

Programmable Safety Controllers

G9SP



Rev. 8.11

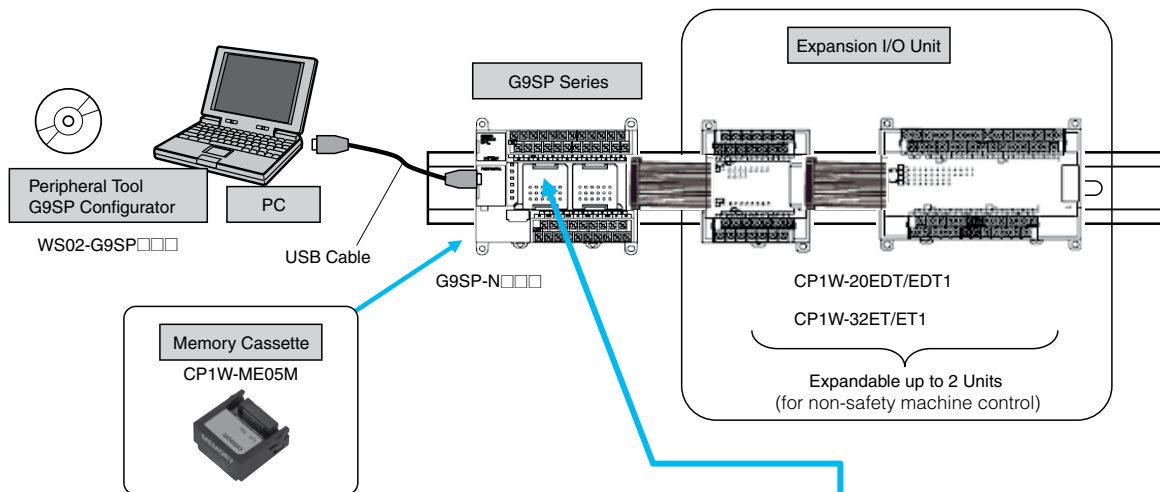


Compact Stand-Alone Programmable Controller

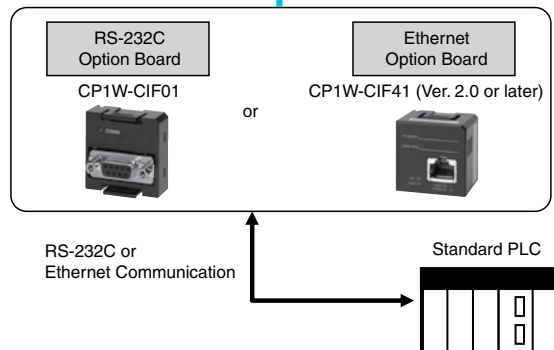
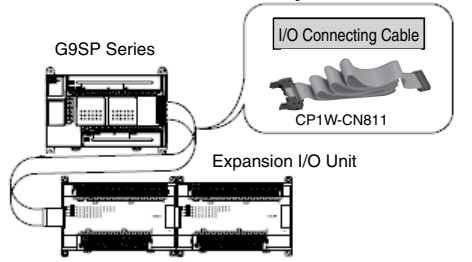
- Stand-alone safety controller for small and mid-sized machinery
- Easy programming for complex safety control
- Three types of CPU with different I/O size to suit the application
- Four types of Expansion I/O Units for hard-wired diagnosis or standard non-safety signals
- Clear diagnosis and monitoring via Ethernet (Omron FINS protocol), EtherNet/IP, or serial (RS-232) connection
- Supports direct connection with non-contact switches and safety mats
- Easy design, verification, standardization and reusage of safety control by unique programming software
- ISO 13849-1(PLe), IEC61508(SIL3) certified



Example of System Configuration



● When the Units are distantly-positioned such as one above the other layout



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Specifications

G9SP Series

General Specifications

| | |
|-------------------------------|--|
| Power supply voltage | 24 VDC (20.4 to 26.4 VDC -15% +10%) |
| Current consumption* | G9SP-N10S: 400 mA (V1: 300 mA, V2: 100 mA) G9SP-N10D: 500 mA (V1: 300 mA, V2: 200 mA) G9SP-N20S: 500 mA (V1: 400 mA, V2: 100 mA) |
| Isolation class | Class III (SELV) |
| Overvoltage category | II |
| Noise immunity | Conforms to IEC61131-2 |
| Vibration resistance | 5 to 8.4 Hz: 3.5 mm, 8.4 to 150 Hz: 9.8 m/s ² |
| Shock resistance | 147 m/s ² : 11 ms |
| Mounting | DIN track mounting (IEC60715 TH35-7.5/TH35-15) or M4 screws |
| Ambient operating temperature | 0 to +55°C |
| Ambient operating humidity | 10% to 90% (with no condensation) |
| Ambient storage temperature | -20°C to +75°C |
| Atmosphere | No corrosive gas |
| Degree of protection | IP20 except terminal blocks |
| Terminal screws | M3 self-rising screws |

*Not including the current consumption of external devices.

| | G9SP-N10S | G9SP-N10D | G9SP-N20S |
|------------------|------------|------------|------------|
| Safety inputs | 10 | 10 | 20 |
| Safety outputs | 4 | 16 | 8 |
| Test outputs | 4 | 6 | 6 |
| Standard outputs | 4 | — | — |
| Weight | 290 g max. | 440 g max. | 430 g max. |

Safety Input Specifications

| | |
|---------------|--|
| Input type | Sinking inputs (PNP) |
| Input current | 6 mA |
| ON voltage | 11 VDC min. (between each input terminal and G1) |
| OFF voltage | 5 VDC max. (between each input terminal and G1) |
| OFF current | 1 mA max. |

Test Output Specifications

| Output type | Sourcing outputs (PNP) |
|--------------------------------------|-------------------------------------|
| Rated Output Current | G9SP-N10S |
| | T0, T1 : 60 mA max. |
| | T2 : 30 mA max. *1 |
| | T3 : 300 mA max. *2 |
| | T0-2 total : 60 mA max. |
| | G9SP-N10D |
| | T0, T1, T2 : 60 mA max. |
| | T3 : 300 mA max. *2 |
| | T4, T5 : 30 mA max. *1 |
| | Total of T0-2 and T4-5 : 60 mA max. |
| | G9SP-N20S |
| | T0, T1, T2 : 100 mA max. |
| T3 : 300 mA max. *2 | |
| T4, T5 : 30 mA max. *1 | |
| Total of T0-2 and T4-5 : 120 mA max. | |

*1 Connection to OMRON D40A Non-contact Door Switch is possible.

*2 With the Muting Lamp Output (open circuit detection)

Safety Output Specifications

| | |
|----------------------|--|
| Output type | Sourcing outputs (PNP) |
| Rated output current | 0.8 A max./output 1.6 A max./4 outputs (G9SP-N10S/-N20) *1 1.2 A max./4 outputs (G9SP-N10D) *2 |
| ON residual voltage | 1.2 V max. (between each output terminal and V2) |
| OFF residual voltage | 2 V max. |
| Leakage current | 0.1 mA max. |

*1. Total current for So0 to So3 and So4 to So7

*2. Total current for So0 to So3, So4 to So7, So8 to So11 and So12 to So15

Note: When a safety output is set as a pulse output, make sure that the connected devices do not malfunction due to the OFF pulse (pulse width: 640 μs).

Standard Output Specifications (G9SP-N10S)

| | |
|----------------------|--|
| Output type | Sourcing outputs (PNP) |
| ON residual voltage | 1.5 V max. (between each output terminal and V2) |
| Rated output current | 100 mA max. |

Specifications (continued)

Configurator

General Specifications

| | | |
|--|--|---|
| Applicable PC | DOS/V PC (Refer to the attached file for the operating environment of G9SP tool.) | |
| CD-ROM or DVD-ROM drive | One or more | |
| Applicable OS | Windows 2000 (Service Pack 3 or later), Windows XP (Service Pack 2 or later) | Windows Vista (32-bit & 64-bit), Windows 7 (32-bit & 64-bit) |
| CPU processing speed | Pentium II 333 MHz or faster (Pentium III 1GHz or faster is recommended.) | Pentium III 1GHz or faster is recommended. |
| Memory (RAM) | 256 MB min. (512 MB or more is recommended.) | 512 MB min. (1 Gbyte or more is recommended.) |
| Hard disk | 200 MB or more | |
| Monitor | High-intensity display of SVGA (800 x 600) or more Required min. 256 colors display | |
| Communication port to connect with G9SP Series | USB 1.1 | |

Certified Standards

| Certification body | Standard |
|--------------------|---|
| TÜV Rheinland | EN ISO 13849-1: 2008 EN ISO 13849-2: 2008 IEC 61508 parts 1-7: 2010 IEC/EN 62061: 2005 IEC 61131-2: 2007 EN ISO 13850: 2008 (EN418: 1992) EN 60204-1: 2006 EN 61000-6-2: 2005 EN 61000-6-4: 2007 NFPA 79-2007 ANSI RIA 15.06-1999 (R2009) ANSI B11.19-2010 UL1998 |
| UL | UL508 CSA22.2 No.142 |

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Specifications (continued)

Expansion I/O Unit

Input Specifications (CP1W-20EDT/20EDT1)

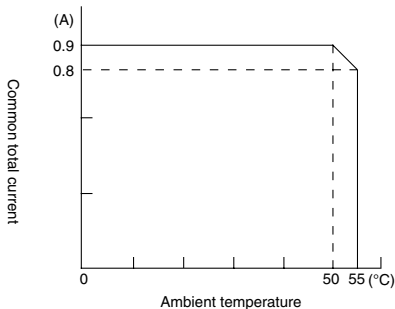
| | |
|-----------------------|-------------------|
| Input voltage | 24 VDC, -15% +10% |
| Input impedance | 4.7 kΩ |
| Input current | 5 mA TYP |
| ON voltage | 14.4 VDC min. |
| OFF voltage | 5.0 VDC max. |
| ON delay | 1 ms max. * |
| OFF delay | 1 ms max. * |
| Circuit configuration | |

*ON/OFF delay represents the hardware delay time.

Output Specifications (Transistor outputs: sinking/sourcing type)

| | CP1W-20EDT/EDT1 | CP1W-32ET/32ET1 |
|---|--|---|
| Maximum switching capacity *1 | 24 VDC -5% +10% 0.3 A/output 0.9 A/common 1.8 A/unit | 4.5 to 30 VDC 0.3 A/output 0.9 A/common 7.2 A/unit |
| Leakage current | 0.1 mA max. | 0.1 mA max. |
| Residual voltage | 1.5 V max. | 1.5 V max. |
| ON delay | 0.1 ms max. | 0.1 ms max. |
| OFF delay | 1 ms max. 24 VDC, -5% +10%, when 5 to 300 mA | 1 ms max. 24 VDC, -5% +10%, when 5 to 300 mA |
| Maximum number of outputs for simultaneous ON | 8 outputs (100% load) | 24 outputs (75% load) |
| Fuse *2 | 1/common | 1/common |
| Circuit configuration | Sinking type (CP1W-20EDT, CP1W-32ET) | Sourcing type (CP1W-20EDT1, CP1W-32ET1) |

*1. A maximum of 0.9 A per common can be switched at an ambient temperature of 50°C.



*2. User cannot replace fuses. Replace the unit if a fuse blows due to short circuit, etc.

Specifications (continued)

Option Unit

RS-232C Option Board (CP1W-CIF01)

Communication Specifications

| | |
|-------------------------------|--|
| Connection method | D-SUB 9P (female) |
| Maximum transmission distance | 15 m |
| Communication protocol | Non-procedural |
| Maximum data length | Refer to the Users Manual for details. |

Ethernet Option Board (CP1W-CIF41 unit ver. 2.0 or later)

Ethernet Communication Specifications

| | | | | |
|-------------------------------------|---|--|--|--|
| Name | CP Series Ethernet Option Board | | | |
| Model | CP1W-CIF41 | | | |
| Type | 100 BASE-TX (applicable as a 10 BASE-T) | | | |
| Transmission specifications | Media access method | CSMA/CD | | |
| | Modulation method | Baseband | | |
| | Transmission path type | Star form | | |
| | Baud rate | 100 Mbps (100 BASE-TX) | 10 Mbps (10 BASE-T) | |
| | | Internal transmission speed between G9SP and Ethernet Option Board is of 115.2 kbps. | | |
| | Transmission media | Unshielded twisted-pair (UDP) cable Categories: 5, 5e Shielded twisted-pair (STP) cable Categories: 100 Ω at 5, 5e | Unshielded twisted-pair (UDP) cable Categories: 3, 4, 5, 5e Shielded twisted-pair (STP) cable Categories: 100 Ω at 3, 4, 5, 5e | |
| | Transmission distance | 100 m (distance between hub and node) | | |
| Number of cascade-connectable units | No limit when a switching hub is used. | | | |
| Weight | 23 g max. | | | |
| Dimensions | 36.4 (W) x 36.4 (H) x 28.2 (D) mm | | | |

EtherNet/IP Option Board (CM-EIP-1)

Communication Specifications

| | | | | |
|-----------------------------|-------------------------------------|--|--|--|
| Communications protocol | EtherNet/IP | | | |
| Type | 100 BASE-TX (See note) | | | |
| Transmission specifications | Media access method | CSMA/CD | | |
| | Modulation method | Baseband | | |
| | Transmission path type | Star form | | |
| | Baud rate | 100 Mbps (100 BASE-TX) | | |
| | Transmission media | Shielded twisted-pair (STP) cable Categories: 100 Ω at 5, 5e or higher | | |
| | Transmission distance | 100 m (distance between hub and node) | | |
| | Number of cascade-connectable units | No limit when a switching hub is used. | | |











Note: If tag data links are being used, use 100 BASE-TX.

*Please note when communicating with the H-T40M-P Status Display Touchscreen, network communication over ethernet is not possible.

Functions







Function Blocks

Logic Functions

| Function Block Name | Notation on Function List | Icon | Details |
|--------------------------------|---------------------------|---|--|
| NOT | NOT |  | Outputs the logical complement of the input condition. |
| AND | AND |  | Outputs the logical AND of the input conditions. |
| OR | OR |  | Outputs the logical OR of the input conditions. |
| NAND | NAND |  | Outputs the logical NAND of the input conditions. |
| NOR | NOR |  | Outputs the logical NOR of the input conditions. |
| Exclusive OR | EXOR |  | Outputs the exclusive OR of the input conditions. |
| Exclusive NOR | EXNOR |  | Outputs the exclusive NOR of the input conditions. |
| RS-FF (Reset Set Flip-Flop) | RS-FF |  | When the input signal turns ON, RS-FF holds the ON status in the function block and continuously connects to the output. |
| Comparator | Comparator |  | Compares the input signals to the set value and turns ON the output if they match. |
| Comparator 2 | Comparator2 |  | Compares the input signals to the set value and outputs the comparison result. |













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Timer/Counter Functions



| Function Block Name | Notation on Function List | Icon | Details |
|---------------------------|---------------------------|---|---|
| Off-Delay Timer | Off-Delay Timer |  | Operates an OFF-delay timer. |
| On-Delay Timer | On-Delay Timer |  | Operates an ON-delay timer. |
| Pulse Generator | Pulse Generator |  | Cyclically outputs ON/OFF pulses on the Output Enable while the input signal is ON. |
| Counter | Counter |  | Counts the number of input signals and turns ON the output when the count reaches the specified number. |
| Up-Down Counter | Up-Down Counter |  | Increments the counter on the leading edge of an up count input and decrements the counter on the leading edge of a down count input. |
| Serial-Parallel Converter | Serial-Parallel Converter |  | Counts the number of input signals and outputs the count value. |

Functions (continued)



Safety Device Function Blocks

| Function Block Name | Notation on Function List | Icon | Details |
|------------------------------------|---------------------------|---|--|
| External Device Monitoring | EDM |  | Evaluates the input signal and external device status and sends a safety output to the external device. This function block is used to detect fused contacts or external wiring problems (disconnected lines) for safety relays, contactors, and other safety devices. |
| Enable Switch Monitoring | Enable Switch |  Enable | Monitors the status of an Enable Switch device. |
| Emergency Stop Switch Monitoring | E-Stop |  | Monitors the status of an Emergency Stop Switch. |
| Light Curtain Monitoring | Light Curtain Monitoring |  | Monitors the input signal from a Safety Light Curtain. |
| Muting | Muting |  Mute | Temporarily disables the input signals for a Light Curtain when the muting signal is detected. |
| Safety Gate Monitoring | Safety Gate Monitoring |  | Monitors the status of a safety door (Safety-door Switch or Safety Limit Switch). This function block can be used to set function tests for Safety Category 2. |
| Two Hand Controller | Two Hand Controller |  | Monitors the status of a Two-hand Switch. |
| User Mode Switch Monitoring | User Mode Switch |  | Monitors the operating mode switch for a user system or device. |
| Redundant Input Monitoring | Redundant Input |  | Monitors for discrepancies in two input signals. |
| Single Beam Safety Sensor | Single Beam Safety Sensor |  | Monitors the input signal of an OMRON E3ZS/E3FS Single-beam Safety Sensor. |
| Non-Contact Door Switch Monitoring | Non-Contact Door Switch |  | Monitors an Omron STI D40A Non-contact Door Switch. |
| Safety Mat Monitoring | Safety Mat |  | Monitors an Omron STI UM Safety Mat. |

Reset and Restart Function Blocks

| Function Block Name | Notation on Function List | Icon | Details |
|---------------------|---------------------------|--|--|
| Reset | Reset |  RESET | Outputs ON if the reset signal is correctly input while the input condition is ON. This function block can be used to prevent equipment from starting automatically. |
| Restart | Restart |  Restart | Performs the same operation as a Reset function block. The icon is different. |

Connector Function Blocks

| Function Block Name | Notation on Function List | Icon | Details |
|---------------------|---------------------------|---|--|
| Multi Connector | Multi Connector |  | Outputs the status of the input signals. |
| Routing | Routing |  | Distributes an input signal to multiple signals. |

Wiring

Terminal Arrangement

G9SP-N10S

| | | | | | | | | | |
|-----------------|----|-----|-----|-----|-----|-----|-----|----|----|
| Top (17 pin) | V1 | G1 | Si1 | Si3 | Si5 | Si7 | Si9 | T1 | T3 |
| | NC | Si0 | Si2 | Si4 | Si6 | Si8 | T0 | T2 | |
| Bottom (14 pin) | NC | So0 | So2 | O0 | O2 | NC | NC | | |
| | V2 | G2 | So1 | So3 | O1 | O3 | NC | | |

G9SP-N10D

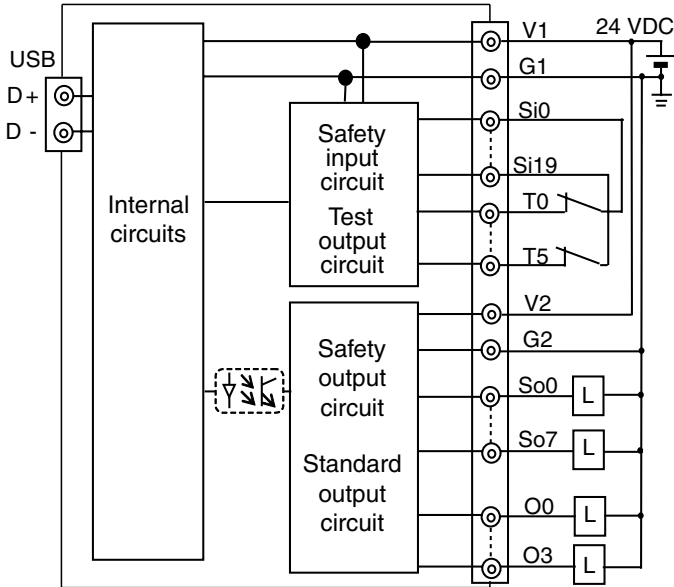
| | | | | | | | | | | | | |
|-----------------|----|-----|-----|-----|-----|-----|------|------|------|------|----|----|
| Top (24 pin) | V1 | G1 | Si1 | Si3 | Si5 | Si7 | Si9 | NC | NC | T1 | T3 | T5 |
| | NC | Si0 | Si2 | Si4 | Si6 | Si8 | NC | NC | T0 | T2 | T4 | NC |
| Bottom (19 pin) | NC | So0 | So2 | So4 | So6 | So8 | So10 | So12 | So14 | | | |
| | V2 | G2 | So1 | So3 | So5 | So7 | So9 | So11 | So13 | So15 | | |

G9SP-N20S

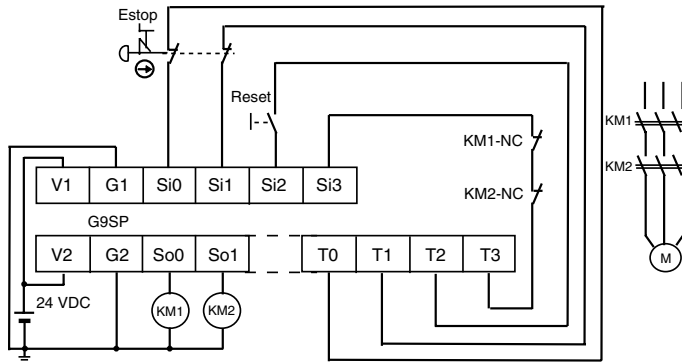
| | | | | | | | | | | | | |
|-----------------|----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| Top (24 pin) | V1 | G1 | Si1 | Si3 | Si5 | Si7 | Si9 | Si11 | Si13 | Si15 | Si17 | Si19 |
| | NC | Si0 | Si2 | Si4 | Si6 | Si8 | Si10 | Si12 | Si14 | Si16 | Si18 | NC |
| Bottom (19 pin) | NC | So0 | So2 | So4 | So6 | NC | T0 | T2 | T4 | | | |
| | V2 | G2 | So1 | So3 | So5 | So7 | NC | T1 | T3 | T5 | | |

| Terminals | Function |
|------------|---|
| V1/G1 | Power supply terminals for Internal/Input circuits (24 VDC) |
| V2/G2 | Power supply terminals for output circuits (24 VDC) |
| NC | Not used (Do not connect.) |
| Si0 - Si19 | Safety input terminals |
| T0 - T5 | Test output terminals |
| So0 - So15 | Safety output terminals |
| O0 - O3 | Standard output terminals |

Internal Circuits and Wiring Example



I/O Wiring Example: Emergency Stop (Dual Channel) with Manual Reset

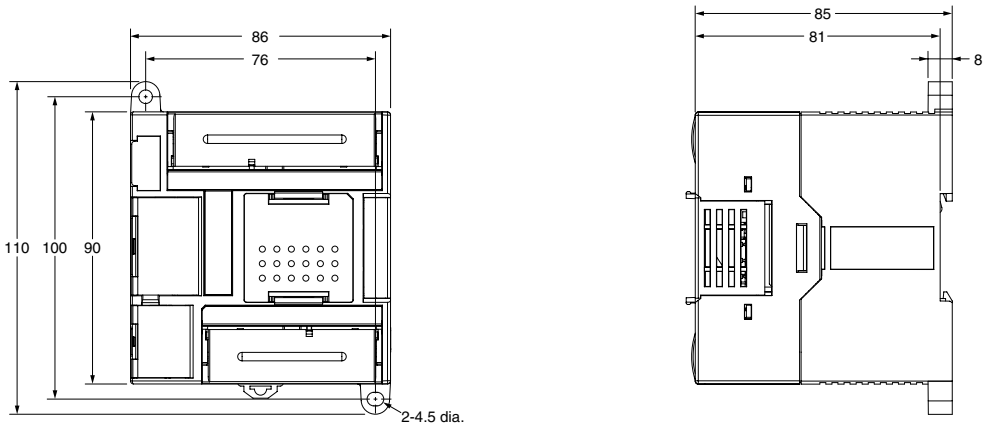


Dimensions

(mm)

Safety Controller

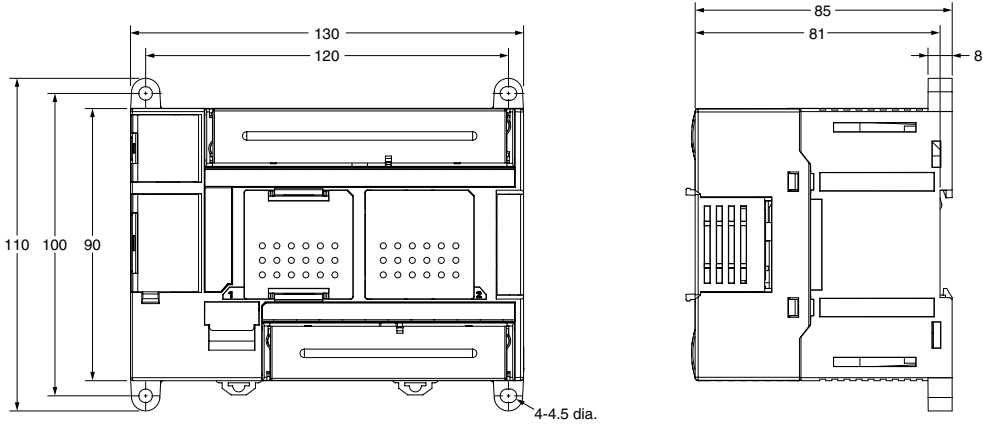
G9SP-N10S



Safety Controller

G9SP-N10D

G9SP-N20S



Ordering

G9SP Series

| Name | Number of I/O | | | | Unit version | Model |
|--|---------------|--------------|-------------------------|------------------|--------------|---------------------|
| | Safety inputs | Test outputs | Safety outputs | Standard outputs | | |
| Safety Controller | 10 | 4 | Solid-state outputs: 4 | 4 | Ver. 1.0 | G9SP-N10S |
| | 10 | 6 | Solid-state outputs: 16 | — | | G9SP-N10D |
| | 20 | 6 | Solid-state outputs: 8 | — | | G9SP-N20S |
| Safety Controller Kit with EIP Communication Module (includes controller and CM-EIP-1) | 10 | 4 | Solid-state outputs: 4 | 4 | Ver. 1.0 | G9SP-N10S-EIP (KIT) |
| | 10 | 6 | Solid-state outputs: 16 | — | | G9SP-N10D-EIP (KIT) |
| | 20 | 6 | Solid-state outputs: 8 | — | | G9SP-N20S-EIP (KIT) |
| Safety Controller Kit with Status Display Touchscreen (includes controller, CP1W-CIF01, H-T40M-P, 2m/6 ft. RS232C cable) | 10 | 4 | Solid-state outputs: 4 | 4 | Ver. 1.0 | G9SP-N10S-SDK (KIT) |
| | 10 | 6 | Solid-state outputs: 16 | — | | G9SP-N10D-SDK (KIT) |
| | 20 | 6 | Solid-state outputs: 8 | — | | G9SP-N20S-SDK (KIT) |

Expansion I/O Unit (for standard non-safety machine control)

| Name | Type | Number of I/O | | Model |
|--------------------|---------------|---------------|-------------------------|-------------|
| | | Inputs | Outputs | |
| Expansion I/O Unit | Sinking type | 12 | Solid-state outputs: 8 | CP1W-20EDT |
| | Sourcing type | | | CP1W-20EDT1 |
| | Sinking type | — | Solid-state outputs: 32 | CP1W-32ET |
| | Sourcing type | | | CP1W-32ET1 |

Note: CP1W-CN811 I/O Connecting Cable is available.

Refer to the Catalog of CP1H/CP1L Programmable Controller (Cat. No. P057-E1) for details.

I/O Connecting Cable

| Name | Specifications | Model |
|----------------------|--|------------|
| I/O Connecting Cable | 80 cm (for the distantly-positioned units connection) | CP1W-CN811 |

Note: An I/O Connecting Cable (approx. 6 cm) for alongside setting is included in the Expansion I/O Unit package.

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Option Unit

| Name | Model |
|--|------------|
| RS-232C Option Board | CP1W-CIF01 |
| Ethernet Option Board (Unit Ver. 2.0 or later) (FINS protocol) | CP1W-CIF41 |
| Memory Cassette | CP1W-ME05M |
| Status Display Touchscreen for G9SP | H-T40M-P |

Note: Refer to the Catalog of CP1H/CP1L Programmable Controller (Cat. No. P057-E1) for details.



For information on the H-T40M-P, see page J14.

Configurator

| Name | Media | Applicable OS | Model |
|-------------------|-----------------------------------|--|----------------|
| G9SP Configurator | Setup Disk (CD-ROM: 1 license) | Windows 2000 (Service Pack 3 or advanced) Windows XP Windows Vista Windows 7 | WS02-G9SP01-V1 |
| | Setup Disk (CD-ROM: 10 licenses) | | WS02-G9SP10-V1 |
| | Setup Disk (CD-ROM: 50 licenses) | | WS02-G9SP50-V1 |
| | Setup Disk (CD-ROM: Site license) | | WS02-G9SPXX-V1 |

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