



型号G9SX-EX401-□

型号G9SX-EX041-T-□

灵活的安全单元

Chinese 使用说明书

感谢您此次购买型号G9SX灵活的安全单元。本使用说明书中描述了型号G9SX使用上所需的功能、性能、使用等信息。

请遵循以下几点，使用G9SX产品。

- 型号G9SX需由掌握电气知识的专门人员操作。
·请务必仔细阅读本说明书后正确使用。
·请妥善保管以备随时参阅。

欧姆龙株式会社

2139837-8B

EU符合性宣言

欧姆龙声明G9SX符合以下EU指令要求。
-EMC指令 2004/108/EC
-机械指令 2006/42/EC

规格

型号G9SX是根据以下规格要求，设计/制造的产品。
-EN954-1 安全等级4,
-EN ISO13849-1:2008 Category 4 PL e,
-IEC/EN61508 SIL3,
-IEC/EN61000-6-2, - IEC/EN61000-6-4,
-UL508, - UL1998,
-CAN/GSA C22.2 No. 142

安全注意事项

警告标识的含义

警告 如果不正确处理，则有可能对人身造成轻度或中度伤害。
严重情况下，甚至会导致重伤和死亡。另外可能会造成重大物损。

图案符号的含义

表示非特定、一般的禁止通告。

表示非特定、指示一般使用者行为的图案符号。

警告标识

警告

输出故障可能造成重大人身伤害。切勿使用超出安全输出额定值的负载。

安全功能损坏可能造成重大人身伤害。为了避免供电电源以及负载电源短路请妥善进行接线。

输出故障可能造成重大人身伤害。在安全输出中连接感性负载时，请附加反电动势保护电路。

安全功能损坏可能造成重大人身伤害。请使用相适合的控制设备。

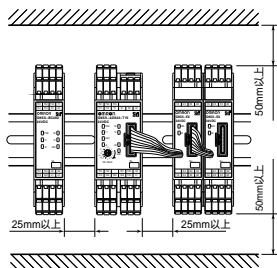
安全上的要点

- (1) 请将型号G9SX放置于防护等级IP54 (IEC/EN60529) 以上的控制箱中使用。
(2) 输入输出端子请正确接线并在运行前进行动作确认。
(3) G9SX的电源输入，请不要连接额定值以上的DC或AC电源输入。
(4) 有触电的危险。
(5) 报错输出、辅助输出不是安全输出。
(6) 型号G9SX的安装、点检、维护是否正正确实行，请务必与“责任人”进行确认。
(7) 型号G9SX的安装与安装后的确认，应由对安装机械非常熟悉的“责任人”进行操作。
(8) 每24小时切断一次安全输入或者是逻辑连接输入信号，通过报错显示灯确认G9SX是否正常工作。
(9) 请勿拆卸、修理、改造本产品。
(10) 连接到G9SX的具有安全功能的设备、部件，请根据安全级别以及安全等级的要求使用相应的规格品。
(11) 系统整体的安全标准符合性，由客户自行负责。
(12) 在安全输出中连接感性负载时，请附加反电动势保护电路。
(13) 在安装端子台的时候，请小心以免夹到手指。
(14) 产品寿命会因开闭条件而大不相同。
(15) 请勿在易燃易爆环境下使用。

使用上的注意

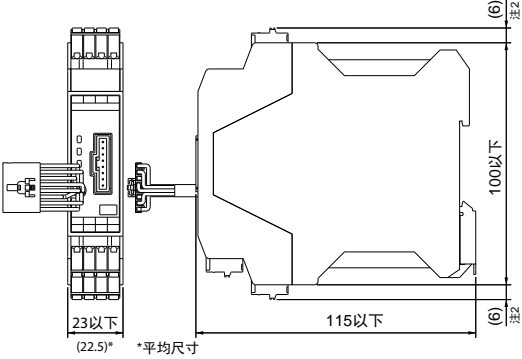
- (1) 使用 请勿使产品坠落或受异常振动冲击。
(2) 保管场所 请勿安装在以下场所。
(3) 安装 相对于G9SX的宽度，在DIN导轨较短的情况下，可能由于振动导致产品从DIN导轨上掉下来。

- (4) 为了利于通风、接线以及满足输出额定，请保留出以下所示的空间。
1. 高性能单元 (型号G9SX-AD322-□-□) 扩展单元间 (型号G9SX-EX□-□-□) 25mm以上
2. 单元上下间距在50mm以上



- (5) 接线
1. 型号G9SX-□ -接线时，请使用以下尺寸的电线。
2. 型号G9SX-□-RT (螺丝式端子台型)
(6) 与高性能单元 (G9SX-AD322□-□) 的连接
1. 取下高性能单元 (型号G9SX-AD322-T□-□) 的终端连接器...
(7) 控制系统请在该系统相关的所有G9SX电源接5秒以上后再进行动作。
(8) 为了防止因干扰而造成的误动作，请务必将电源的A2端子接地。
(9) 请务必切断电源后再进行单元更换。
(10) 溶剂附着
(11) 请勿在1台G9SX-EX□-□的接口输出处混合使用AC、DC电路。
(12) 本产品为「class A」工业环境产品。

外形尺寸



注1.上图为-RC型单元。注2.-为-RC型时。

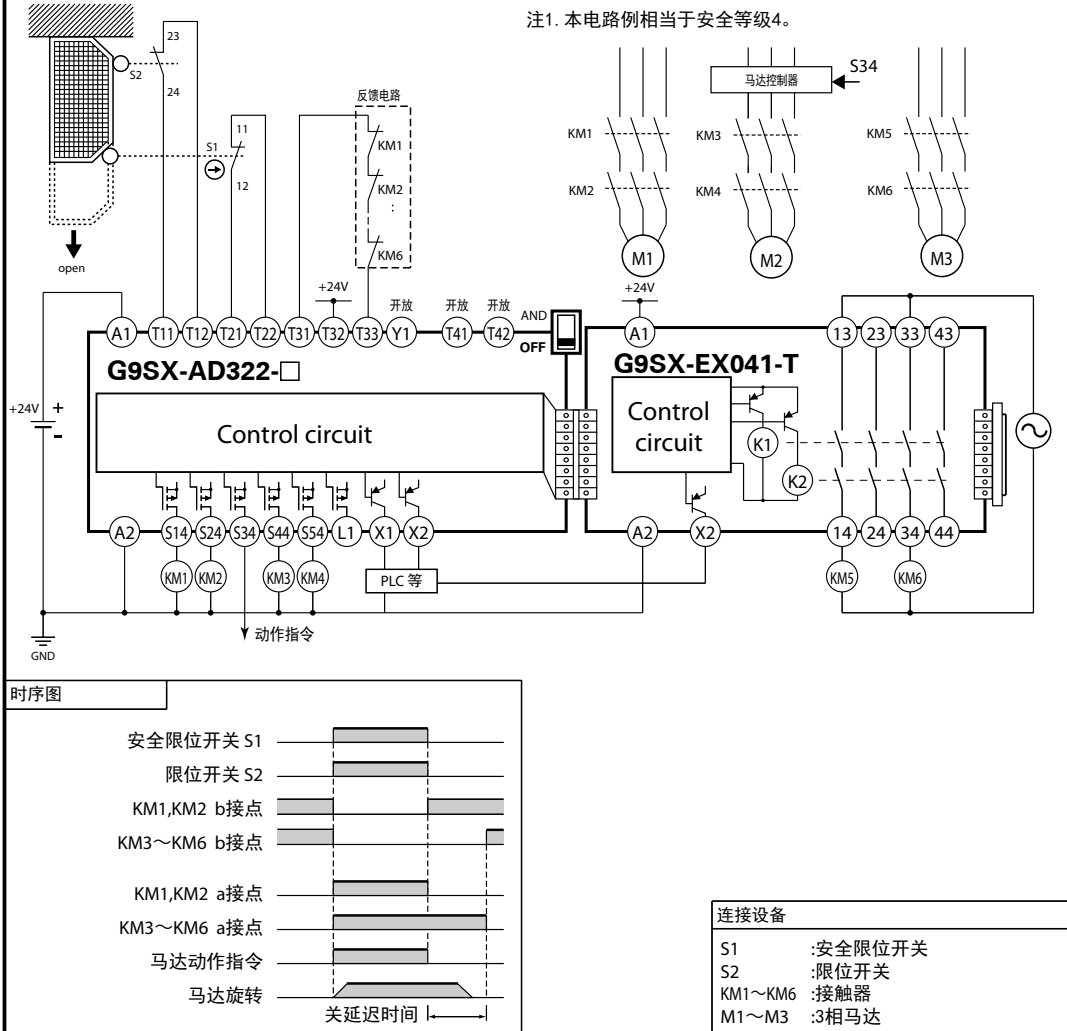
性能

Table with 3 columns: 项目, 型号G9SX-EX401-□, 型号G9SX-EX041-T-□. Rows include: 过电压等级, 动作时间, 响应时间, 连接台数, 绝缘阻抗, 耐电压, 耐振动, 耐冲击, 使用环境温度, 使用环境湿度, 端子紧固强度, 重量.

(注1) 不包括型号G9SX-AD322-□-□ (高性能单元) 的动作时间、响应时间。
(注2) 不包括内部继电器的复位时间的精度。
(注3) 关延迟时间与所连接的高性能单元的设定时间一致。

使用用途范例

G9SX-AD322-□ (24VDC) + G9SX-EX041-T (24VDC) <安全限位开关2通道(2ch)输入/自动复位>



安全等级 (欧盟机械安全标准EN954-1, ISO13849-1)

型号G9SX符合欧洲标准EN954-1所要求的安全等级4以及国际标准ISO13849-1所要求的性能级别 (PL) e。但是该符合性判定是根据本公司的电路实例以及使用条件而得出的判定。

故障检测

型号G9SX检测到报错时，ERR显示灯将亮起，以此通知报错内容。请根据下表实施对策。

Table with 4 columns: ERR显示灯, 内容, 原因, 对策. Row: 扩展单元安全继电器输出故障.

各部分的名称

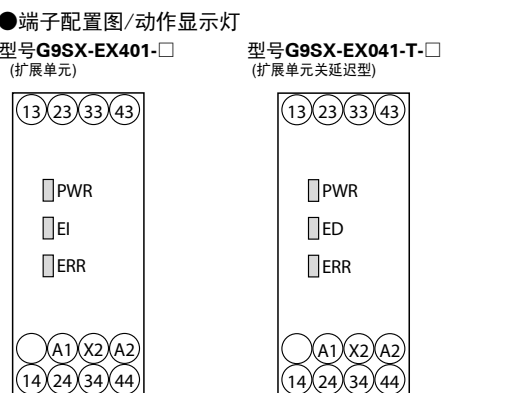
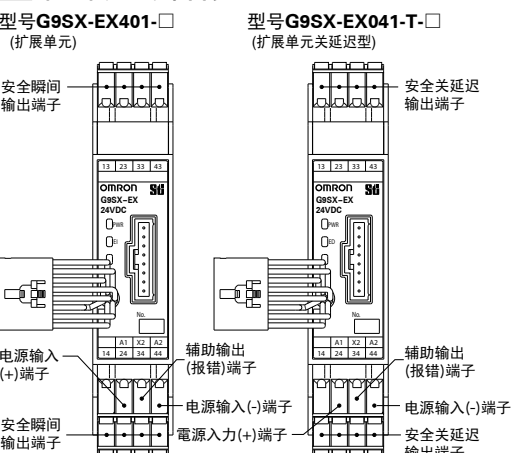
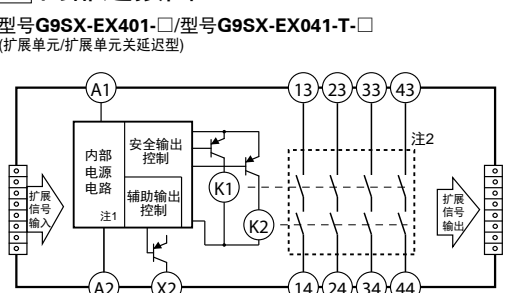


Table with 3 columns: 显示, 颜色, 名称, 功能. Rows: PWR (绿), ERR (红), EI (橙), ED (橙).

Table with 4 columns: 信号名, 端子名, 动作概要, 接线. Rows: 电源输入, 安全输出, 辅助输出 (报错).

内部连接图



注1.内部电源电路不隔离。注2.继电器接点输出被隔离。

额定·性能

Table with 2 columns: 项目, G9SX-EX401-□/G9SX-EX041-T-□. Rows: 电源电压, 电压容许变动范围, 消耗功率, 额定负载, 额定通电电流, 触点电压的最大值, 辅助输出, 电气耐久性, 机械耐久性.

注1.上图为-RC型单元。注2.-为-RC型时。

注1. 不包括型号G9SX-AD322-□-□ (高性能单元) 的动作时间、响应时间。
注2) 不包括内部继电器的复位时间的精度。
注3) 关延迟时间与所连接的高性能单元的设定时间一致。

使用时的承诺事项

本产品是用于机械安全的Component商品，不同的使用方法有时可能无法满足要求的安全性。请遵守安全Component综合商品样本卷首所记载的“警告”内容。

\* 上述仅列出一部分适用用途。使用前，请先仔细阅读本公司的最佳、综合商品样本、规格书等，最新版的商品样本、规格书中所记载的保证/免责事项。

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**OMRON****ST****Type G9SX-EX401-□**  
**Type G9SX-EX041-T-□**

Flexible Safety Unit

**English USER'S MANUAL**

Thank you for purchasing G9SX Flexible Safety Unit. Please read and understand this manual before using the products. Keep this manual ready to use whenever needed. Only qualified person trained in professional electrical technique should handle G9SX. Please consult your OMRON representative if you have any questions or comments. Make sure that information written in this document are delivered to the final user of the product.

OMRON Corporation

2139837-8B

**EU Declaration of Conformity**

OMRON declares that G9SX is in conformity with the requirements of the following EU Directives:

- EMC Directive 2004/108/EC
- Machinery Directive 2006/42/EC

**Standards**

G9SX is designed and manufactured in accordance with the following standards:

- EN954-1 Category 4,
- EN ISO13849-1:2008 Category 4 PL e,
- IEC/EN61508 SIL3,
- IEC/EN61000-6-2, - IEC/EN61000-6-4,
- UL508, - UL1998,
- CAN/CSA C22.2 No.142

**Precaution for Safe Use****Meanings of Signal Words**

The following signal words are used in this manual.



Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

**Meaning of Alert Symbols**

The following alert symbols are used in this manual.



Indicates prohibited actions



Indicates mandatory actions

**Alert Statements****WARNING**

Serious injury may possibly occur due to breakdown of safety outputs. Do not connect loads beyond the rated value to the safety outputs.

Serious injury may possibly occur due to loss of required safety functions. Wire G9SX properly so that supply voltages or voltages for loads do NOT touch the safety inputs accidentally or unintentionally.

Serious injury may possibly occur due to damages of safety inputs. Apply protection circuitry against back electromotive force in case connecting inductiveloads to safety outputs.

Serious injury may possibly occur due to loss of safety functions. Use devices appropriate for the application and the condition where G9SX is used.

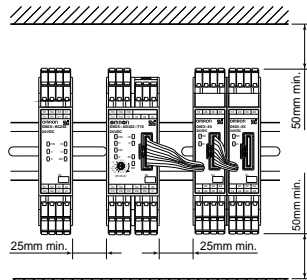
**Precaution for Safe Use**

- Use G9SX within an enclosure with IP54 protection or higher of IEC/EN60529.
- Incorrect wiring may lead to loss of safety function. Wireconductors correctly and verify the operation of G9SX before commissioning the system in which G9SX is incorporated.
- Do not apply DC voltages exceeding the rated voltages, nor any AC voltages to G9SX.
- Use DC supply satisfying requirements below to prevent electric shock.
  - DC power supply with double or reinforced insulation, for example, according to IED/EN60950 or EN50178 or a transformer according to IEC/EN61558.
  - DC supply used satisfies the requirement for class 2 circuits or limited voltage/current circuit stated in UL 508.
- Auxiliary error output is NOT safety outputs. Do not use auxiliary error output as any safety output. Such incorrect use causes loss of safety function of G9SX and its relevant system.
- After installation of G9SX, qualified personnel should confirm the installation, and should conduct test operations and maintenance. The qualified personnel should be qualified and authorized to secure the safety on each phases of design, installation, running, maintenance and disposal of system.
- A person in charge, who is familiar to the machine in which G9SX is to be installed, should conduct and verify the installation.
- Turn OFF the signal to Safety input or Logical AND connection input every 24hours and make sure G9SX operates without faults by checking the state of the ERR indicator.
- Do not dismantle, repair, or modify G9SX. It may lead to loss of its safety functions.
- Use only appropriate components or devices complying with relevant safety standards corresponding to the required level of safety categories. Conformity to requirements of safety category is determined as an entire system. It is recommended to consult a certification body regarding assessment of conformity to the required safety level.
- OMRON shall not be responsible for conformity with any safety standards regarding to customer's entire system.
- Disconnect G9SX from power supply when wiring, to prevent electric shock or unexpected operation.
- Be cautious not to have your fingers caught when attaching terminal sockets to the plugs on G9SX.
- The lifetime of G9SX depends on the conditions of switching of its outputs. Be sure to conduct its test operation under actual operating conditions in advance and use it within appropriate switching cycles
- Do not use in combustible gases or explosive gases. Arcs or heat generated by switching elements of G9SX can lead to fire or explosion.

**Precautions for Correct Use**

- Handle with care. Do not drop G9SX to the ground or expose to excessive vibration or mechanical shocks. G9SX may be damaged and may not function properly.
- Conditions of storage. Do not store in such conditions stated below.
  - In direct sunlight
  - At ambient temperatures out of the range of -10 to 55°C
  - At relative humidity out of the range of 25 to 85% or under such temperature change that causes condensation.
  - In corrosive or combustible gases
  - With vibration or mechanical shocks out of the rated values.
  - Under splashing of water, oil, chemicals
  - In the atmosphere containing dusts, saline or metal powder G9SX may be damaged and may not function properly.
- Mounting. Mount G9SX to DIN rails with attachments (TYPE PFP-M, not incorporated to this product), not to drop out of rails by vibration etc. especially when the length of DIN raiing is short compared to the widths of G9SX.

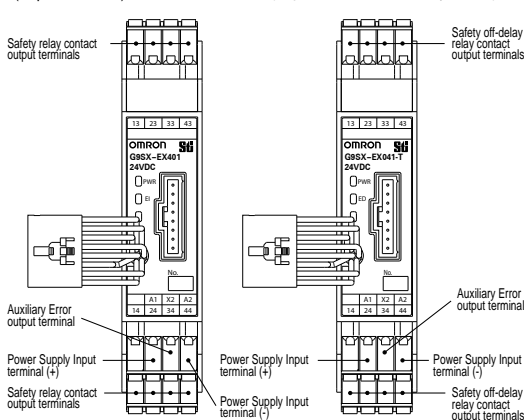
- Following spacing around G9SX should be available to apply rated current to outputs of G9SX and for enough ventilation and wiring:
  - At least 25 mm beside side faces of G9SX.
  - At least 50 mm above top face of G9SX and below bottom face of G9SX.
  - At least 25 mm between side face of Advanced unit (G9SX-AD322-□-□) and side face of Expansion unit (G9SX-EX401-□ or G9SX-EX041-T-□).

**(5) Wiring**

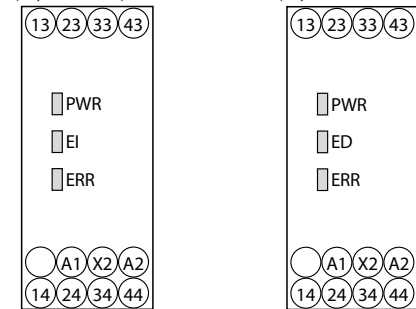
- For model G9SX-□
  - Use the following to wire to G9SX-□.
    - Solid wire: 0.2 to 2.5mm<sup>2</sup> AWG24 to AWG12
    - Stranded wire (Flexible wire): 0.2 to 2.5mm<sup>2</sup> AWG24 to AWG12
 Strip the cover of wire no longer than 7mm.
  - For model G9SX-□-RT (with screw terminals) Tighten each screw with a specified torque of 0.5 to 0.6N·m, or the G9SX-□ may malfunction or generate heat. When replacing G9SX, disconnect it from power supply.
- When connecting Expansion Units to Advanced Unit (TYPE G9SX-AD322-□-□):
  - Follow the procedure below:
    - Remove the termination connector from the receptacle on Advanced Unit (TYPE G9SX-AD322-□-□).
    - Insert the head of the connecting cable of Expansion Unit to the receptacle on the Advanced Unit.
    - Set the termination connector to the receptacle on the Expansion Unit at the end position. When Advanced Unit is used as without expansion units, leave the termination connector set on the Advanced Unit.
  - Do not remove the termination connector while the system is operating.
  - Before applying supply voltage, confirm that the connecting sockets and plugs are locked firmly.
  - All of the Expansion Units should be supplied with its specified voltages within 10s after the connected Advanced Unit is supplied with voltage. Otherwise, Advanced Unit detects the power-supply error for the Expansion Units.
- Start entire system after more than 5s have passed since applying supply voltage to all G9SXs in the system.
- G9SX may malfunction due to electro-magnetic disturbances. Be sure to connect the terminal A2 to ground.
- Devices connected to G9SX may operate unexpectedly. When replacing G9SX, disconnect it from power supply.
- Adhesion of solvent such as alcohol, thinner, trichloroethane or gasoline on the product should be avoided. Such solvents make the marking on G9SX illegible and cause deterioration of parts.
- Do NOT mix AC load and DC load to be switched in one G9SX-EX-□. When switching of both AC load and DC load is necessary, connect more than two G9SX-EX-□ and use each unit for AC load and DC load exclusively.
- This is a class A product. In residential areas it may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.

**1 Appearance and Explanation of Each Parts**

**TYPE G9SX-EX401-□** (Expansion Unit)      **TYPE G9SX-EX041-T-□** (Expansion Unit: Off-delay Model)

**Terminal arrangement and LED indicators**

**TYPE G9SX-EX401-□** (Expansion Unit)      **TYPE G9SX-EX041-T-□** (Expansion Unit: Off-delay Model)

**LED Indicators**

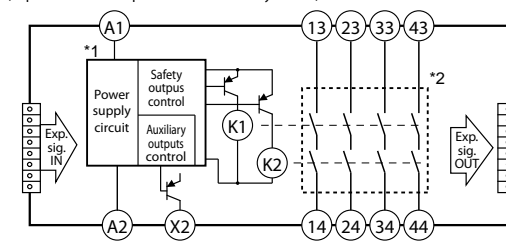
Marking	Color	Name	Function
PWR	Green	Power Supply Indicator	Lights up while power is supplied.
ERR	Red	Error Indicator	Lights up when an error occurs. For details refer to '7. Fault Detection'.
EI	Orange	Safety Output Indicator	Lights up while Safety relay outputs are in ON-state.
ED	Orange	Off-delayed Safety Output Indicator	Lights up while Off-delayed relay outputs are in ON-state.

**Wiring of inputs and outputs**

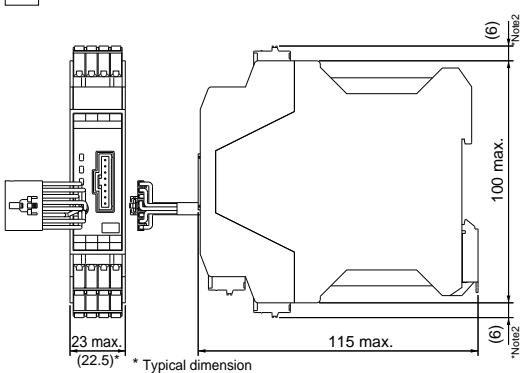
Signal name	Terminal name	Description of operation	Wiring
Power supply input	A1, A2	The input terminals for power supply. Connect the power source to A1 and A2 terminals.	Connect the power supply plus to the A1 terminal. Connect the power supply minus to the A2 terminal.
Safety relay output	13-14, 23-24, 33-34, 43-44	The outputs synchronize with safety outputs of Advanced unit.	Keep these outputs Open when NOT used.
Auxiliary error output	X2	Outputs during error indicator is lighting up.	Keep these outputs Open when NOT used.

**2 Internal Connection**

**TYPE G9SX-EX401-□ / TYPE G9SX-EX041-T-□** (Expansion Unit / Expansion Unit off-delay model)



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

**3 Dimensions**

\*Note1 Above outline drawing is for -RC terminal type.  
\*Note2 For -RC terminal type only.

**Specifications and Performance**

Item	G9SX-EX401-□	G9SX-EX041-T-□
Over voltage category (IEC/EN 60664-1)	II (safety relay outputs 13 to 43, 14 to 44 : III)	
Operating time (OFF to ON state) (See Note1)	30ms Max.	
Response time (ON to OFF state) (See Note1)	10ms Max.	
Maximum number of connectable units (See Note2)	5 units Max.	
Accuracy of Off-delay time (See Note3)	- Within plus or minus 5% of the set value (See Note4)	
Vibration resistance	Frequency: 10 to 55 to 10 Hz, Amplitude: 0.375mm half amplitude (0.75mm double amplitude)	
Mechanical shock resistance	300 m/s <sup>2</sup> (destruction), 100m/s <sup>2</sup> (malfunction)	
Ambient temperature	-10 to +55°C (No freezing or condensation)	
Ambient humidity	25~85%RH	
Terminal tightening	0.5 Nm (Applicable only to TYPE G9SX-□-RT:screw terminal model)	
Weight	Approx. 145 g	

Note1: Not including Operating time or Response time of G9SX-AD322-□-□ (Advanced Unit).

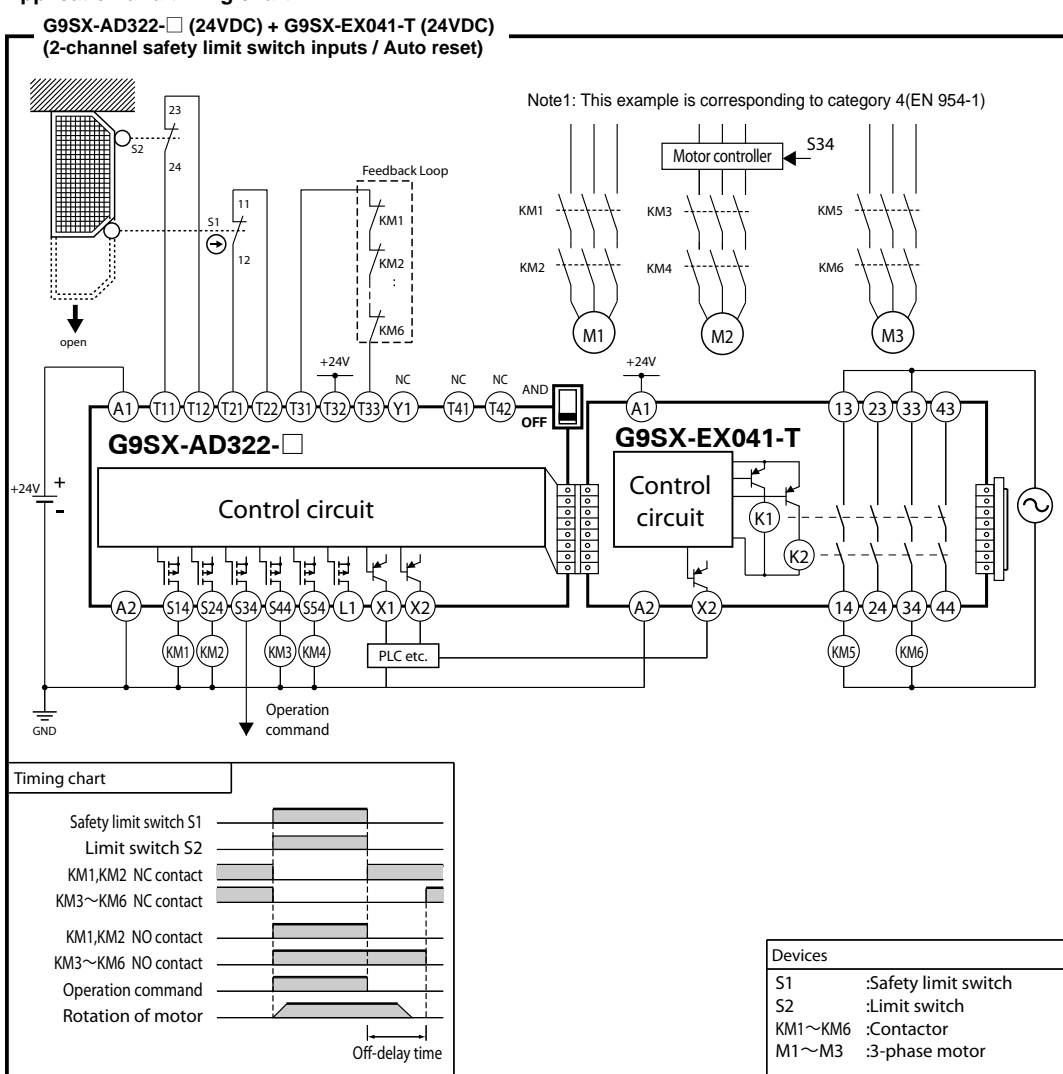
Note2: Both G9SX-EX401-□ (Expansion Unit) and G9SX-EX041-T-□ (Expansion Unit: Off-delay Model) can be connected in the same system.

Note3: Not including accuracy of release time of the relays.

Note4: Off-delay time setting is applied from Advanced Unit.

**Isolation specification**

Item	G9SX-EX401-□/G9SX-EX041-T-□
Insulation resistance	Between all terminals connected together and DIN rail
	Between different poles of outputs
Dielectric strength	Between Safety relay outputs connected together and other terminals connected together.
	Between all terminals connected together and DIN rail
Dielectric strength	Between different poles of outputs
	Between Safety relay outputs connected together and other terminals connected together.

**5 Examples of application****Application and timing chart****6 Category of EN 954-1, ISO13849-1**

In the condition shown in '5.Examples of Application' on this paper, G9SX can be used for the corresponding categories up to category 4 per EN954-1 and performance level(PL) up to e per ISO13849-1. This does NOT mean that G9SX can always be used for required category under all the similar conditions and situations. Conformity to the categories must be assessed as a whole system. When using G9SX for safety categories, be sure to confirm the conformity as a whole system.

For use of Safety category 4, fuses of 3.15A current rating should be connected to safety relay outputs to prevent welding of the contacts.

**7 Fault Detection**

When G9SX detects a fault, ERR indicator lights up to show the information of the fault. Check and take needed measures referring to the following table. And then apply supply voltage to G9SX.

ERR indicator	Conditions	Expected causes of the faults	Expected causes of the faults
Light up	Faults involved with Safety relay outputs of Expansion Units	1) Welding of relay contacts 2) Failures of the parts of the internal circuits	Replace with a new product.

**Suitability for Use**

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of the products in the customer's application or use of the product. Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used. Know and observe all prohibitions of use applicable to this product. NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

**OMRON**

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Note: Specifications subject to change without notice.