



YASKAWA

AC SERVO DRIVES JUNMA SERIES

SJME SERVOMOTOR
SJDE SERVOPACK



駿馬 *Swift and Sure*

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AC SERVO DRIVES JUNMA SERIES CONTENTS

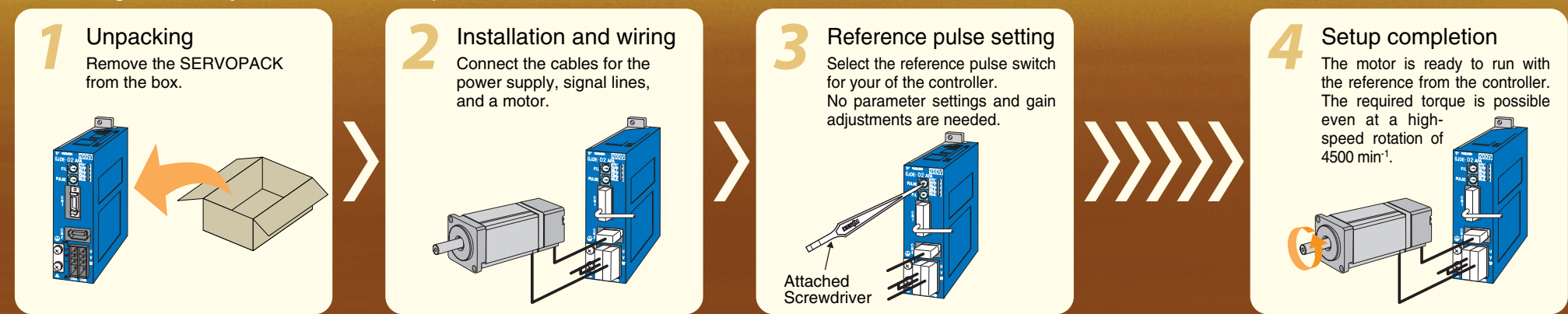
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Junma—a true thoroughbred

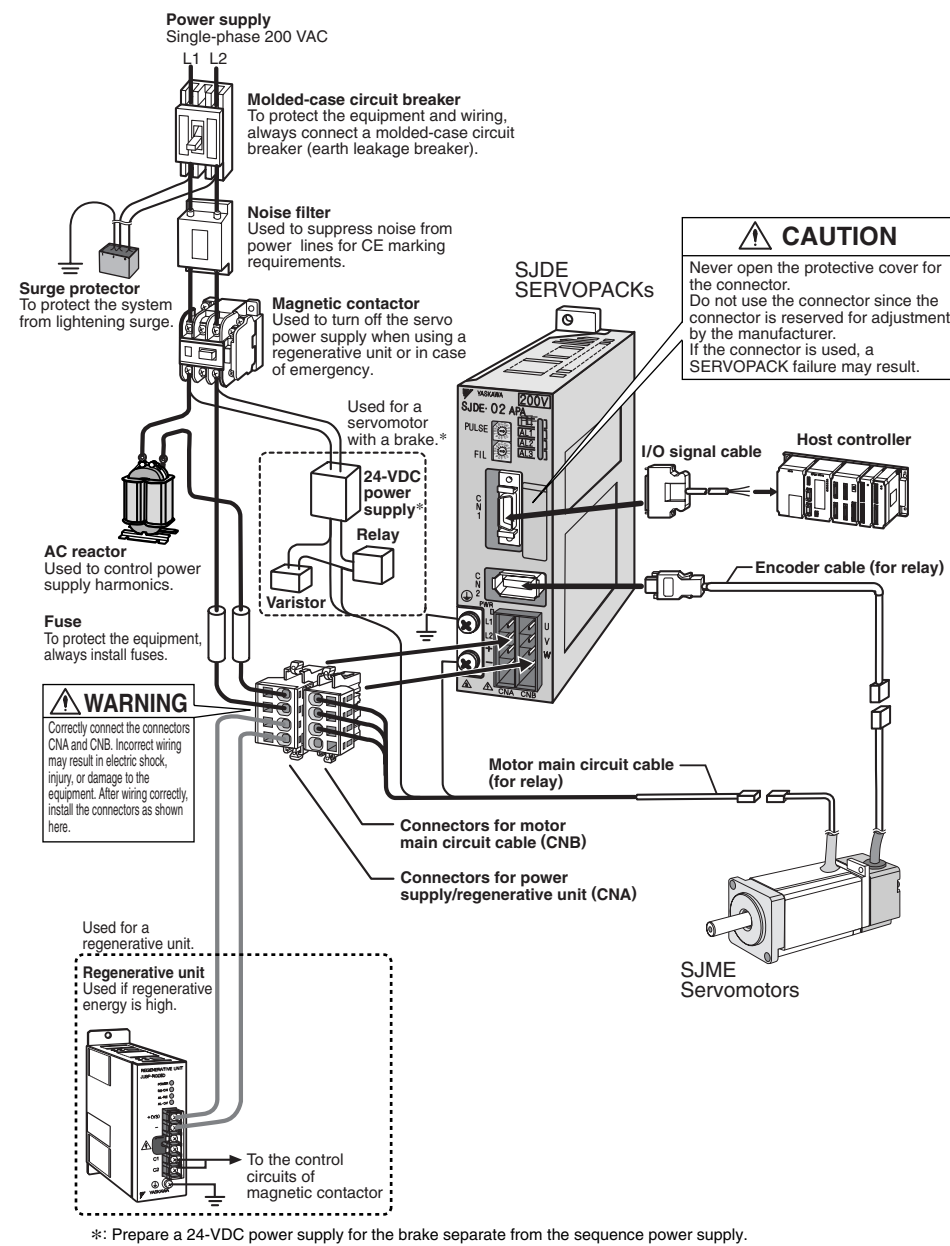
With Yaskawa's world-leading servo drive technology, we are proud to introduce the Junma series for a wide range of applications. Following our policy to make user-friendly products, the Junma series is different from conventional models, because no more parameter settings and no more servo adjustments are required; therefore, the setup and test runs are greatly reduced. Also, the Junma series has the standard servo characteristics such as high response, high speed, high torque, and high accuracy. Try Yaskawa's Junma series to improve your system so that it better suits your needs.

● Fast & Easy Setup

Settings are easy to make, so setup time is reduced.



■ Connection to Peripheral Devices



■ Cables and Connectors

Name	Type/Model	Length	Specifications	Manufacturer	Contact*4	
Servomotor main circuit cables with connectors at both ends (for relay)*1	No brake	JZSP-CHM000-05	5m		Fujix Co., Ltd	KUNSHAN FUJIX IMPORT AND EXPORT TRADE CO.,LTD.
	With brakes	JZSP-CHM000-10	10m			
		JZSP-CHM030-05	5m			
		JZSP-CHM030-10	10m			
Connectors for servomotor main circuit cables*2	Motor end	• Crimp type*3 Receptacle: 5557-06R-210 Terminal: 5556T(chained) or 5556TL(detached)	—		Molex Japan Co., Ltd	① Shanghai Molex Interconnect (Shanghai) Co.,Ltd ② Shenzhen Molex Hong Kong China Ltd., Shenzhen Office
	SERVOPACK end (for CNB)	• Spring type Receptacle: 04JFAT-SAYGF-N	—		JST. Mfg. Co., Ltd.	① Shanghai J.S.T (SHANGHAI) CO.,LTD. ② Hong Kong J.S.T (H.K.) CO.,LTD.
Tool to remove wires*2	J-FAT-OT	—		JST. Mfg. Co., Ltd.		
Connectors for battery case/regenerative unit*2	For CNA	• Spring type Receptacle: 04JFAT-SBXGF-N	—			
Encoder cables with connectors at both ends (for relay)*1		JZSP-CHP800-05	5m		Sun-Wa Technos Corporation	SHANGHAI SUN-WA TECHNOS CO.,LTD
		JZSP-CHP800-10	10m			
Connectors for encoder cables*2	Motor end	• Crimp type*3 Receptacle: 5557-12R-210 Terminal: 5556T2(chained) or 5556T2L(detached)	—		Molex Japan Co., Ltd	① Shanghai Molex Interconnect (Shanghai) Co.,Ltd ② Shenzhen Molex Hong Kong China Ltd., Shenzhen Office
		• Crimp type(gray)*3 Plug and cable cover set: 54599-1005 Plug housing: 51209-1001 Crimp terminal: 59351-8087(chained) or 59351-8187(detached)	—			
	SERVOPACK end (for CN2)	• Soldered type (gray) Plug and cable cover set: 54599-1005 Plug connector: 54593-1011 • Soldered type (black) Shell kit: 36310-3200-008 Receptacle: 36210-0100JL	—			
Cables for I/O signals		JZSP-CHI003-01	1m		Sun-Wa Technos Corporation	SHANGHAI SUN-WA TECHNOS CO.,LTD
		JZSP-CHI003-02	2m			
		JZSP-CHI003-03	3m			
Connectors for I/O signals (for CN1)*2		• Soldered type Shell kit: 10314-52A0-008 Plug: 10114-3000VE	—		Sumitomo 3M Ltd.	

*1: Contact your Yaskawa representative for the servomotor main circuit or the encoder cables of 3m, 15m, and 20m.

*2: Connectors for CNA, CNB, CN1, and CN2 are sold separately.

Connectors at the motor end are also sold separately. The customer must provide these connectors.

*3: Refer to page 27 for a list of models of crimping tools.

*4: Refer to the list on page 34 for contact information.

■ SERVOPACKs and Applicable Peripheral Devices

Rated output	Servomotor		SERVOPACK	Power Supply Capacity per SERVOPACK kVA	Current Capacity for Molded-case Circuit Breakers Arms*1,*2	Current Capacity and Model of External Fuse	Inrush Current Ao-P	Magnetic Contactor	Noise Filter	Surge Protector	AC Reactor	Regenerative Unit
	Without brake	With brake										
100W	SJME-01AMA41	SJME-01AMA4C	SJDE-01APA	0.40	4	OKLK015.T (15Arms)	30	HI-11J	FN2070-6/07	R·C·M-601BQZ-4	X5052	JUSP-RG08D
200W	SJME-02AMA41	SJME-02AMA4C	SJDE-02APA	0.75								
400W	SJME-04AMA41	SJME-04AMA4C	SJDE-04APA	1.2								
750W	SJME-08AMA41	SJME-08AMA4C	SJDE-08APA	2.2								
Manufacturer	Yaskawa Electric Corporation			—	—	Littelfuse Inc.	—	Yaskawa Controls Co., Ltd.	Schaffner Electronic	Okaya Electric Industries Co., Ltd.	Yaskawa Controls Co., Ltd.	Yaskawa Electric Corporation
Contact*3	YASKAWA ELECTRIC (SHANGHAI) CO.,LTD			—	—	KUNSHAN FUJIX IMPORT AND EXPORT TRADE CO.,LTD.	—	YASKAWA ELECTRIC (SHANGHAI) CO.,LTD	Schaffner EMC Ltd.Shanghai	OKAYA HONG KONG TRADING LIMITED.	YASKAWA ELECTRIC (SHANGHAI) CO.,LTD	

*1: Typical value at the rated load. The specified derating is required to select the appropriate capacity of molded-case circuit breaker.

*2: Operating characteristics (25°C): 200% two seconds min. and 700% 0.01 seconds min.

*3: Refer to the list on page 34 for contact information.

Note: The ground protection circuit is designed for ground fault inside the motor windings while the motor is running. Therefore, it may not protect the system under the following conditions.

- A low-resistance ground fault occurs between the main circuit cable and connector for the servomotor.
- The power supply is turned ON during a ground fault.

To configure a safer system, install an earth leakage breaker to protect against both overloads and shortcircuits, or install an earth leakage breaker for ground protection and a molded-case circuit breaker.

Selection of Devices

■ Precautions when Selecting Peripheral Devices

● Regenerative Units

The rotational energy of driven machines, including servomotor, is returned to the SERVOPACK as electric power. This is called regenerative power. The power is absorbed by the smoothing capacitor. When the capacitor has reached its limit in power absorption, the excess is then consumed by the regenerative unit.

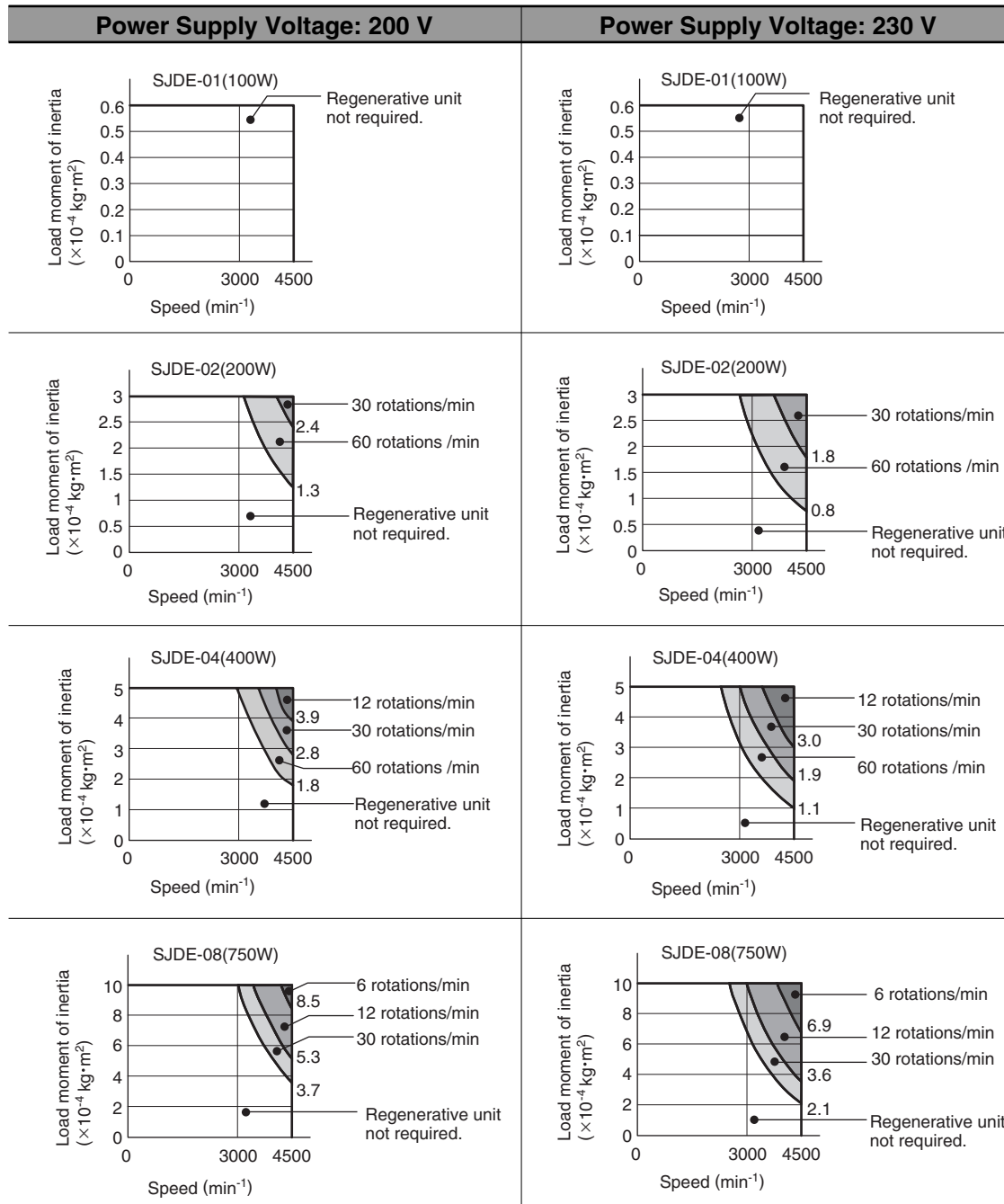
The servomotor is driven in the regeneration state in the following circumstances:

- While decelerating to a stop during acceleration and deceleration operation.
- During continuous operation on the vertical axis.
- During continuous operation with the servomotor rotated from the load side (negative load).

<Allowable Load Inertia Moment and Allowable Regenerative Frequency with Regenerative Unit >

The graphs below show the capacity absorbed regenerative energy and allowable regenerative frequency of the SERVOPACKs with regenerative units connected.

The graphs show values for horizontal axis. For the vertical axis, refer to the JunmaSize+: AC Servomotor Selection Software.



Note: An overvoltage alarm will occur without a required regenerative unit.

<Caution>

- Do not touch the regenerative units as they reach high temperatures. Use heat-resistant, non-flammable wiring and make sure that the wiring does not touch the units. For connecting wire size when connecting a unit, refer to P16.
- The regenerative unit has three error detection functions: regenerative resistor burnout, regenerative transistor failure, and overvoltage detection. When these functions are tripped, the built-in alarm relay will operate and the C1 and C2 output terminals of the regenerative unit will be opened.
- Construct a sequence so that the power supply (through L1 and L2) to the SERVOPACK will be always shut OFF when the alarm relay operates. Two to three seconds are required to reset the alarm relay once the alarm relay operates. The alarm state will return to normal when the main capacitor in the SERVOPACK finishes discharging.

● Molded-case Circuit Breaker (MCCB)

If selecting a molded-case circuit breaker, observe the following precautions.

<Maximum Input Current >

- The instantaneous maximum output of SERVOPACK is approximately 3 times the rated output. The output can last up to 3 seconds. Accordingly, select a molded-case circuit breaker whose breaking time is 5 seconds or more at 300% of SERVOPACK rated current. The general-purpose low-speed acting molded-case circuit breakers are applicable.
- The consumption of other controllers must be considered when selecting a molded-case circuit breaker.
- The power-supply capacity per SERVOPACK when using a servomotor is described in ■ *SERVOPACKs and Applicable Peripheral Devices* on page 4. If using several SERVOPACKs, select a molded-case circuit breaker with a capacity larger than the effective load current, which is calculated from the total power supply capacity.

< Inrush Current >

- The allowable inrush current for a low-speed acting molded-case circuit breaker is approximately 10 times the rated current for 0.02 seconds.
- If several SERVOPACKs are being used at the same time, select a molded-case circuit breaker with an allowable current (20 ms) greater than the total inrush current of the SERVOPACK.
- Refer to ■ *SERVOPACKs and Applicable Peripheral Devices* on page 4 for more information on the SERVOPACK's inrush current.

● Earth Leakage Breaker

- It is recommended to use a general-purpose circuit breaker of the rated current 200 mA or more, or a circuit breaker for inverters (for high-frequency).
- High-frequency current may leak through the armature of a servomotor when switching in the SERVOPACKs.

● Magnetic Contactor

A magnetic contactor is required to make the AC power to SERVOPACK ON/OFF sequence externally. Be sure to attach a spark killer to the excitation coil of the magnetic contactor.

● Noise Filter

- Install a noise filter on the power supply line for peripheral equipment as necessary.
- Use a noise filter to prevent noise interference. If the equipment is to be used near private houses or may receive noise interference, install a noise filter on the input side of the power supply line. Because the SJDE SERVOPACK is designed as an industrial device, it provides no mechanism to prevent noise interference.
- Install the input reference device and noise filter as close to the SERVOPACK as possible.

Servomotors

Ratings and Specifications

Voltage		200 VAC				Description
Servomotor Model: SJME-□□A		01	02	04	08	
Applicable SERVOPACK	SJDE-□□A	01	02	04	08	—
Rated Output*1	W	100	200	400	750	Motor output at the rated operating point
Rated Torque*1,*2	N·m	0.318	0.637	1.27	2.39	Torque at the rated operating point
Instantaneous Peak Torque*1	N·m	0.955	1.91	3.82	7.16	Maximum instantaneous torque of the motor
Rated Current*1	Arms	0.84	1.1	2.0	3.7	Current flowing to the motor at the rated operating point
Instantaneous Max. Current*1	Arms	2.5	3.3	6.0	11.1	Maximum instantaneous current that is allowed to flow to the motor
Rated Speed*1	min ⁻¹	3000				Speed at the rated operating point
Max. Speed*1	min ⁻¹	4500				Highest possible speed
Torque Constant	N·m/Arms	0.413	0.645	0.682	0.699	Generated torque ratio for current flowing to the motor
Rotor Moment of Inertia	kg·m ² × 10 ⁻⁴	0.0634	0.330	0.603	1.50	Inertia moment at the rotor shaft
Rated Power Rate*1	kw/s	16.0	12.3	26.7	38.1	Motor output per unit time
Rated Angular Acceleration*1	rad/s ²	50200	19300	21100	15900	The theoretical angular acceleration (also called torque-to-inertia ratio) at the rated torque
Time Rating		Continuous				"Continuous rating" means that the temperature of the servomotor in continuous operation under specified conditions will not exceed a specified temperature or other limitation.
Thermal Class		B				Highest allowable temperature for armature winding: 130°C
Vibration Class		15µm or below				The maximum vibration amplitude of the motor expressed in units of micrometers on the condition that the vibration is measured with a vibrometer parallel to the shaft and in two directions perpendicular to the shaft.
Withstand Voltage		1500 VAC for one minute				—
Insulation Resistance		500 VDC, 10 MΩ min.				—
Enclosure		Totally enclosed, self-cooled, IP55 (excluding shaft opening and connectors)				Level of protection from dust and water drops
Impact Resistance		Impact acceleration: 490 m/s ² in three directions — vertical, side to side, and front to back. Impact occurrences: 2				Impact resistance of the motor in three directions (up and down, left and right, and back and forth) with the motor shaft mounted horizontally
Vibration Resistance		Vibration acceleration: 49 m/s ² in three directions — vertical, side to side, and front to back.				Vibration resistance of the motor in three directions (up and down, left and right, and back and forth) with the motor shaft mounted horizontally

*1: These items and speed/torque characteristics quoted in combination with an SJDE SERVOPACK are at an armature winding temperature of 100°C. Other values quoted at 20°C.

*2: The rated torques listed here are the values for the continuous allowable torque at 40°C with an aluminum heatsink (250 mm × 250 mm × 6 mm) attached.

Holding Brake Specifications

Servomotor Model: SJME-□□A		01	02	04	08	Description
Rated Voltage		24 VDC ±10%				—
Holding Brake Moment of Inertia*	kg·m ² × 10 ⁻⁴	0.0075	0.064	0.171		—
Capacity	W	6	6.9	7.7		—
Min. Holding Torque (Static Friction Torque)	N·m	0.318	1.27	2.39		Torque against an external force to hold the shaft
Coil Resistance	Ω(at 20°C)	96	83	75		Resistance of the built-in coil in the brake
Rated Current	A(at 20°C)	0.25	0.29	0.32		Current that flows when the brake is released
Brake Release Time	ms	80 max.				Time from when the power for the holding brake is turned on until the brake is released.
Rise Time for Holding Torque	ms	100 max.				Time from when the power for the holding brake is turned off until the brake reaches the set torque.

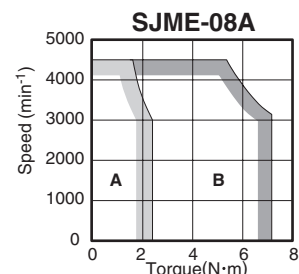
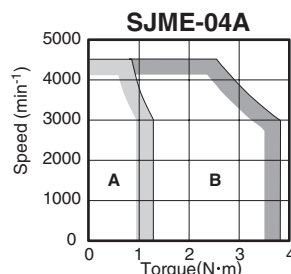
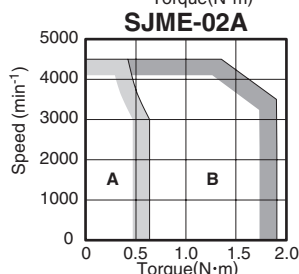
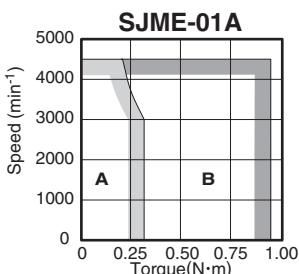
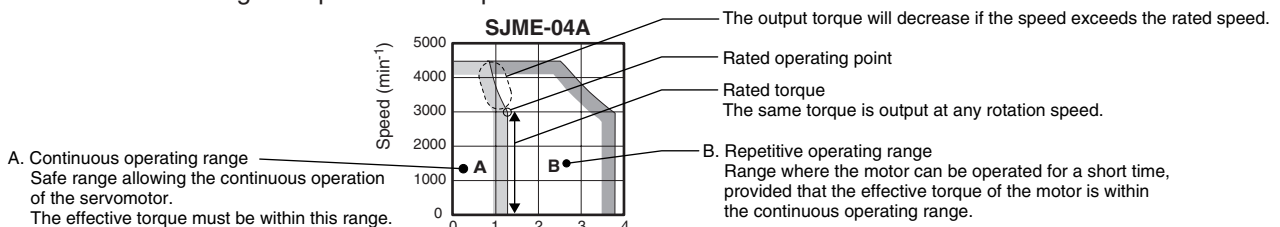
*: To obtain the motor moment of inertia with a brake, add the holding brake moment of inertia to the rotor moment of inertia. The rated power rate and angular acceleration of the motor will change according to the motor moment of inertia.

Notes: 1 The holding brake is only used to hold the load and cannot be used to stop the servomotor.

2 Do not use the holding brake when the servo is on. Failure to observe this caution may result in an overload in the SERVOPACK or a decrease in the brake life.

Speed / Torque Characteristics

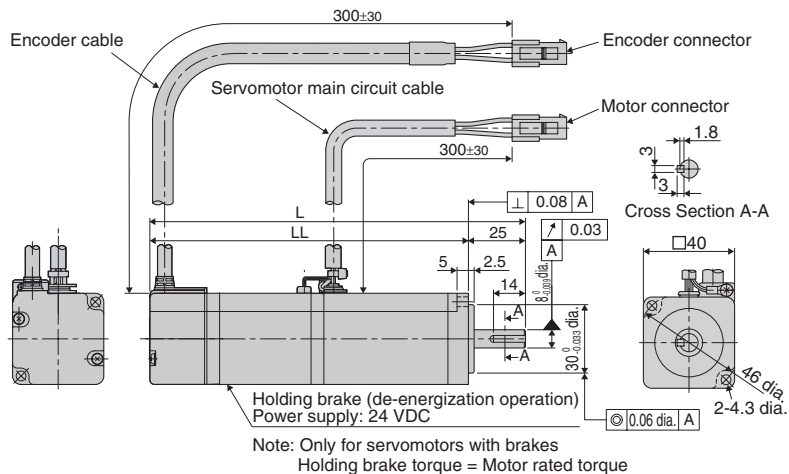
How to Read a Graph of Speed and Torque Characteristics



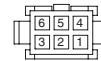
8 Note: Solid lines show the torque/speed characteristics of the servomotor at 200 VAC, and the broken lines show them at 230 VAC.

■ Dimensions Units: mm

● 100W



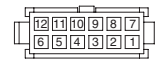
Motor Connector Specifications



Plug:
5559-06P-210
Terminal (No.1 to 3, 5, 6):
5558T(chained) or 5558TL(detached)
Grounding Pin (No.4):
30490-2002(chained) or
30490-2012 (detached)
(Manufacture: Molex Japan Co., Ltd)

No brake		With brake		
1	Phase U	Red	Phase U	Red
2	Phase V	White	Phase V	White
3	Phase W	Blue	Phase W	Blue
4	F G	Green/Yellow	F G	Green/Yellow
5	-	-	Brake	Red
6	-	-	Brake	Black

Encoder Connector Specifications

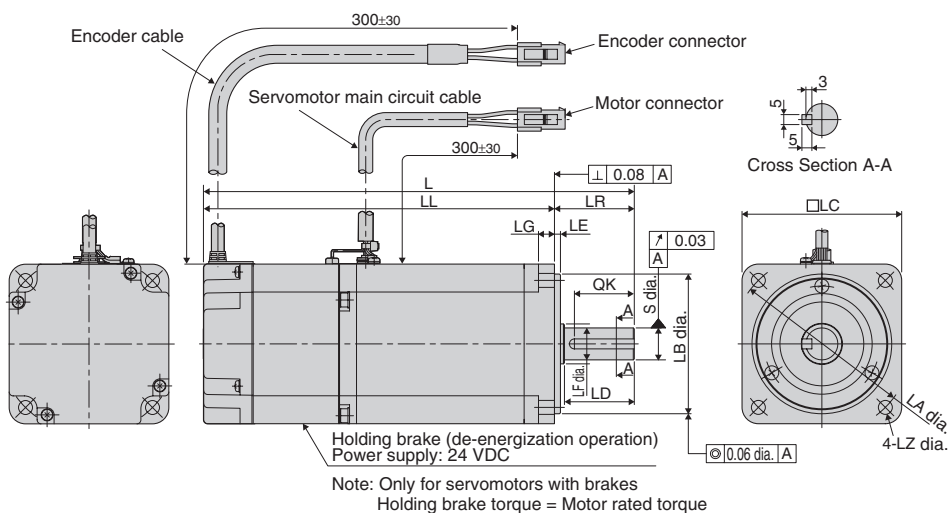


Plug:
5559-12P-210
Terminal:
5558T2(chained) or
5558T2L(detached)
(Manufacture: Molex Japan Co., Ltd)

1	PG5V	Red
2	PG0V(GND)	Black
3	Phase A+	Blue
4	Phase A-	Blue/White
5	Phase B+	Yellow
6	Phase B-	Yellow/White
7	Phase /Z	Purple
8	Phase U	Gray
9	Phase V	Green
10	Phase W	Orange
11	-	-
12	FG	Shield

Type SJME-	L	LL	Approx. Mass kg
01AMA41	119	94	0.5
01AMA4C	164	139	0.8

● 200W to 750W



Type SJME-	L	LL	LR	LG	LE	S	LB	LC	LD	LF	LA	LZ	QK	Approx. Mass kg
02AMA41	125.5	95.5	30	6	3	14 ⁰ _{-0.011}	50 ⁰ _{-0.039}	60	-	-	70	5.5	20	0.9
02AMA4C	165.5	135.5												1.5
04AMA41	148.5	118.5												1.3
04AMA4C	188.5	158.5	40	8	3	16 ⁰ _{-0.011}	70 ⁰ _{-0.046}	80	35	20	90	7	30	1.9
08AMA41	173	133												2.6
08AMA4C	216	176												3.5

■ Ratings and Specifications

SERVOPACK model		SJDE-	01APA	02APA	04APA	08APA	Description
Max. applicable servomotor capacity [kW]			0.1	0.2	0.4	0.75	Motor capacity that the SERVOPACK can drive.
Continuous output current [Arms]			0.84	1.1	2.0	3.7	Current that the SERVOPACK can output continuously.
Instantaneous max. output current [Arms]			2.5	3.3	6.0	11.1	Maximum current that the SERVOPACK can output instantaneously.
Input power supply (for main circuit and control circuit)		Voltage	Single-phase 200 V to 230 VAC, +10% to -15%				-
		Frequency	50/60Hz ±5%				-
		Capacity at rated output [kVA]	0.40	0.75	1.2	2.2	Power supply capacity required to operate a motor at the rated output.
Power loss at rated output [W]			14	16	24	35	Electric power emitted as heat from the SERVOPACK while operating the motor at the rated torque and rated speed.
Input control method		Capacitor-input type, single-phase full-wave rectification with resistance to prevent inrush currents.					-
Output control method		PWM control, sine wave power driven system					-
Feedback		Analog output encoder					Speed or position detector fixed on the motor shaft opposite the load side.
Allowable load inertia [kgm ²]*1			0.6×10 ⁻⁴	3×10 ⁻⁴	5×10 ⁻⁴	10×10 ⁻⁴	Maximum allowable moment of inertia converted into the moment of inertia at the motor shaft of the machine.
I/O Signals	Input signal for reference Designated pulse type and pulse resolution with PULSE switch.	Pulse type	Select one of the following signals: 1. CCW + CW 2. Sign + pulse train 3. CCW + CW (logic reversal) 4. Sign + pulse train (logic reversal)				Type of pulse train signal to drive motor, input into the SERVOPACK. For CCW+CW, input both forward and reverse rotation pulse trains.
		Pulse resolution	Select one of the following signals: 1. 1000 pulses/rev (Open collector/line driver) 75 kpps max. 2. 2500 pulses/rev (Open collector/line driver) 187.5 kpps max. 3. 5000 pulses/rev (Line driver) 375 kpps max. 4. 10000 pulses/rev (Line driver) 750 kpps max.				Number of reference pulses required to rotate the motor one turn
	Clear input signal	Clears the positioning error when turned ON.					-
	Servo ON input signal	Turns the servomotor on or off.					-
	Alarm output signal	OFF if an alarm occurs. Note: OFF for 2s when power is turned ON.					-
	Brake output signal	External signal to control brakes. Turn ON to release the brake.					-
	Positioning completed output signal	ON if the current position is equal to the reference position ± 10 pulses.					-
Built-in functions	Origin output signal	ON if the motor is at the origin. (Width: 1/500 rev) Note: Use the pulse edge that changes the signal from OFF to ON.					Only one point of origin per rotation
	Dynamic brake (DB)	Operated at main power OFF, servo alarm, servo OFF. (OFF after motor stops; ON if the motor power is off.)					Method that stops the motor by short-circuiting the internal circuit of the SERVOPACK.
	Regenerative processing	Optional (If the regenerated energy is too large, install a regenerative unit.)					Function to consume rotational power generated when the motor is rotated by external force. This function is required for a high load moment of inertia.
	Protection*2	Speed errors, overload, encoder errors, voltage errors, overcurrents, disablement of the built-in cooling fan, system errors. Note: No built-in circuit for ground protection.					-
	LED display	5 (PWR, REF, AL1, AL2, AL3)					-
	Reference filter	Select one of eight levels with FIL switch.					-
	Cooling method	Forced cooling (built-in fan)					-
Operating temperature	0°C to +55°C					-	
Operating humidity	90% RH or less (with no condensation)					-	
Storage temperature	-20°C to +70°C					-	
Storage humidity	90% RH or less (with no condensation)					-	
Installation site	<ul style="list-style-type: none"> Free of corrosive gases Free of dust and iron powder Clean and dry 					-	
Altitude	1000 m or below					-	
Vibration resistance	4.9m/s ²					-	
Shock resistance	19.6m/s ²					-	
Operating conditions	Installation category (overvoltage category): II Pollution degree: 2 Protection class: IP1X (EN50178)					-	

*1: Be sure to use the motor with in the allowable load inertia moment.

The operation of the motor will become unstable if the allowable load Inertia moment is exceeded.

*2: The ground protection circuit is designed for ground fault inside the motor windings while the motor is running.

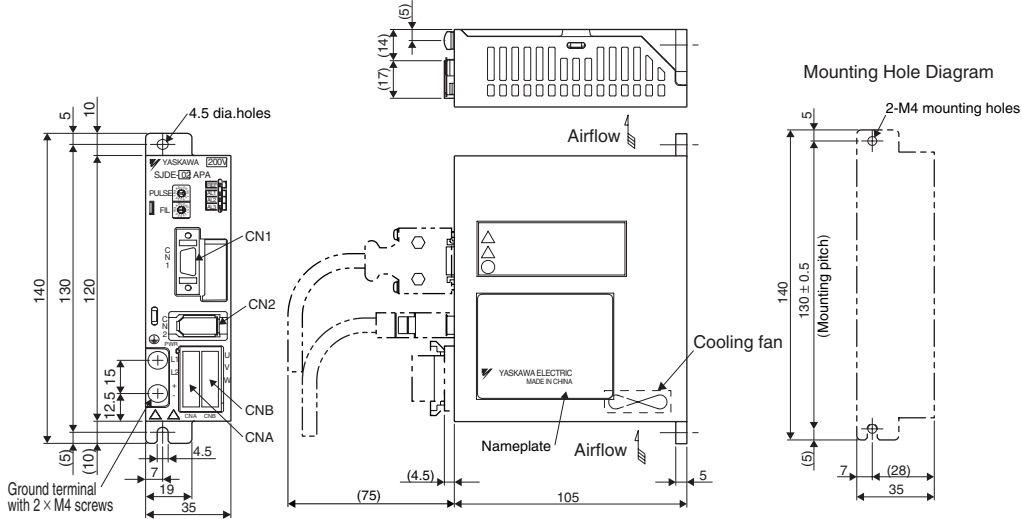
Therefore, it may not protect the system under the following conditions.

- A low-resistance ground fault occurs in the main circuit cable or in the connector of the cable for the servomotor.
- The power supply is turned ON during a ground fault.

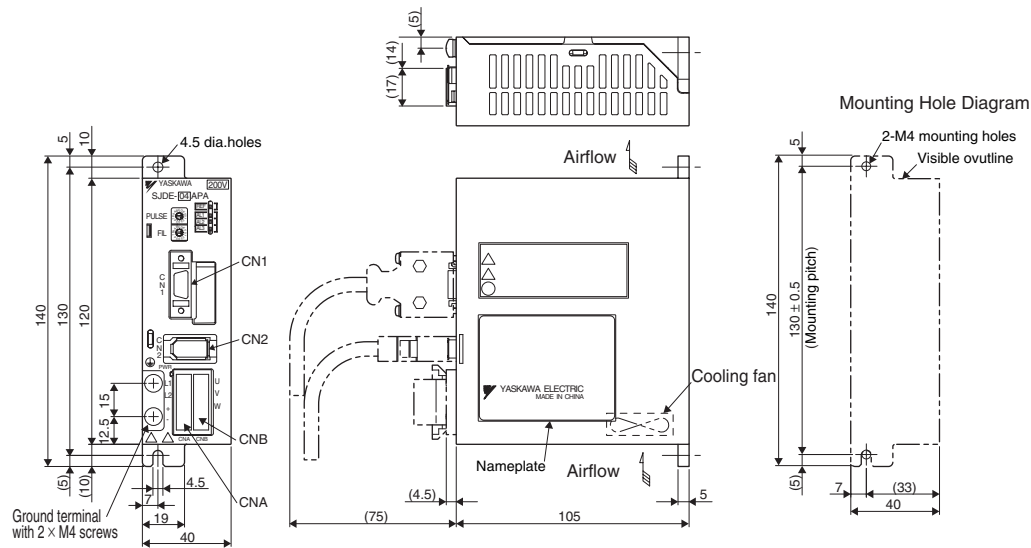
To configure a safer system, install an earth leakage breaker to protect against both overloads and shortcircuits, or install an earth leakage breaker for ground protection and a molded-case circuit breaker.

■ Dimensions Units: mm

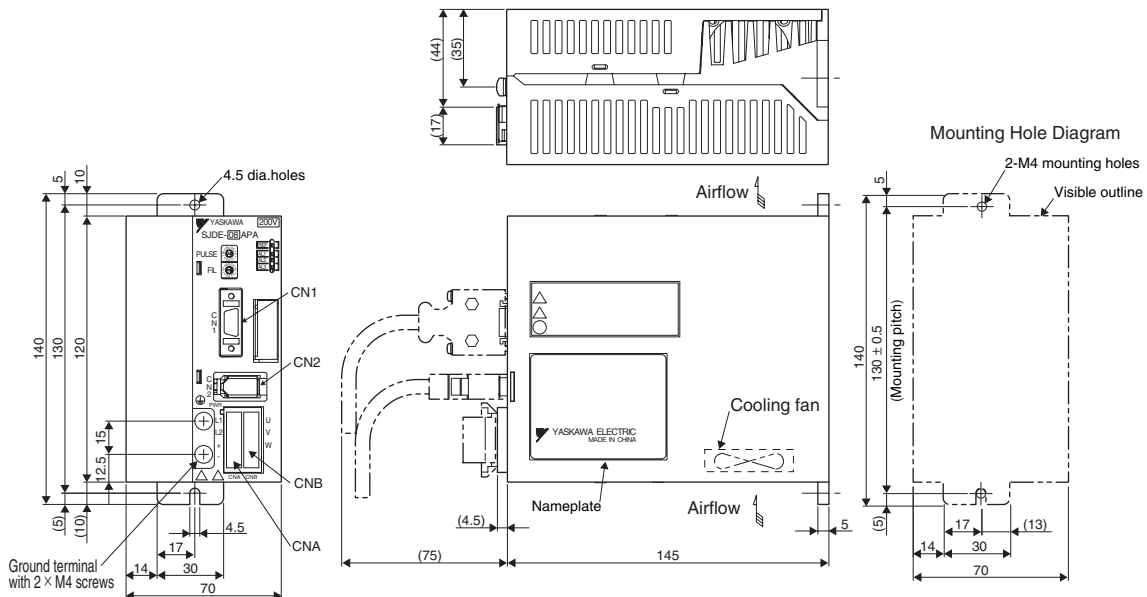
● SJDE-01, 02 (100W, 200W)



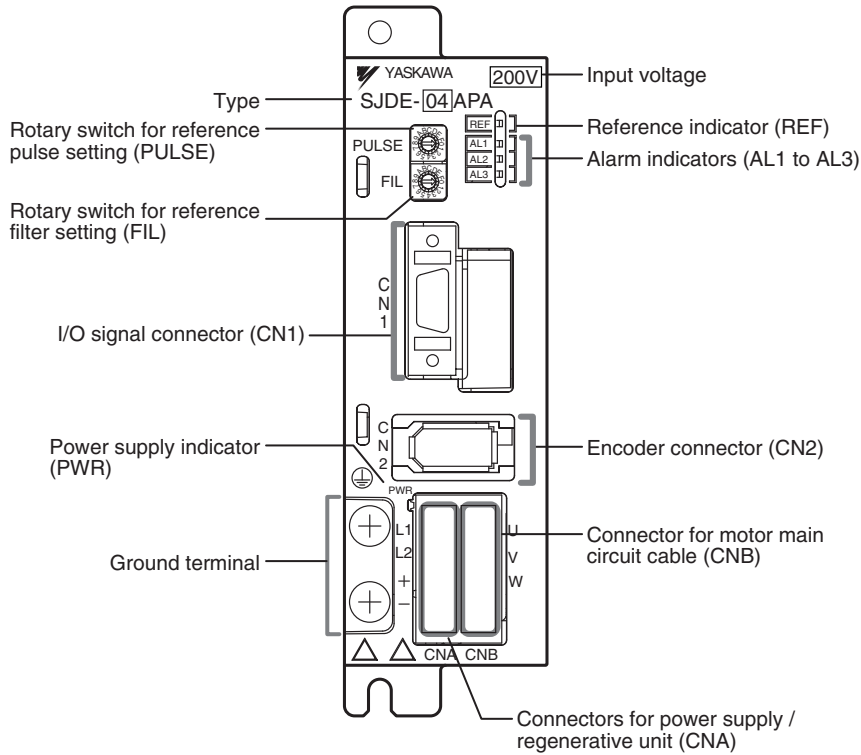
● SJDE-04 (400W)



● SJDE-08 (750W)



Part Names and Functions



Reference Pulse Setting (PULSE)



Pulse Setting Value	Reference Pulse Resolution (P/REV)	Reference Pulse Connection Method	Reference Pulse Type
0	1000	Open collector or line driver	CW + CCW Positive logic
1	2500		CW
2	5000		CCW
3	10000	Line driver	
4	1000	Open collector or line driver	CW + CCW Negative logic
5	2500		CW
6	5000		CCW
7	10000	Line driver	
8	1000	Open collector or line driver	Sign + pulse sequence, Positive logic
9	2500		PULS
A	5000		SIGN
B	10000	Line driver	
C	1000	Open collector or line driver	Sign + pulse sequence, Negative logic
D	2500		PULS
E	5000		SIGN
F	10000	Line driver	

Notes: 1 Make settings after turning OFF the power.
2 The factory setting is 0.

Reference Filter Setting (FIL)



Filter Setting Value*1	Acceleration/Deceleration Time for Step Reference*4	Time between Set Reference and Completed Positioning (Settling Time)*3	Description
0*2	45ms	100 to 200ms	Small filter time constant (short positioning time) Large filter time constant (little vibration with a long positioning time)
1	50ms	110 to 220ms	
2	60ms	130 to 260ms	
3	65ms	150 to 300ms	
4	70ms	170 to 340ms	
5	80ms	200 to 400ms	
6	85ms	250 to 500ms	
7	170ms	500 to 1000ms	
8 to F	Do not set 8 through F.		

*1: If the machine vibrates when starting or stopping the machine, set a larger value.
 *2: The factory setting is 0. Not necessary to change this value unless machine vibrates.
 *3: The value changes depending on conditions such as the level of command acceleration and deceleration, the rigidity of the motor drive of the machine, and the motor resolution.
 *4: Select the appropriate servomotor capacity with these values if using a step reference without any acceleration or deceleration time.

● Reference (REF)

Indicators*	Motor Power	Reference Pulses
Lit orange.	OFF	—
Blinks orange.	OFF	Input
Lit green.	ON	—
Blinks green.	ON	Input

*: Lit yellow for 1 s when the clear signal is input.

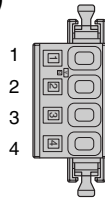
● Alarm (AL1, AL2, and AL3)

■ : Lit □ : OFF

Indicators	Meaning of Alarm	Indicators	Meaning of Alarm
AL1 □ AL2 □ AL3 □	Normal	AL1 ■ AL2 □ AL3 ■	Overcurrent
AL1 ■ AL2 □ AL3 □		Speed error	
AL1 □ AL2 ■ AL3 □	Overload	AL1 ■ AL2 ■ AL3 ■	System error
AL1 ■ AL2 ■ AL3 □	Encoder error	AL1 ■ □ AL2 ■ ↔ □ AL3 ■ □	Rotary switch for reference pulse setting (PULSE) changed. Blinks at regular intervals.
AL1 □ AL2 □ AL3 ■		Voltage error	

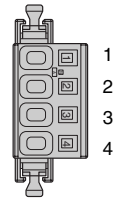
● Connector for Power Supply/Regenerative Unit (CNA)

Pin No.	Symbol	Signal Name
1	L1	Power supply input terminals
2	L2	
3	+	Regenerative unit connection terminals
4	-	



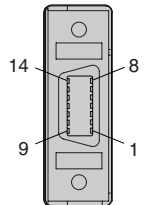
● Connector for Motor Main Circuit Cable (CNB)

Pin No.	Symbol	Signal Name
1	U	Phase U
2	V	Phase V
3	W	Phase W
4	-	Not used



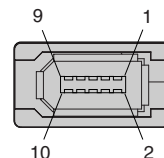
● I/O Signal Connector (CN1)

Pin No.	I/O	Symbol	Signal Name	Pin No.	I/O	Symbol	Signal Name
1	Input	CW, PULS	Reverse rotation pulse, reference pulse	8	Input	CLR	Position error pulse clear
2	Input	/CW, /PULS		9	Input	/CLR	
3	Input	CCW, SIGN	Forward rotation pulse, reference sign	10	Output	PCO	Phase-C signal
4	Input	/CCW, /SIGN		11	Output	SG-PCO	Phase-C signal ground
5	Input	+24VIN	External input power supply	12	Output	ALM	Servo alarm
6	Input	/S-ON	Servo ON	13	Output	/BK	Brake
7	Output	SG-COM	Output signal ground	14	Output	/COIN	Positioning completed
				Shell	-	-	FG



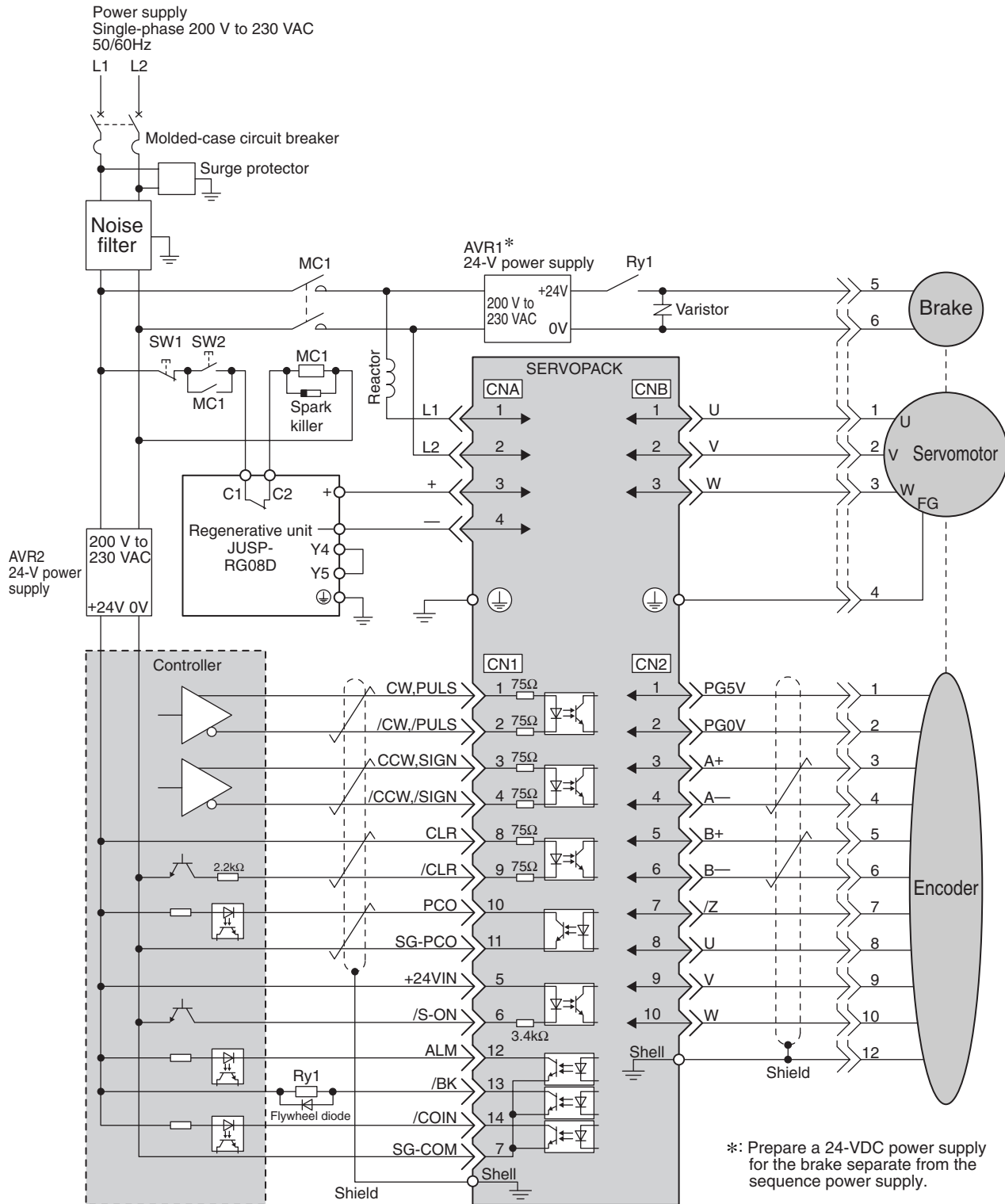
● Encoder Connector (CN2)

Pin No.	Symbol	Signal Name	Pin No.	Symbol	Signal Name
1	PG5V	PG power supply +5 V	6	B-	Phase B-
2	PG0V	PG power supply 0 V	7	/Z	Phase /Z
3	A+	Phase A+	8	U	Phase U
4	A-	Phase A-	9	V	Phase V
5	B+	Phase B+	10	W	Phase W



Connection Diagram

Example



Notes: 1 AVR1: 24-VDC power supply for brake
 AVR2: 24-VDC power supply for sequence
 SW1 : Power OFF switch
 SW2 : Power ON switch
 MC1 : Magnetic contactor
 Ry1 : Relay for brake

• Manufacturers of Components

Spark killer	Okaya Electric Industries Co., Ltd.:	CRE-50500
Flywheel diode	Toshiba Corp.:	1NH42
Relay for brake	Omron Corp.:	MY series
Varistor	Nippon Chemi-Con Corp.:	TNR7V121K

2 The ground protection circuit is designed for ground fault inside the motor windings while the motor is running. Therefore, it may not protect the system under the following conditions.

- A low-resistance ground fault occurs between the main circuit cable and connector for the servomotor.
- The power supply is turned ON during a ground fault.

To configure a safer system, install an earth leakage breaker to protect against both overloads and shortcircuits, or install an earth leakage breaker for ground protection and a molded-case circuit breaker.

■ Main Circuit Wiring

- SJDE SERVOPACKs are suitable where the power supply is less than 5000 Arms (230 V rms max.).
- SERVOPACKs must be used with UL-listed fuses or circuit breakers, in accordance with the National Electrical Code (NEC).
- Use 75 °C heat-resistant copper wires or an equivalent.

■ SERVOPACK Main Circuit Wire Size and Tightning Torque

● Cable Types

Cable Types		Allowable Conductor Temperature
Symbol	Name	
PVC	Normal vinyl cable	–
IV	600-V vinyl cable	60°C
HIV	Temperature-resistant vinyl cable	75°C

- Wire sizes are selected for three cables per bundle at 40 °C ambient temperature with the rated current.
- Use cables with a minimum withstand voltage of 600 V for main circuits.
- If cables are bundled in PVC or metal ducts, consider the reduction ratio of the allowable current.
- Use heat-resistant cables under high ambient or panel temperatures where normal vinyl cables will rapidly deteriorate.
- Do not use cables under continuous regenerative state.

The following table shows the wire size and allowable current for three cables. Use a cable whose specifications meet or are less than the values in the table.

● 600-V Heat-resistant Vinyl Cables (HIV)

AWG Size	Nominal Cross Section Diameter mm ²	Configuration Number of wires/mm ²	Conductive Resistance Ω /mm	Allowable Current at Ambient Temperature A		
				30°C	40°C	50°C
20	0.5	19/0.18	39.5	6.6	5.6	4.5
—	0.75	30/0.18	26.0	8.8	7.0	5.5
18	0.9	37/0.18	24.4	9.0	7.7	6.0
16	1.25	50/0.18	15.6	12.0	11.0	8.5
14	2.0	7/0.6	9.53	23	20	16

Note: The values in the table are only for reference.

Connection Diagram

● Power Supply Input Terminals (L1, L2), Motor Connection Terminals (U, V, W), and Regenerative Unit Connection Terminals (+, -)

Capacity W	SERVOPACK Type	Terminal Symbol		
		L1, L2	U, V, W	+, -
100	SJDE-01A	HIV1.25mm ²	HIV1.25mm ² Wiring length: 20 m max.	HIV1.25mm ² Wiring length: 0.5 m max.
200	SJDE-02A			
400	SJDE-04A	HIV2.0mm ²		
750	SJDE-08A			

Note: Connectors are used for all wiring.

● Ground Terminal (⊕)

Wire Size	Terminal Screw Size	Tightening Torque
HIV 2.0 mm ² min.	M4	1.2 to 1.4N·m

<Signal Line Wire Sizes>

The following wires are used for the CN1 and CN2 connectors on the SERVOPACK.

Connector Name and Symbol		Item	Specifications
I/O signal connector	CN1	Cable	Use twisted-pair wires or shielded twisted-pair wires.
		Maximum cable length	3m
		Applicable wires	AWG24(0.2 mm ²), AWG26(0.12 mm ²), AWG28(0.08 mm ²)
		Finished cable outer diameter	8 mm dia. max.
Encoder signal connector	CN2	Cable	Use the cables specified by Yaskawa or use shielded twisted-pair wires.
		Maximum cable length	20m
		Applicable wires	AWG22 (0.33 mm ²) and AWG26 (0.12 mm ²) Used AWG22 for the encoder power supply and AWG26 for signal lines.
		Finished cable outer diameter	9 mm dia. max.

■ Wiring Precautions

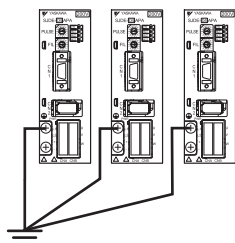
- Only an electrical engineer should perform the wiring.
- Design the circuit so that both the /S-ON signal and the main-circuit power supply turn OFF at an emergency stop.
- An overtravel function is not provided for the SERVOPACK. To configure a safer system, include a function so that the /S-ON signal will turn OFF when the limit switch is activated.
- If the servomotor is used to drive a vertical axis, install a safety device such as a counterweight to prevent the workpiece from falling down when an alarm occurs. Failure to observe this precaution may result in injury or damage to the equipment from fallen workpieces.
- Use a molded-case circuit breaker and fuse to protect the power supply line from high voltage. The SJDE SERVOPACK connects directly to a commercial power supply without a transformer, so always use a circuit breaker and fuse to protect the SERVOPACK from accidental high voltage.
- The ground protection circuit is designed for ground fault inside the motor windings while the motor is running. Therefore, it may not protect the system under the following conditions.
 - A low-resistance ground fault occurs between the main circuit cable and connector for the servomotor.
 - The power supply is turned ON during a ground fault.

To configure a safer system, install an earth leakage breaker to protect against both overloads and shortcircuits, or install an earth leakage breaker for ground protection and a molded-case circuit breaker.

- The distance between a power line (such as a power supply line or servomotor cable) and a signal line must be at least 30 cm. Do not put the power and signal lines in the same duct, and do not bundle them together.
- The longer a pulse line is, the lower the maximum frequency of the line is.
- Customers must purchase a 24 VDC power supply with double-shielded enclosure.
- Install an interlock system in the circuit to avoid any accident when opening or closing the machine's protective cover.

● Caution for Grounding

- To ground a SERVOPACK, follow these conditions.
 - Use as thick a cable as possible (HIV 2.0 mm² or thicker) for grounding.
 - A ground resistance of 100Ω or less is recommended.
 - Ground to one point only.



● Caution for Cable

- For wiring, use the specified cables. Use cables that are as short as possible.
- Do not bend excessively or apply tension to cables. The conductor of a signal cable is very thin (0.08 to 0.12 mm²), so handle the cables carefully.

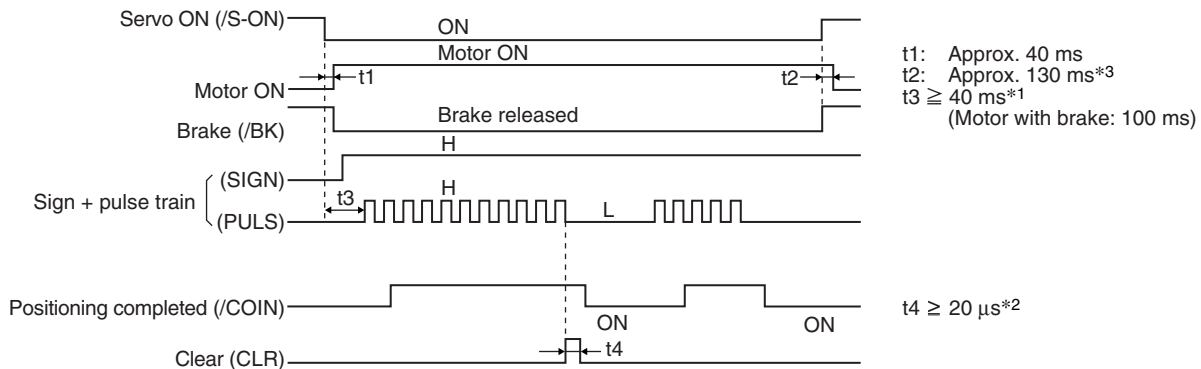
Connection Diagram

Explanation of I/O Signals

Pulse train references are given to control the position of the servomotor. The following pulse train output forms are supported from the host controller.

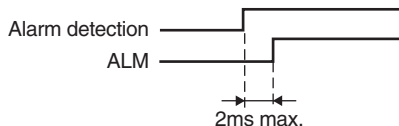
- Line driver output
- +24-V open-collector output
- +12-V open-collector output
- +5-V open-collector output

I/O Signal Timing Examples

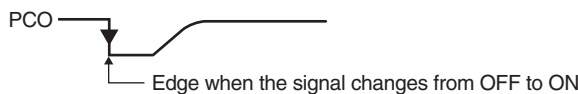


- *1: The interval from when the servo ON signal is turned ON until the reference pulse is input must be at least 40 ms, or the reference pulse may not be received by the SERVOPACK. If a motor with a brake is in used, more time will be required to release the brake. Therefore, provide an interval of at least 100 ms.
- *2: The error counter clear signal must be ON for at least 20 μs . If the reference pulse is stopped when the clear signal is turned ON, the motor will stop at that position.
- *3: The lag time for the brake is 100 ms. Use a relay for brakes with an operating time of 30 ms or less.

Notes: 1 The maximum lag time from the moment that an error or fault was detected until the alarm signal turns ON is 2ms.



2 If using the phase-C output signal, use an edge when the signal changes from OFF to ON at the beginning, so that the changes in the waveform from ON to OFF are round edged.

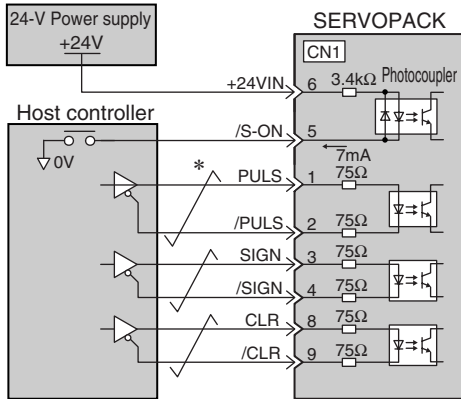


Reference Pulse Signal Form	Electrical Specifications	Remarks
Sign + pulse train input (SIGN + PULS signal) Maximum reference frequency: 750 kpps (187.5 kpps for an open-collector output)	<p> $t_1, t_2, t_3 > 3\mu\text{s}$ $\tau \geq 0.65\mu\text{s}$ $(\tau / T) \times 100 \leq 50\%$ </p>	Sign (SIGN): High = Forward reference Low = Reverse reference
CW pulse + CCW pulse Maximum reference frequency: 750 kpps (187.5 kpps for an open-collector output)	<p> $t_1 > 3\mu\text{s}$ $\tau \geq 0.65\mu\text{s}$ $(\tau / T) \times 100 \leq 50\%$ </p>	—

■ Connection Examples of Input Signal

● Line Driver Output

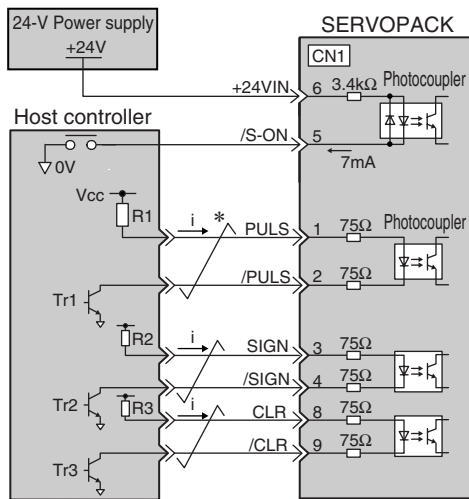
Applicable line driver: SN75174 or MC3487 (Manufactured by Texas Instruments or equivalent)



*: Twisted-pair wires

● Open-collector Output

Set the R1 through R3 current limit resistors so that input current (i) will fall within the following range.
Input current (i) = 7 mA to 15 mA



*: Twisted-pair wires

Examples:

- When Vcc is +24 V: R1 through R3 = 2.2 kΩ
- When Vcc is +12 V: R1 through R3 = 1 kΩ
- When Vcc is +5 V: R1 through R3 = 180 Ω

Note: The following signal logic applies for an open-collector output.

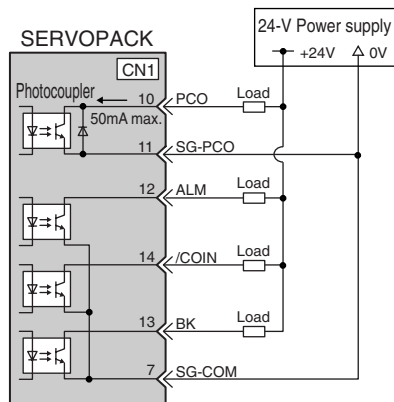
Tr1 to Tr3 ON	Equivalent to high level input
Tr1 to Tr3 OFF	Equivalent to low level input

■ Connection Example of Output Signal

Set the load so that the output current (i) will fall within 50 mA or less.

Photocopler output (per output signal)

- Max. voltage: 30 VDC
- Max. current: 50 mADC



Installation

■ Servomotor Installation

● Precautions

The service life of the servomotor will be shortened or unexpected problems will occur if the servomotor is installed incorrectly or in an inappropriate location. Always observe the precautions in this section when installing a servomotor.

- If the relay cables are connected to the motor, be sure to connect the end for the servomotor's main-circuit cables before connecting the end for the encoder cable. If the encoder cable's end is connected first, the encoder may become damaged because of the voltage differences between the Frame Ground (FG) pins on the servomotor and the grounding terminal of the SERVOPACK.
- If using cables that are not made by Yaskawa, ensure that connector pins and cables are correctly configured.
- Make sure there is no foreign matter (such as dust and metal chips) in the connector before connecting.
- When handling a servomotor with its cables connected, hold the servomotor or the connectors and cables will be damaged.

● Installation Conditions

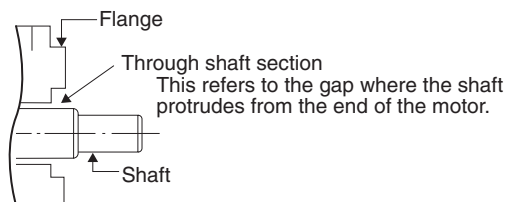
Environment	Environment
Operating temperature	0°C to +40°C without freezing
Operating humidity	20% to 80%RH with no condensation
Installation sites	<ul style="list-style-type: none">• Indoors• Free of corrosive or explosive gases• Well-ventilated and free of dust and moisture• Facilitates inspection and cleaning
Storage conditions	If the power cable is disconnected, store the motor under these conditions. Temperature: -20°C to +60°C without freezing Humidity: 20% to 80%RH with no condensation
Altitude	1000 m or below above sea level

Note: Do not directly connect the servomotor to a commercial power line. This will damage the servomotor.

● Waterproof Specifications

The protective structure of the servomotors is designed with an IP55 rating.

- The servomotor can be used in a location that is subject to water drops, except for the connector and the section where the shaft passes through.
- Do not use the servomotor in a location that is subject to oil mist.



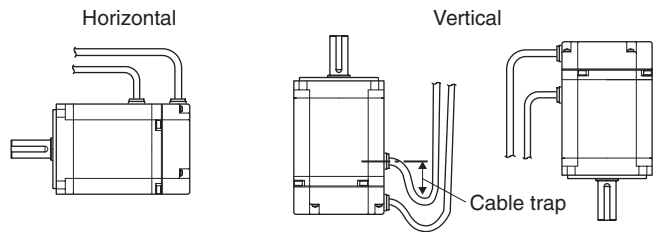
● Direction of Servomotor Rotation

Positive rotation of the servomotor is counterclockwise when viewed from the load.



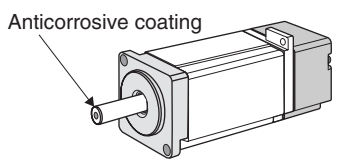
● Installation Direction

- The motor can be installed horizontally or vertically. If the motor is mounted vertically, provide a cable trap so that water drops do not enter the motor.
If the motor is installed with the axis pointing up, take preventative measures so that oil does not splash on the motor from other parts of the machine such as the gearbox.
- Do not bend or pull excessively any cables, the lead openings, and the junctions of the cables.
The cores in the encoder cable and the brake signal line in the main circuit cable are only 0.2 mm² or 0.3 mm². Be sure to protect them from stress.

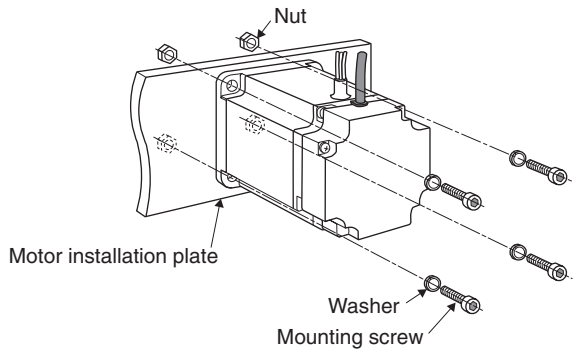


● Installation Method

- The end of the motor shaft is coated with an anticorrosive coating. Thoroughly remove the coating prior to installation, or it will not be possible to couple the motor to the mechanical system.



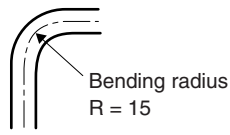
- Use the mounting holes (two for 100-W models and four for 200- to 750-W models) on the motor installation surface to secure the motor.



- Do not apply shock directly to the output shaft or encoder when mounting the motor, because the servomotor shaft is directly coupled to the encoder. The encoder may be damaged by the shock.

<Precautions>

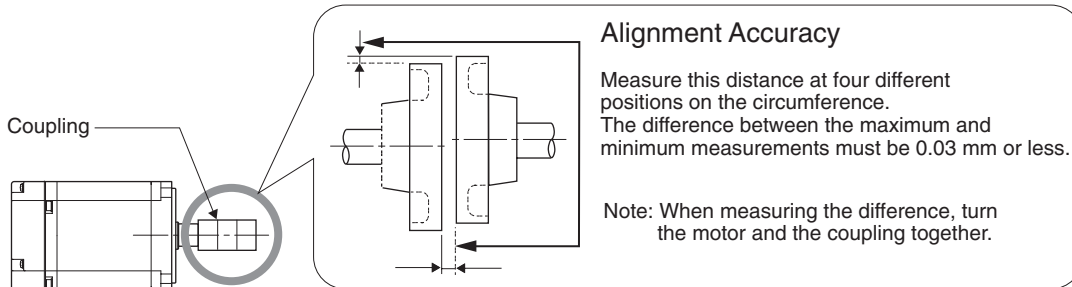
The motor main circuit cable, encoder cable, and relay cable cannot be used for applications in which the cables are moved, twisted, or rotated to a small bending radius. The cable bending radius in the center of the cable must be a of 15 mm or larger. If the cables need to be bent, consult your Yaskawa representative.



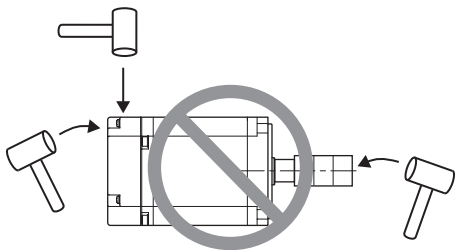
● Coupling to the Machine

Observe the following precautions when coupling the servomotor with the drive axis of the machine.

- Align the shaft of the servomotor with the shaft of the equipment, and then couple the shafts.
- Make sure that the motor and the machine are accurately aligned.
Failure to observe this caution may result in damage to the motor axis or deterioration of the standard life of the servomotor by an eccentric load. Keep the eccentric load as small as possible.



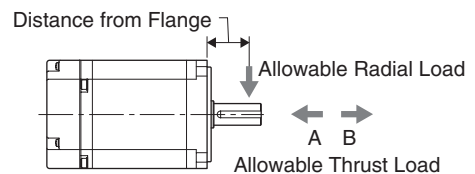
- A metal disk coupling designed for servomotors is recommended to maintain the response characteristics and durability of the servomotor.
- When attaching the coupling to the shaft of the servomotor, do not hammer the axis or near the encoder. Such shocks and vibrations may cause the encoder to malfunction.



● Allowable Loads

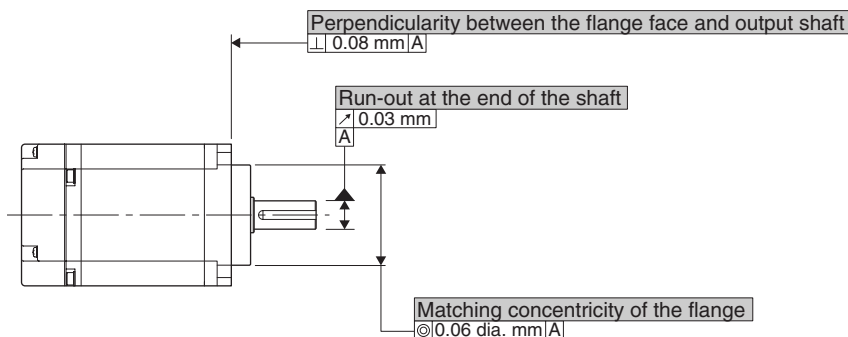
Design the mechanical system so that, during operation, the thrust and radial loads applied to the servomotor shaft do not exceed the range shown in the table below.

Servomotor Model SJME-	Allowable Radial Load N	Allowable Thrust Load N	Distance from Flange mm
		Direction A or B	
01A	78	54	20
02A	245	74	25
04A	245	74	25
08A	392	147	35



● Mechanical Tolerance TIR (Total Indicator Reading)

The following diagram shows tolerances for the servomotor's output shaft and installation area.



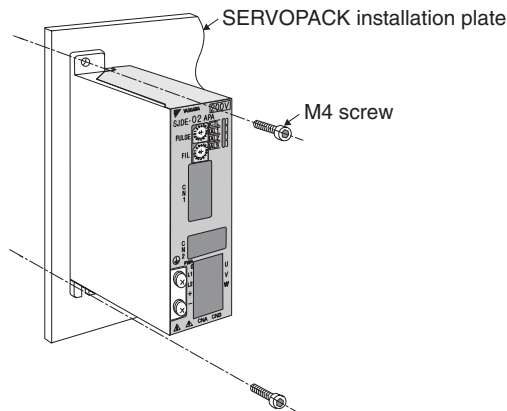
■SERVOPACK Installation

● Installation Conditions

Installation Site	Notes
Installation in a control panel	Design the control panel size, unit layout, and cooling method so the temperature around the SERVOPACK does not exceed 55°C. Note: The maximum ambient temperature for long-term reliability is 45°C.
Installation near a heating unit	Minimize the heat radiating from the heating unit as well as any temperature rise caused by natural convection so the temperature around the SERVOPACK does not exceed 55°C.
Installation near a source of vibration	Install a vibration isolator beneath the SERVOPACK to avoid subjecting it to vibration.
Installation at a site exposed to corrosive gas	Corrosive gas does not have an immediate effect on the SERVOPACK but will eventually cause the electronic components and contactor-related devices to malfunction. Take appropriate action to avoid corrosive gas.
Installation at a contaminated site	Take appropriate action to avoid any contaminants such as dust, iron particles, water drops, or oil mist. Contamination will cause the electronic components to malfunction.

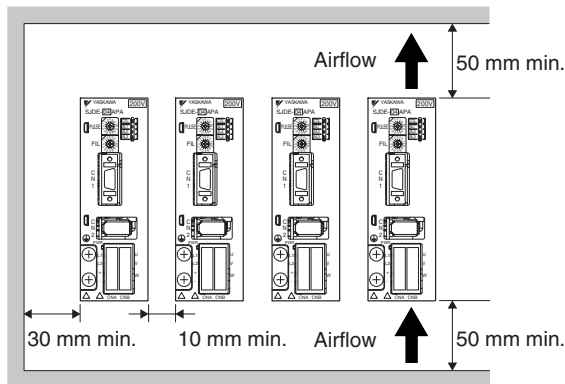
● Installation Method

- Install the SERVOPACK perpendicular to the wall. The SERVOPACK contains a built-in fan for cooling and must be mounted in the specified direction.
- Connect the mounting holes securely to the mounting surface with M4 screws (two mounting holes).



● Space between SERVOPACK Units

Be sure to keep a space between adjacent SERVOPACK units if they are mounted inside the control panel so that the units can be cooled.



Cables / Peripheral Devices

Servomotor Main-circuit Cables with Connectors at both Ends (for Relays)

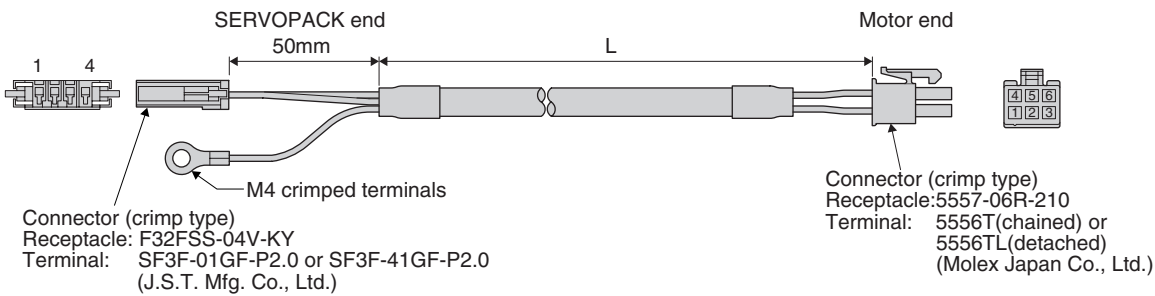
■ Specifications

Motor Type	Cable Model	Length (L)	Manufacturer	Contact
No brake	JZSP-CHM000-05	5m	Fujix Co., Ltd	KUNSHAN FUJIX IMPORT AND EXPORT TARDE CO.,LTD.
	JZSP-CHM000-10	10m		
With brakes	JZSP-CHM030-05	5m		
	JZSP-CHM030-10	10m		

Note: Contact your Yaskawa representative for the servomotor main-circuit cables of 3m, 15m, and 20m.

■ Dimensions / Wiring Specifications

● JZSP-CHM000-□□(For motors without brakes)



SERVOPACK-end Connector

Pin No.	Signal	Wire Color
1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
4	—	—

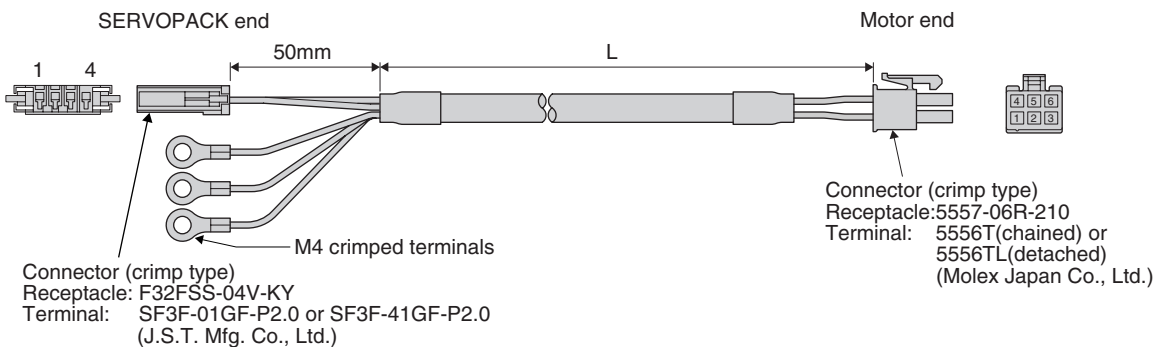
Crimped terminals	F G*	Green/Yellow
-------------------	------	--------------

Servomotor-end Connector

Pin No.	Signal	Wire Color
1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
4	F G	Green/Yellow
5	—	—
6	—	—

*: Connect the FG pin to the grounding terminal of the SERVOPACK.

● JZSP-CHM030-□□(For motors with brakes)



SERVOPACK-end Connector

Pin No.	Signal	Wire Color
1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
4	—	—

Crimped terminals	F G*1	Green/Yellow
Crimped terminals	Brake*2	Black
Crimped terminals	Brake*2	Black

Servomotor-end Connector

Pin No.	Signal	Wire Color
1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
4	F G	Green/Yellow
5	Brake	Black
6	Brake	Black

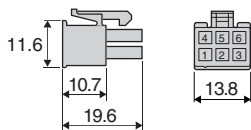
*1: Connect the FG pin to the grounding terminal of the SERVOPACK.
*2: No polarity for connection to the brake.

Connectors for Servomotor Main-circuit Cables

■ Specifications

Type	Parts	Model	Manufacturer	Contact
Crimp type	Receptacle	5557-06R-210	Molex Japan Co., Ltd.	Shanghai
	Terminal	5556T(chained) or 5556TL(detached)		Molex Interconnect(Shanghai)Co.,Ltd.
	Crimping tool	57027-5000		Shenzhen Molex Hong Kong China Ltd., Shenzhen Office

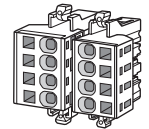
■ Dimensions Units: mm



Connectors for Battery Case, Regenerative Unit, and Servomotor Main-circuit Cables

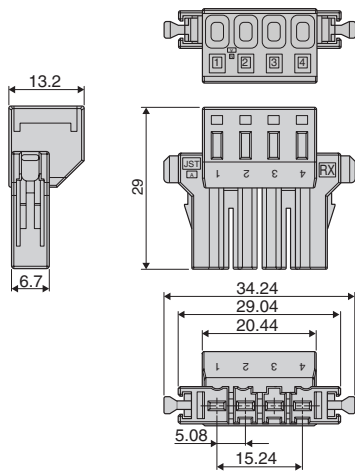
■ Specifications

Type	Parts	Model	Manufacturer	Contact
Spring type	For battery case/regenerative unit	CNA connector	J.S.T. Mfg. Co., Ltd.	Shanghai J.S.T.(SHANGHAI) CO LTD
	For servomotor main-circuit cables	CNB connector		Shenzhen J.S.T.(H.K) CO LTD
	Tool to remove wires	J-FAT-OT		

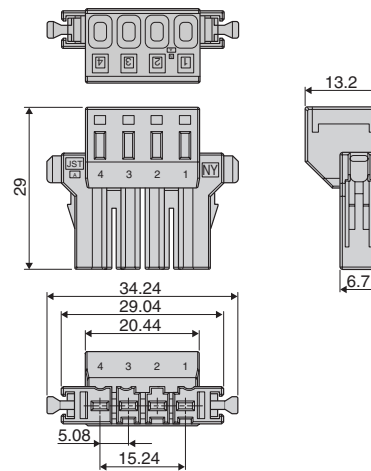


■ Dimensions Units: mm

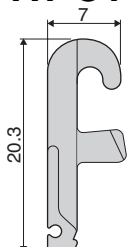
● Power Supply/Regenerative Unit Connector 04JFAT-SBXGF-N



● Servomotor Main Circuit Cable Connector 04JFAT-SAYGF-N



● Tool to Remove Wires J-FAT-OT



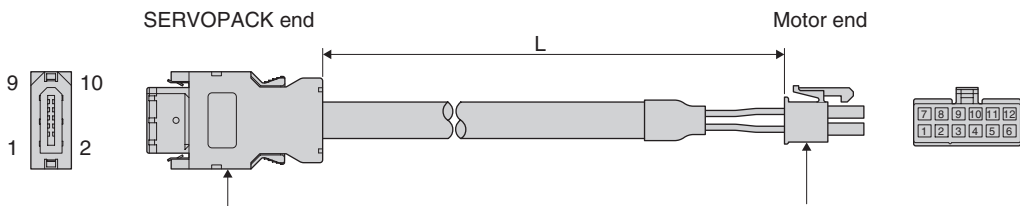
Encoder Cables with Connectors at both Ends (for Relay)

■ Specifications

Model	Length (L)	Manufacturer	Contact
JZSP-CHP800-05	5m	Sun-Wa Technos Corporation	SHANGHAI SUN-WA TECHNOS CO.,LTD
JZSP-CHP800-10	10m		

Note: Contact your Yaskawa representative for the encoder cables of 3m, 15m, and 20m.

■ Dimensions



• Crimp type (Gray)

Plug and cable cover set : 54599-1005
 Plug housing : 51209-1001
 Crimped terminals: 59351-8087(chained) or 59351-8187(detached)
 (Molex Japan Co., Ltd.)

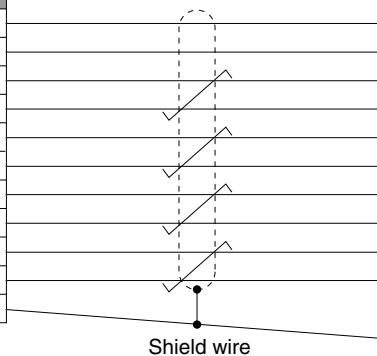
Receptacle : 5557-12R-210
 Terminal : 5556T2(chained) or 5556T2L(detached)
 (Molex Japan Co., Ltd.)

• Solder type (Black)

Shell kit : 36310-3200-008
 Receptacle : 36210-0100FD

■ Wiring Specifications

Pin No.	Signal	Wire Color
1	PG5V	Red
2	PG0V(GND)	Black
3	Phase A+	Blue
4	Phase A-	Blue/White
5	Phase B+	Yellow
6	Phase B-	Yellow/White
7	Phase /Z	Purple
8	Phase U	Gray
9	Phase V	Green
10	Phase W	Orange
Shell	—	Shield wire



Pin No.	Signal	Wire Color
1	PG5V	Red
2	PG0V(GND)	Black
3	Phase A+	Blue
4	Phase A-	Blue/White
5	Phase B+	Yellow
6	Phase B-	Yellow/White
7	Phase /Z	Purple
8	Phase U	Gray
9	Phase V	Green
10	Phase W	Orange
11	—	—
12	FG	Shield

Connectors for Encoder Cables

■ Specifications

● Motor End

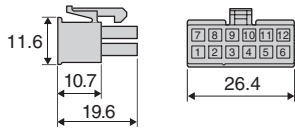
Type	Parts	Model	Manufacturer	Contact
Crimp type	Receptacle	5557-12R-210	Molex Japan Co., Ltd.	Shanghai
	Terminal	5556T2(chained) or 5556T2L(detached)		Molex Interconnect(Shanghai)Co.,Ltd.
	Crimping tool	57026-5000		Shenzhen
				Molex Hong Kong China Ltd., Shenzhen Office

● SERVOPACK End

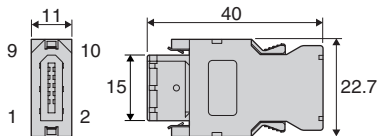
Type	Parts	Model	Manufacturer	Contact
Crimp type (gray)	Plug and cable cover set	54599-1005	Molex Japan Co., Ltd.	Shanghai
	Plug housing	51209-1001		Molex Interconnect(Shanghai) Co.,Ltd.
	Crimp terminal	59351-8087(chained) or 59351-8187(detached)		Shenzhen
	Crimping tool	57401-5300		Molex Hong Kong China Ltd., Shenzhen Office
Soldered type (gray)	Plug and cable cover set	54599-1005	Sumitomo 3M Ltd.	SHANGHAI SUN-WA TECHNOS CO.,LTD
	Plug connector	54593-1011		
Soldered type (black)	Shell kit	36310-3200-008	Sumitomo 3M Ltd.	SHANGHAI SUN-WA TECHNOS CO.,LTD
	Receptacle	36210-0100FD		

■ Dimensions Units: mm

● Motor End



● SERVOPACK End



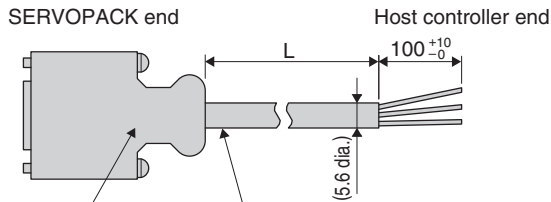
Cables / Peripheral Devices

Cables for I/O Signals

■ Specifications

Cable Model	Length (L)	Manufacturer	Contact
JZSP-CHI003-01	1m	Sun-Wa Technos Corporation	SHANGHAI SUN-WA TECHNOS CO.,LTD
JZSP-CHI003-02	2m		
JZSP-CHI003-03	3m		

■ Dimensions Units: mm



Connector(14P) : 10114-6000EL
Shell : 10314-52A0-008
(Sumitomo 3M Ltd.)

Cable (black)
HP-SB/20276SR AWG#28×7P
UL20276 VW-1

■ Wiring Specifications

Pin No.	Signal Code	Signal Name	Lead Color	Marking		Pin No.	Signal Code	Signal Name	Lead Color	Marking	
				Dots	Color					Dots	Color
1	CW, PULS	Reverse rotation pulse, reference pulse	Orange	1	Black	8	CLR	Position error pulse clear	Yellow	1	Red
2	/CW, /PULS					9	/CLR				Pink
3	CCW, SIGN	Forward rotation pulse, reference signal	Light gray			10	PCO	Phase-C signal	Orange	2	Black
4	/CCW, /SIGN					11	SG-PCO				Phase-C signal ground
5	+24VIN	External input power supply Servo ON	White	12	ALM	Servo alarm	Light gray	Red			
6	/S-ON			13	/BK	Brake		Black			
7	SG-COM	Output signal ground	Yellow	14	/COIN	Positioning completed	Light gray	Red			
						Shell	-	FG	-	-	-

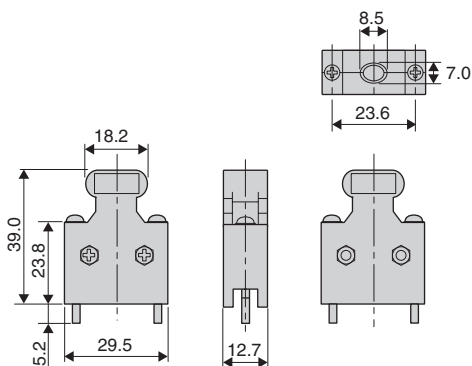
Connectors for I/O Signals

■ Specifications

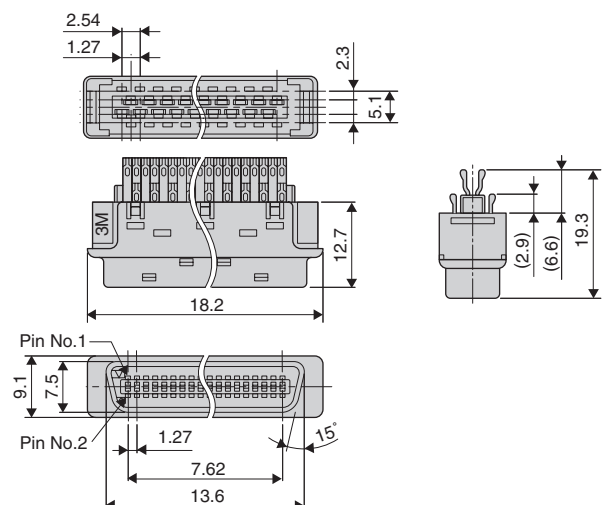
Type	Parts	Models	Manufacturer	Contact
Soldered type	Shell kit	10314-52A0-008	Sumitomo 3M Ltd.	SHANGHAI SUN-WA TECHNOS CO.,LTD
	Plug	10114-3000VE		

■ Dimensions Units: mm

● Shell Kit



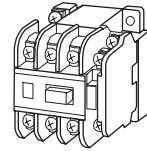
● Plug



Magnetic Contactor

■ Specifications

Model	Specifications	Manufacturer	Contact
HI-11J	20A	Yaskawa Controls Co., Ltd.	YASKAWA ELECTRIC (SHANGHAI) CO.,LTD.
HI-15J	35A		



■ Dimensions Units: mm

● HI-11J

Dimensions	Mounting Hole Dimensions	Terminal Symbols						
		<table border="1"> <thead> <tr> <th>Auxiliary Contact</th> <th>Structure</th> </tr> </thead> <tbody> <tr> <td>NO</td> <td> NO A1 A2 NC R 1 S 3 T 5 1 13 2 14 U 2 V 4 W 6 </td> </tr> <tr> <td>NC</td> <td> NO A1 A2 NC R 1 S 3 T 5 1 11 2 12 U 2 V 4 W 6 </td> </tr> </tbody> </table>	Auxiliary Contact	Structure	NO	NO A1 A2 NC R 1 S 3 T 5 1 13 2 14 U 2 V 4 W 6	NC	NO A1 A2 NC R 1 S 3 T 5 1 11 2 12 U 2 V 4 W 6
Auxiliary Contact	Structure							
NO	NO A1 A2 NC R 1 S 3 T 5 1 13 2 14 U 2 V 4 W 6							
NC	NO A1 A2 NC R 1 S 3 T 5 1 11 2 12 U 2 V 4 W 6							

● HI-15J

Dimensions	Mounting Hole Dimensions	Terminal Symbols				
		<table border="1"> <thead> <tr> <th>Auxiliary Contact</th> <th>Structure</th> </tr> </thead> <tbody> <tr> <td>NONC</td> <td> NO A1 A2 NC R 1 S 3 T 5 1 21 3 13 2 22 4 14 U 2 V 4 W 6 </td> </tr> </tbody> </table>	Auxiliary Contact	Structure	NONC	NO A1 A2 NC R 1 S 3 T 5 1 21 3 13 2 22 4 14 U 2 V 4 W 6
Auxiliary Contact	Structure					
NONC	NO A1 A2 NC R 1 S 3 T 5 1 21 3 13 2 22 4 14 U 2 V 4 W 6					

External Fuse

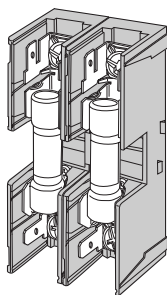
■ Specifications

● Fuse

Model	Rated Current	Rated Voltage	Fusing Time	Applicable SERVOPACKs	Manufacturer	Contact
OKLK015.T	15Arms	600V	Within 2 s at 200%	SJDE-01 to 04	Littelfuse Inc.	KUNSHAN FUJIX IMPORT AND EXPORT TARDE CO.,LTD.
OKLK030.T	30Arms			SJDE-08		

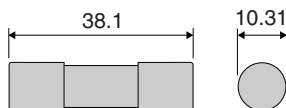
● Fuse Block

Model	Type	Manufacturer	Contact
L60030M2SQ	Screw terminal, 2 poles	Littelfuse Inc.	KUNSHAN FUJIX IMPORT AND EXPORT TARDE CO.,LTD.
L60030M2C	Copper box lug, 2 poles		

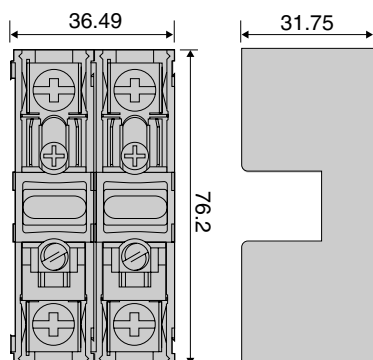


■ Dimensions Units: mm

● Fuse



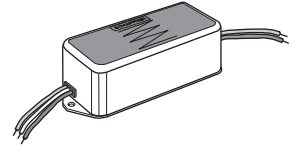
● Fuse Block



Noise Filter

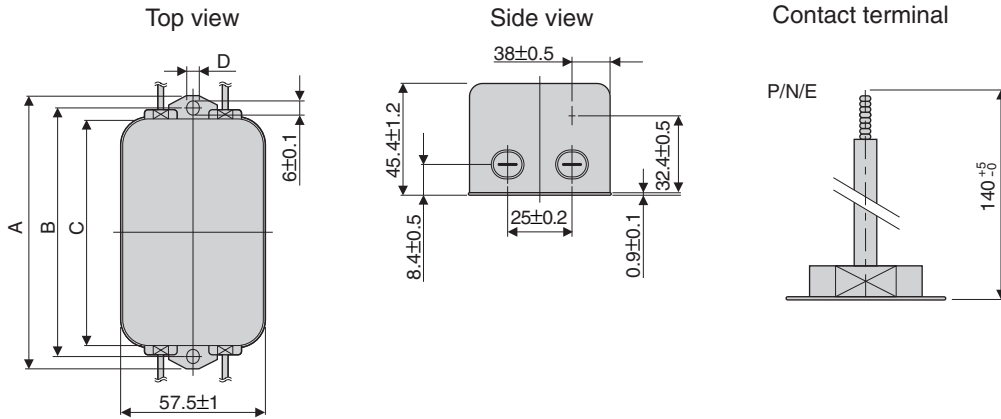
■ Specifications

Model	Specifications	Manufacturer	Contact
FN2070-6/07	Single-phase 250 VAC, 6A	Schaffner Electronic	Schaffner Shanghai Co.,LTD.
FN2070-10/07	Single-phase 250 VAC, 10A		
FN2070-16/07	Single-phase 250 VAC, 16A		



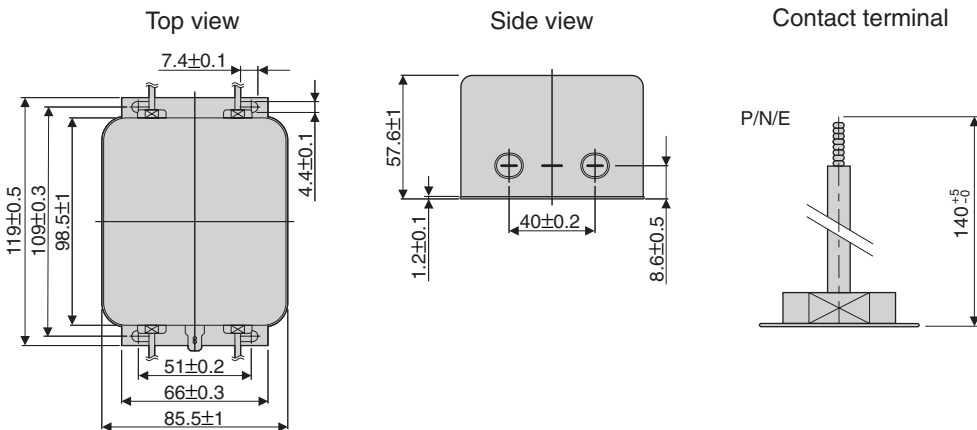
■ Dimensions Units: mm

● FN2070-6/07, FN2070-10/07



Model	A	B	C	D
FN2070-6/07	113.5±1	103±0.3	94±1	4.4±0.1
FN2070-10/07	156±1	143±0.3	130.5±1	5.3±0.1

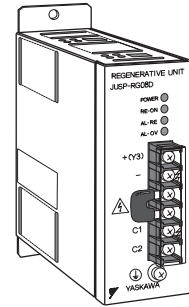
● FN2070-16/07



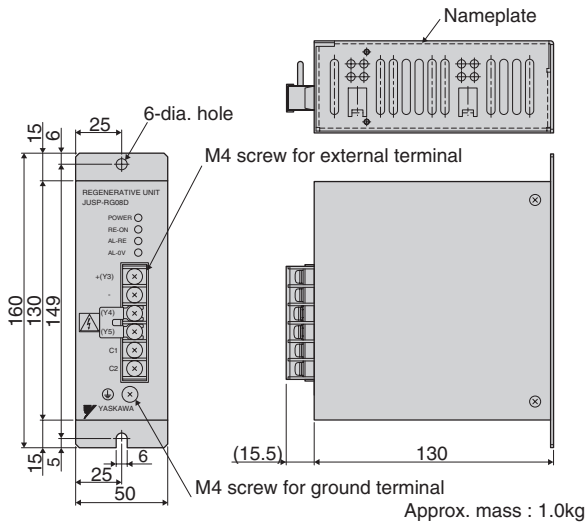
Regenerative Unit

■ Specifications

Model	JUSP-RG08D	Manufacturer	Contact
Resistance	50Ω	Yaskawa Electric Corporation	YASKAWA ELECTRIC (SHANGHAI) CO.,LTD.
Allowable regenerative energy	12W		
Regenerative operating voltage	380 Vdc		
Regenerative processing current	8 Adc		
Error detection	Disconnection of regenerative resistance, failure of regenerative transistor, or overvoltage		
Alarm output	NC contact (Opens if a protective function is used.) Contact specifications: 250 VAC, 1.5A (inductive load)		



■ Dimensions Units: mm



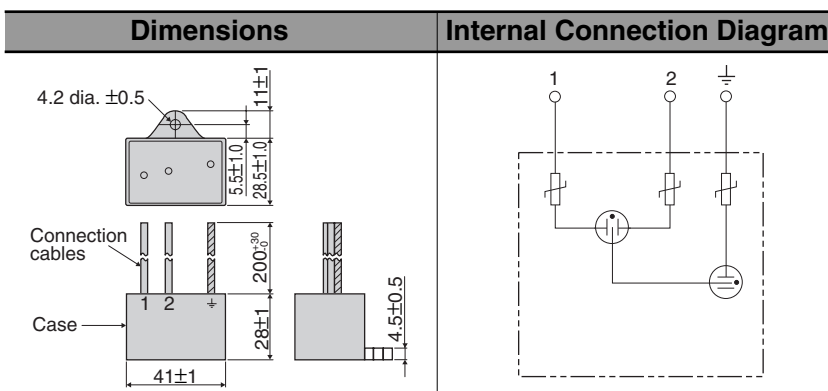
Surge Protector (For lightning surge protection)

■ Specifications

Model	Specifications	Manufacturer	Contact
R·C·M-601BQZ-4	Single-phase 250 VAC	Okaya Electric Industries Co., Ltd.	OKAYA HONG KONG TRADING LIMITED



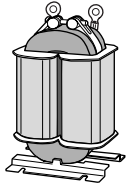
■ Dimensions Units: mm



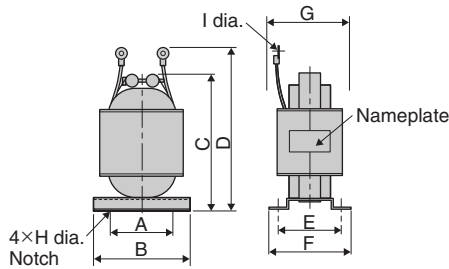
AC Reactor

■ Specifications

Model	Inductance (mH)	Rated Current (A)	Manufacturer	Contact
X5052	45.0	1.0	Yaskawa Controls Co., Ltd.	YASKAWA ELECTRIC (SHANGHAI) CO.,LTD.
X5053	20.0	2.0		
X5054	5.0	3.0		
X5056	2.0	5.0		



■ Dimensions Units: mm

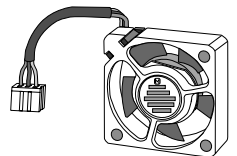


Model	Dimensions mm									Approx. Mass kg
	A	B	C	D	E	F	G	H	I	
X5052	35	52	80	95	30	40	45	4	4.3	0.4
X5053	35	52	90	105	35	45	50	4	4.3	0.6
X5054	35	52	80	95	30	40	45	4	4.5	0.4
X5056	35	52	80	95	30	40	45	4	4.3	0.4

Replacement Cooling Fan

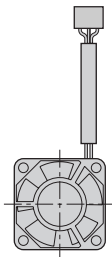
■ Specifications

Model	Applicable SERVOPACKs	Manufacturer	Contact
JZSP-CHF08-1	SJDE-01 to 04	Sun-Wa Technos Corporation	SHANGHAI SUN-WA TECHNOS CO.,LTD
JZSP-CHF08-2	SJDE-08		

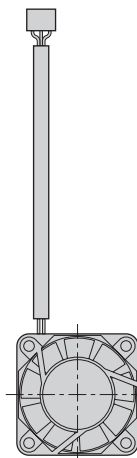


■ External Views

● JZSP-CHF08-1



● JZSP-CHF08-2



■ Contact Information

Manufacture	Representative in China
Fujix Co., Ltd	Kunshan Fujix Import and Export Trade Co.,Ltd South to No.312 National Trunk Highway HuaQiao,KunShan,JiangSu,China Phone: 0512-5769-6298 Fax : 0512-5469-6296
Molex Japan Co., Ltd	①Shanghai Molex Interconnect (Shanghai) Co., Ltd. 889, Ying Lun Road, WaiGaoQiao Free Trade Zone, Pudong, Shanghai, 200131, China Phone: 021-5048-0889 Fax : 021-5048-0011 ②Shenzhen Molex Hong Kong China Ltd., Shenzhen Office Room 3608, PangLin Hotel, 2002, Jiablin Road, Shenzhen, China Phone: 0755-2518-5819 Fax : 0750-2518-5810
JST. Mfg. Co., Ltd.	①Shanghai J.S.T.(SHANGHAI)CO.,LTD. 55 Fu Te South Road, Waigaoqiao Free Trade Zone, Pudong Shanghai, 200131 China. Phone : 021-5048-2225 Fax : 021-5064-4297 ②Hong Kong J.S.T.(H.K.)CO.,LTD. UnitA,15/F.,China Dyeing Works Building, 382-392, Castle Peak Road, Tsuen Wan, N.T.,Hong Kong, China Phone : +852-2413-7979 Fax : +852-2411-1193
Sun-Wa Technos Corporation	Shanghai Sun-Wa Technos Co.,Ltd 8F-G Majesty Bldg.,138 Pudong Avenue, Shanghai, 200120 , China.
Sumitomo 3M Ltd.	Phone : 021-5882-3366 Fax : 021-5882-3377
Schaffner Electronic	Schaffner EMC Ltd.Shanghai Blg 11,Lane 1365,East Kang Qiao Rd, Shanghai,China Phone : 021-6813-9855-2269 Fax : 021-6813-9811

Manufacture	Representative in China	
Okaya Electric Industries Co., Ltd.	①Shanghai Okaya Hong Kong Trading Limited. Shanghai Representative Office Room 1225, Plaza Hanzhong, No.158 Hanzhong Road, Shanghai, China Phone : 021-6353-5978 Fax : 021-6353-5979 ②Shenzhen Okaya Hong Kong Trading Limited. Shenzhen Representative Office 20B1, Block C, Electronics Science & Technology Bldg., 2070 Shen Nan RD. Middle, Shenzhen, China Phone: 0755-8368-3486 Fax : 0755-8368-3488 ③Hong Kong Okaya Hong Kong Trading Limited. Flatc, 10/FL., VGA Building, 532-532A Castle Peak Road Kowloon, Hong Kong, China Phone: +852-2744-0628 Fax : +852-2741-9801	
	Littelfuse Inc.	Kunshan Fujix Import and Export Trade Co.,Ltd TRADE CO.,LTD. South to No.312 National Trunk Highway HuaQiao,KunShan,JiangSu,China Phone: 0512-5769-6298 Fax : 0512-5469-6296
	Yaskawa Controls Co., Ltd.	Yaskawa Electroc (Shanghai) Co.,Ltd. No.18 Xizang Zhong Road, 1702 to 1707 Harbour Ring Plaza, Shanghai 200001, China Phone: 021-5385-2200 Fax : 021-5385-3299
Yaskawa Electric Corporation	Yaskawa Electric Corporation Phone: 021-5385-2200 Fax : 021-5385-3299	

Selection of Servomotor Size

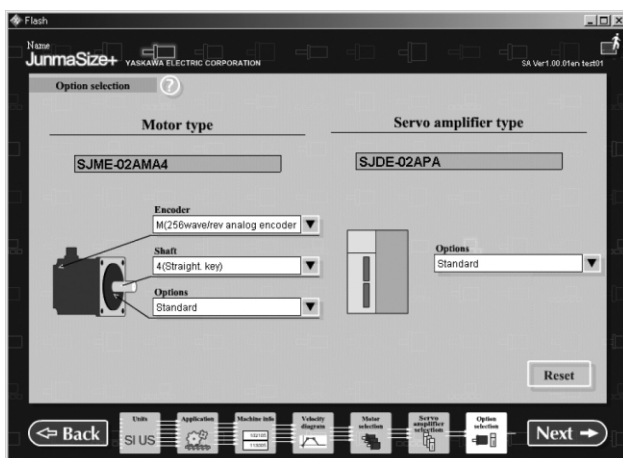
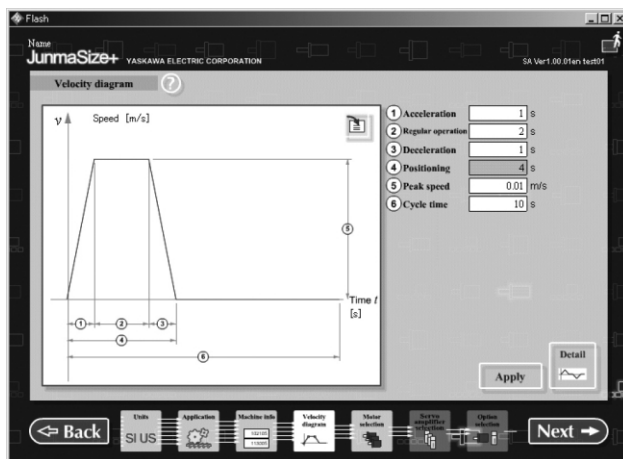
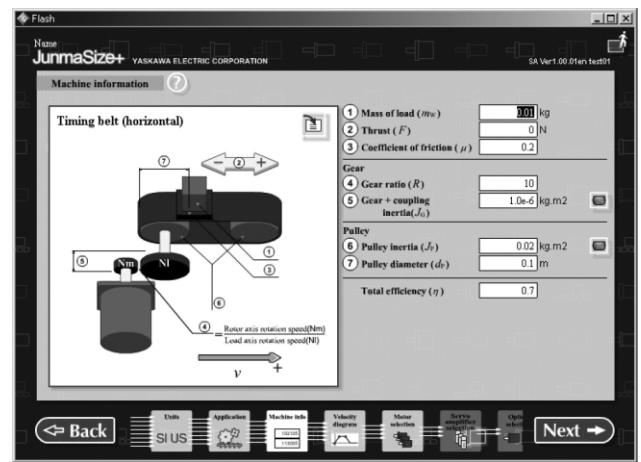
■ AC Servomotor Selection Software: JunmaSize+

JunmaSize+ is software designed for the capacity selection of servomotors in the Junma series.

● Features

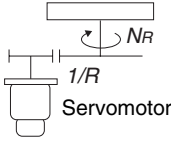
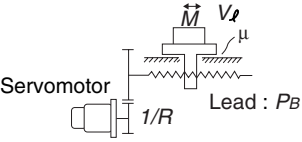
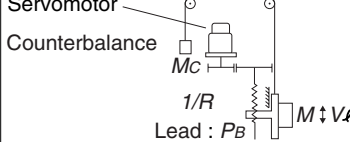
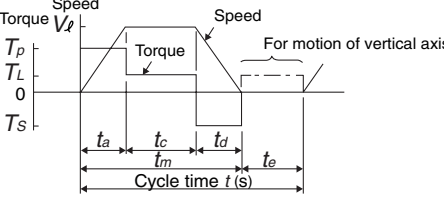
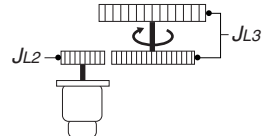
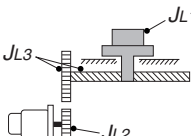
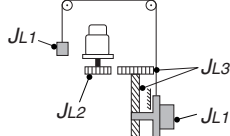
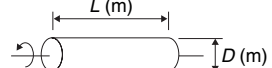
- The latest product information.
- A wizard system with conversational mode to select optimal servomotors.
- References and reuses previously input and stored data.

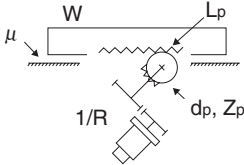
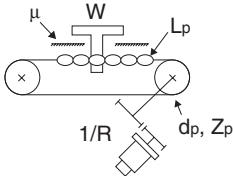
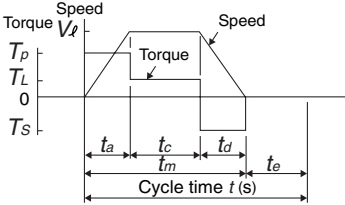
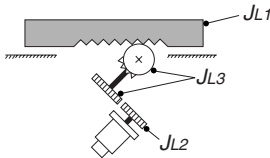
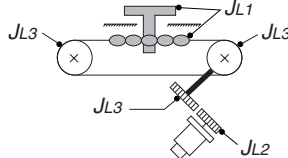
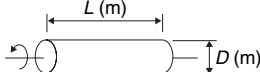
● Servomotor Selection Screen



Selection of Servomotor Size

Formulas for Selecting Servomotor Capacity

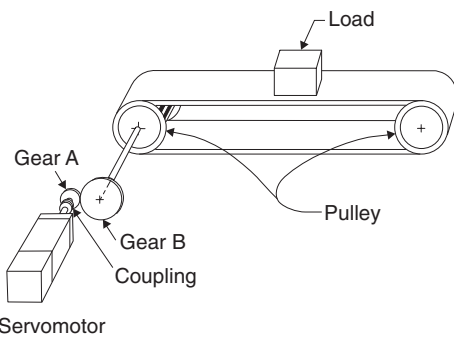
Motions	Rotational Motion	Linear Motion	
		Horizontal Axis	Vertical Axis
Mechanical Configuration			
	<p>N : Load axis speed (min^{-1}) V : Load speed (m/min) T : Effective load torque at motor shaft ($\text{N}\cdot\text{m}$) μ : Friction coefficient</p>	<p>P_B : Ball screw lead (m) M : Mass of linear-motion unit (kg) MC : Mass of counterbalance (kg)</p>	<p>$1/R$: Gear ratio η : Combined efficiency T_M : Servomotor maximum torque ($\text{N}\cdot\text{m}$)</p>
Speed Diagram			
Travel Distance (m)		$R = \frac{V\ell}{60} \cdot \frac{t_a + 2t_c + t_d}{2} \quad \left(\text{Where } t_a = t_d, R = \frac{V\ell}{60} (t_m - t_a) \right)$	
Load axis speed (min^{-1})	$N\ell$	$N\ell = \frac{V\ell}{P_B}$	$N\ell = \frac{V\ell}{P_B}$
Motor Speed (min^{-1})		$N_M = N\ell \cdot R$	
Effective Load Torque at Motor Shaft ($\text{N}\cdot\text{m}$)	$T_L = \frac{T\ell}{R \cdot \eta}$	$T_L = \frac{9.8 \times \mu \cdot M \cdot P_B}{2\pi \cdot R \cdot \eta}$	$T_L = \frac{9.8 \times (M - MC) P_B}{2\pi \cdot R \cdot \eta}$
Effective Load Inertia at Motor Shaft ($\text{kg}\cdot\text{m}^2$)		$J_L = J_{L1} + J_{L2} + J_{L3}$	
			
Linear Motion	—	$J_{L1} = M \cdot \left(\frac{P_B}{2\pi R} \right)^2$	$J_{L1} = (M + MC) \cdot \left(\frac{P_B}{2\pi R} \right)^2$
Rotational Motion	<p>• Solid cylinder</p>  <p><Inertia for motor shaft> At gear input side $J_{L2} = J_K$ At gear output side $J_{L3} = \frac{J_K}{R^2}$</p>	$J_K = \frac{1}{8} M_K \cdot D^2 \quad \text{or} \quad J_K = \frac{\pi}{32} \rho \cdot L \cdot D^4$ <p>M_K : Mass (kg) ρ : Density (kg/m^3) (Iron $\rho = 7.87 \times 10^3$ (kg/m^3)) (Aluminum $\rho = 2.70 \times 10^3$ (kg/m^3))</p>	
Running Power (W)		$P_0 = \frac{2\pi \cdot N_M \cdot T_L}{60}$	
Acceleration Power (W)		$P_a = \left(\frac{2\pi \cdot N_M}{60} \right)^2 \frac{J_L}{t_a}$	
Required Starting Torque ($\text{N}\cdot\text{m}$)		$T_P = \frac{2\pi \cdot N_M (J_M + J_L)}{60 \times t_a} + T_L$	
Required Braking Torque ($\text{N}\cdot\text{m}$)		$T_S = \frac{2\pi \cdot N_M (J_M + J_L)}{60 \times t_d} - T_L$	
Effective Torque ($\text{N}\cdot\text{m}$)		$T_{ms} = \sqrt{\frac{T_P^2 \cdot t_a + T_L^2 \cdot t_c + T_S^2 \cdot t_d}{t}}$	$T_{ms} = \sqrt{\frac{T_P^2 \cdot t_a + T_L^2 (t_c + t_e) + T_S^2 \cdot t_d}{t}}$
Min. Starting Time (S)		$t_{am} = \frac{2\pi \cdot N_M (J_M + J_L)}{60 (T_M - T_L)}$	
Min. Braking Time (S)		$t_{dm} = \frac{2\pi \cdot N_M (J_M + J_L)}{60 (T_M + T_L)}$	

Motions	Linear Motion		
	Rack & Pinion	Chain and Timing Belt	
Mechanical Configuration			
	$N\ell$: Load axis speed (min ⁻¹) $V\ell$: Load speed (m/min) $T\ell$: Effective load torque at motor shaft (N·m) μ : Friction coefficient	M : Mass of linear-motion unit (kg) $1/R$: Gear ratio η : Combined efficiency T_M : Servomotor maximum torque (N·m)	d_p : Pitch diameter (m) Z_p : Number of gear L_p : Pitch (m) $P_B = Z_p \cdot L_p$ or $\pi \cdot d_p$
Speed Diagram			
Travel Distance (m)	$R = \frac{V\ell}{60} \cdot \frac{t_a + 2t_c + t_d}{2}$ (Where $t_a = t_d$, $R = \frac{V\ell}{60} (t_m - t_a)$)		
Load axis speed (min ⁻¹)	$N\ell = \frac{V\ell}{P_B}$		
Motor Speed (min ⁻¹)	$N_M = N\ell \cdot R$		
Effective Load Torque at Motor Shaft (N·m)	$T_L = \frac{9.8 \times \mu \cdot M \cdot P_B + 2\pi \cdot T\ell}{2\pi \cdot R \cdot \eta}$		
Effective Load Inertia at Motor Shaft (kg·m ²)	$J_L = J_{L1} + J_{L2} + J_{L3}$		
			
Linear Motion	$J_{L1} = M \cdot \left(\frac{P_B}{2\pi R}\right)^2$		
Rotational Motion	<ul style="list-style-type: none"> Solid cylinder  <p><Inertia for motor shaft> At gear input side $J_{L2} = J_K$ At gear output side $J_{L3} = \frac{J_K}{R^2}$</p>	$J_K = \frac{1}{8} M_K \cdot D^2$ or $J_K = \frac{\pi}{32} \rho \cdot L \cdot D^4$ M_K : Mass (kg) ρ : Density (kg/m ³) (Iron $\rho = 7.87 \times 10^3$ (kg/m ³) Aluminum $\rho = 2.70 \times 10^3$ (kg/m ³)	
Running Power (W)	$P_o = \frac{2\pi \cdot N_M \cdot T_L}{60}$		
Acceleration Power (W)	$P_a = \left(\frac{2\pi}{60} \cdot N_M\right)^2 \frac{J_L}{t_a}$		
Required Starting Torque (N·m)	$T_P = \frac{2\pi \cdot N_M (J_M + J_L)}{60 \times t_a} + T_L$		
Required Braking Torque (N·m)	$T_S = \frac{2\pi \cdot N_M (J_M + J_L)}{60 \times t_d} - T_L$		
Effective Torque(N·m)	$T_{rms} = \sqrt{\frac{T_P^2 \cdot t_a + T_L^2 \cdot t_c + T_S^2 \cdot t_d}{t}}$		
Min. Starting Time (S)	$t_{am} = \frac{2\pi \cdot N_M (J_M + J_L)}{60 (T_M - T_L)}$		
Min. Braking Time (S)	$t_{dm} = \frac{2\pi \cdot N_M (J_M + J_L)}{60 (T_M + T_L)}$		

Selection of Servomotor Size

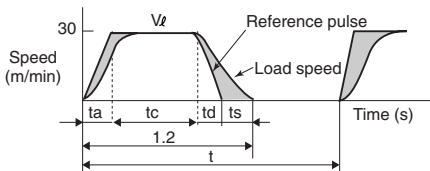
■ Servomotor Selection Example

Mechanical Specifications



- Load speed : $V\ell = 30\text{m/min}$
- Mass of linear-motion unit : $M = 4\text{kg}$
- Pulley diameter : $DP = 0.064\text{m}$
- Pulley thickness : $LP = 0.02\text{m}$
- Coupling mass : $MC = 2690\text{kg/m}^3$
- Coupling outer diameter : $DC = 0.03\text{m}$
- Gear A outer diameter : $DA = 0.02\text{m}$
- Gear A thickness : $LA = 0.02\text{m}$
- Gear B outer diameter : $DB = 0.1\text{m}$
- Gear B thickness : $LB = 0.02\text{m}$
- Gear density : $\rho_A, \rho_B = 7870\text{kg/m}^3$
- Gear ratio : $R = 5$
- Positioning frequency : $n = 40\text{ times/min}$
- Traveling distance : $\ell = 0.5\text{m}$
- Positioning interval : $t_m = 1.2\text{ S max.}$
- Friction coefficient : $\mu = 0.2$
- Effective load torque : $T\ell = 0.05\text{N}\cdot\text{m}$ at motor shaft
- Combined efficiency : $\eta = 0.9$ (90%)

● Speed Diagram



$$\text{Cycle time } t = \frac{60}{n} = \frac{60}{40} = 1.5 \text{ (s)}$$

Where acceleration time (t_a) = deceleration time (t_d) and setting time (t_c) = 0.1 s when the filter setting of the FIL rotary switch is 0.

$$\text{Acceleration time : } t_a = t_d = t_m - t_s - \frac{60 \times \ell}{V\ell} = 1.2 - 0.1 - \frac{60 \times 0.5}{30} = 0.1 \text{ (s)}$$

$$\text{Constant-speed time : } t_c = t_m - t_s - t_a - t_d = 1.2 - 0.1 - 0.1 - 0.1 = 0.9 \text{ (s)}$$

● Speed

$$P_B = \pi d = \pi \times 0.064 = 0.201$$

$$\text{• Load axis speed } N\ell = \frac{V\ell}{P_B} = \frac{30}{0.201} = 149 \text{ (min}^{-1}\text{)}$$

$$\text{• Motor speed } N_M = N\ell \cdot R = 149 \times 5 = 745 \text{ (min}^{-1}\text{)}$$

● Effective Torque at Motor Shaft

$$T_L = \frac{\mu \cdot 9.8 \cdot M \cdot P_B + 2\pi \cdot T\ell}{2\pi R \cdot \eta} = \frac{0.2 \times 9.8 \times 4 \times 0.201 + 2\pi \times 0.05}{2\pi \times 5 \times 0.9} = 0.0669 \text{ (N}\cdot\text{m)}$$

● Effective Load Moment of Inertia at Motor Shaft

$$J_L = J_{L1} + J_{L2} + J_{L3} = (1.639 + 0.687 + 0.362) \times 10^{-4} = 2.69 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$$

• Linear motion

$$J_{L1} = M \left(\frac{P_B}{2\pi R} \right)^2 = 4 \times \left(\frac{0.201}{2\pi \times 5} \right)^2 = 1.639 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$$

• Load-shaft motion: Pulley $\times 2$ + Gear B

$$J_{L2} = \frac{\sum J_i}{R^2} = \frac{1}{5^2} \times \frac{\pi}{32} \times (2690 \times 0.02 \times (0.064)^4 \times 2 + 7870 \times 0.02 \times (0.1)^4) = 0.687 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$$

• Motor-shaft motion: Gear A + Coupling

$$J_{L3} = \frac{\pi}{32} \times 7870 \times 0.02 \times (0.02)^4 + \frac{1}{8} \times 0.3 \times (0.03)^2 = 0.362 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$$

● Load Running Power

$$P_o = \frac{2\pi N_M \cdot T_L}{60} = \frac{2\pi \times 745 \times 0.0669}{60} = 5.2(\text{W})$$

● Load Acceleration Power

$$P_a = \left(\frac{2\pi N_M}{60}\right)^2 \frac{J_L}{t_a} = \left(\frac{2\pi}{60} \times 745\right)^2 \times \frac{2.69 \times 10^{-4}}{0.1} = 16.4(\text{W})$$

● Recommended Servomotor Selections

- Conditions
- $T_L \leq$ Motor rated torque
 - $P_a + P_o = (1 \text{ to } 2) \times$ Motor rated output
 - $N_M \leq$ Motor rated speed or maximum speed
 - $J_L \leq$ Allowable load inertia of SERVOPACK

From these conditions, the following selections are recommended :

- Servomotor : SJME-02AMA4
- SERVOPACK : SJDE-02APA

<Ratings>

- Rated output : 200(W)
- Rated speed : 3000(min⁻¹)
- Maximum speed : 4500(min⁻¹)
- Rated torque : 0.637(N·m)
- Instantaneous peak torque : 1.91(N·m)
- Rotor moment of inertia : 0.417×10⁻⁴(kg·m²)
- Allowable load inertia of SERVOPACK : 3×10⁻⁴(kg·m²)

● Servomotor Check

Required Starting Torque

$$T_P = \frac{2\pi N_M (J_M + J_L)}{60 t_a} + T_L = \frac{2\pi \times 745 \times (0.417 + 2.69) \times 10^{-4}}{60 \times 0.1} + 0.0669 = 0.309(\text{N}\cdot\text{m})$$

< 1.91(N·m) = Instantaneous peak torque
Therefore, the servomotor can be used.

Required Braking Torque

$$T_S = \frac{2\pi N_M (J_M + J_L)}{60 t_a} - T_L = \frac{2\pi \times 745 \times (0.417 + 2.69) \times 10^{-4}}{60 \times 0.1} - 0.0669 = 0.175(\text{N}\cdot\text{m})$$

< 1.91(N·m) = Instantaneous peak torque
Therefore, the servomotor can be used.

Effective Torque

$$T_{rms} = \sqrt{\frac{T_P^2 \cdot t_a + T_L^2 \cdot t_c + T_S^2 \cdot t_d}{t}} = \sqrt{\frac{(0.297)^2 \times 0.1 + (0.0669)^2 \times 0.9 + (0.177)^2 \times 0.1}{1.5}}$$

= 0.1032(N·m)
< 0.637(N·m) = Rated torque
Therefore, the servomotor can be used.

Therefore the recommended selection of servomotors and SERVOPACKs has sufficient capacity and can be used.

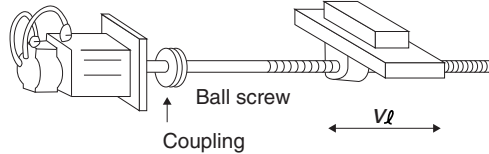
Selection of Servomotor Size

■ Servomotor Selection Example

Mechanical Specifications

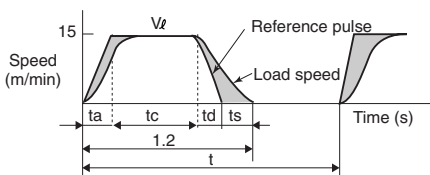
Servomotor

Linear motion unit



- Load speed : $V\ell = 15\text{m/min}$
- Mass of linear motion unit: $M = 80\text{kg}$
- Ball screw length : $L_B = 0.8\text{m}$
- Ball screw diameter : $D_B = 0.016\text{m}$
- Ball screw lead : $P_B = 0.005\text{m}$
- Coupling mass : $M_C = 0.3\text{kg}$
- Coupling outer diameter: $D_C = 0.03\text{m}$
- Positioning frequency : $n = 40\text{ times/min}$
- Traveling distance : $\ell = 0.25\text{m}$
- Positioning interval : $t_m = 1.2\text{ s max.}$
- Friction coefficient : $\mu = 0.2$
- Combined efficiency : $\eta = 0.9$
(90%)

● Speed Diagram



$$\text{Cycle time } t = \frac{60}{n} = \frac{60}{40} = 1.5 \text{ (s)}$$

Where acceleration time (t_a) = deceleration time (t_d) and setting time (t_c) = 0.1 s when the filter setting of the FIL rotary switch is 0.

$$\text{Acceleration time : } t_a = t_d = t_m - t_s - \frac{60 \times \ell}{V\ell} = 1.2 - 0.1 - \frac{60 \times 0.5}{30} = 0.1 \text{ (s)}$$

$$\text{Constant-speed time : } t_c = t_m - t_s - t_a - t_d = 1.2 - 0.1 - 0.1 - 0.1 = 0.9 \text{ (s)}$$

● Speed

• Load axis speed $N\ell = \frac{V\ell}{P_B} = \frac{15}{0.005} = 3000 \text{ (min}^{-1}\text{)}$

• Motor speed Because of direct coupling, the gear ratio is $1/R = 1/1$.
Then, $N_M = N\ell \cdot R = 3000 \times 1 = 3000 \text{ (min}^{-1}\text{)}$

● Effective Torque at Motor Shaft

$$T_L = \frac{\mu \cdot 9.8 \cdot M \cdot P_B}{2\pi R \cdot \eta} = \frac{0.2 \times 9.8 \times 80 \times 0.005}{2\pi \times 1 \times 0.9} = 0.139 \text{ (N}\cdot\text{m)}$$

● Effective Load Moment of Inertia at Motor Shaft

$$J_L = J_{L1} + J_B + J_C = 1.25 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$$

• Linear motion $J_{L1} = M \left(\frac{P_B}{2\pi R} \right)^2 = 80 \times \left(\frac{0.005}{2\pi \times 1} \right)^2 = 0.507 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$

• Ball screw $J_B = \frac{\pi}{32} \rho \cdot L_B \cdot D_B^4 = \frac{\pi}{32} \times 7.87 \times 10^3 \times 0.8 \times (0.016)^4 = 0.405 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$

• Coupling $J_C = \frac{1}{8} M_C \cdot D_C^2 = \frac{1}{8} \times 0.3 \times (0.03)^2 = 0.338 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$

● Load Running Power

$$P_o = \frac{2\pi N_M \cdot T_L}{60} = \frac{2\pi \times 3000 \times 0.139}{60} = 43.7 \text{ (W)}$$

● Load Acceleration Power

$$P_a = \left(\frac{2\pi}{60} N_M \right)^2 \frac{J_L}{t_a} = \left(\frac{2\pi}{60} \times 3000 \right)^2 \times \frac{1.25 \times 10^{-4}}{0.1} = 123.4(\text{W})$$

● Recommended Servomotor Selections

- Conditions
- $T_L \leq$ Motor rated torque
 - $P_a + P_o = (1 \text{ to } 2) \times$ Motor rated output
 - $N_M \leq$ Motor rated speed or maximum speed
 - $J_L \leq$ Allowable load inertia of SERVOPACK

From these conditions, the following selections are recommended :

- Servomotor : SJME-02AMA4
- SERVOPACK : SJDE-02APA

<Ratings>

- Rated output : 200(W)
- Rated speed : 3000(min⁻¹)
- Maximum speed : 4500(min⁻¹)
- Rated torque : 0.637(N·m)
- Instantaneous peak torque : 1.91(N·m)
- Rotor moment of inertia : 0.417×10⁻⁴(kg·m²)
- Allowable load inertia of SERVOPACK : 3×10⁻⁴(kg·m²)

● Servomotor Check

Required Starting Torque

$$T_P = \frac{2\pi N_M (J_M + J_L)}{60 t_a} + T_L = \frac{2\pi \times 3000 \times (0.417 + 1.25) \times 10^{-4}}{60 \times 0.1} + 0.139 \doteq 0.662(\text{N}\cdot\text{m})$$

< 1.91(N·m)=Instantaneous peak torque
Therefore, the servomotor can be used.

Required Braking Torque

$$T_S = \frac{2\pi N_M (J_M + J_L)}{60 t_a} - T_L = \frac{2\pi \times 3000 \times (0.417 + 1.25) \times 10^{-4}}{60 \times 0.1} - 0.139 \doteq 0.384(\text{N}\cdot\text{m})$$

< 1.91(N·m)= Instantaneous peak torque
Therefore, the servomotor can be used.

Effective Torque

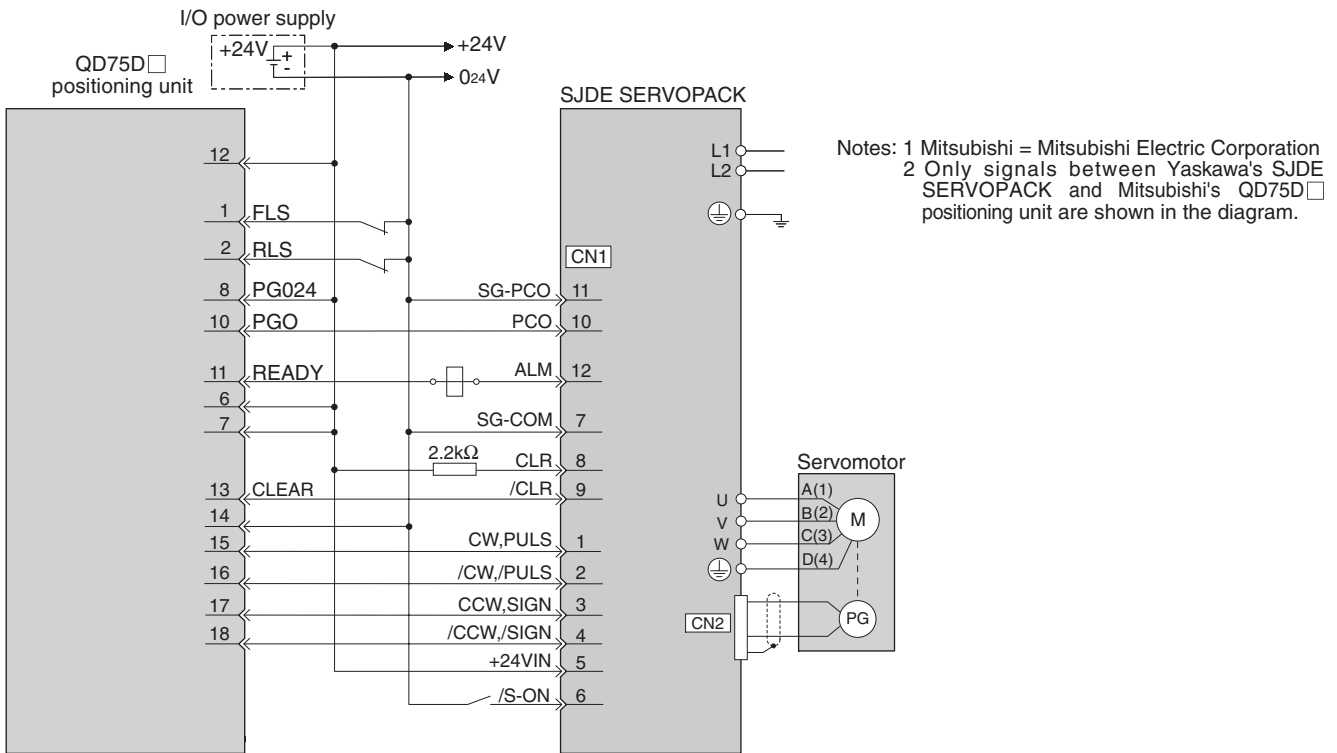
$$T_{rms} = \sqrt{\frac{T_P^2 \cdot t_a + T_L^2 \cdot t_c + T_S^2 \cdot t_d}{t}} = \sqrt{\frac{(0.662)^2 \times 0.1 + (0.139)^2 \times 0.9 + (0.384)^2 \times 0.1}{1.5}}$$

$\doteq 0.225(\text{N}\cdot\text{m})$
< 0.637(N·m)= Rated torque
Therefore, the servomotor can be used.

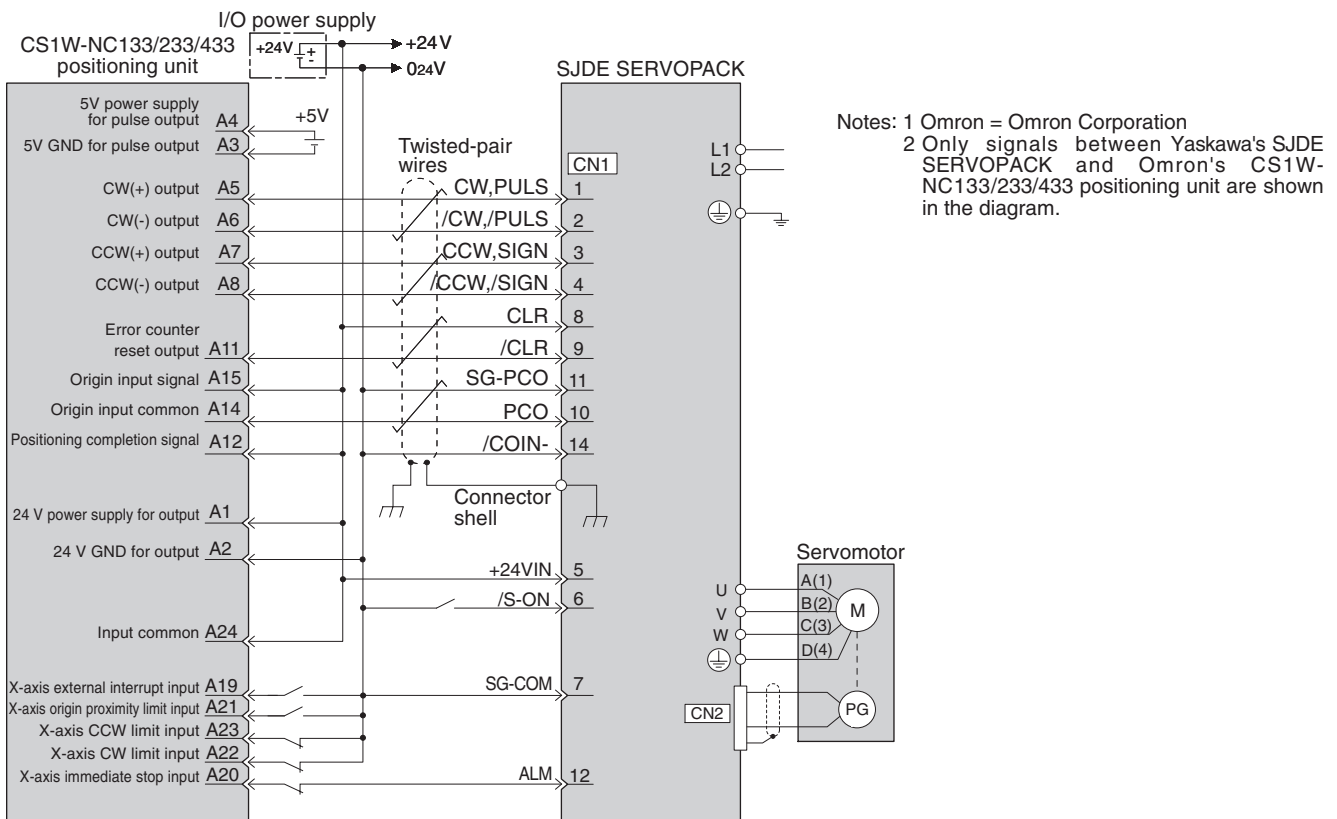
Therefore the recommended selection of servomotors and SERVOPACKs has sufficient capacity and can be used.

Connection to Host Controller

● Wiring to Mitsubishi's QD75D Positioning Unit



● Wiring to Omron's CS1W-NC133/233/433 Positioning Unit



Product Standard Life

Servodrive parts are subject to deterioration caused by mechanical friction and aging.

- The following standard service life is for reference only. The service life varies with environmental conditions and application methods. Refer to the standard life provided in the table and contact your Yaskawa representative to determine whether part replacement is required. If a problem occurs, inspection is necessary regardless of the length of the service life.

● SERVOPACKs

Part	Standard Life	Remarks
Cooling fan	30,000 hours	The service life varies with the operating conditions. Check for abnormal sounds or vibration during inspection.

Note: The following cooling fans are available for replacement
(manufactured by Sun-Wa Technos Corporation).

- SJDE-01 to 04 : JZSP-CHF08-1
- SJDE-08 : JZSP-CHF08-2

● Servomotors

Part	Standard Life	Remarks
Bearings	20,000 hours	The service life varies with the operating conditions. Check for abnormal sounds or vibration during inspection.

Terminology

■SERVOPACKs

●Servo OFF

The state in which the motor is free and not controlled and power is not supplied to the motor.

●Servo ON

The state in which the motor is controlled and power is supplied to the motor.

●H level

When the digital signal is at high level (5 V for TTL levels).

●L level

When the digital signal is at low level (0 V for TTL levels).

●Rising edge

Where an electric signal shifts from low level to high level.

●Position settling time

The SERVOPACK drives the motor with a pulse train input for position reference. The position settling time is the time from when the pulse train input is completed until the positioning error is within the acceptable range.

●Overload

The state in which the torque integrated over a certain period exceeds a preset allowable value.

●Momentary power interruption

The state where the supply of voltage to the SERVOPACK turns OFF momentarily.

●Open collector

An IC with an output collector that is open or a circuit using such an IC.

●Line driver

An IC with a relatively long-distance signal transmission method, or the circuit using such an IC.

●Momentary power hold time

The maximum time that the voltage of the main circuit can be maintained without generating an alarm during a momentary interruption of power.

●Noise countermeasures

A method to prevent or suppress noise that may disturb the signal lines resulting in malfunctions. Countermeasures should be taken so that noise is not radiated from the SERVOPACK and so that the SERVOPACK is not adversely influenced by external noise.

●D-grade grounding

A grounding method with a grounding resistance of 100 Ω or less.

●Frame ground

Frame ground (FG). Connected to the shield wire of the cable.

●Signal ground

The signal ground (SG) is a signal level of 0 V.

■Servomotors

●Forward rotation and reverse rotation

With Yaskawa's AC servomotors, forward rotation is the CCW direction and reverse rotation is the CW direction as seen from the load side of the motor.

●Motor with brake

The brake is used while the motor is not rotating. Do not use the brake to stop the motor during operation. The servo must remain off while the brake is functioning.

●Centering precision

The mechanical precision between the two shafts of the rotating machines coupled together. Centering precision usually refers to the difference in position between the axes of the motor shaft and the load shaft.

●Allowable thrust load

The maximum allowable load applied parallel to the axis of the motor shaft.

●Allowable radial load

The maximum allowable load applied vertically to the axis of the motor shaft.

■Peripheral Devices

●Short circuit breaker

A device that automatically shuts off the circuit when the low-voltage line has a ground fault.

●Magnetic contactor

A magnetic switch that turns power ON and OFF.

●Surge protector

A device that absorbs external voltages, such as lightning surges, to prevent the malfunctioning and destruction of peripheral electronic circuits.

●Noise filter

A device installed to prevent external noise from power lines.

●Servomotor size selection software

Software used to select servomotors and SERVOPACKs.

Product name: JunmaSize+

●Coupling

A joint that connects the motor shaft and load shaft. The coupling can absorb differences between the position of the motor shaft and the load shaft to a certain extent. Couplings are available in metal disk types, Oldham types, and bellows types. Metal disk couplings are recommended for the optimum performance of the servomotor and have good durability.

Q. What are the features of a servomotor?

A. Compared with a stepping motor, a servomotor can output constant torque in low- to high-speed ranges. Unlike a stepping motor, which causes problems with vibration, noise, and heat generation, a servomotor ensures smooth rotation without loss of control.

Q. What features does the JUNMA servodrive have compared with other servodrives?

A. Conventional servodrives require settings for a variety of functions, including servo gain settings. The JUNMA servodrive works with minimal adjustments of two rotary switches instead of parameters. Therefore, high-performance control is ensured with the same ease as a stepping motor.

Q. What machines can the JUNMA be used for?

A. The JUNMA can be used for almost all machines, including timing belts and ball screws. The JUNMA cannot be used if the installation precision exceeds the recommended precision specified in *Coupling to the Machine* (page 22).

Q. What is "Servo ON"?

A. It refers to the application of power to the servomotor by turning ON the /S-ON I/O signal. When power is applied to the motor, the position of the motor shaft will be locked unless a reference is input. In the servo ON state, the servomotor is in a servo-locked state and will not move even if external force is applied.

Q. The red indicator on the front panel of the SERVOPACK is lit and the servomotor stopped operating. What should be done?

A. The alarm has been turned on. The meaning of alarms and corrections vary with the display on the indicator and the number of indicators that light. For details, refer to *Alarm* (page 13).

Q. Why does the REF (green indicator) blink while the motor is in operation?

A. The REF blinks to indicate that a reference pulse is being input (i.e., the motor is rotating). Do not touch the machine or motor shaft while the REF is blinking, no matter how slowly the motor is turning. For details, refer to *Part Names and Functions* (page 12).

Q. When is the FIL rotary switch for the reference filter setting used?

A. The FIL switch is used to smooth the reference input to the SERVOPACK. The initial value (0) may be used in most cases. If the machine vibrates, increase the value. The higher the value is, the smoother the motion becomes but the longer the position settling time will be. Settings up to 7 are available.

Q. The servomotor generates noise after the servomotor is turned on or after the value of the FIL rotary switch for reference filter setting is changed. What should be done?

A. The JUNMA starts vibration detection when the servo is turned on, and makes automatic adjustments if needed. While making these adjustments, some noise may be generated. Once the adjustments are made, the adjusted value will be used until the setting of the FIL rotary switch for reference filter is changed. Therefore, no further noise will be generated.

Q. The machine vibrates. What should be done?

A. The JUNMA detects machine vibration and makes automatic adjustments. Any unusual noise while the machine is running may be caused by errors in the automatic adjustments. Increase the Reference Filter Setting (FIL) by one, and then return to the previous setting. JUNMA will now be able to make the correct automatic adjustments.

JUNMA SERIES

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YASKAWA ELECTRIC CORPORATION

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In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.

Specifications are subject to change without notice for ongoing product modifications and improvements.

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