

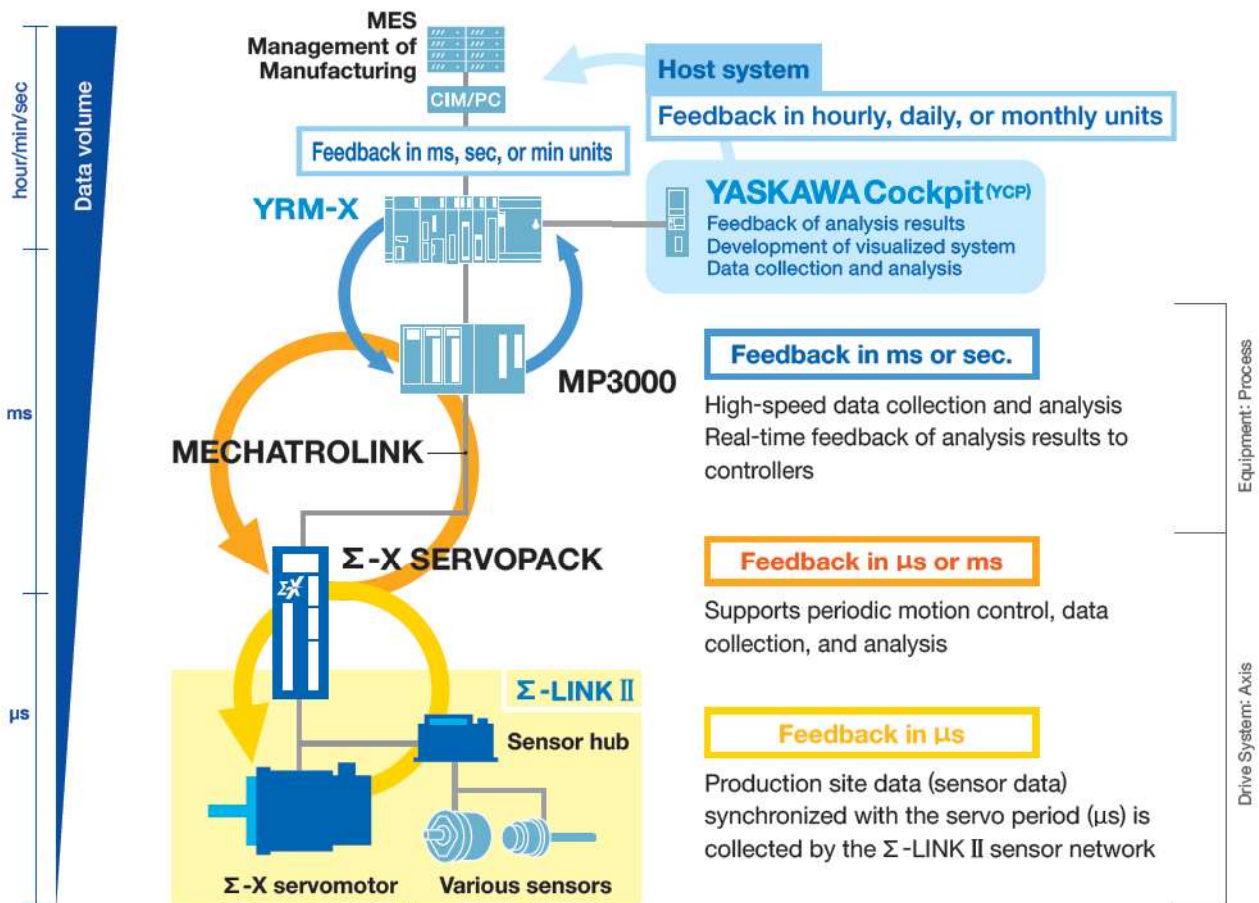
**YASKAWA**

AC Servo Drive

# $\Sigma$ -X Series



## Components that bring i<sup>3</sup>-Mechatronics to life

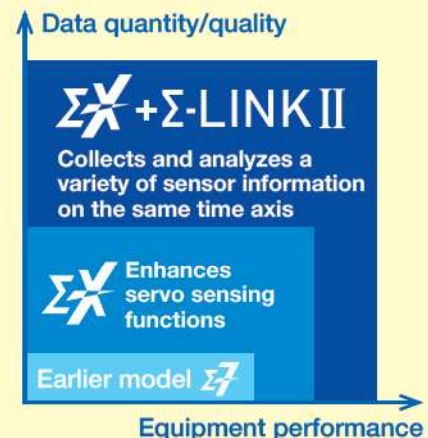


### Σ-X: Becoming a key factor in collection of real-time data

Σ-X features enhanced servo sensing functions. What's more, Σ-LINK II sensor networks can be used to collect sensor information at the same time, for equipment offering higher performance and functionality than ever.

#### What is Σ-LINK II?

A network providing integrated collection of servo and sensor information. Maintains advanced, highly reliable communication between SERVOPACKs and servomotor encoders while enabling cascaded connections of sensors and I/O devices.



# Integrated “Data Collection and Visualization”



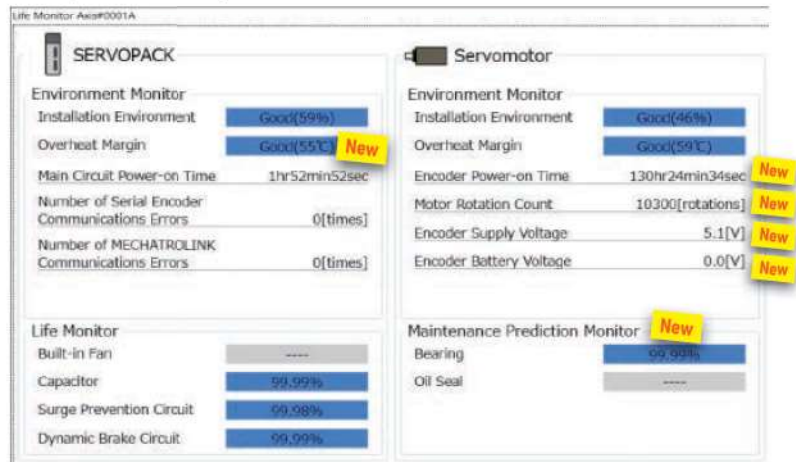
The servomotor acts as a sensor and collects various data. It can be used for preventive maintenance of equipment.

Sigma-X uses the servomotor as a sensor to sense and monitor the parts used by the servo and the servo’s installation environment. This can be useful for accurately determining maintenance periods and for preventing sudden failures.

## ■ Sensing Items

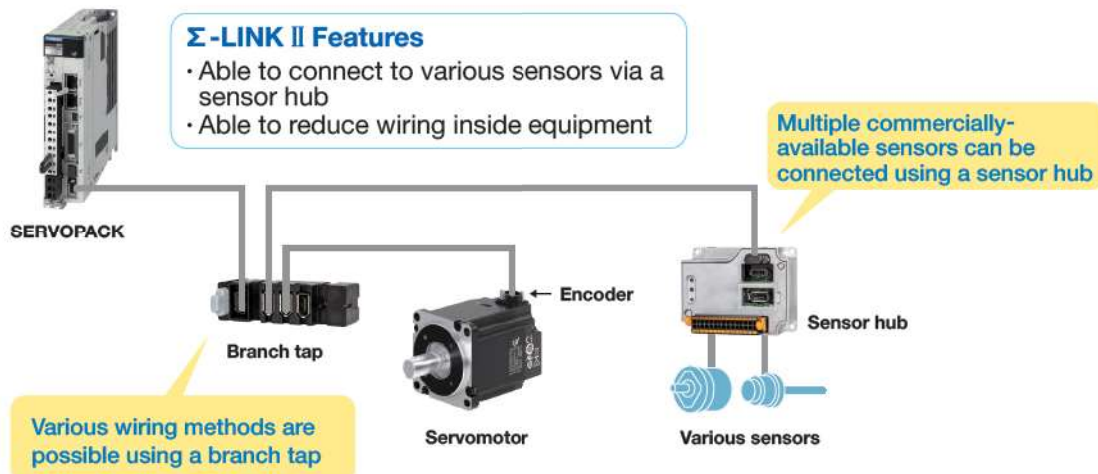
Encoder Power-on Time	
Encoder Supply Voltage	
Encoder Battery Voltage	
Motor Rotation Count	
Maintenance Prediction Monitor: Bearing	
Maintenance Prediction Monitor: Oil Seal	
Acceleration Sensor Monitor	
Estimated External Disturbance Torque	
Number of Serial Encoder Communications Errors	
Settling Time	
Amount of Overshoot	
Residual Vibration Frequency	
Estimated Vibration	
Maximum Value of Accumulated Load Ratio	
Number of MECHATROLINK Communications Errors	
Margin until Overload	
Temperature Margin until Servomotor Overheats	

- Both installation environment information and the service life of parts used by the servo can be monitored.



## Sigma-X + Sigma-LINK II

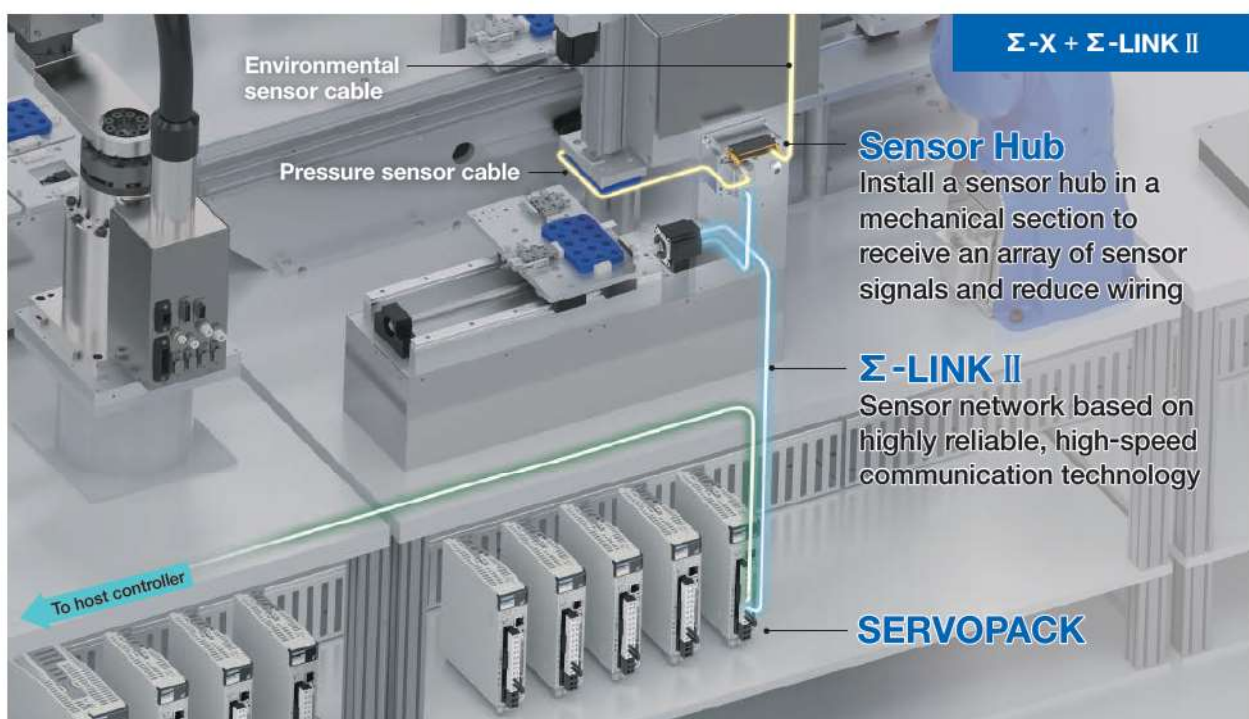
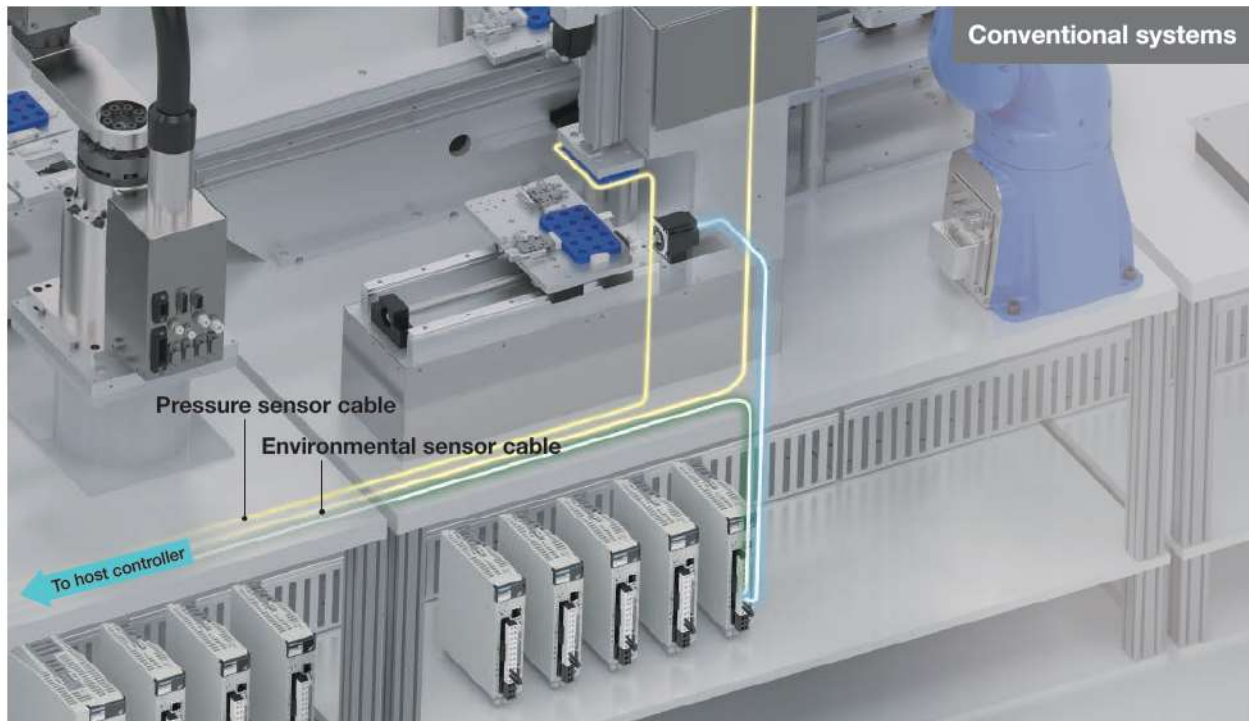
Motion and sensor data on the same time axis is collected using Sigma-LINK II. Along with reducing the man-hours required for data processing, Sigma-X also enables errors to be detected by identifying changes in the equipment.



**$\Sigma$ -X +  $\Sigma$ -LINK II** System example

# Optimal device layout in equipment, less wiring

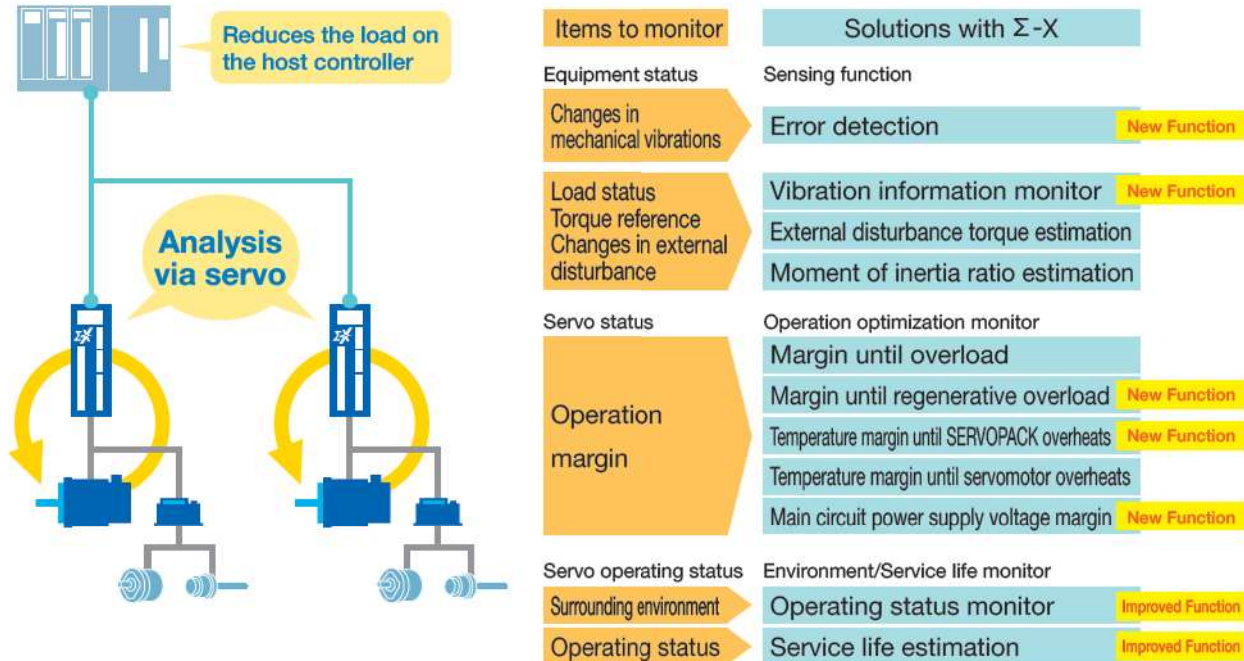
- Can receive an array of sensor signals via a sensor hub.
- Less affected by noise, because wiring from sensors to the controller can be shortened.
- Installing a sensor hub in mechanical sections reduces wiring.



# Intelligent “Utilization of Sensing Data”

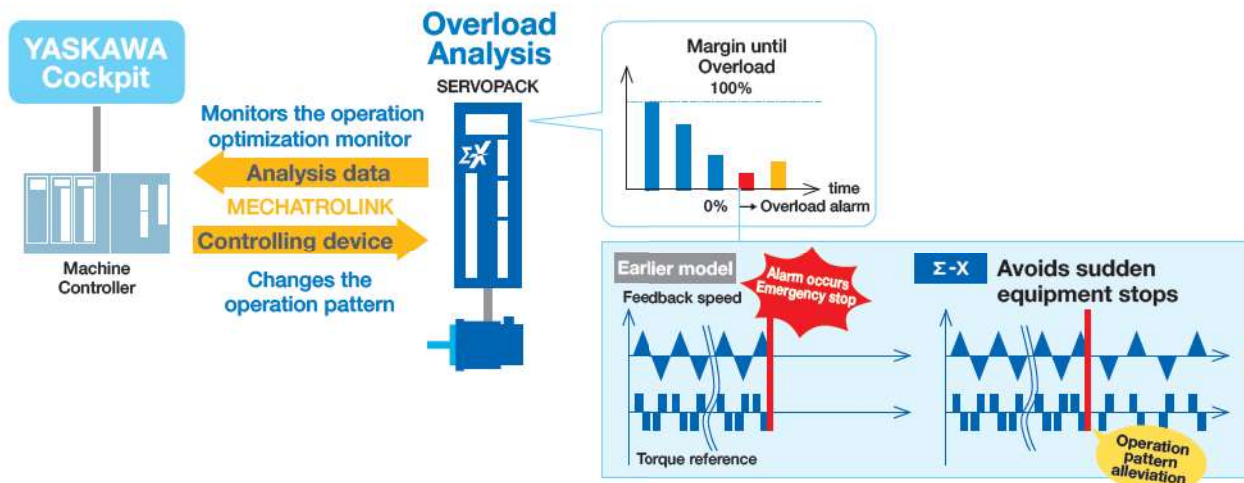


Data utilization can be completed by the servo alone, from digitizing operation data to detecting errors. It is able to provide feedback to the host system in real time.



## Utilizes the operation optimization monitor to ensure that equipment does not stop working.

Sudden equipment stops can be prevented by monitoring the operation optimization monitor and changing the operation pattern with the controller according to the equipment status.



# 4

## More Compact/ Less Wiring

### Multi-axis amplifiers for more compact sizes and reduced wiring

The introduction of  $\Sigma$ -X-Series multi-axis amplifiers mitigates the increase in control panel size and wiring time that are usually required when the number of axes is increased.

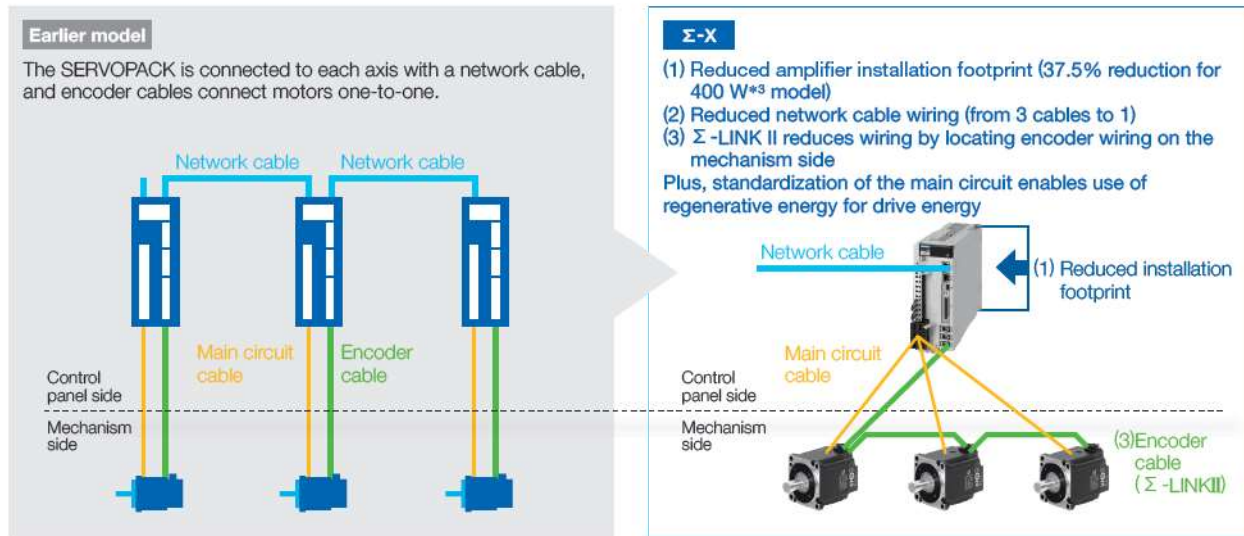


- ✓ Amplifier installation footprint
- ✓ Wiring man-hours due to additional axes

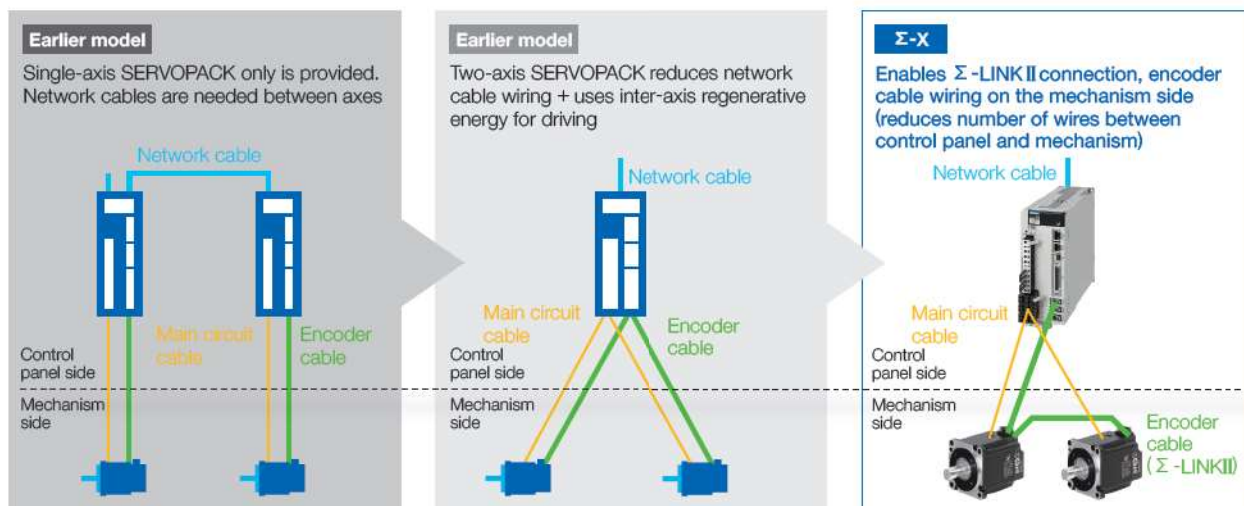


### Three-axis integrated amplifiers for more compact sizes and reduced wiring

The three-axis amplifier  $\Sigma$ -XT, and the  $\Sigma$ -LINK II that locates the encoder wiring on the mechanism side, reduce the amplifier installation footprint and wiring.



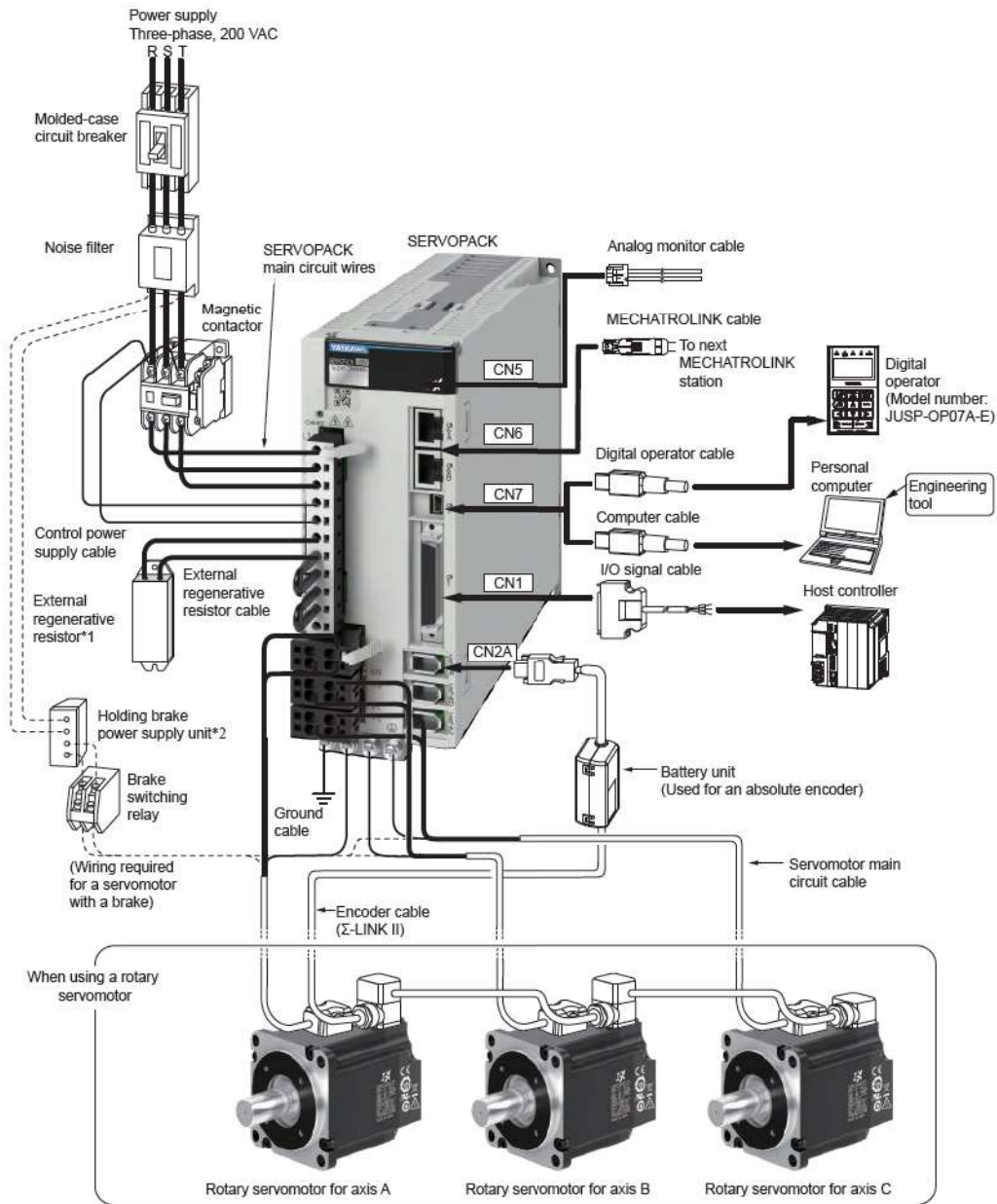
### Two-axis integrated amplifiers for reduced wiring



# System Configuration Examples (Continued)

## Combination of $\Sigma$ -XT SERVOPACK and Rotary Servomotor

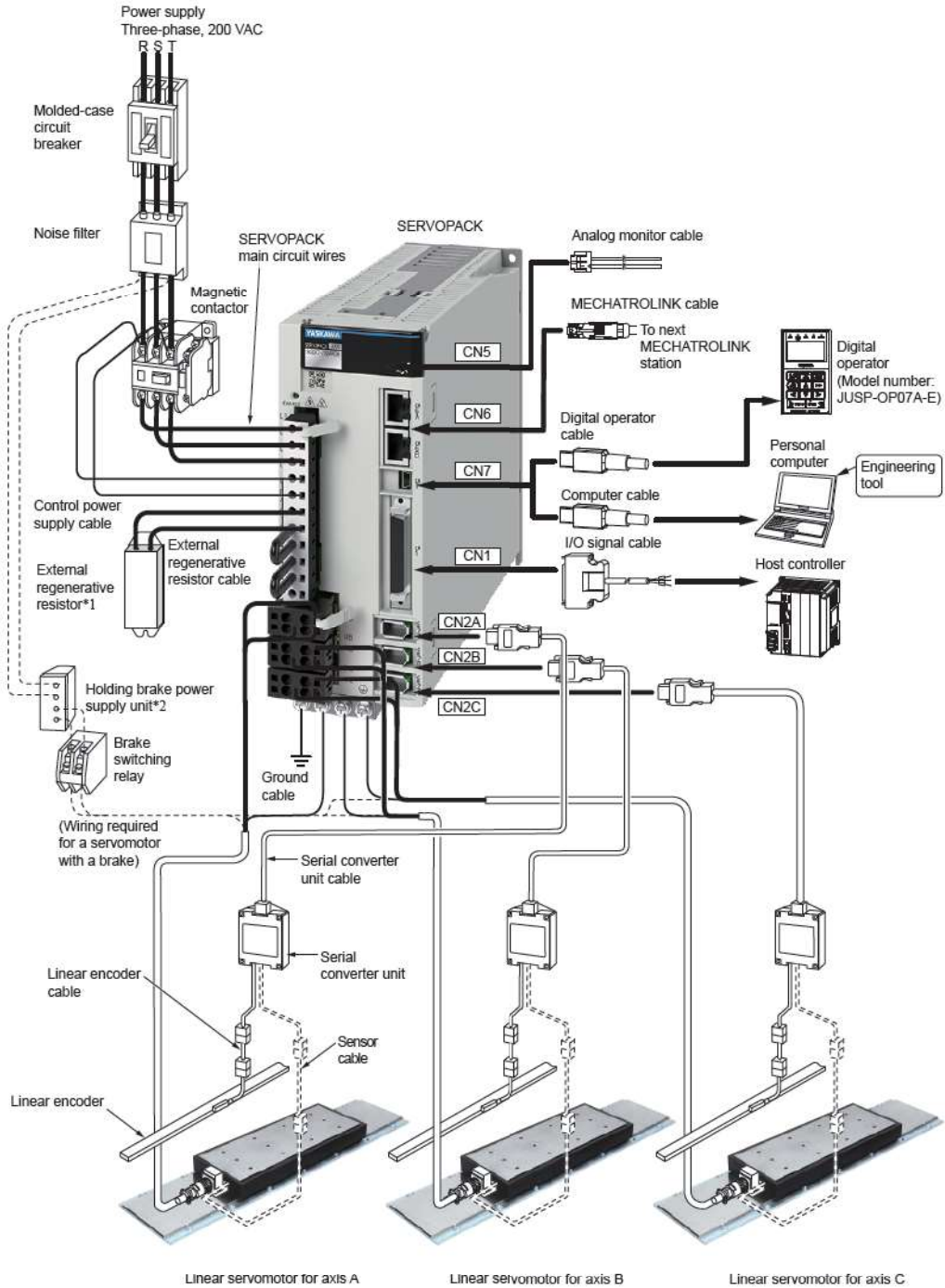
● For MECHATROLINK-4/III Communications/Three-phase 200 VAC



\*1 External regenerative resistors are not provided by Yaskawa.  
 \*2 The power supply unit for the holding brake is not provided by Yaskawa. Select a power supply unit based on the holding brake specifications. 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.

## Combination of $\Sigma$ -XT SERVOPACK and Linear Servomotor

● For MECHATROLINK-4/III Communications/Three-phase 200 VAC



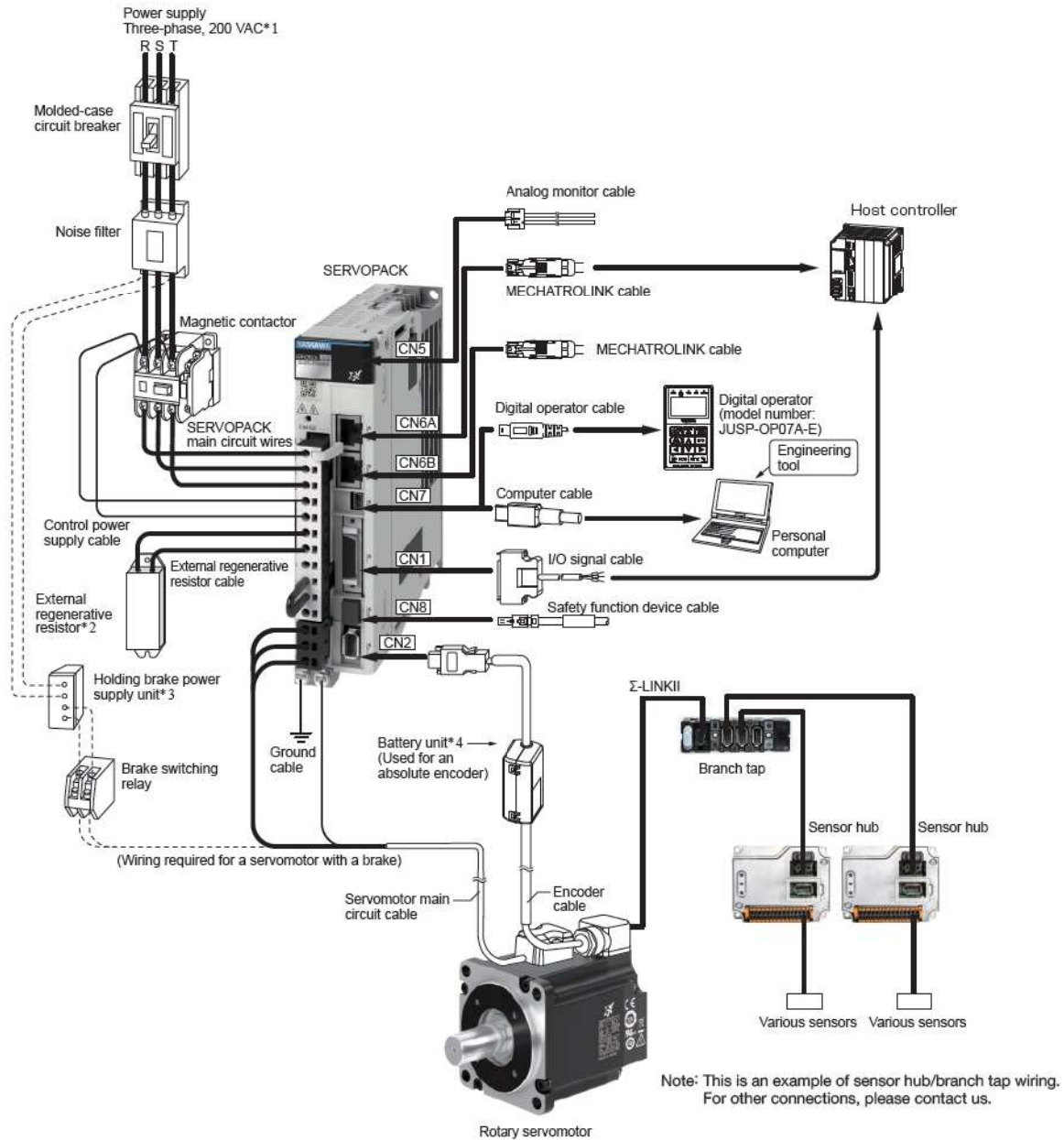
\*1 External regenerative resistors are not provided by Yaskawa.



# System Configuration Examples (Continued)

## Combination of $\Sigma$ -XS SERVOPACK and Rotary Servomotor, $\Sigma$ -LINK II

- For MECHATROLINK-4/III Communications/Three-phase 200 VAC



- \*1 This example is for a SERVOPACK with a three-phase, 200-VAC power supply input. The pin layout of the main circuit connector depends on the voltage.
- \*2 External regenerative resistors are not provided by Yaskawa.
- \*3 The power supply for the holding brake is not provided by Yaskawa. Select a power supply based on the holding brake specifications. 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 No battery unit is required when using a servomotor equipped with a batteryless absolute encoder.

## Interpreting Model Numbers

### Interpreting SERVOPACK Model Numbers

SGDXT - 1R6 A 40 A 0001 00 B

Σ-X-Series  
Σ-XT model
1st+2nd+3rd  
digits
4th  
digit
5th+6th  
digits
7th  
digit
8th+9th+10th+11th  
digits
12th+13th  
digits
14th  
digit

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

Voltage	Code	Specification
Three-Phase, 200 VAC	1R6* <sup>1</sup>	0.2 kW
	2R8* <sup>1</sup> ,* <sup>2</sup>	0.4 kW

**5th+6th digits** Interface\*<sup>3</sup>

Code	Specification
40	MECHATROLINK-4/III communications reference

**8th+9th+10th+11th digits** Hardware Options Specification

Code	Specification
None	Without options
0000	
0001	Rack-mounted
0002	Varnished
0020* <sup>4</sup>	No dynamic brake
1000* <sup>5</sup>	HWBB function

**4th digit** Voltage

Code	Specification
A	200 VAC

**7th digit** Design Revision Order

A

**12th+13th digits** FT Specification

Code	Specification
None	None
00	

**14th digit** BTO Specification (under development)

Code	Specification
None	None
B	BTO specification

\*1 You can use these models with either a single-phase or three-phase input.

\*2 If you use the servomotor with a single-phase power supply input, derate the total continuous output of the motors to 65% of maximum applicable motor capacity × number of axes.

Example: For the SGDXT-2R8A, make the output  $0.4 \text{ kW} \times 3 \text{ axes} \times 65\% = 0.78 \text{ kW}$  or less. To perform operation at an output of 0.4 kW for the first axis and 0.2 kW for the second axis, you must limit the output for the third axis to 0.18 kW or less.

\*3 The same SERVOPACKs are used for both rotary servomotors and linear servomotors.

\*4 For details, refer to the following manual.

📖 Σ-X-Series Σ-XS/Σ-XW/Σ-XT SERVOPACK with Dynamic Brake Hardware Option Specifications Product Manual (Manual No.: SIEP C710812 14)

\*5 For details, refer to the following manual.

📖 Σ-X-Series Σ-XW/Σ-XT SERVOPACK Hardware Option Specifications HWBB Function Product Manual (Manual No.: SIEP C710812 13)

## Ratings and Specifications

This section gives the ratings and specifications of SERVOPACKs.

### Ratings

#### ■ Three-Phase, 200 VAC

Model SGDXT-		1R6A	2R8A
Maximum Applicable Motor Capacity (each axis) [kW]		0.2	0.4
Continuous Output Current (each axis) [Arms]		1.6	2.8
Instantaneous Maximum Output Current (each axis) [Arms]		5.9	9.3
Main Circuit	Power Supply	200 VAC to 240 VAC, -15% to +10%, 50 Hz/60 Hz	
	Input Current [Arms] *1	3.9	7.5
Control	Power Supply	200 VAC to 240 VAC, -15% to +10%, 50 Hz/60 Hz	
	Input Current [Arms] *1	0.3	
Power Supply Capacity [kVA] *1		1.5	3.0
Power Loss *1	Main Circuit Power Loss [W]	33.3	60.4
	Control Circuit Power Loss [W]	17	
	Total Power Loss [W]	50.3	77.4
Regenerative Resistor	Built-In Regenerative Resistor	Resistance [Ω]	12
		Capacity [W]	70
		Allowable Power Consumption [W]	14
	Minimum Allowable External Resistance [Ω]	12	
Overvoltage Category		III	

\*1 This is the net value at the rated load.

#### ■ Single-Phase, 200 VAC

Model SGDXT-		1R6A	2R8A
Maximum Applicable Motor Capacity (each axis) [kW]		0.2	0.4 *1
Continuous Output Current (each axis) [Arms]		1.6	2.8
Instantaneous Maximum Output Current (each axis) [Arms]		5.9	9.3
Main Circuit	Power Supply	200 VAC to 240 VAC, -15% to +10%, 50 Hz/60 Hz	
	Input Current [Arms] *2	7.2	12
Control	Power Supply	200 VAC to 240 VAC, -15% to +10%, 50 Hz/60 Hz	
	Input Current [Arms] *2	0.3	
Power Supply Capacity [kVA] *2		1.8	3.6
Power Loss *2	Main Circuit Power Loss [W]	36.2	60.7
	Control Circuit Power Loss [W]	17	
	Total Power Loss [W]	53.2	77.7

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Model SGDXT-		1R6A	2R8A
Regenerative Resistor	Built-In Regenerative Resistor	Resistance [ $\Omega$ ]	12
		Capacity [W]	70
		Allowable Power Consumption [W]	14
	Minimum Allowable External Resistance [ $\Omega$ ]	12	
Overvoltage Category		III	

- \*1 If you use the servomotor with a single-phase power supply input, derate the total continuous output of the motors to 65% of maximum applicable motor capacity  $\times$  number of axes.  
 Example: For the SGDXT-2R8A, make the output  $0.4 \text{ kW} \times 3 \text{ axes} \times 65\% = 0.78 \text{ kW}$  or less. To perform operation at an output of  $0.4 \text{ kW}$  for the first axis and  $0.2 \text{ kW}$  for the second axis, you must limit the output for the third axis to  $0.18 \text{ kW}$  or less.
- \*2 This is the net value at the rated load (when derated for the SGDXT-2R8A).

## ■ 270 VDC

Model SGDXT-		1R6A	2R8A
Maximum Applicable Motor Capacity (each axis) [kW]		0.2	0.4
Continuous Output Current (each axis) [Arms]		1.6	2.8
Instantaneous Maximum Output Current (each axis) [Arms]		5.9	9.3
Main Circuit	Power Supply	270 VDC to 324 VDC, -15% to +10%	
	Input Current [Arms] *1	4.5	9.0
Control	Power Supply	270 VDC to 324 VDC, -15% to +10%	
	Input Current [Arms] *1	0.3	
Power Supply Capacity [kVA] *1		1.8	3.0
Power Loss *1	Main Circuit Power Loss [W]	28.1	50.4
	Control Circuit Power Loss [W]	17	
	Total Power Loss [W]	45.1	67.4
Overvoltage Category		III	

- \*1 This is the net value at the rated load.

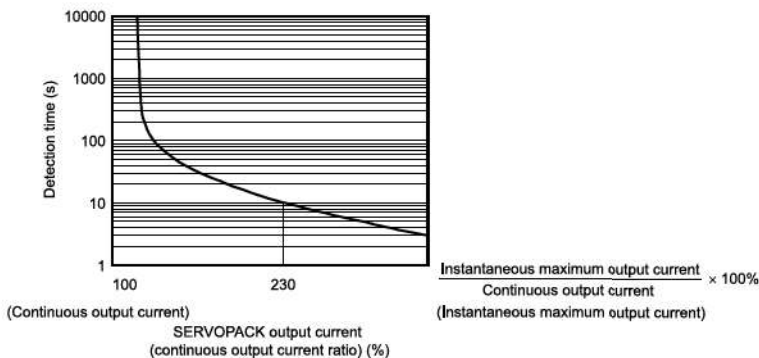
## SERVOPACK Overload Protection Characteristics

The overload detection level is set for hot start conditions with a SERVOPACK surrounding air temperature of  $55^{\circ}\text{C}$ .

A.710 or A.720 (an overload alarm) will occur if overload operation that exceeds the overload protection characteristics shown in the following diagram (i.e., operation on the right side of the vertical line) is performed.

The actual overload detection level will be the detection level of the connected SERVOPACK or servomotor that has the lower overload protection characteristics.

In most cases, that will be the overload protection characteristics of the servomotor.

**Note:**

- The above overload protection characteristics do not mean that you can perform continuous duty operation with an output of 100% or higher. For a Yaskawa-specified combination of SERVOPACK and servomotor, maintain the effective torque within the continuous duty zone of the torque-motor speed characteristic of the servomotor.
- This overload protection function is not a protection function related to speed. This product does not have a built-in thermal memory hold function.

In addition, the model that requires derating when using with single-phase power supply input (applicable model: SGDXT-2R8A) has separate overload protection characteristics (= SERVOPACK overload detection) in addition to the overload protection characteristics listed above. SERVOPACK overload detection will activate A.729 (Overload 2 Alarm) if operation that exceeds the derated value is continuously performed. Use the following values as guidelines for continuous operation that will exceed the derated value.

- Operation for a long period of time at a load of 115% or more of the derated value.
- Operation for 5 s at a load of 200% of the derated value.

Even if the above conditions are satisfied, the above alarm may not be activated when the SERVOPACK is producing a low amount of heat.


## Specification

### ■ Environmental Conditions

Item	Specification
Surrounding Air Temperature	-5°C to 55°C (With derating, usage is possible between 55°C and 60°C.) Refer to the following section for derating specifications. ☞ <a href="#">Derating Specifications on page 514</a>
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	When there is continuous vibration: 10 Hz to 55 Hz, acceleration amplitude 5.9 m/s <sup>2</sup> (0.6G)
Impact Resistance	19.6 m/s <sup>2</sup>
Degree of Protection	IP20
Pollution Degree	2 <ul style="list-style-type: none"> <li>• Must be no corrosive or flammable gases.</li> <li>• Must be no exposure to water, oil, or chemicals.</li> <li>• Must be no dust, salts, or iron dust.</li> </ul>

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Item	Specification
Altitude	1000 m max. (With derating, usage is possible between 1000 m and 2000 m.) Refer to the following section for derating specifications.  <i>Derating Specifications on page 514</i>
Others	Do not use the SERVOPACK in the following locations: Locations subject to static electricity noise, strong electromagnetic/magnetic fields, or radioactivity

## ■ I/O Signals

Item	Specification
Outputs for Triggers at Preset Positions	Number of output points: 3 (output method: a line driver output) Output signals: High-Speed Output Signal for Triggers at Preset Positions 1 to 3 (HSO1 to 3) <b>Note:</b> Normal Output Signal for Triggers at Preset Positions 1 to 5 (NSO1 to 5) are used by allocating the signals to sequence output signals.
Sequence Input Signals	Input Signals That Can Be Allocated Allowable voltage range: 24 VDC $\pm$ 20% Number of input points: 16 (input method: sink inputs or source inputs) Input signals: <ul style="list-style-type: none"> <li>• P-OT (Forward Drive Prohibit Input) and N-OT (Reverse Drive Prohibit Input) signals</li> <li>• /P-CL (Forward External Torque Limit Input) and /N-CL (Reverse External Torque Limit Input) signals</li> <li>• /DEC (Origin Return Deceleration Switch Input) signal</li> <li>• /EXT1 to /EXT3 (External Latch Input 1 to 3) signals</li> <li>• FSTP (Forced Stop Input) signal</li> </ul> A signal can be allocated and the positive and negative logic can be changed.
Sequence Output Signals	Fixed Output Allowable voltage range: 5 VDC to 30 VDC Number of output points: 3 (output method: a photocoupler output (isolated)) Output signal: ALM (Servo Alarm Output) signal
	Output Signals That Can Be Allocated Allowable voltage range: 5 VDC to 30 VDC Number of output points: 5 (output method: a photocoupler output (isolated)) Output signals: <ul style="list-style-type: none"> <li>• /COIN (Positioning Completion Output) signal</li> <li>• /V-CMP (Speed Coincidence Detection Output) signal</li> <li>• /TGON (Rotation Detection Output) signal</li> <li>• /S-RDY (Servo Ready Output) signal</li> <li>• /CLT (Torque Limit Detection Output) signal</li> <li>• /VLT (Speed Limit Detection Output) signal</li> <li>• /BK (Brake Output) signal</li> <li>• /WARN (Warning Output) signal</li> <li>• /NEAR (Near Output) signal</li> <li>• Normal Output Signal for Triggers at Preset Positions 1 to 5 (NSO1 to 5)</li> </ul> A signal can be allocated and the positive and negative logic can be changed.

## ■ Function

Item		Specification	
Communications	USB Communications (CN7)	Interfaces	Personal computer (with SigmaWin+), digital operator (JUSP-OP07A-E)
		Communications Standard	Conforms to USB2.0 standard (12 Mbps).
Displays/Indicators		CHARGE, PWR, CN, L1, and L2 indicators, and three, one-digit seven-segment displays	
MECHATROLINK-4 Communications *1	Communications Protocol	MECHATROLINK-4	
	Station Address Settings	01h to FFh (maximum number of slaves: 127) The rotary switches (S1 and S2) are used to set the station address.	
	Extended Address Settings	Axis A: 00h, Axis B: 01h, Axis C: 02h	
	Transmission Speed	100 Mbps	
	Transmission Cycle *2	125 μs, 250 μs, 500 μs, 750 μs, 1.0 ms to 4.0 ms (multiples of 0.5 ms)	
	Number of Transmission Bytes	16 to 80 bytes/station	
Reference Methods for MECHATROLINK-4 Communications	Performance	Position, speed, or torque control with MECHATROLINK-4 communications	
	Reference Input	MECHATROLINK-4 commands (sequence, motion, data setting, data access, monitoring, adjustment, etc.)	
	Profile	MECHATROLINK-4 standard servo profile MECHATROLINK-III standard servo profile	
MECHATROLINK-III Communications *1	Communications Protocol	MECHATROLINK-III	
	Station Address Settings	03h to EFh (maximum number of slaves: 62) The rotary switches (S1 and S2) are used to set the station address.	
	Extended Address Settings	Axis A: 00h, Axis B: 01h, Axis C: 02h	
	Transmission Speed	100 Mbps	
	Transmission Cycle	250 μs, 500 μs, 750 μs, 1.0 ms to 4.0 ms (multiples of 0.5 ms)	
	Number of Transmission Bytes	32 or 48 bytes/station A DIP switch (S3) is used to select the transmission bytes.	
Reference Methods for MECHATROLINK-III Communications	Performance	Position, speed, or torque control with MECHATROLINK-III communications	
	Reference Input	MECHATROLINK-III commands (sequence, motion, data setting, data access, monitoring, adjustment, etc.)	
	Profile	MECHATROLINK-III standard servo profile	
MECHATROLINK-4 and MECHATROLINK-III Communications Setting Switches		Rotary switch (S1 and S2) positions: 16 Number of DIP switch (S3) pins: 4	
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	
Dynamic Brake (DB)		Activated when a servo alarm or overtravel (OT) occurs, or when the power to the main circuit or servo is OFF.	
Regenerative Processing		Built-in	
Overtravel (OT) Prevention		Stopping with dynamic brake, deceleration to a stop, or coasting to a stop for the P-OT (Forward Drive Prohibit Input) or N-OT (Reverse Drive Prohibit Input) signal	

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Item	Specification
Protective Functions	Overcurrent, overvoltage, undervoltage, overload, regeneration error, etc.
Utility Functions	Gain tuning, alarm history, jogging operation, origin search, etc.

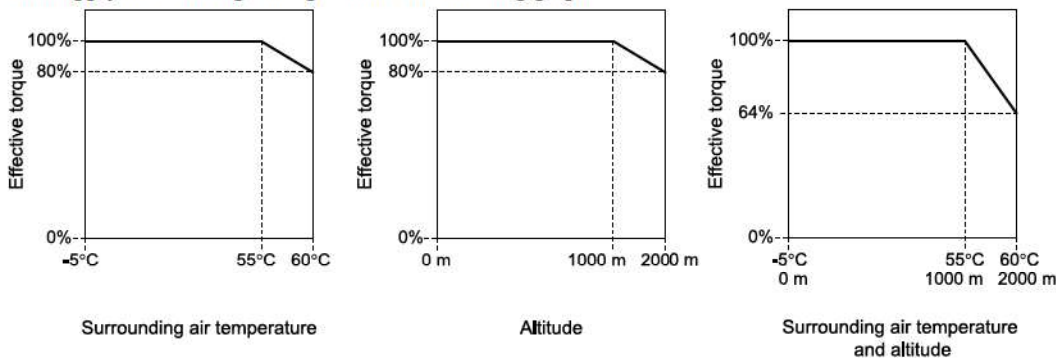
- \*1 Use the DIP switch S3 to switch the communications protocol. For details, refer to the following manual.  
 □ Σ-X-Series AC Servo Drive Σ-XT SERVOPACK with MECHATROLINK-4/III Communications References Product Manual (Manual No.: SIEP C710812 16)
- \*2 Multiple transmission cycles are supported.

■ Option

Item	Specification
Applicable Option Modules	None

**Derating Specifications**

If you use the SERVOPACK at a surrounding air temperature of 55°C to 60°C or at an altitude of 1000 m to 2000 m, you must apply the derating rates given in the following graphs.

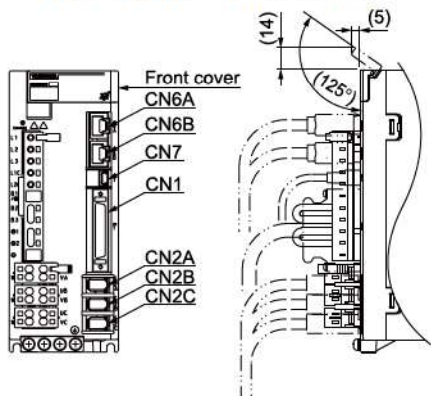


**External Dimensions**

**Front Cover Dimensions and Connector Specifications**

The front cover dimensions and panel connector section are the same for all capacities. Refer to the following figures and table.

■ Front Cover Dimensions





## ■ Connector Specifications

Connector No.	Model	Number of Pins	Manufacturer
CN1	10250-52A2PL	50	3M Japan Limited
CN2A, CN2B, CN2C	53460-0669	6	Molex Japan Co., Ltd.
CN6A, CN6B	3-1734579-4	8	Tyco Electronics Japan G.K.
CN7	2342993-1	5	Tyco Electronics Japan G.K.

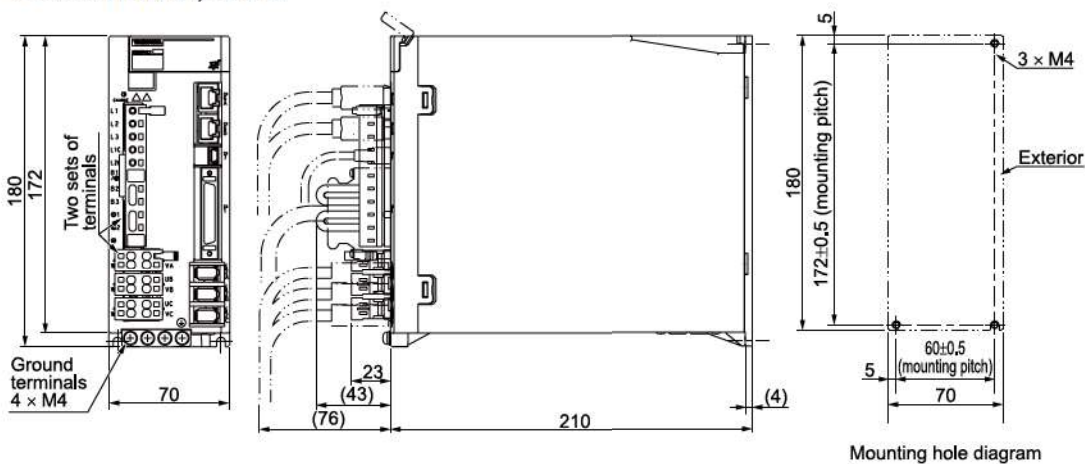
### Note:

The above connectors or their equivalents are used for the SERVOPACKs.

## SERVOPACK External Dimensions

### ■ Base-mounted SERVOPACKs

#### ◆ SGDXT-1R6A, -2R8A



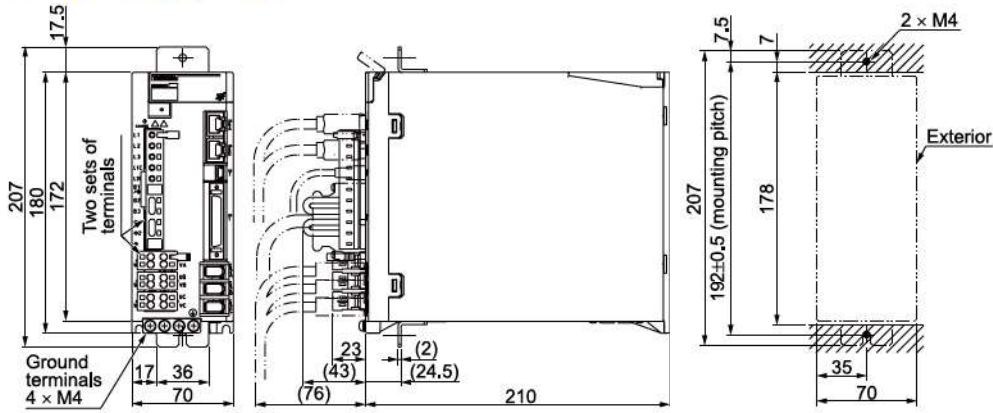
Mounting hole diagram

Approx. mass: 2.3 kg  
Unit: mm

### ■ Rack-mounted SERVOPACKs

Hardware Option Code: 0001

◆ SGDXT-1R6A, -2R8A



Mounting hole diagram

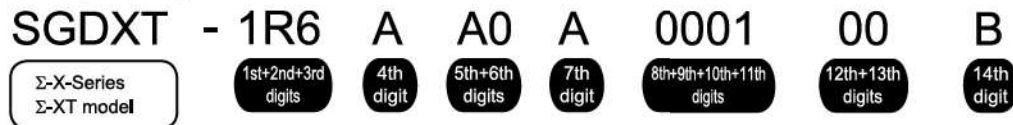
Approx. mass: 2.3 kg  
Unit: mm



# Σ-XT Models with EtherCAT Communications References

## Interpreting Model Numbers

### Interpreting SERVOPACK Model Numbers



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

Voltage	Code	Specification
Three-Phase, 200 VAC	1R6* <sup>1</sup>	0.2 kW
	2R8* <sup>1</sup> ,* <sup>2</sup>	0.4 kW

4th digit Voltage

Code	Specification
A	200 VAC

5th+6th digits Interface\*<sup>3</sup>

Code	Specification
A0	EtherCAT communications reference

7th digit Design Revision Order

A

8th+9th+10th+11th digits Hardware Options Specification

Code	Specification
None	Without options
0000	
0001	Rack-mounted
0002	Varnished
0020* <sup>4</sup>	No dynamic brake
1000* <sup>5</sup>	HWBB function

12th+13th digits FT Specification

Code	Specification
None	None
00	

14th digit BTO Specification (under development)

Code	Specification
None	None
B	BTO specification

\*1 You can use these models with either a single-phase or three-phase input.

\*2 If you use the servomotor with a single-phase power supply input, derate the total continuous output of the motors to 65% of maximum applicable motor capacity × number of axes.

Example: For the SGDXT-2R8A, make the output  $0.4 \text{ kW} \times 3 \text{ axes} \times 65\% = 0.78 \text{ kW}$  or less. To perform operation at an output of 0.4 kW for the first axis and 0.2 kW for the second axis, you must limit the output for the third axis to 0.18 kW or less.

\*3 The same SERVOPACKs are used for both rotary servomotors and linear servomotors.

\*4 For details, refer to the following manual.

📖 Σ-X-Series Σ-XS/Σ-XW/Σ-XT SERVOPACK with Dynamic Brake Hardware Option Specifications Product Manual (Manual No.: SIEP C710812 14)

\*5 For details, refer to the following manual.

📖 Σ-X-Series Σ-XW/Σ-XT SERVOPACK Hardware Option Specifications HWBB Function Product Manual (Manual No.: SIEP C710812 13)

## Ratings and Specifications

This section gives the ratings and specifications of SERVOPACKs.

### Ratings

#### ■ Three-Phase, 200 VAC

Model SGDXT-		1R6A	2R8A
Maximum Applicable Motor Capacity (each axis) [kW]		0.2	0.4
Continuous Output Current (each axis) [Arms]		1.6	2.8
Instantaneous Maximum Output Current (each axis) [Arms]		5.9	9.3
Main Circuit	Power Supply	200 VAC to 240 VAC, -15% to +10%, 50 Hz/60 Hz	
	Input Current [Arms] *1	3.9	7.5
Control	Power Supply	200 VAC to 240 VAC, -15% to +10%, 50 Hz/60 Hz	
	Input Current [Arms] *1	0.3	
Power Supply Capacity [kVA] *1		1.5	3.0
Power Loss *1	Main Circuit Power Loss [W]	33.3	60.4
	Control Circuit Power Loss [W]	17	
	Total Power Loss [W]	50.3	77.4
Regenerative Resistor	Built-In Regenerative Resistor	Resistance [Ω]	12
		Capacity [W]	70
		Allowable Power Consumption [W]	14
	Minimum Allowable External Resistance [Ω]	12	
Overvoltage Category		III	

\*1 This is the net value at the rated load.

#### ■ Single-Phase, 200 VAC

Model SGDXT-		1R6A	2R8A
Maximum Applicable Motor Capacity (each axis) [kW]		0.2	0.4 *1
Continuous Output Current (each axis) [Arms]		1.6	2.8
Instantaneous Maximum Output Current (each axis) [Arms]		5.9	9.3
Main Circuit	Power Supply	200 VAC to 240 VAC, -15% to +10%, 50 Hz/60 Hz	
	Input Current [Arms] *2	7.2	12
Control	Power Supply	200 VAC to 240 VAC, -15% to +10%, 50 Hz/60 Hz	
	Input Current [Arms] *2	0.3	
Power Supply Capacity [kVA] *2		1.8	3.6
Power Loss *2	Main Circuit Power Loss [W]	36.2	60.7
	Control Circuit Power Loss [W]	17	
	Total Power Loss [W]	53.2	77.7

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Model SGDXT-		1R6A	2R8A
Regenerative Resistor	Built-In Regenerative Resistor	Resistance [ $\Omega$ ]	12
		Capacity [W]	70
		Allowable Power Consumption [W]	14
	Minimum Allowable External Resistance [ $\Omega$ ]	12	
Overtoltage Category		III	

- \*1 If you use the servomotor with a single-phase power supply input, derate the total continuous output of the motors to 65% of maximum applicable motor capacity  $\times$  number of axes.  
 Example: For the SGDXT-2R8A, make the output  $0.4 \text{ kW} \times 3 \text{ axes} \times 65\% = 0.78 \text{ kW}$  or less. To perform operation at an output of  $0.4 \text{ kW}$  for the first axis and  $0.2 \text{ kW}$  for the second axis, you must limit the output for the third axis to  $0.18 \text{ kW}$  or less.
- \*2 This is the net value at the rated load (when derated for the SGDXT-2R8A).

## ■ 270 VDC

Model SGDXT-		1R6A	2R8A
Maximum Applicable Motor Capacity (each axis) [kW]		0.2	0.4
Continuous Output Current (each axis) [Arms]		1.6	2.8
Instantaneous Maximum Output Current (each axis) [Arms]		5.9	9.3
Main Circuit	Power Supply	270 VDC to 324 VDC, -15% to +10%	
	Input Current [Arms] *1	4.5	9.0
Control	Power Supply	270 VDC to 324 VDC, -15% to +10%	
	Input Current [Arms] *1	0.3	
Power Supply Capacity [kVA] *1		1.8	3.0
Power Loss *1	Main Circuit Power Loss [W]	28.1	50.4
	Control Circuit Power Loss [W]	17	
	Total Power Loss [W]	45.1	67.4
Overtoltage Category		III	

- \*1 This is the net value at the rated load.

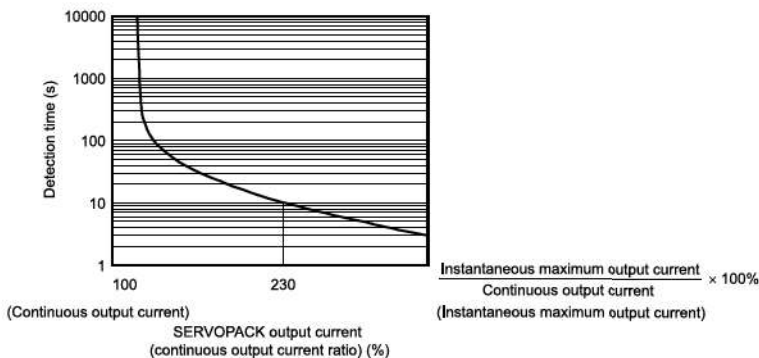
## SERVOPACK Overload Protection Characteristics

The overload detection level is set for hot start conditions with a SERVOPACK surrounding air temperature of  $55^\circ\text{C}$ .

A.710 or A.720 (an overload alarm) will occur if overload operation that exceeds the overload protection characteristics shown in the following diagram (i.e., operation on the right side of the vertical line) is performed.

The actual overload detection level will be the detection level of the connected SERVOPACK or servomotor that has the lower overload protection characteristics.

In most cases, that will be the overload protection characteristics of the servomotor.

**Note:**

- The above overload protection characteristics do not mean that you can perform continuous duty operation with an output of 100% or higher. For a Yaskawa-specified combination of SERVOPACK and servomotor, maintain the effective torque within the continuous duty zone of the torque-motor speed characteristic of the servomotor.
- This overload protection function is not a protection function related to speed. This product does not have a built-in thermal memory hold function.

In addition, the model that requires derating when using with single-phase power supply input (applicable model: SGDXT-2R8A) has separate overload protection characteristics (= SERVOPACK overload detection) in addition to the overload protection characteristics listed above. SERVOPACK overload detection will activate A.729 (Overload 2 Alarm) if operation that exceeds the derated value is continuously performed. Use the following values as guidelines for continuous operation that will exceed the derated value.

- Operation for a long period of time at a load of 115% or more of the derated value.
- Operation for 5 s at a load of 200% of the derated value.

Even if the above conditions are satisfied, the above alarm may not be activated when the SERVOPACK is producing a low amount of heat.


## Specification

### ■ Environmental Conditions

Item	Specification
Surrounding Air Temperature	-5°C to 55°C (With derating, usage is possible between 55°C and 60°C.) Refer to the following section for derating specifications. ☞ <a href="#">Derating Specifications on page 524</a>
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	When there is continuous vibration: 10 Hz to 55 Hz, acceleration amplitude 5.9 m/s <sup>2</sup> (0.6G)
Impact Resistance	19.6 m/s <sup>2</sup>
Degree of Protection	IP20
Pollution Degree	2 <ul style="list-style-type: none"> <li>• Must be no corrosive or flammable gases.</li> <li>• Must be no exposure to water, oil, or chemicals.</li> <li>• Must be no dust, salts, or iron dust.</li> </ul>

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Item	Specification
Altitude	1000 m max. (With derating, usage is possible between 1000 m and 2000 m.) Refer to the following section for derating specifications.  <a href="#">Derating Specifications on page 524</a>
Others	Do not use the SERVOPACK in the following locations: Locations subject to static electricity noise, strong electromagnetic/magnetic fields, or radioactivity

## ■ I/O Signals

Item	Specification
Outputs for Triggers at Preset Positions	Number of output points: 3 (output method: a photocoupler output) Output signals: High-Speed Output Signal for Triggers at Preset Positions 1 to 3 (HSO1 to 3) <b>Note:</b> Normal Output Signal for Triggers at Preset Positions 1 to 5 (/NSO1 to 5) are used by allocating the signals to sequence output signals.
Sequence Input Signals	Input Signals That Can Be Allocated Allowable voltage range: 24 VDC $\pm$ 20% Number of input points: 16 (input method: sink inputs or source inputs) Input signals: <ul style="list-style-type: none"> <li>• P-OT (Forward Drive Prohibit Input) and N-OT (Reverse Drive Prohibit Input) signals</li> <li>• /Probe1 (Probe 1 Latch Input) signal</li> <li>• /Probe2 (Probe 2 Latch Input) signal</li> <li>• /Home (Home Switch Input) signal</li> <li>• /P-CL (Forward External Torque Limit Input) and /N-CL (Reverse External Torque Limit Input) signals</li> <li>• FSTP (Forced Stop Input) signal</li> </ul> A signal can be allocated and the positive and negative logic can be changed.
Sequence Output Signals	Fixed Output Allowable voltage range: 5 VDC to 30 VDC Number of output points: 3 (output method: a photocoupler output (isolated)) Output signal: ALM (Servo Alarm Output) signal
	Output Signals That Can Be Allocated Allowable voltage range: 5 VDC to 30 VDC Number of output points: 5 (output method: a photocoupler output (isolated)) Output signals: <ul style="list-style-type: none"> <li>• /COIN (Positioning Completion Output) signal</li> <li>• /V-CMP (Speed Coincidence Detection Output) signal</li> <li>• /TGON (Rotation Detection Output) signal</li> <li>• /S-RDY (Servo Ready Output) signal</li> <li>• /CLT (Torque Limit Detection Output) signal</li> <li>• /VLT (Speed Limit Detection Output) signal</li> <li>• /BK (Brake Output) signal</li> <li>• /WARN (Warning Output) signal</li> <li>• /NEAR (Near Output) signal</li> <li>• Normal Output Signal for Triggers at Preset Positions 1 to 5 (/NSO1 to 5)</li> </ul> A signal can be allocated and the positive and negative logic can be changed.



## ■ Function

Item		Specification	
Communications	USB Communications (CN7)	Interfaces	Personal computer (with SigmaWin+), digital operator (JUSP-OP07A-E)
		Communications Standard	Conforms to USB2.0 standard (12 Mbps).
Displays/Indicators		CHARGE, RUN, ERR, L/A A, L/A B, and three one-digit seven-segment LED	
EtherCAT Communications Setting Switches		ID Selector (S1 and S2) positions: 16	
EtherCAT Communications	Applicable Communications Standards		IEC 61158 Type 12, IEC 61800-7 CiA402 drive profile
	Physical Layer		100BASE-TX (IEEE802.3)
	Communications Connectors		CN6A (RJ45): EtherCAT signal input connector CN6B (RJ45): EtherCAT signal output connector
	Cable		Category 5, 4 shielded twisted pairs The cable is automatically detected with AUTO MDIX.
	SyncManager		SM0: Mailbox output, SM1: Mailbox input, SM2: Process data output, and SM3: Process data input
	FMMU		FMMU 0: Mapped in process data output (RxPDO) area. FMMU 1: Mapped in process data input (TxPDO) area. FMMU 2: Mapped to mailbox status.
	EtherCAT Commands (Data Link Layer)		APRD, APWR, APRW, FPRD, FPWR, FPRW, BRD, BWR, BRW, LRD, LWR, LRW, ARMW, FRMW
	Process Data		Assignments can be changed with PDO mapping.
	Mailbox		Emergency messages, SDO requests, SDO responses, and SDO information (TxPDO/RxPDO and remote TxPDO/RxPDO are not supported.)
	Distributed Clocks		Free-run mode and DC mode (can be switched.) Applicable DC cycles: 125 μs to 4 ms in 125-μs increments
	Slave Information IF		4 KB
	LED Indicator		During EtherCAT communications: L/A x 2 EtherCAT communications status: RUN x 1 EtherCAT error status: ERR x 1
CiA402 Drive Profile		<ul style="list-style-type: none"> <li>• Homing Mode</li> <li>• Profile Position Mode</li> <li>• Interpolated Position Mode</li> <li>• Profile Velocity Mode</li> <li>• Profile Torque Mode</li> <li>• Cyclic Synchronous Position Mode</li> <li>• Cyclic Synchronous Velocity Mode</li> <li>• Cyclic Synchronous Torque Mode</li> <li>• Touch Probe Function</li> <li>• Torque Limit Function</li> </ul>	
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	
Dynamic Brake (DB)		Activated when a servo alarm or overtravel (OT) occurs, or when the power to the main circuit or servo is OFF.	
Regenerative Processing		Built-in	

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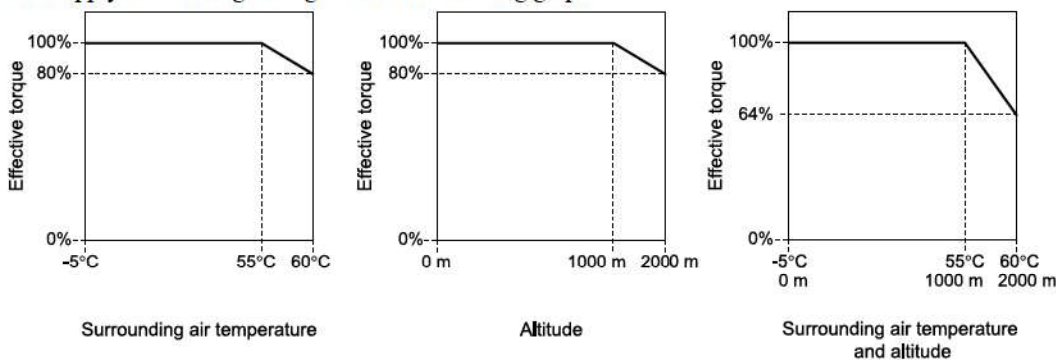
Item	Specification
Overtravel (OT) Prevention	Stopping with dynamic brake, deceleration to a stop, or coasting to a stop for the P-OT (Forward Drive Prohibit Input) or N-OT (Reverse Drive Prohibit Input) signal
Protective Functions	Overcurrent, overvoltage, undervoltage, overload, regeneration error, etc.
Utility Functions	Gain tuning, alarm history, jogging operation, origin search, etc.

### ■ Option

Item	Specification
Applicable Option Modules	None

## Derating Specifications

If you use the SERVOPACK at a surrounding air temperature of 55°C to 60°C or at an altitude of 1000 m to 2000 m, you must apply the derating rates given in the following graphs.

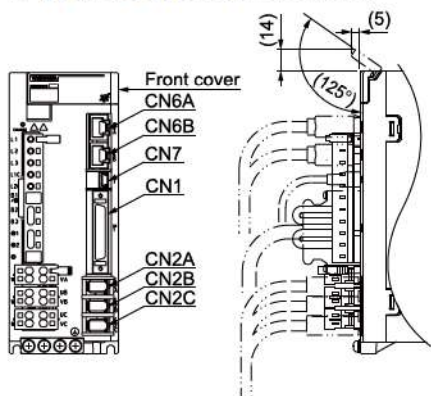


## External Dimensions

### Front Cover Dimensions and Connector Specifications

The front cover dimensions and panel connector section are the same for all capacities. Refer to the following figures and table.

#### ■ Front Cover Dimensions



## ■ Connector Specifications

Connector No.	Model	Number of Pins	Manufacturer
CN1	10250-52A2PL	50	3M Japan Limited
CN2A, CN2B, CN2C	53460-0669	6	Molex Japan Co., Ltd.
CN6A, CN6B	3-1734579-4	8	Tyco Electronics Japan G.K.
CN7	2342993-1	5	Tyco Electronics Japan G.K.

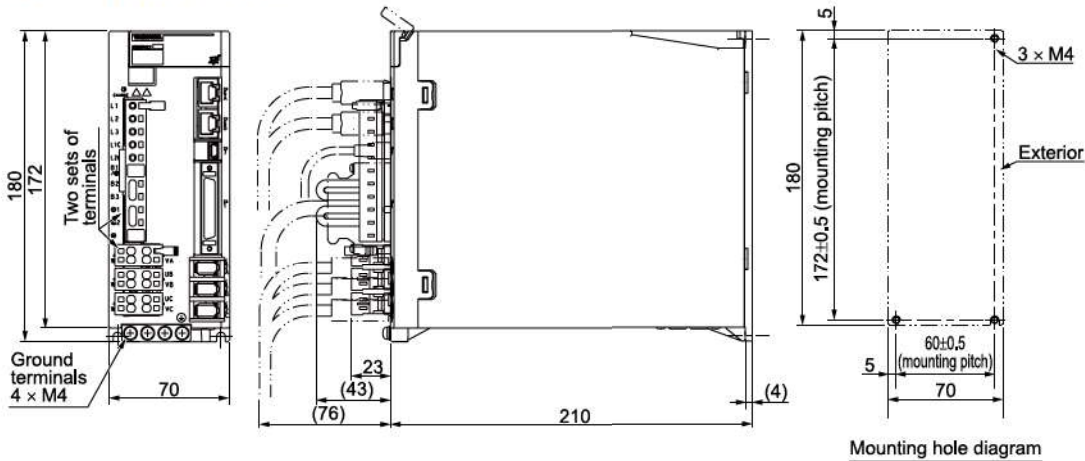
Note:

The above connectors or their equivalents are used for the SERVOPACKs.

## SERVOPACK External Dimensions

### ■ Base-mounted SERVOPACKs

#### ◆ SGDXT-1R6A, -2R8A

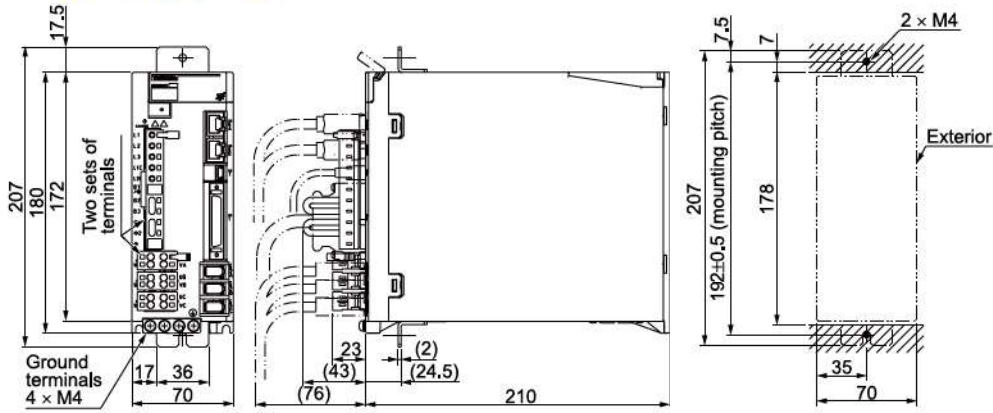


Approx. mass: 2.3 kg  
 Unit: mm

### ■ Rack-mounted SERVOPACKs

Hardware Option Code: 0001

◆ SGDXT-1R6A, -2R8A



Mounting hole diagram

Approx. mass: 2.3 kg  
Unit: mm