

YASKAWA

SigmaLogic7 Compact Hardware Manual





100V/200V Safety Standards and Performance Level

Certification marks for the standards for which the product has been certified by certification bodies are shown on nameplate. Products that do not have the marks are not certified for the standards.

North American Safety Standards (UL)



| Product | Model | UL Standards (UL File No.) |
|------------|---------|---|
| SERVOPACKs | • SGD7S | UL 61800-5-1 (E147823), CSA C22.2 No.274 |

European Directives



| Product | Model | European Directive | Harmonized Standards |
|-----------------|---------|-------------------------------------|--|
| SERVO- PACKs | • SGD7S | Machinery Directive 2006/42/EC | EN ISO13849-1: 2015 |
| | | EMC Directive 2014/30/EU | EN 55011 group 1, class A EN 61000-6-2 EN 61000-6-4 EN 61800-3 (Category C, Second environ- ment) |
| | | Low Voltage Directive 2014/35/EU | EN 50178 EN 61800-5-1 |

Safety Standards



| Product | Model | European Directive | Harmonized Standards |
|-----------------|---------|---------------------|---|
| SERVO- PACKs | • SGD7S | Safety of Machinery | EN IOSO13849-1:2015 IEC 60204-1 |
| | | Functional Safety | IEC 61508 series IEC 62061 IEC61800-5-2 |
| | | EMC | IEC 61326-3-1 |

Safety Performance Amplifier Alone

| Items | Standards | Performance Level | |
|--|------------------------|--|--|
| Safety Integrity Level | IEC 61508 | SIL3 | |
| | IEC 62061 | SILCL3 | |
| Mission Time | IEC 61508 | 10 years | 20 years |
| Probability of Dangerous Failure per Hour | IEC 61508 IEC 62061 | PFH = 4.60×10^{-9} [1/h] 4.60% of SIL3 | PFH = 4.62×10^{-9} [1/h] 4.62% of SIL3 |
| Performance Level | EN ISO 13849-1 | PLe (Category 3) | |
| Mean Time to Dangerous Failure of Each Channel | EN ISO 13849-1 | MTTFd: High | |
| Average Diagnostic Coverage | EN ISO 13849-1 | DCavg: Medium | |
| Stop Category | IEC 60204-1 | Stop category 0 | |
| Safety Function | IEC 61800-5-2 | STO | |
| Hardware Fault Tolerance | IEC 61508 | HFT = 1 | |
| Subsystem | IEC 61508 | B | |

Safety Performance with Safety Module

| Items | Standards | Performance Level | |
|--|------------------------|--|--|
| Safety Integrity Level | IEC 61508 | SIL2 | |
| | IEC 62061 | SILCL2 | |
| Probability of Dangerous Failure per Hour | IEC 61508 IEC 62061 | PFH = 3.3×10^{-7} [1/h] 3.3% of SIL2 | |
| Performance Level | EN ISO 13849-1 | PL d (Category 2) | |
| Mean Time to Dangerous Failure of Each Channel | EN ISO 13849-1 | MTTFd: High | |
| Average Diagnostic Coverage | EN ISO 13849-1 | DCavg: Medium | |
| Safety Function | IEC 61800-5-2 | STO/SS1/SS2/SLS | |
| Mission Time | IEC 61508 | 10 Years | |
| Hardware Fault Tolerance | IEC 61508 | HFT = 1 | |
| Subsystem | IEC 61508 | B | |

400V Safety Standards and Performance Level

Certification marks for the standards for which the product has been certified by certification bodies are shown on nameplate. Products that do not have the marks are not certified for the standards.

North American Safety Standards (UL)



| Product | Model | UL Standards (UL File No.) |
|------------|---------|---|
| SERVOPACKs | • SGD7S | UL 61800-5-1 (E147823), CSA C22.2 No.274 |

European Directives



| Product | Model | European Directive | Harmonized Standards |
|-----------------|---------|-------------------------------------|---|
| SERVO- PACKs | • SGD7S | Machinery Directive 2006/42/EC | EN ISO13849-1: 2015 |
| | | EMC Directive 2014/30/EU | EN 55011 group 1, class A EN 61000-6-2 EN 61000-6-4 EN 61800-3 (Category C, Second environment) |
| | | Low Voltage Directive 2014/35/EU | EN 50178 EN 61800-5-1 |
| | | RoHS Directive 2011/65/EU | EN 50581 |

Safety Standards



| Product | Model | European Directive | Harmonized Standards |
|-----------------|---------|---------------------|---|
| SERVO- PACKs | • SGD7S | Safety of Machinery | EN ISO13849-1:2015 IEC 60204-1 |
| | | Functional Safety | IEC 61508 series IEC 62061 IEC61800-5-2 |
| | | EMC | IEC 61326-3-1 |

Safety Performance Amplifier Alone

| Items | Standards | Performance Level | |
|--|------------------------|--|--|
| Safety Integrity Level | IEC 61508 | SIL3 | |
| | IEC 62061 | SILCL3 | |
| Mission Time | IEC 61508 | 10 years | 20 years |
| Probability of Dangerous Failure per Hour | IEC 61508 IEC 62061 | PFH = 4.60×10^{-9} [1/h] 4.60% of SIL3 | PFH = 4.62×10^{-9} [1/h] 4.62% of SIL3 |
| Performance Level | EN ISO 13849-1 | PLe (Category 3) | |
| Mean Time to Dangerous Failure of Each Channel | EN ISO 13849-1 | MTTFd: High | |
| Average Diagnostic Coverage | EN ISO 13849-1 | DCavg: Medium | |
| Stop Category | IEC 60204-1 | Stop category 0 | |
| Safety Function | IEC 61800-5-2 | STO | |
| Hardware Fault Tolerance | IEC 61508 | HFT = 1 | |
| Subsystem | IEC 61508 | B | |

Safety Performance with Safety Module

| Items | Standards | Performance Level | |
|--|------------------------|--|--|
| Safety Integrity Level | IEC 61508 | SIL2 | |
| | IEC 62061 | SILCL2 | |
| Probability of Dangerous Failure per Hour | IEC 61508 IEC 62061 | PFH = 3.3×10^{-7} [1/h] 3.3% of SIL2 | |
| Performance Level | EN ISO 13849-1 | PL d (Category 2) | |
| Mean Time to Dangerous Failure of Each Channel | EN ISO 13849-1 | MTTFd: High | |
| Average Diagnostic Coverage | EN ISO 13849-1 | DCavg: Medium | |
| Safety Function | IEC 61800-5-2 | STO/SS1/SS2/SLS | |
| Mission Time | IEC 61508 | 10 Years | |
| Hardware Fault Tolerance | IEC 61508 | HFT = 1 | |
| Subsystem | IEC 61508 | B | |

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1 Introduction

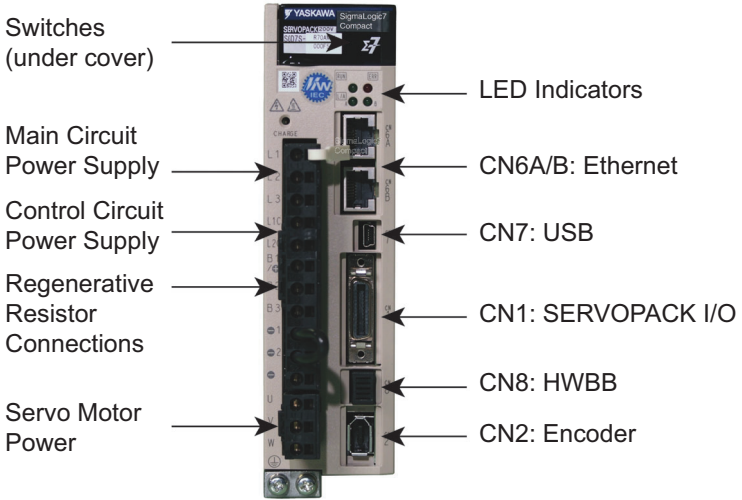
1.1 SigmaLogic7 Compact Features

The SigmaLogic7 Compact is a Sigma-7 SERVOPACK that features built-in functionality which can be accessed by a Rockwell PLC using EtherNet/IP protocol. Product features include:

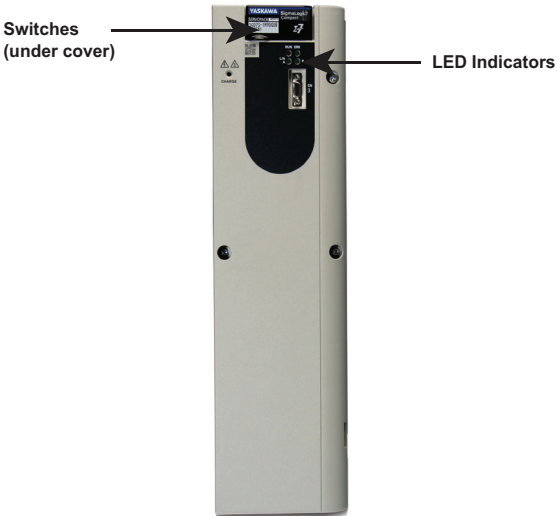
- Easy configuration with Yaskawa's free LogicWorks software
- Add On Instructions (AOIs) are provided for use with Rockwell RSLogix 5000 software
- Ethernet (100Mbps) auto crossover switching
 - EtherNet/IP
 - Allow high-speed communications with PLC
- Sigma-7 servo amplifier I/O features
 - 7 digital inputs
 - 3 digital outputs (200 V models)
 - 5 digital outputs (400 V models)

1.2 SigmaLogic7 Compact Appearance

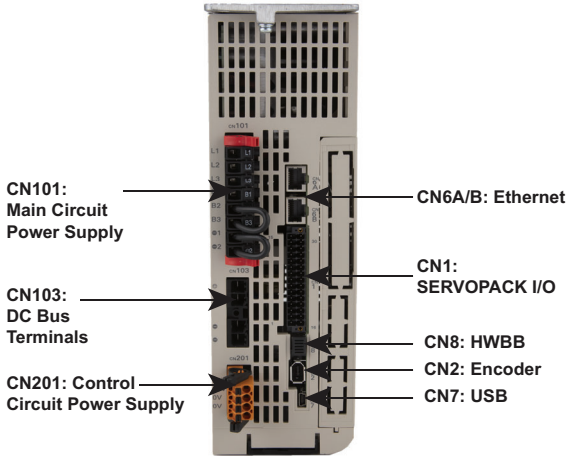
The following figure shows the external appearance of the SigmaLogic7 Compact servo interface.



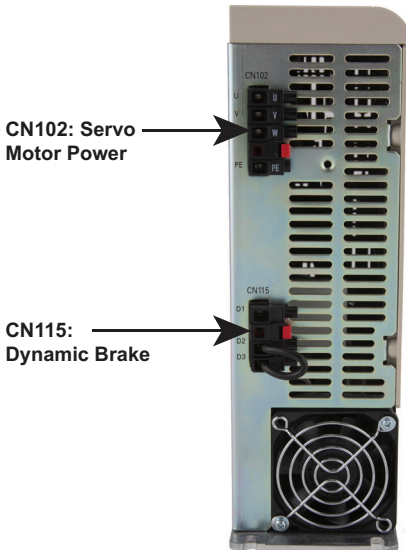
200V Front View



400V Front View



400V Top View



400V Bottom View

1.3 Model Number Designation

SGD7S - 2R8 A Q0 A 000 F51

Σ-7 Series
SERVOPACK

1st+2nd+3rd digits

4th digit

5th+6th digits

7th digit

8th+9th+10th digits

11th+12th+13th digits

1st+2nd+3rd digits Maximum Applicable Motor Capacity

4th digit Voltage

8th+9th+10th digits Hardware Options Specification

| Voltage | Code | Spec. | Voltage | Code | Spec. |
|-----------------------|-------------------|---------|----------------------|------|--------|
| Three-phase, 200 VAC | R70 ^{*1} | 0.05 kW | Three-phase, 400 VAC | 1R9 | 500 W |
| | R90 ^{*1} | 0.1 kW | | 3R5 | 1.0 kW |
| | 1R6 ^{*1} | 0.2 kW | | 5R4 | 1.5 kW |
| | 2R8 ^{*1} | 0.4 kW | | 8R4 | 2.0 kW |
| | 3R8 | 0.5 kW | | 120 | 3.0 kW |
| | 5R5 ^{*1} | 0.75 kW | | 170 | 5.0 kW |
| | 7R6 | 1.0 kW | | 210 | 6.0 kW |
| | 120 | 1.5 kW | | 260 | 7.5 kW |
| | 180 | 2.0 kW | | 280 | 11 kW |
| | 200 | 3.0 kW | | 370 | 15 kW |
| | 330 | 5.0 kW | | | |
| | 470 | 6.0 kW | | | |
| | 550 | 7.5 kW | | | |
| | 590 | 11 kW | | | |
| 780 | 15 kW | | | | |
| Single-phase, 100 VAC | R70 | 0.05 kW | | | |
| | R90 | 0.1 kW | | | |
| | 2R1 | 0.2 kW | | | |
| | 2R8 | 0.4 kW | | | |

| Code | Specification |
|------|---------------|
| A | 200 VAC |
| F | 100 VAC |
| D | 400 VAC |

| Code | Specification | Applicable Models |
|------|-----------------|-------------------|
| 000 | Without options | All models |

11th+12th+13th digits FT/EX Specification

5th+6th digits Interface

| Code | Specification |
|------|---------------------|
| Q0 | SigmaLogic7 Compact |

| Code | Specification |
|------|--|
| F51 | Application function for SigmaLogic7 |
| F82 | Application function for SigmaLogic7 with support for SGM7D motors |

7th digit Design Revision Order

- A: Global design revision
- B: 400 V global design revision

*1: These models can be used with either a single-phase or three-phase power supply input

1.4 Accessories

| System Components | | | |
|--|---|-------------------|--|
| Type | Description | Model Number | Note |
| Accessories and Cables (100 VAC and 200 VAC) | CN1 Terminal Block Conversion Kit | SBK-U-VBA-xx(B) | xx denotes cable length ♦ A5: 0.5 m ♦ 01: 1.0 m ♦ 03: 3.0 m |
| | CN1 Cable (Flying leads) | JZSP-CSI02-x-E | x denotes cable length ♦ A: 1.0 m ♦ B: 2.0 m ♦ C: 3.0 m |
| Communication | Ethernet Cable | Customer Supplied | Use high quality shielded industrial Ethernet cables (Yaskawa model JZSP-CM3RRM0-x-E is recommended) |
| Accessory (400 VAC) | CN1 Connector | JUSP-7CN001 | 30 Pin I/O Connector |
| Option Case Kit | Module cover and mounting plate for 200V amps | SGDV-OZA01A | Used for mounting safety module |
| Option Case Kit | Mounting plate for 400V amps | JZSP-P7R2-8-E | Using for mounting safety module |

2 Specifications and Settings

2.1 Specifications

2.1.1 200 V Specifications

| Item | | Specification | | |
|--------------------------|--|---|--|--|
| Control Method | | IGBT-based PWM control, sine wave current drive | | |
| Feedback | With Rotary Servomotor | Serial encoder: 20 bits or 24 bits (incremental encoder/absolute encoder) 22 bits (absolute encoder) | | |
| | With Linear Servomotor | <ul style="list-style-type: none"> Absolute linear encoder (The signal resolution depends on the absolute linear encoder.) Incremental linear encoder (The signal resolution depends on the incremental linear encoder or Serial Converter Unit.) | | |
| Environmental Conditions | Surrounding Air Temperature | -5°C to 55°C (With derating, usage is possible between 55°C and 60°C.) | | |
| | Storage Temperature | -20°C to 85°C | | |
| | Surrounding Air Humidity | 95% relative humidity max. (with no freezing or condensation) | | |
| | Storage Humidity | 95% relative humidity max. (with no freezing or condensation) | | |
| | Vibration Resistance | 4.9 m/s ² | | |
| | Shock Resistance | 19.6 m/s ² | | |
| | Degree of Protection | Degree | SERVOPACK Model: SGD7S- | |
| | | IP20 | R70A, R90A, 1R6A, 2R8A, 3R8A, 5R5A, 7R6A, 120A, R70F, R90F, 2R1F, 2R8F | |
| | | IP10 | 180A, 200A, 330A, 470A, 550A, 590A, 780A | |
| | Pollution Degree | <ul style="list-style-type: none"> Must be no corrosive or flammable gases. Must be no exposure to water, oil, or chemicals. Must be no dust, salts, or iron dust. | | |
| Altitude | 1,000 m or less. (With derating, usage is possible between 1,000 m and 2,000 m.) | | | |
| Others | Do not use the SERVOPACK in the following locations: Locations subject to static electricity noise, strong electromagnetic/magnetic fields, or radioactivity | | | |
| Applicable Standards | | Compliance with UL Standards, EU Directives and Other Safety Standards | | |
| Mounting | Mounting | SERVOPACK Model: SGD7S- | | |
| | Base-mounted | All Models | | |
| | Rack-mounted | R70A, R90A, 1R6A, 2R8A, 3R8A, 5R5A, 7R6A, 120A, 180A, 200A, 330A, R70F, R90F, 2R1F, 2R8F | | |
| | Duct-ventilated | 470A, 550A, 590A, 780A | | |


2 Specifications and Settings

2.1.1 200 V Specifications

(cont?d)

| Item | | Specification |
|-------------------------|--|---|
| Performance | Speed Control Range | 1:5000 (At the rated torque, the lower limit of the speed control range must not cause the Servomotor to stop.) |
| | Coefficient of Speed Fluctuation | ±0.01% of rated speed max. (for a load fluctuation of 0% to 100%) |
| | | 0% of rated speed max. (for a voltage fluctuation of ±10%) |
| | Torque Control Precision (Repeatability) | ±0.1% of rated speed max. (for a temperature fluctuation of 25°C ±25°C) |
| Soft Start Time Setting | ±1% | |
| | 0 s to 10 s (Can be set separately for acceleration and deceleration.) | |
| I/O Signals | Encoder Divided Pulse Output | Phase A, phase B, phase C: Line-driver output Number of divided output pulses: Any setting is allowed. |
| | Linear Servomotor Overheat Protection Signal Input | Number of input points: 1 Input voltage range: 0 V to +5 V |
| | Digital Input Signals | Allowable voltage range: 24 VDC ±20% Number of input points: 7 Input method: Sink inputs or source inputs Input Signals <ul style="list-style-type: none"> • P-OT (Forward Drive Prohibit) and N-OT (Reverse Drive Prohibit) signals • /EXT1 External latch signal input (General purpose input) • /EXT2 (General Purpose Input) signal • /EXT3 (General Purpose Input) signal • /P-CL (Forward External Torque Limit) and /N-CL (Reverse External Torque Limit) signals • FSTP (Forced Stop Input) signal A signal can be allocated and the positive and negative logic can be changed. |
| I/O Signals | Fixed Output | Allowable voltage range: 5 VDC to 30 VDC Number of output points: 1 Output signal: ALM (Servo Alarm) signal |
| | Digital Output Signals | Allowable voltage range: 5 VDC to 30 VDC Number of output points: 3 (A photocoupler output (isolated) is used.) Output Signals <ul style="list-style-type: none"> • /COIN (Positioning Completion) signal • /V-CMP (Speed Coincidence Detection) signal • /TGON (Rotation Detection) signal • /S-RDY (Servo Ready) signal • /CLT (Torque Limit Detection) signal • /VLT (Speed Limit Detection) signal • /BK (Brake) signal • /WARN (Warning) signal • /NEAR (Near) signal A signal can be allocated and the positive and negative logic can be changed. |


(cont'd)

| Item | | Specification | |
|---|---|--|---|
| Communications | RS-422A Communications (CN502) | Inter- faces | A JUSP-JC001 Communications Unit is required to connect to a Digital Operator (JUSP-OP05A-1-E). |
| | | 1:N Com- muni- cations | Up to N = 15 stations possible for RS-422A port |
| | | Axis Ad- dres s Set- ting | Set with parameters. |
| | USB Com- mu- nica- tions (CN7) | Inter- face | Personal computer (with SigmaWin+) |
| Com- muni- cations Stan- dard | | Conforms to USB2.0 standard (12 Mbps). | |
| Displays/Indicators | | CHARGE, PWR, CN, RUN, ERR, and L/A (A and B) indicators, and one-digit seven-segment display | |
| Analog Monitor (CN5) | | Number of points: 2 Output voltage range: ± 10 VDC (effective linearity range: ± 8 V) Resolution: 16 bits Accuracy: ± 20 mV (Typ) Maximum output current: ± 10 mA Settling time ($\pm 1\%$): 1.2 ms (Typ) | |
| Dynamic Brake (DB) | | Activated when a servo alarm or overtravel (OT) occurs, or when the power supply to the main circuit or servo is OFF. | |
| Regenerative Processing | | Built-in (An external resistor must be connected to the SGD7S-470A to -780A.) Refer to the following manual for details.  S-7-Series AC Servo Drive Peripheral Device Selection Manual (Manual No.: SIEP S800001 32) | |
| Overtravel (OT) Prevention | | Stopping with dynamic brake, deceleration to a stop, or coasting to a stop for the P-OT (Forward Drive Prohibit) or N-OT (Reverse Drive Prohibit) signal | |
| Protective Functions | | Overcurrent, overvoltage, low voltage, overload, regeneration error, etc. | |
| Utility Functions | | Gain adjustment, alarm history, jogging, origin search, etc. | |
| Safety Func- tions | Inputs | /HWBB1 and /HWBB2: Base block signals for Power Modules | |
| | Output | EDM1: Monitors the status of built-in safety circuit (fixed output). | |
| | Applicable Standards | ISO13849-1 PLe (Category 3), IEC61508 SIL3 | |
| Applicable Option Modules | | Fully-closed Modules and Safety Modules Note: You cannot use a Fully-closed Module and a Safety Module together. | |

2 Specifications and Settings

2.1.2 400 V Specifications

2.1.2 400 V Specifications

| Item | | Specification |
|--------------------------|--|---|
| Control Method | | IGBT-based PWM control, sine wave current drive |
| Feedback | With Rotary Servomotor | Serial encoder: 24 bits (incremental encoder/absolute encoder) |
| | With Linear Servomotor | <ul style="list-style-type: none"> Absolute linear encoder (The signal resolution depends on the absolute linear encoder.) Incremental linear encoder (The signal resolution depends on the incremental linear encoder or Serial Converter Unit.) |
| Environmental Conditions | Surrounding Air Temperature ^{*1} | -5°C to 55°C |
| | Storage Temperature | -20°C to 85°C |
| | Surrounding Air Humidity | 95% relative humidity max. (with no freezing or condensation) |
| | Storage Humidity | 95% relative humidity max. (with no freezing or condensation) |
| | Vibration Resistance | 4.9 m/s ² |
| | Shock Resistance | 19.6 m/s ² |
| | Degree of Protection | IP10 |
| | Pollution Degree | 2 <ul style="list-style-type: none"> Must be no corrosive or flammable gases. Must be no exposure to water, oil, or chemicals. Must be no dust, salts, or iron dust. |
| | Altitude | 1,000 m or less. |
| | Others | Do not use the SERVOPACK in the following locations: Locations subject to static electricity noise, strong electromagnetic/magnetic fields, or radioactivity |
| Applicable Standards | | Refer to the following section for details.  Compliance with UL Standards, EU Directives, and Other Safety Standards on page xxi |
| Mounting | | Base-mounted |
| Performance | Speed Control Range | 1:5000 (At the rated torque, the lower limit of the speed control range must not cause the Servomotor to stop.) |
| | Coefficient of Speed Fluctuation ^{*2} | ±0.01% of rated speed max. (for a load fluctuation of 0% to 100%) |
| | | 0% of rated speed max. (for a voltage fluctuation of ±10%) |
| | | ±0.1% of rated speed max. (for a temperature fluctuation of 25°C ±25°C) |
| | Torque Control Precision (Repeatability) | ±1% |
| Soft Start Time Setting | 0 s to 10 s (Can be set separately for acceleration and deceleration.) | |

| Item | | Specification | |
|-------------------------|--|---|--|
| I/O Signals | Encoder Divided Pulse Output | Phase A, phase B, phase C: Line-driver output Number of divided output pulses: Any setting is allowed. | |
| | Linear Servomotor Overheat Protection Signal Input | Number of input points: 1 Input voltage range: 0 V to +5 V | |
| | Digital Input Signals | Input Signals That Can Be Allocated | Allowable voltage range: 24 VDC \pm 20% Number of input points: 7 |
| | | | Input method: Sink inputs or source inputs Input Signals <ul style="list-style-type: none"> • P-OT (Forward Drive Prohibit) and N-OT (Reverse Drive Prohibit) signals • /EXT1 External latch signal input (General purpose input) • /EXT2 (General purpose input) signal • /EXT3 (General purpose input) signal • /P-CL (Forward External Torque Limit) and /N-CL (Reverse External Torque Limit) signals • /SI0 and /SI3 (General-Purpose Input) signals A signal can be allocated and the positive and negative logic can be changed. |
| | Digital Output Signals | Fixed Output | Allowable voltage range: 5 VDC to 30 VDC Number of output points: 1 Output signal: ALM (Servo Alarm) signal |
| | | Output Signals That Can Be Allocated | Allowable voltage range: 5 VDC to 30 VDC Number of output points: 5 (A photocoupler output (isolated) is used.) Output Signals <ul style="list-style-type: none"> • /COIN (Positioning Completion) signal • /V-CMP (Speed Coincidence Detection) signal • /TGON (Rotation Detection) signal • /S-RDY (Servo Ready) signal • /CLT (Torque Limit Detection) signal • /VLT (Speed Limit Detection) signal • /BK (Brake) signal • /WARN (Warning) signal • /NEAR (Near) signal A signal can be allocated and the positive and negative logic can be changed. |
| Communications | RS-422A Communications (CN502) | Interfaces | Digital Operator (JUSP-OP05A-1-E). |
| | | 1:N Communications | Up to N = 15 stations possible for RS-422A port |
| | | Axis Address Setting | Set with parameters. |
| | USB Communications (CN7) | Interface | Personal computer (with SigmaWin+) The software version of the SigmaWin+ must be version 7.11 or higher. |
| Communications Standard | | Conforms to USB2.0 standard (12 Mbps). | |

2 Specifications and Settings

2.1.2 400 V Specifications

| Item | | Specification |
|--------------------------------------|------------------------------------|--|
| Displays/Indicators | | CHARGE, PWR, RUN, ERR, and L/A (A and B) indicators, and one-digit seven-segment display |
| Ethernet IP Address Setting Switches | | Used to configure IP address |
| Analog Monitor (CN5) | | Number of points: 2 Output voltage range: ± 10 VDC (effective linearity range: ± 8 V) Resolution: 16 bits Accuracy: ± 20 mV (Typ) Maximum output current: ± 10 mA Settling time ($\pm 1\%$): 1.2 ms (Typ) |
| Dynamic Brake (DB) | | Activated when a servo alarm or overtravel (OT) occurs, or when the power supply to the main circuit or servo is OFF. |
| Regenerative Processing | | Built-in Refer to the catalog for details. |
| Overtravel (OT) Prevention | | Stopping with dynamic brake, deceleration to a stop, or coasting to a stop for the P-OT (Forward Drive Prohibit) or N-OT (Reverse Drive Prohibit) signal |
| Protective Functions | | Overcurrent, overvoltage, low voltage, overload, regeneration error, etc. |
| Utility Functions | | Gain adjustment, alarm history, jogging, origin search, etc. |
| Safety Functions | Inputs | /HWBB1 and /HWBB2: Base block signals for Power Modules |
| | Output | EDM1: Monitors the status of built-in safety circuit (fixed output). |
| | Applicable Standards ^{*3} | ISO13849-1 PLe (category 3), IEC61508 SIL3 |

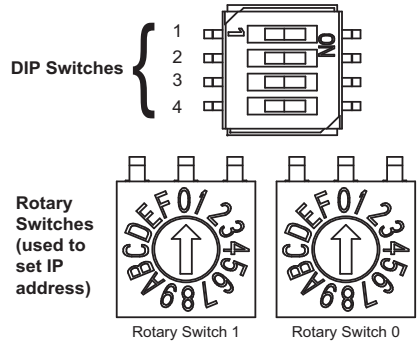
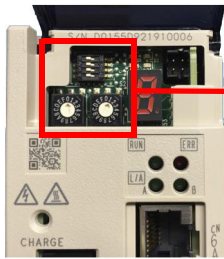
* 1. If you combine a Σ -7-Series SERVOPACK with a Σ -V-Series Option Module, the surrounding air temperature specification of the Σ -V-Series SERVOPACKs must be used, i.e., 0°C to 55°C. Also, the applicable surrounding range cannot be increased by derating.

* 2. The coefficient of speed fluctuation for load fluctuation is defined as follows:

$$\text{Coefficient of speed fluctuation} = \frac{\text{No-load motor speed} - \text{Total-load motor speed}}{\text{Rated motor speed}} \times 100\%$$

* 3. Always perform risk assessment for the system and confirm that the safety requirements are met.

2.2 DIP Switch Settings



| Switch | Name | Setting | Operating Mode | Setting for Normal Operation | Details |
|--------|--------|---------|----------------------------------|------------------------------|---|
| 1 | STOP | ON | User program execution inhibited | OFF | Inhibits user program execution |
| | | OFF | Normal operation | | |
| 2 | SUP | ON | Firmware programming mode | OFF | Enables servo controller firmware programming. This mode can also be performed via web UI without changing the DIP switch. |
| | | OFF | Normal operation | | |
| 3 | INIT | ON | Configuration bypass mode | OFF | Set to ON to bypass the stored configuration (e.g. in case of a configuration problem that prevents servo controller startup) |
| | | OFF | Normal operation | | |
| 4 | E-INIT | ON | Normal operation | OFF | Rotary switches used to set IP address |
| | | OFF | Rotary switches ignored | | IP address is set from configuration settings in servo controller |

2.3 Rotary Switches

When DIP switch 4 (E-INIT) is OFF, the rotary switches are ignored. The IP address is set from configuration settings stored on the servo controller.

Rotary switches are normally used to set the IP address. This is the case when DIP switch 4 (E-INIT) is ON

- If both rotary switches are set to 0, use DHCP.
- If either rotary switch is non zero, the last octet of the IP address is set by the value on the switches. Note that the switch values are labeled in hexadecimal. The IP address will be 192.168.1.x where x is 0x01 to 0xFF for a decimal value of 01 to 255.

| Rotary Switch 1 | Rotary Switch 0 | IP Address |
|-----------------|-----------------|---------------|
| 0 | 0 | Set by DHCP |
| 0 | 1 | 192.168.1.1 |
| 0 | 2 | 192.168.1.2 |
| ... | ... | ... |
| 0 | F | 192.168.1.15 |
| 1 | 0 | 192.168.1.16 |
| ... | ... | ... |
| 1 | F | 192.168.1.31 |
| 2 | 0 | 192.168.1.32 |
| ... | ... | ... |
| F | F | 192.168.1.255 |

2.4 Switch Factory Settings

- All DIP switches off
- Rotary switches at 0 and 1.
- Configured IP address is 192.168.1.1

3 Installation Standards

3.1 Mechanical Installation/Dimensions

The SigmaLogic7 Modbus servo interface is based on the Sigma-7S EtherCAT servo amplifier. As such, it has the same envelope and mechanical installation directions.

For 200V models, please refer to section 2.3 of the Sigma-7S EtherCAT (CoE) Communications Reference Product Manual (document number SIEPS80000155).


For 400V Models, please refer to section 2.3 of the Sigma-7S with 400V Input Power EtherCAT (CoE) Communications Reference Product Manual (document number SIEPS80000180).

3.2.1 200 V SERVOPACKS

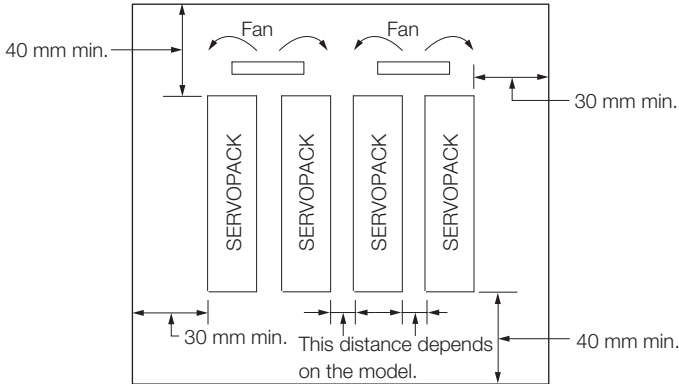
3.2 Installing Multiple SERVOPACKS in a Control Panel

3.2.1 200 V SERVOPACKS

Provide the following intervals between the SERVOPACKs and spaces around the SERVOPACKs.



Important Install cooling fans above the SERVOPACKs so that hot spots do not occur around the SERVOPACKs. Provide sufficient intervals and spaces as shown in the following figure to enable cooling by the fans and natural convection.



The space required on the right side of a SERVOPACK (when looking at the SERVOPACK from the front) depends on the SERVOPACK models. Refer to the following table.

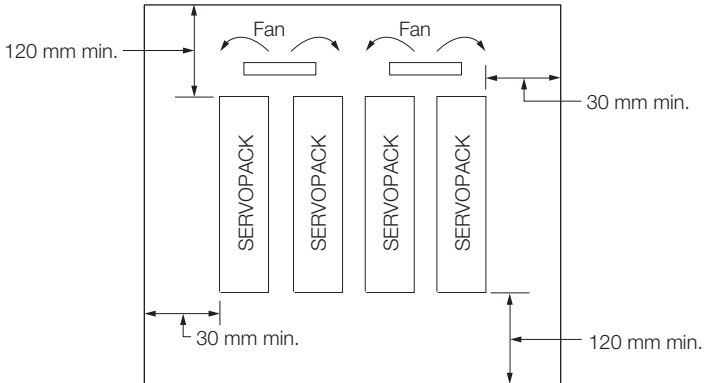
| SERVOPACK Model | | Space on Right Side | Cooling Fan Installation Conditions |
|-----------------|--|---------------------|-------------------------------------|
| | | | 10 mm above SERVOPACK's Top Surface |
| SGD7S- | R70A, R90A, 1R6A, 2R8A, 3R8A, 5R5A, 7R6A, R70F, R90F, 2R1F, 2R8F | 1 mm min. | Air speed: 1.0 m/s min. |
| | 120A, 180A, 200A, 330A, 470A, 550A, 590A, 780A | 10 mm min. | Air speed: 1.0 m/s min. |

3.2.2 400 V SERVOPACKS

400 V SERVOPACKS can be mounted side-by-side as shown.



Install cooling fans above the SERVOPACKs so that hot spots do not occur around the SERVOPACKs.



| SERVOPACK Model | Cooling Fan Installation Conditions | |
|--|-------------------------------------|--|
| | 10 mm above SERVOPACK's Top Surface | |
| SGD7S- 1R9D, 3R5D, 5R4D, 8R4D, 120D, 170D, 210D, 260D, 280D, 370D | Air speed: 1.0 m/s min. | |

3.2.2 400 V SERVOPACKS

4 Inputs and Outputs

4.1 Input Signals

4.1.1 200 V SERVOPACKS

Default settings are provided in parentheses

| Signal | Pin No. | Name | Function |
|-----------------|---------|---|--|
| /SI1 (P-OT) | 7 | General-purpose Digital Input 1 (Forward Drive Prohibit Input) | You can allocate the input signal to use with a parameter. (Stops Servomotor drive (to prevent over-travel) when the moving part of the machine exceeds the range of movement.) |
| /SI2 (N-OT) | 8 | General-purpose Digital Input 2 (Reverse Drive Prohibit Input) | |
| /SI3 | 9 | General-purpose Digital Input 3 | You can allocate the input signal to use with parameters. (Used for general-purpose input.) |
| /SI4 (/EXT1) | 10 | External latch signal 1 input (General purpose input 4) | You can allocate the input signals to use with parameters. |
| /SI5 (/EXT2) | 11 | General-purpose Digital Input 5 | |
| /SI6 (/EXT3) | 12 | General-purpose Digital Input 6 | |
| /SI0 | 13 | General-purpose Digital Input 0 | You can allocate the input signal to use with a parameter. (Used for general-purpose input.) |
| +24VIN | 6 | Digital Input Signal Power Supply Input | Inputs the Digital Input signal power supply. Allowable voltage range: 24 VDC \pm 20% The 24-VDC power supply is not provided by Yaskawa. |
| BAT+ | 14 | Battery for Absolute Encoder (+) | These are the pins to connect the absolute encoder backup battery. Do not connect these pins if you use the Encoder Cable with a Battery Case. |
| BAT- | 15 | Battery for Absolute Encoder (-) | |
| TH | 5 | Linear Servomotor Overheat Protection Input | Inputs the overheat protection signal from a Linear Servomotor. |

Note: If forward drive prohibition or reverse drive prohibition is used, the SERVOPACK is stopped by software controls. If the application does not satisfy the safety requirements, add external safety circuits as required.

4.1.2 400V SERVOPACKS

Default settings are given in parentheses.

| Signal | Pin No. | Name | Function |
|-----------------|---------|--|--|
| /SI1 (P-OT) | 7 | General-purpose Digital Input 1 (Forward Drive Prohibit Input) | You can allocate the input signal to use with a parameter. (Stops Servomotor drive (to prevent overtravel) when the moving part of the machine exceeds the range of movement.) |
| /SI2 (N-OT) | 8 | General-purpose Digital Input 2 (Reverse Drive Prohibit Input) | |
| /SI3 | 9 | General-purpose Digital Input 3 | You can allocate the input signal to use with parameters. (Used for general-purpose input.) |
| /SI4 (/EXT1) | 10 | External latch signal 1 input(General purpose input 4) | You can allocate the input signals to use with parameters. |
| /SI5 (/EXT2) | 11 | General-purpose Digital Input 5 | |
| /SI6 (/EXT3) | 12 | General-purpose Digital Input 6 | You can allocate the input signal to use with parameters. |
| /SI0 | 13 | General-purpose Digital Input 0 | You can allocate the input signal to use with a parameter. (Used for general-purpose input.) |
| +24VIN | 6 | Digital Input Signal Power Supply Input | Inputs the Digital input signal power supply. Allowable voltage range: 24 VDC \pm 20% The 24-VDC power supply is not provided by Yaskawa. |
| BAT+ | 14 | Battery for Absolute Encoder (+) | These are the pins to connect the absolute encoder backup battery. Do not connect these pins if you use the Encoder Cable with a Battery Case. |
| BAT- | 15 | Battery for Absolute Encoder (-) | |
| TH | 5 | Linear Servomotor Overheat Protection Input | Inputs the overheat protection signal from a Linear Servomotor. |

Note: If forward drive prohibition or reverse drive prohibition is used, the SERVOPACK is stopped by software controls. If the application does not satisfy the safety requirements, add external safety circuits as required.

4.2 Output Signals

4.2.1 200 V SERVOPACKS

Default settings are provided in parentheses.

| Signal | Pin No. | Name | Function |
|-----------------|---------|---|--|
| ALM+ | 3 | Servo Alarm Output | Turns OFF (opens) when an error is detected. |
| ALM- | 4 | | |
| /SO1+ (/BK+) | 1 | General-purpose Digital Output 1 (Brake Output) | You can allocate the output signal to use with a parameter. (Controls the brake. The brake is released when the signal turns ON (closes).) |
| /SO1- (/BK-) | 2 | | |
| /SO2+ | 23 | General-purpose Digital Output 2 | Used for general-purpose outputs. Set the parameters to allocate functions. |
| /SO2- | 24 | | |
| /SO3+ | 25 | General-purpose Digital Output 3 | |
| /SO3- | 26 | | |
| PAO | 17 | Encoder Divided Pulse Output, Phase A | Output the encoder divided pulse output signals with a 90° phase differential. |
| /PAO | 18 | | |
| PBO | 19 | Encoder Divided Pulse Output, Phase B | |
| /PBO | 20 | | |
| PCO | 21 | Encoder Divided Pulse Output, Phase C | Outputs the origin signal once every encoder rotation. |
| /PCO | 22 | | |
| SG | 16 | Signal ground | This is the 0-V signal for the control circuits. |
| FG | Shell | Frame ground | Connected to the frame ground if the shield of the I/O Signal Cable is connected to the connector shell. |

4.2.2 400 V SERVOPACKS

4.2.2 400 V SERVOPACKS

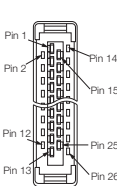
Default settings are provided in parentheses.

| Signal | Pin No. | Name | Function |
|-----------------|---------|---|---|
| ALM+ | 3 | Servo Alarm Output | Turns OFF (opens) when an error is detected. |
| ALM- | 4 | | |
| /SO1+ (/BK+) | 1 | General-purpose Digital Output 1 (Brake Output) | You can allocate the output signal to use with a parameter. (Controls the brake. The brake is released when the signal turns ON (closes).) |
| /SO1- (/BK-) | 2 | | |
| /SO2+ | 23 | General-purpose Digital Output 2 | Used for general-purpose outputs. Set the parameters to allocate functions. |
| /SO2- | 24 | General-purpose Digital Output 2 | |
| /SO3+ | 25 | General-purpose Digital Output 3 | |
| /SO3- | 26 | General-purpose Digital Output 3 | |
| /SO4+ | 27 | General-purpose Digital Output 4 | |
| /SO4- | 28 | General-purpose Digital Output 4 | |
| /SO5+ | 29 | General-purpose Digital Output 5 | |
| /SO5- | 30 | General-purpose Digital Output 5 | |
| PAO | 17 | Encoder Divided Pulse Output, Phase A | Output the encoder divided pulse output signals with a 90° phase differential. |
| /PAO | 18 | | |
| PBO | 19 | Encoder Divided Pulse Output, Phase B | |
| /PBO | 20 | | |
| SG | 16 | Signal ground | This is the 0-V signal for the control circuits. |

4.3 I/O Signal Connector (CN1) Pin Arrangement

4.3.1 200 V SERVOPACKS

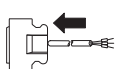
The following figure gives the pin arrangement of the of the I/O signal connector (CN1) for the default settings.



The diagram shows a top-down view of the I/O signal connector (CN1) with pins numbered 1 through 26. The pins are arranged in two rows of 13 pins each. The functions for each pin are listed in the table below.

| | | | | | | | | | | | |
|----|-----------------|---|----|-----------------|---|----|-------|---------------------------------------|----|-------|---------------------------------------|
| 2 | /SO1- (/BK-) | General-purpose Digital Output 1 | 1 | /SO1+ (/BK+) | General-purpose Digital Output 1 | 15 | BAT- | Battery for Absolute Encoder (-) | 14 | BAT+ | Battery for Absolute Encoder (+) |
| 4 | ALM- | Servo Alarm Output | 3 | ALM+ | Servo Alarm Output | 17 | PAO | Encoder Divided Pulse Output, Phase A | 16 | SG | Signal Ground |
| 6 | +24V N | Digital Input Signal Power Supply Input | 5 | TH | Linear Servomotor Overheat Protection Input | 19 | PBO | Encoder Divided Pulse Output, Phase B | 18 | /PAO | Encoder Divided Pulse Output, Phase A |
| 8 | /SI2 (N-OT) | General-purpose Digital Input 2 | 7 | /SI1 (P-OT) | General-purpose Digital Input 1 | 21 | PCO | Encoder Divided Pulse Output, Phase C | 20 | /PBO | Encoder Divided Pulse Output, Phase B |
| 10 | /SI4 (/EXT1) | External latch signal 1 input (General purpose input 4) | 9 | /SI3 (/DEC) | General-purpose Digital Input 3 | 23 | /SO2+ | General-purpose Digital Output 2 | 22 | /PCO | Encoder Divided Pulse Output, Phase C |
| 12 | /SI6 (/EXT3) | General-purpose Digital Input 6 | 11 | /SI5 (/EXT2) | General-purpose Digital Input 5 | 25 | /SO3+ | General-purpose Digital Output 3 | 24 | /SO2- | General-purpose Digital Output 2 |
| | | | 13 | /SI0 | General-purpose Digital Input 0 | | | | 26 | /SO3- | General-purpose Digital Output 3 |

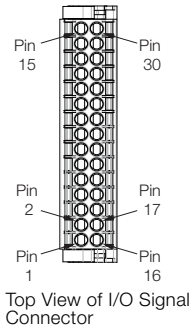
The above view is from the direction of the following arrow with out the connector shell attached .



4.3.2 400 V SERVOPACKS

4.3.2 400 V SERVOPACKS

The following figure gives the pin arrangement of the of the I/O signal connector (CN1) for the default settings.

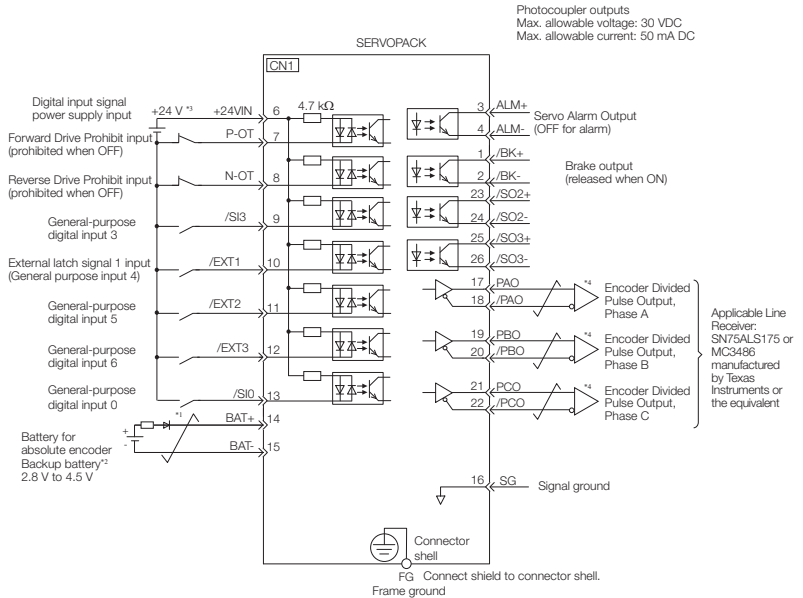



| No | Signal | Specification | No | Signal | Specification |
|----|--------------|---|----|--------|---------------------------------------|
| 15 | PG BAT- | Battery for absolute encoder (-) | 30 | /SO5- | General-purpose Digital Output 5 |
| 14 | PG BAT+ | Battery for absolute encoder (+) | 29 | /SO5+ | General-purpose Digital Output 5 |
| 13 | /SI0 | General-purpose Digital Input 0 | 28 | /SO4- | General-purpose Digital Output 4 |
| 12 | /SI6 (/EXT3) | General-purpose Digital Input 6 | 27 | /SO4+ | General-purpose Digital Output 4 |
| 11 | /SI5 (/EXT2) | General-purpose Digital Input 5 | 26 | /SO3- | General-purpose Digital Output 3 |
| 10 | /SI4 (/EXT1) | General-purpose Digital Input 4 | 25 | /SO3+ | General-purpose Digital Output 3 |
| 9 | /SI3 | General-purpose Digital Input 3 | 24 | /SO2- | General-purpose Digital Output 2 |
| 8 | /SI2 (N-OT) | General-purpose Digital Input 2 | 23 | /SO2+ | General-purpose Digital Output 2 |
| 7 | /SI1 (P-OT) | General-purpose Digital Input 1 | 22 | /PCO | Encoder divided pulse output, phase C |
| 6 | +24VIN | Digital input signal power supply input | 21 | PCO | Encoder divided pulse output, phase C |
| 5 | TH | Linear Servomotor overheat protection input | 20 | /PBO | Encoder divided pulse output, phase B |
| 4 | ALM- | Servo alarm output | 19 | PBO | Encoder divided pulse output, phase B |
| 3 | ALM+ | Servo alarm output | 18 | /PAO | Encoder divided pulse output, phase A |
| 2 | /SO1- (/BK-) | General-purpose Digital Output 1 | 17 | PAO | Encoder divided pulse output, phase A |
| 1 | /SO1+ (/BK+) | General-purpose Digital Output 1 | 16 | SG | Signal ground |

4.4 I/O Signal Wiring Examples

4.4.1 Using a Rotary Servo Motor

200 V SERVOPACKS



* 1.  represents twisted-pair wires.

* 2. Connect these when using an absolute encoder. If the Encoder Cable with a Battery Case is connected, do not connect a backup battery.

* 3. The 24-VDC power supply is not provided by Yaskawa. Use a 24-VDC power supply with double insulation or reinforced insulation.

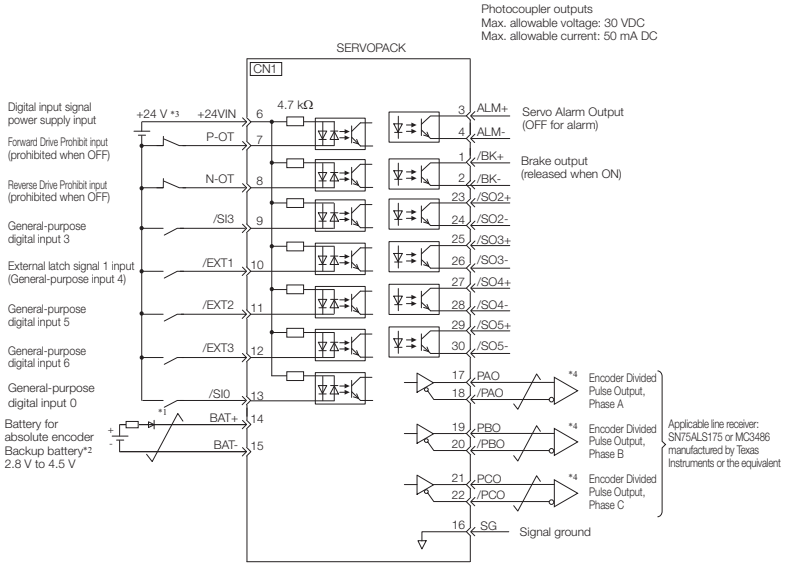
* 4. Always use line receivers to receive the output signals.

Note: 1. You can use parameters to change the functions allocated to the /SI0, /SI3, P-OT, N-OT, /EXT1, /EXT2, and /EXT3 input signals and the /SO1, /SO2, and /SO3 output signals.

2. If you use a 24-V brake, install a separate power supply for the 24-VDC power supply from other power supplies, such as the one for the I/O signals of the CN1 connector.

If the power supply is shared, the I/O signals may malfunction.

400 V SERVOPACKS



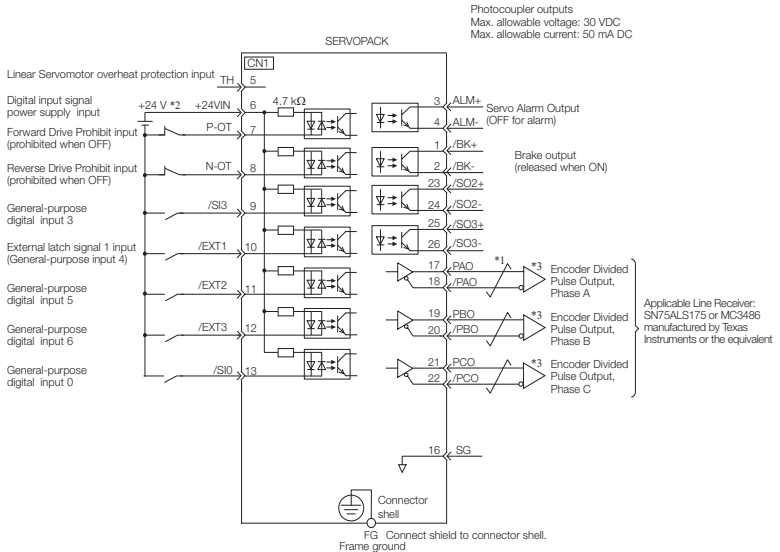
- * 1. represents twisted-pair wires.
- * 2. Connect these when using an absolute encoder. If the Encoder Cable with a Battery Case is connected, do not connect a backup battery.
- * 3. The 24-VDC power supply is not provided by Yaskawa. Use a 24-VDC power supply with double insulation or reinforced insulation.
- * 4. Always use line receivers to receive the output signals.


Note: 1. You can use parameters to change the functions allocated to the /SI0, /SI3, P-OT, N-OT, /EXT1, /EXT2, and /EXT3 input signals and the /SO1, /SO2, and /SO3 output signals.

2. If you use a 24-V brake, install a separate power supply for the 24-VDC power supply from other power supplies, such as the one for the I/O signals of the CN1 connector. If the power supply is shared, the I/O signals may malfunction.

4.4.2 Using a Linear Servo Motor

200 V SERVOPACKS



* 1.  represents twisted-pair wires.

* 2. The 24-VDC power supply is not provided by Yaskawa. Use a 24-VDC power supply with double insulation or reinforced insulation.

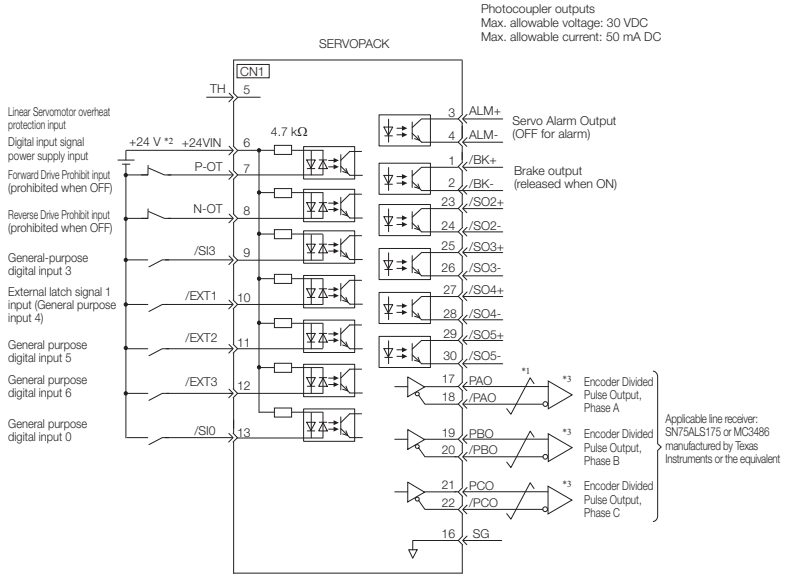
* 3. Always use line receivers to receive the output signals.

Note: 1. You can use parameters to change the functions allocated to the /SI0, /SI3, P-OT, N-OT, /EXT1, /EXT2, and /EXT3 input signals and the /SO1, /SO2, and /SO3 output signals.

2. If you use a 24-V brake, install a separate power supply for the 24-VDC power supply from other power supplies, such as the one for the I/O signals of the CN1 connector.

If the power supply is shared, the I/O signals may malfunction.

400 V SERVOPACKS



* 1. represents twisted-pair wires.

* 2. The 24-VDC power supply is not provided by Yaskawa. Use a 24-VDC power supply with double insulation or reinforced insulation.

* 3. Always use line receivers to receive the output signals.

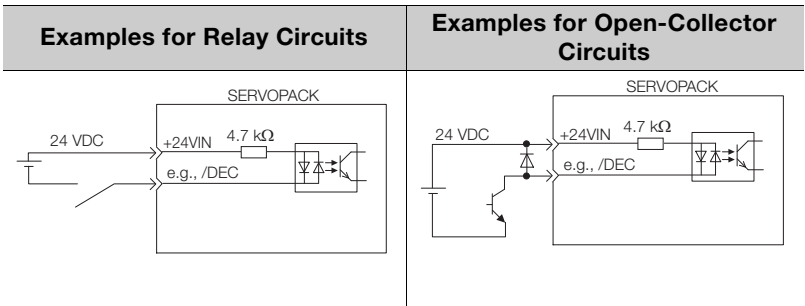
- Note:
1. You can use parameters to change the functions allocated to the /SI0, /SI3, P-OT, N-OT, /EXT1, /EXT2, and /EXT3 input signals and the /SO1, /SO2, and /SO3 output signals.
 2. If you use a 24-V brake, install a separate power supply for the 24-VDC power supply from other power supplies, such as the one for the I/O signals of the CN1 connector.
If the power supply is shared, the I/O signals may malfunction.

4.5 I/O Circuits

4.5.1 Digital Input Circuits

◆ Photocoupler Input Circuits

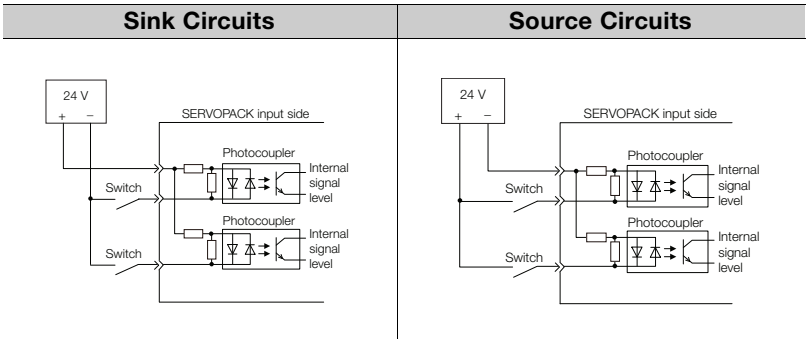
This section describes CN1 connector terminals 6 to 13.



Note: The 24-VDC external power supply capacity must be 50 mA minimum.

The SERVOPACK input circuits use bi-directional photocouplers. Select either a sink circuit or source circuit according to the specifications required by the machine.

Note: The connection examples in 4.4 I/O Signal Wiring Examples are for sink circuit connections.



| Input Signal Polarity | | Input Signal Polarity | |
|-----------------------|-----------------------|-----------------------|-----------------------|
| Photocoupler | Internal Signal Level | Photocoupler | Internal Signal Level |
| ON | Low level | ON | Low level |
| OFF | High level | OFF | High level |

4.5.2 Digital Output Circuits



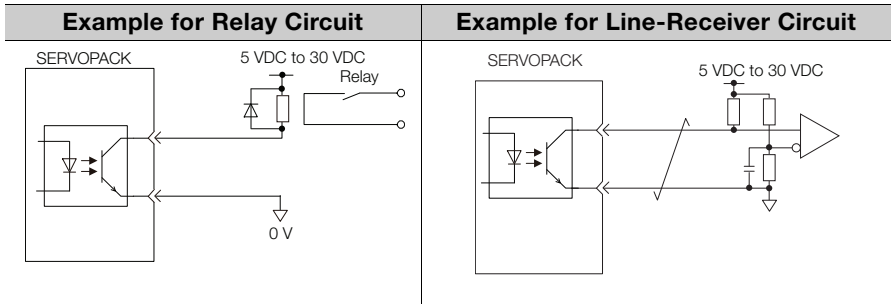
Important

Incorrect wiring or incorrect voltage application to the output circuits may cause short-circuit failures.

If a short-circuit failure occurs as a result of any of these causes, the holding brake will not work. This could damage the machine or cause an accident that may result in death or injury.

◆ Photocoupler Output Circuits

Photocoupler output circuits are used for the ALM (Servo Alarm), /S-RDY (Servo Ready), and other digital output signals. Connect a photocoupler output circuit to a relay or line-receiver circuit.



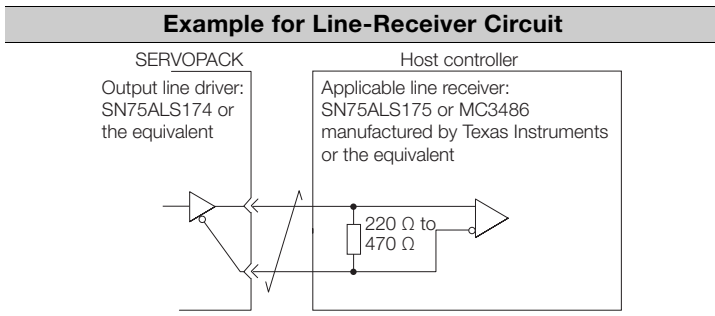
Note: The maximum allowable voltage and current range for photocoupler output circuits are as follows:

- Maximum allowable voltage: 30 VDC
- Current range: 5 mA to 50 mA DC

◆ Line-Driver Output Circuits

This section describes CN1 connector terminals 17-18 (Phase-A Signal), 19-20 (Phase-B Signal), and 21-22 (Phase-C Signal).

The serial data from the encoder is converted to two-phase (phases A and B) pulses. The resulting output signals (PAO, /PAO and PBO, /PBO) and origin pulse signal (PCO and /PCO) are output with line-driver output circuits. Connect the line-driver output circuits to line-receiver circuits at the host controller.



5 LED Outputs

The following indicators show the operating status of the servo controller and error information.

ERR:

- Solid at power up
- Off when there is no error
- Solid when there is an alarm
- Blinking when there is a critical error

RUN:

- Solid when internal logic controller is booted and ready
- Blinking when internal logic controller is running a program

Ethernet Link/Activity:

- Off when CN6A/B does not have an active Ethernet connection
- Solid when CN6A/B has an active Ethernet connection
- Blinking when CN6A/B is transmitting or receiving data

6 Ethernet Connectivity

The SigmaLogic7 Compact supports both 100 Mbps/100Base-TX and 10 Mbps/10Base-T connections. One single network is accessed using both CN6A and CN6B. The same IP address is set for both ports. The Ethernet address (MAC address) can be found on the nameplate.

6.1 Ethernet Connector Details

Ethernet Connector Specification and Pin Array

The following table provides the Ethernet connector specifications.

| Connector Name | Number of Pins | Connector Model | | |
|----------------|----------------|-------------------|-----------------|-----------------|
| | | Module Side | Cable Side | Manufacturer |
| Ethernet | 8 | RJ-45 CAT5 Socket | RJ-45 CAT5 Plug | TE Connectivity |

The following table provides Ethernet connector pin array details.



| Pin Number | Signal Name | Description |
|------------|-------------|-------------------------|
| 1 | TXD+ | Transmitted data + side |
| 2 | TXD- | Transmitted data – side |
| 3 | RXD+ | Received data + side |
| 4 | – | – |
| 5 | – | – |
| 6 | RXD- | Received data – side |
| 7 | – | – |
| 8 | – | – |

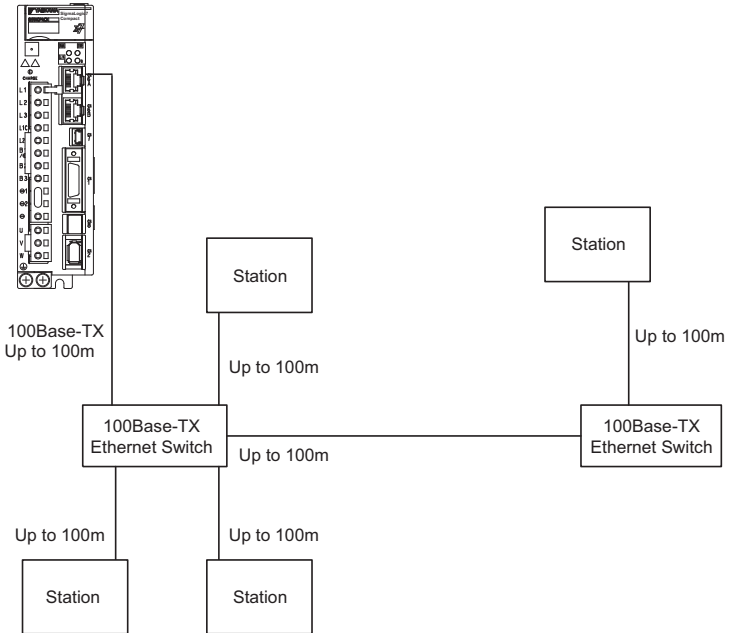
6.2 Ethernet Cable

For the Ethernet cable, use a twisted pair cable with RJ-45 connector. Yaskawa strongly recommends the use of shielded ethernet cables (Yaskawa model JZSP-CM3RRM0-xx-E). Ethernet ports are capable of auto-crossover, so crossover cables are not necessary.

6.3 Ethernet Connection Examples

Connection Example 1 (When using a Repeater Hub)

SigmaLogic7 Compact

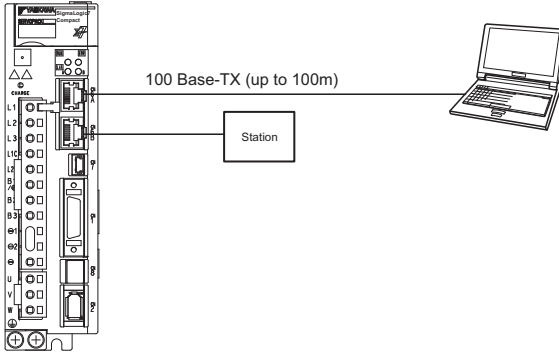


Specification

| | |
|---|---------------|
| Cable length from node to Ethernet hub or switch | 100 m or less |
| Cable length between Ethernet hubs or switches | 100 m or less |
| Number of Ethernet hubs or switches between nodes | Unlimited |

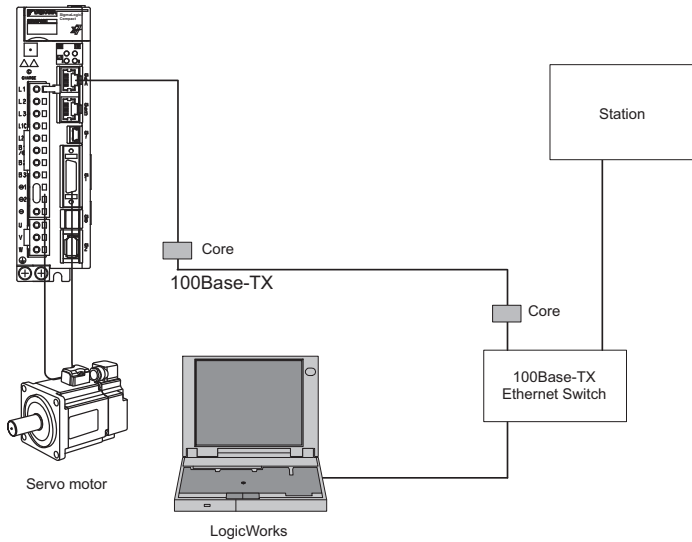
Connection Example 2

SigmaLogic7 Compact



Connection Example 3

SigmaLogic7 Compact



■ Caution

Electromagnetic interference (EMI) may interfere with Ethernet communication. The following measures can help minimize the influence of EMI:

1. Locate Ethernet cables so that they are well-separated from power cables or other sources of EMI
2. Yaskawa strongly recommends the use of high-quality shielded Ethernet cables such as JZSP-CM3RRM0-xx-E
3. Attach ferrite cores to Ethernet cables that are subjected to EMI



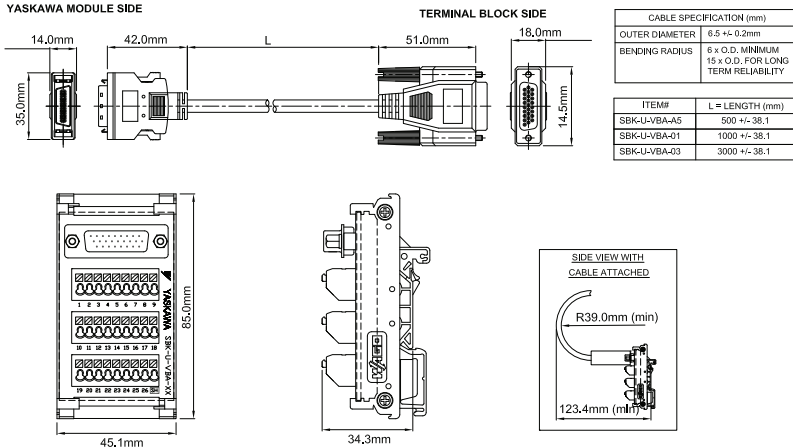
Recommended ferrite core:

| Model | Manufacturer |
|-------------|------------------------------|
| E04SR301334 | Seiwa Electric Mfg. Co., Ltd |

7 Cable Diagrams

7.1 SBK-U-VBA-xx (200 V Only)

Terminal Block - CN1 I/O.



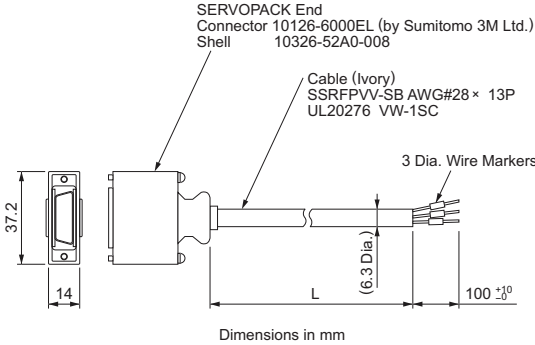
SBK-U-VBA-xx Function Chart for Sigma-5 or Sigma-7 Servo Amplifier

| Pin No. | Mechatrolink-II type Servo Amplifier / Option type | |
|---------|--|---|
| | Signal | Function |
| 1 | /BK+ (/SO1+) | Brake interlock output (+) (General purpose output 1 (+)) |
| 2 | /BK- (/SO1-) | Brake interlock output (-) (General purpose output 1 (-)) |
| 3 | ALM+ | Servo alarm output (+) |
| 4 | ALM- | Servo alarm output (-) |
| 5 | - | |
| 6 | +24VIN | Control power supply for digital signal input |
| 7 | P-OT (/SI1) | Forward run prohibited input (General purpose input 1) |
| 8 | N-OT (/SI2) | Reverse run prohibited input (General purpose input 2) |
| 9 | /DEC (/SI3) | Zero-point return deceleration switch input (General purpose input 3) |
| 10 | /EXT1 (/SI4) | External latch signal 1 input (General purpose input 4) |
| 11 | /EXT2 (/SI5) | External latch signal 2 input (General purpose input 5) |
| 12 | /EXT3 (/SI6) | External latch signal 3 input (General purpose input 6) |
| 13 | /SI0 | General purpose input 0 |
| 14 | BAT (+) | Battery (+) input |
| 15 | BAT (-) | Battery (-) input |
| 16 | SG | Signal ground |
| 17 | PAO | Phase-A pulse output (+) |
| 18 | /PAO | Phase-A pulse output (-) |
| 19 | PBO | Phase-B pulse output (+) |
| 20 | /PBO | Phase-B pulse output (-) |
| 21 | PCO | Phase-C pulse output (+) |
| 22 | /PCO | Phase-C pulse output (-) |
| 23 | /SO2+ | General purpose output 2 (+) |
| 24 | /SO2- | General purpose output 2 (-) |
| 25 | /SO3+ | General purpose output 3 (+) |
| 26 | /SO3- | General purpose output 3 (-) |

Note: General purpose input and output signals are shown with their default signals assigned - signal assignment may have been changed by parameter

7.2 JZSP-CSI02-x-E (200 V Only)

Flying Lead - CN1 I/O.



| Model | Cable Length |
|----------------|--------------|
| JZSP-CSI02-1-E | 1000 mm |
| JZSP-CSI02-2-E | 2000 mm |
| JZSP-CSI02-3-E | 3000 mm |

| Pin No. | Signal | Wire Color | Marking | | | Host Controller End |
|---------|---------|------------|---------|------|--|---------------------|
| | | | Color | Dots | | |
| 1 | /BK+ | Blue | Red | 1 | | 1 |
| 2 | /BK- | Blue | Black | 1 | | 2 |
| 3 | ALM+ | Pink | Red | 1 | | 3 |
| 4 | ALM- | Pink | Black | 1 | | 4 |
| 5 | - | Green | Red | 1 | | 5 |
| 6 | +24VIN | Green | Black | 1 | | 6 |
| 7 | P-OT | Orange | Red | 1 | | 7 |
| 8 | N-OT | Orange | Black | 1 | | 8 |
| 9 | /DEC | Gray | Red | 1 | | 9 |
| 10 | /EXT1 | Gray | Black | 1 | | 10 |
| 11 | /EXT2 | Blue | Red | 2 | | 11 |
| 12 | /EXT3 | Blue | Black | 2 | | 12 |
| 13 | /SIO | Pink | Red | 2 | | 13 |
| 14 | BAT (+) | Green | Red | 2 | | 14 |
| 15 | BAT (-) | Green | Black | 2 | | 15 |
| 16 | SG | Pink | Black | 2 | | 16 |
| 17 | PAO | Orange | Red | 2 | | 17 |
| 18 | /PAO | Orange | Black | 2 | | 18 |
| 19 | PBO | Gray | Red | 2 | | 19 |
| 20 | /PBO | Gray | Black | 2 | | 20 |
| 21 | PCO | Blue | Red | 3 | | 21 |
| 22 | /PCO | Blue | Black | 3 | | 22 |
| 23 | /SO2+ | Pink | Red | 3 | | 23 |
| 24 | /SO2- | Pink | Black | 3 | | 24 |
| 25 | /SO3+ | Green | Red | 3 | | 25 |
| 26 | /SO3- | Green | Black | 3 | | 26 |

: Represents twisted-pair wires.

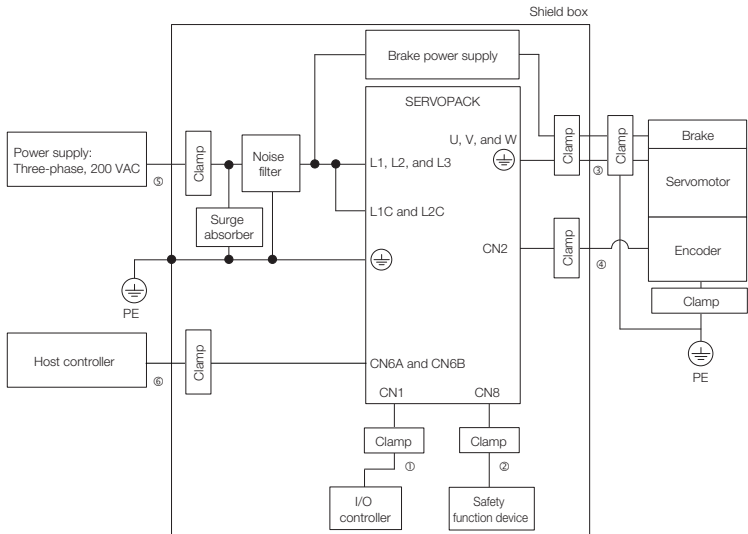
8 EMC Installation Conditions

This section gives the installation conditions that were used for EMC certification testing.

The EMC installation conditions that are given here are the conditions that were used to pass testing criteria at Yaskawa. The EMC level may change under other conditions, such as the actual installation structure and wiring conditions. These Yaskawa products are designed to be built into equipment. Therefore, you must implement EMC measures and confirm compliance for the final equipment.

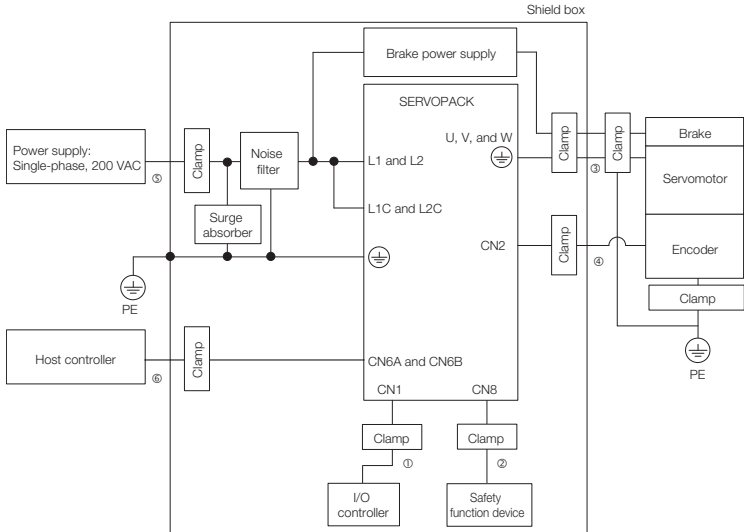
The applicable standards are EN 55011 group 1 class A, EN 61000-6-2, EN 61000-6-4, and EN 61800-3 (category C2, second environment).

- **Three-Phase, 200 VAC**



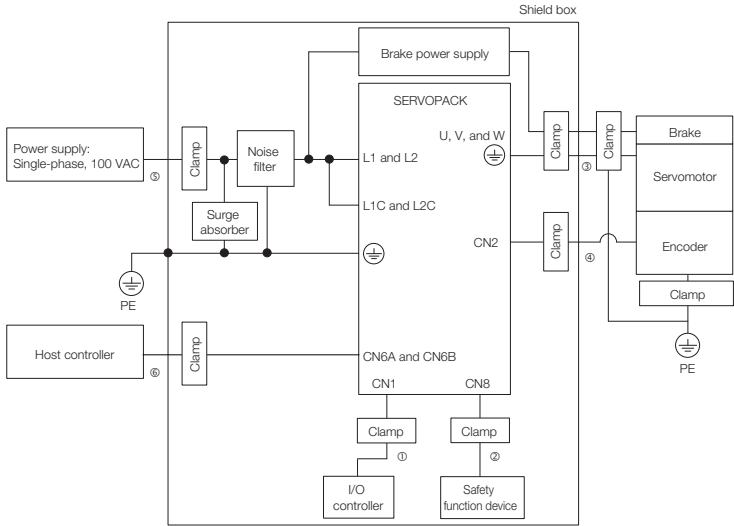
| Symbol | Cable Name | Specification |
|--------|-------------------------------|----------------|
| ① | I/O Signal Cable | Shielded cable |
| ② | Safety Function Device Cable | Shielded cable |
| ③ | Servomotor Main Circuit Cable | Shielded cable |
| ④ | Encoder Cable | Shielded cable |
| ⑤ | Main Circuit Power Cable | Shielded cable |
| ⑥ | Ethernet Communications Cable | Shielded cable |

• **Single-Phase, 200 VAC**



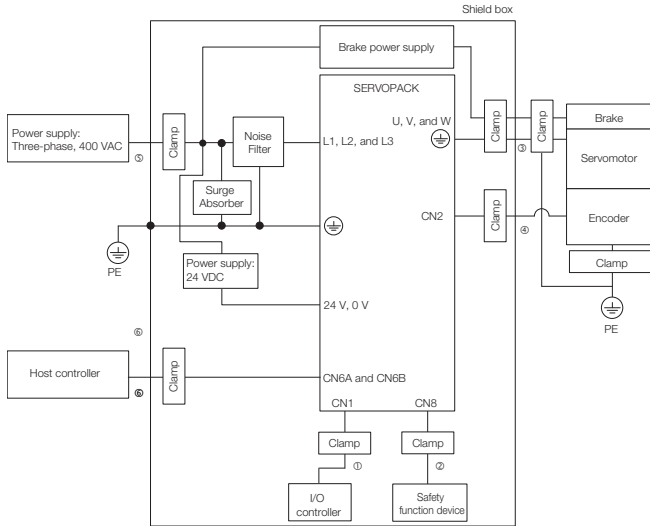
| Symbol | Cable Name | Specification |
|--------|-------------------------------|----------------|
| ① | I/O Signal Cable | Shielded cable |
| ② | Safety Function Device Cable | Shielded cable |
| ③ | Servomotor Main Circuit Cable | Shielded cable |
| ④ | Encoder Cable | Shielded cable |
| ⑤ | Main Circuit Power Cable | Shielded cable |
| ⑥ | Ethernet Communications Cable | Shielded cable |

• Single-Phase, 100 VAC



| Symbol | Cable Name | Specification |
|--------|-------------------------------|----------------|
| ① | I/O Signal Cable | Shielded cable |
| ② | Safety Function Device Cable | Shielded cable |
| ③ | Servomotor Main Circuit Cable | Shielded cable |
| ④ | Encoder Cable | Shielded cable |
| ⑤ | Main Circuit Power Cable | Shielded cable |
| ⑥ | Ethernet Communications Cable | Shielded cable |

• Three-Phase, 400 VAC



| Symbol | Cable Name | Specification |
|--------|---------------------------------|----------------|
| ① | I/O Signal Cable | Shielded cable |
| ② | Safety Function Device Cable | Shielded cable |
| ③ | Servomotor Main Circuit Cable | Shielded cable |
| ④ | Encoder Cable | Shielded cable |
| ⑤ | Main Circuit Power Supply Cable | Shielded cable |
| ⑥ | Ethernet Communications Cable | Shielded cable |

9 Safety

9.1 Safety Modules

The SigmaLogic7 Compact can support safety functions in combination with the following Safety Module for Σ -V Series, Large-Capacity Σ -V Series, and Σ -7 Series SERVOPACKs:

- “SGDV-OSA01A” for 200V SigmaLogic7 Compact
- “SGDV-OSA01A000FT900” for 400V SigmaLogic7 Compact

9.2 Safety Module Installation

For the installation procedure of SGDV-OSA01A, please refer to the Σ -V Series/ Σ -V Series for Large-Capacity Models/ Σ -7 Series Safety Module Installation Guide (document number TOBPC72082906)

For the installation procedure of SGDV-OSA01A000FT900, please refer to the Σ -V Series AC SERVOPACK Safety Module with FT900 Specification Installation Guide (document number TOBPC72082909)

9.3 Supported Safety Functions

The SigmaLogic7 Compact on its own supports Hard Wire Base Block (HWBB) Safety function. For more information on HWBB, please see section 11 in Σ -7S SERVOPACK with EtherCAT (CoE) Communications Reference Product Manual (document number SIEPS80000155).

The SigmaLogic7 Compact also supports other safety functions in combination with the safety modules mentioned above. For more details, please see section 6 in the Safety Module for Σ -V Series, Large-Capacity Σ -V Series, and Σ -7 Series SERVOPACKs User's Manual (document number SIEPC72082906).

9.4 Relationship with Function Blocks for Motion

[For Customers using an Allen-Bradley Controller]

If the SigmaLogic7 Compact changes to HWBB state during operation due to motion commanded by AOIs (Add on Instructions), a “4400h: Hard Wire Base Block” error will occur.

If this error occurs, the user can use the following AOIs (Add on Instructions) and steps in sequence to reset errors and resume operation:

1. MAS_Yaskawa (Motion Axis Stop)
2. Turn on the /HWBB1 and /HWBB2 signals (Safety request input signals in case of SBB)
3. MAFR_Yaskawa (Motion Axis Fault Reset)
4. MSO_Yaskawa (Motion Servo On)

For more details, please refer to the SigmaLogic AOI User Guide, which can be downloaded at www.yaskawa.com/SigmaLogic

[For customers using 3rd party controller other than Allen-Bradley]

If the SigmaLogic7 Compact changes to HWBB state during operation due to motion command bits of output registers, a “4400h: Hard Wire Base Block” error will occur.

The user will see the HWBB error status in the following Ethernet/IP status register bits:

| Variable Name | Modbus TCP register | Ethernet/IP register | | Notes |
|---------------------------|---------------------|----------------------------------|----------------------------------|-------|
| Hardware Base Block (HBB) | 30078 bit 12 | Inst. 102: DINT[38] Bit 28 | Inst. 103: DINT[06] Bit 28 | |

To reset all errors and to resume operation, the user will need to use the following steps and Ethernet/IP command bits:

1. Turn on the Abort Move command bit
2. Turn off ServoOn command bit
3. Turn on the /HWBB1 and /HWBB2 signals (Safety request input signals in case of SBB)
4. Turn on ServoAlarmReset command bit
5. Turn on ServoOn command bit

COMMAND:

Instance 112 - 256byte

| Master Output to SigmaLogic Input, E/IP Instance 112: 256 bytes | | | | |
|---|-----|---------------------------|------------------------|------|
| Ethernet/IP Scanner | | SigmaLogic (E/IP Adapter) | | |
| Output DWord (DINT) | Bit | Block use | Description | Type |
| EIP_Scanner:O.Data[00] | 0 | Command Bits (1) | ServoOn | BOOL |
| | 1 | | | BOOL |
| | 2 | | Home | BOOL |
| | 3 | | Start Move 1 | BOOL |
| | 4 | | | BOOL |
| | 5 | | | BOOL |
| | 6 | | SuperImpose | BOOL |
| | 7 | | ServoAlarmReset | BOOL |
| | 8 | | ControllerAlarmReset | BOOL |
| | 9 | | Start Move 2 | BOOL |
| | 10 | | Abort Move | BOOL |
| | 11 | | Pause Move | BOOL |
| | 12 | | Sequence Pause | BOOL |
| | 13 | | Sequence Resume | BOOL |
| | 14 | | Sequence Cancel | BOOL |
| | 15 | | Absolute Encoder Reset | BOOL |
| | 16 | | SequenceRun | BOOL |
| | 17 | | SeqEditStartSpeed | BOOL |
| | 18 | | SeqEditStartDistance | BOOL |
| | 19 | | PLS_Enable | BOOL |
| | 20 | | PLS_ActivateOutput1 | BOOL |
| | 21 | | PLS_ActivateOutput2 | BOOL |
| | 22 | | PLS_ActivateOutput3 | BOOL |
| | 23 | | PLS_ActivateOutput4 | BOOL |

For more information on command bits and status register bits, please refer to the Direct Control User Guide (document number TM.SigmaLogic7.01).

Keep in mind, the Direct Control User Guide can only be accessed after the user completes an eLearning module, sign and return the MOU (Memorandum of Understanding) as well as pass the certification test. Please contact your local sales representative for more information.

9.5 Risk Assessment

When using the Safety Module, be sure to perform risk assessment of the servo system in advance. Make sure that the safety level of the standards is met. For details about the standards, refer to front of this manual.

The following residual risks can be present even when the safety functions operate. Therefore, safety must always be given consideration during risk assessment.

- If external forces (such as gravitational force with a vertical axis) are applied when the safety functions of the Safety Module are operating, the motor will rotate due to the action of these external forces. Provide a separate mechanical brake to secure the motor.
- If the SERVOPACK fails, the motor may operate within a range of 180 electrical degrees. Make sure that safety is ensured even in hazardous situations.
- The number of rotations and movement distance for each type of motor are listed below.
 - Rotational Servomotor: 1/6 rotation max. (Rotation angle at motor shaft conversion)
 - Direct Drive Motor: 1/20 rotation max. (Rotation angle at motor shaft conversion)
 - Linear Servomotor: 30 mm max.

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