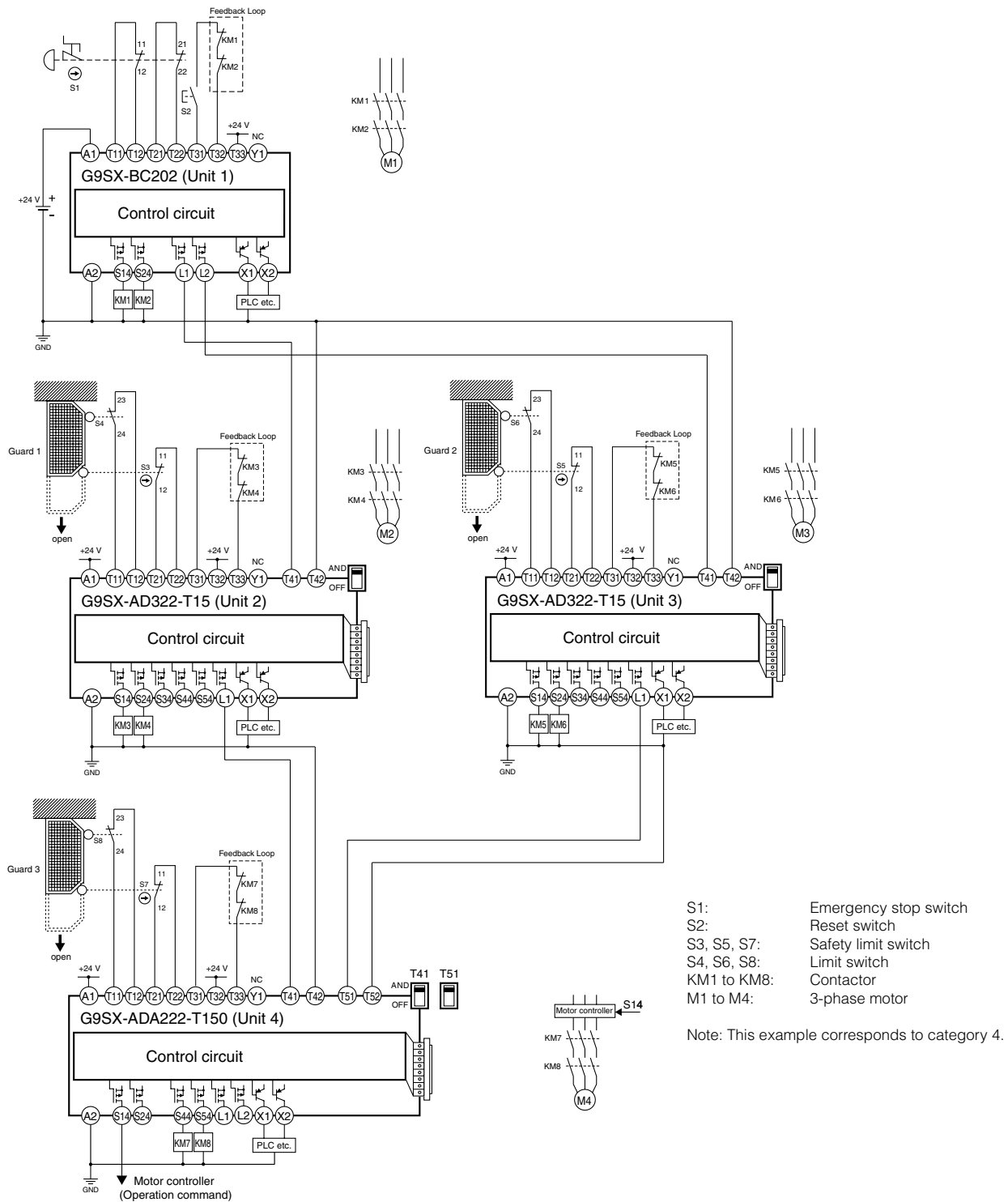
Ordering

Model Number Legend

G9SX – □ □ □ □ – □ – □
   ❶❷❸❹ ❺   ❻

❶ Functions
   AD/ADA: Advanced Unit
   BC: Basic Unit
   EX: Expansion Unit

❷ Output Configuration (Instantaneous Safety Outputs)
   0: None
   2: 2 outputs
   3: 3 outputs
   4: 4 outputs

❸ Output Configuration (OFF-delayed Safety Outputs)
   0: None
   2: 2 outputs
   4: 4 outputs

❹ Output Configuration (Auxiliary Outputs)
   1: 1 output
   2: 2 outputs

❺ Max. OFF-delay Time
   Advanced Unit
      T15: 15 s
      T150: 150 s
   Basic Unit
      No indicator: No OFF delay
   Expansion Unit
      No indicator: No OFF delay
      T: OFF delay

❻ Terminal Block Type
   RT: Screw terminals
   RC: Spring-cage terminals

Note: See List of Models below for the actual models that can be ordered.

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List of Models

Advanced Unit

Safety outputs *3		Auxiliary outputs *4	Logical AND connection		No. of input channels	Max. OFF-delay time *1	Rated voltage	Terminal block type	Model
Instant-aneous	OFF-delayed *2		Inputs	Outputs					
3 (Semi-conductor)	2 (Semi-conductor)	2 (Semi-conductor)	1 (Semi-conductor)	1 (Semi-conductor)	1 or 2 channels	15 s	24 VDC	Screw terminals	G9SX-AD322-T15-RT
								Spring-cage terminals	G9SX-AD322-T15-RC
						150 s		Screw terminals	G9SX-AD322-T150-RT
								Spring-cage terminals	G9SX-AD322-T150-RC
2 (Semi-conductor)			2 (Semi-conductor)	2 (Semi-conductor)		15 s		Screw terminals	G9SX-ADA222-T15-RT
								Spring-cage terminals	G9SX-ADA222-T15-RC
						150 s		Screw terminals	G9SX-ADA222-T150-RT
								Spring-cage terminals	G9SX-ADA222-T150-RC

*1. The OFF-delay time can be set in 16 steps as follows:
   T15: 0/0.2/0.3/0.4/0.5/0.6/0.7/1/1.5/2/3/4/5/7/10/15 s
   T150: 0/10/20/30/40/50/60/70/80/90/100/110/120/130/140/150 s
*2. The OFF-delayed output becomes an instantaneous output by setting the OFF-delay time to 0 s.
*3. P channel MOS FET transistor output
*4. PNP transistor output

Basic Unit

Safety outputs *1		Auxiliary outputs *2	No. of input channels	Rated voltage	Terminal block type	Model
Instantaneous	OFF-delayed					
2	---	2 (Semiconductor)	1 or 2 channels	24 VDC	Screw terminals	G9SX-BC202-RT
					Spring-cage terminals	G9SX-BC202-RC

*1. P channel MOS FET transistor output
*2. PNP transistor output

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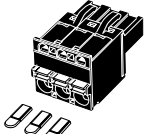
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Ordering (continued)

Expansion Unit

Safety outputs		Auxiliary outputs *1	OFF-delay time	Rated voltage	Terminal block type	Model
Instantaneous	OFF-delayed					
4 PST-NO	---	1 (Semiconductor)	---	24 VDC	Screw terminals	G9SX-EX401-RT
					Spring-cage terminals	G9SX-EX401-RC
---	4 PST-NO		*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 Advanced Unit (G9SX-AD-□/G9SX-ADA-□).

Accessories
Terminal Block

Appearance *	Specifications	Applicable units	Model	Remarks
	Terminal Block with screw terminals (3-pin)	G9SX-AD-□ G9SX-ADA-□	Y9S-03T1B-02A	Two Terminal Blocks (black) with screw terminals, and a set of six code marks to prevent erroneous insertion.
	Terminal Block with screw terminals (4-pin)	G9SX-BC-□ 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 (3-pin)	G9SX-AD-□ G9SX-ADA-□	Y9S-03C1B-02A	Two Terminal Blocks (black) with spring-cage terminals, and a set of six code marks to prevent erroneous insertion.
	Terminal Block with spring-cage terminals (4-pin)	G9SX-BC-□ 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

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