YASKAWA

AC SERVO DRIVES
Σ-Ⅲ SERIES

SERVOMOTOR TYPE : SGMAS
SGMPS
SGMSS
SGMCS
SERVOPACK TYPE : SGDS

another step ahead

Σ-Ⅲ

AC SERVODRIVE Σ-Ⅲ

Certified for
ISO9001

JQA-0422

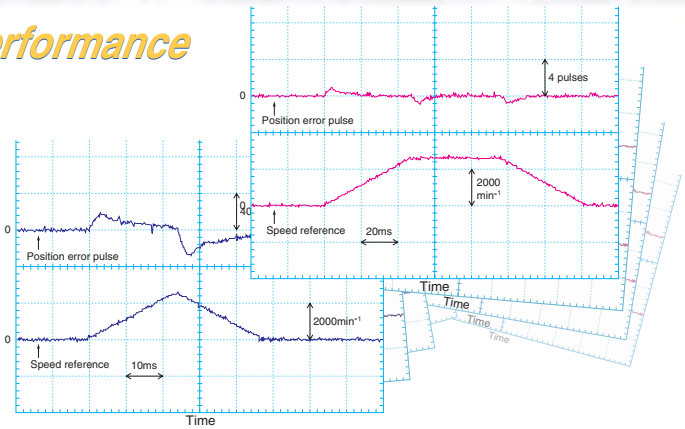
With the Σ-III, make the most of your machine's characteristics and realize the best high-speed positioning.

The Σ (Sigma)-III series has been developed specially for frequent high-speed and high-precision positioning operations. Also, the Σ-III series with its compact size and upgraded functions improves operability, makes the most of your machine's characteristics, and contributes to higher productivity.

Note: The motors do not include the connectors shown in the photo.

High control technology for top performance

To drive your machine correctly at higher speeds, the Σ-III series uses high control technologies such as less deviation control, a frequency response at 600 Hz, and a vibration suppression control. With a maximum motor speed of 6000 min^{-1}, the Σ-III series provides servo high-speed performance to meet your needs.



Tuning functions and engineering tools to maximize servo system

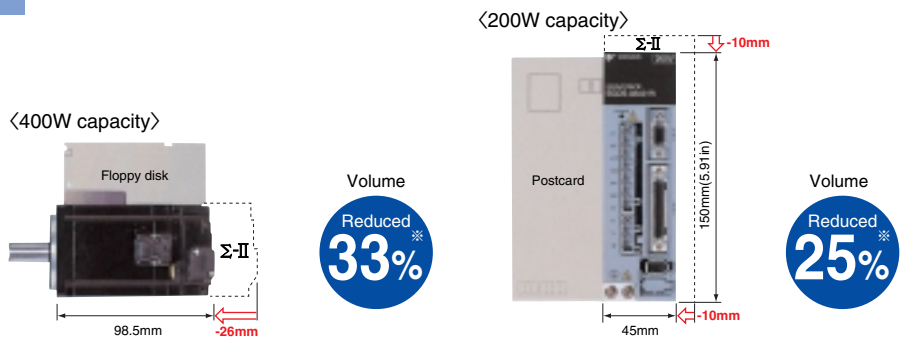
To quickly and correctly adapt the servo drive to your machine, the Σ-III series includes user-friendly tuning functions and a new remote digital operator with a liquid crystal display for greater operability.
"SigmaSize+" allows you to select a servo drive of optimum capacity online through the World Wide Web, and "SigmaWin200", an engineering tool, allows you to analyze your machine characteristics to tune the servo drive.

Applications: For high-speed and high-response performance, especially for machines that require high productivity with a quick tact time.

Equipment	Machines
・Semiconductor-manufacturing machines	・Die-bonding machines and wire-bonding machines
・Electronic parts assembling machines	・Chip mounters and IC handlers
・Inspection units	・Probers and in-circuit testers
・Metal-processing machines	・Winding machines, feeders, and loaders
・Food-packing machines	・Pillow-packing machines

Advantage **Compact**

1 Smaller but more powerful driving section

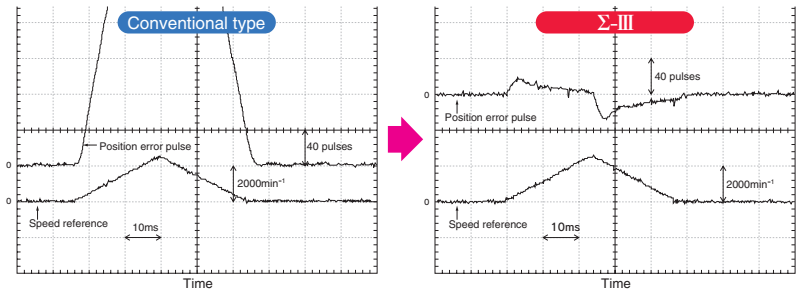


※Compared with the YASKAWA's Σ-Ⅱ series.

Advantage **Quick**

2 High-speed positioning with minimum machine vibration

- The less deviation control reduces the positioning settling time for high-rigidity machines to 1 ms or less.
- The advanced control enables smooth, high-speed operations and minimizes the positioning deviation for low-rigidity machines.
- Upgraded Follow-up Control for triangle patterns
- 17-bit encoder mounted as a standard feature
  The highly accurate absolute position data and upgraded vibration suppression control on stopping are indispensable for extra-fine processing and high-precision mounting.
- The torque ripple is greatly reduced to assure smooth rotation.



Advantage **Simple**

3 Simplified tuning for connected servo drives

- Advanced autotuning
  With the remote digital operator or the built-in panel operator, you can automatically adjust settings, such as those for the gain and the filter, for the optimum operation of the servo drive while you are using the motor.
- One-parameter autotuning
  You can easily adjust the servo gains as if you were moving a slide lever.
- EasyFFT function
  A simplified version of the FFT function is pre-installed in the SERVOPACKs in the Σ-III series. You can monitor the frequency of the mechanical vibration and automatically set the frequency of the notch filter with the remote digital operator.
- Parameter copying function
  New digital operator with 5-digit liquid crystal display (Optional)
  The SERVOPACK parameters can be read out and stored in the digital operator.

One-parameter Autotuning Screen(SigmaWin+)

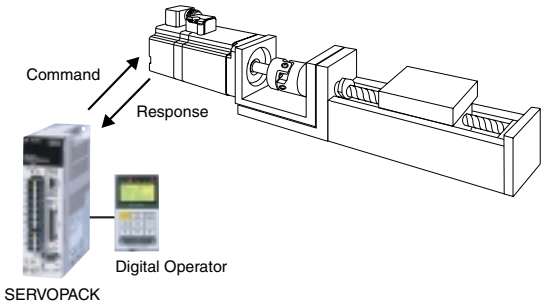
CONTENTS

Tuning

Smooth tuning of connected servo drives

Advanced Autotuning

With the remote digital operator or the built-in panel operator, set the servo drive to run so that you can tune the parameters, and the optimum settings for the load moment of inertia, the servo gains, and the filter for the connected machine will be automatically set.



〈Note〉
To be used when the results of normal autotuning are not satisfactory.
The advanced autotuning is applicable when the stroke is long enough to allow the auto run.

One-parameter Autotuning

Four servo gains can be automatically adjusted by tuning just one parameter for a servo gain with the onscreen slider.

〈Note〉
To be used when you want to judge the results of servo tuning.
Using this function shortens the time required for tuning.
To be used when you want to improve the servo response after advanced autotuning.

EasyFFT

A simplified version of the FFT function is pre-installed in the SERVOPACKs in the Σ-III series.
The mechanical vibration frequency is monitored on the remote digital operator or the built-in panel operator, and a notch filter is automatically set to minimize the vibration.

〈Note〉
To be used this function to set a notch filter for the individual machine that is connected before adjusting the servo gains.

Operation

Upgraded display and functions

The new JUSP-OP05A digital operator (optional) displays the four specified data such as parameter settings and the monitored data at the same time to make tuning the servo drive even easier.

〈Functions〉
- Parameter editing
- Monitoring
- Utility functions (Eg: Jog operation)
- Parameter copying function (for seven SERVOPACKs)
- Saving of onscreen configurations

Liquid crystal display (17 letters×5 lines)

Simple messages in alphanumeric characters give helpful guidance.

Parameter copying function

The parameters in a Σ-III SERVOPACK are read out and stored in seven areas in the remote digital operator. The stored parameters can be written into a Σ-III SERVOPACK.
These seven storage areas can be used for various purposes such as storing the parameters of seven Σ -III SERVOPACKs or recording seven histories of parameter modifications.

Functions — Full range of functions for optimizing your machine

New Functions

Online vibration monitor
To detect the vibration frequency while the machine is running and to automatically set the required frequency of the notch filter.

Vibration suppression control*
To minimize the vibration caused by the resonance of a low-rigidity machine.

Less deviation control
To improve the machine's follow-up accuracy. Almost no error is caused in not only triangle and but also trapezoid patterns for references.

Predictive control
To amend the command being executed for improved servo response.

Backlash compensation
To compensate the machine backlash in one direction by adding a value to the position reference in one direction.

High Performance

Model follow-up control
This function is effective for the high-speed positioning of low rigidity machines. The optimum positioning control for machines suppresses vibrations and reduces the positioning time of your machines.

Vibration control*
The observer reduces the vibration, which allows high servo gain to be used in the drive if a machine drive system is subject to vibrations. This function enhances the servo characteristics.

Notch filter
Resonance is suppressed by setting the notch filter in accordance with mechanical system resonance frequency when a high frequency resonance noise is made by the machine.

Torque reference filter
In the event that shaft resonance causes vibration in the servo system, the torque reference filter suppresses resonance.

Speed observer control
The speed observer enables smooth motion even at low speeds and a shorter position settling time.

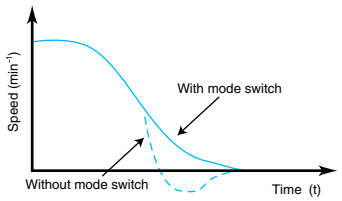
Speed bias
Load conditions are optimized to shorten positioning time.

Vibration suppression control on stopping
To minimize vibration when the motor is stopped (servo-lock). If no position reference is input, a damping is set to the torque reference so that the torque variation at stopping is moderated.

Automatic gain switching
To shorten the settling time and minimize vibration on stopping. Four combinations of four parameters for the speed loop gain, the speed control integral time constant, the position loop gain, and the filter time constant for torque reference are possible. The combinations can be switched by the G-SEL1 and G-SEL2 external input signals, or two combinations can be switched by setting the automatic gain switching function.

High-speed rotation
Maximum motor speed: 6000 min^{-1}
This brings the machine's performance to that of a higher grade.

Mode switch
To improve transient characteristics during motor acceleraion and deceleration, the system can be switched between speed loop PI (proportional and integral) and P (proportional) control, helping to prevent overshoot.



Feed-forward compensation
Feed-forward compensation provides reduced positioning time.

Zero clamp operation
When speed control is used, drift may occur even with a speed command of 0V. The zero clamp function uses a position loop to stop motor (servo-lock) below a preset speed command.

*: Contact your YASKAWA representatives if planning to use these functions.

Easy Setup

Normal autotuning
Enhanced precision of the identification of the moment of inertia eliminates the need for servo gain adjustment.

Automatic motor discrimination function
The use of the serial encorder makes it possible for the SERVOPACK to automatically sense motor capacity and type, and set motor parameters accordingly.
Using a non-recommended motor may result in an alarm.

Load ratio monitor
Allows monitoring of effective torque for torque reference.

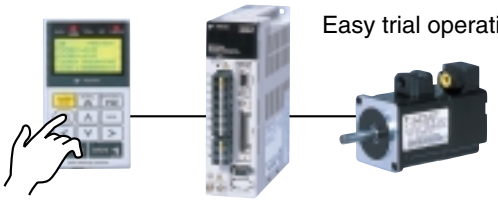
Regenerative load ratio monitor
Allows monitoring of regenerative ratio.

Regenerative overload warning
Allows a warning to be issued before a regenerative overload alarm is triggered.

Password
Prevents unauthorized alteration of parameters.

PC interface
Simplifies parameter settings, supports the waveforms of speed and torque references, and supports 1:n communications(n≦14).

Jog operation
The motor can be controlled through the remote digital operator, even without inputting speed references. Handy for trial operation.



Alarm traceback
Even if the power is turned OFF, a total running hours and data for the last ten alarms are stored, simplifying troubleshooting.

Flexible Adjustment

I/O signal mapping function
For input signals, used to allocate a function. For output signals, used to select three types of the nine signals.

Zero position search
The SERVOPACK moves a motor to the zero position pulse position of the encoder and then stops: handy for positioning motor shaft and machine.

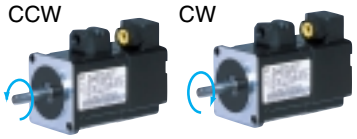
All-in-one control
Position, torque and speed can be controlled independently, with simple switching between control modes.

Torque limit
Used to limit the maximum torque so to reduce damage to the machinery.

Support for encoders
Can also be used with an absolute encoder so that zero-return operations are unnecessary and that operation is possible immediately after a power loss.

Encoder divider
The encoder pulses can be devided in any ratio, and the positioning resolution for the host controller can be set without any limits.

Reverse mode
Motor forward and reverse rotation directions can be defined through a simple parameters, without rewiring the motor or the encoder.



	Standard mode	Reverse mode
Forward reference	CCW	CW
Reverse reference	CW	CCW

Soft start
Used to set the motor acceleration and deceleration times and to smoothly start rotations.

Brake interlock
A brake ON or OFF signal can be output for motors with brakes. This signal is interlocked with the servo-ON state and the motor's speed.

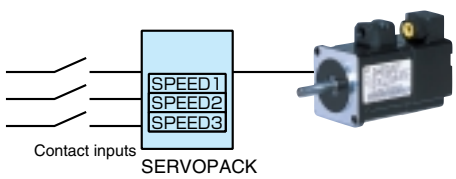
Overtravel prevention
Motor run can be stopped when the machinery exceeds its defined motion range.

Regenerative processing
The regenerative power regenerated during motor deceleration is absorbed by the SERVOPACK regenerative circuit. A larger capacity may be required for external regenerative resistor, depending on the load moment of inertia and operating conditions.

Positioning completed signal
Shows the value of the error counter if it is within the positioning completed range that is specified as a parameter.

Dynamic brake
If a power loss occurs while operating the machine, the dynamic brake enables the motor energy that was generated to be consumed by the resistance in the motor's coil and by external resistance. As a result, the machine stops rapidly to minimize damage and accidents.

Internally set speed selection
The motor can be operated at any of the three preset user speeds.



Reference pulses
Supports all types of reference pulses:Sign+pulse train, 90° phase displacement 2-phase pulse train, CCW/CW pulse train.

AC Servomotor Selection Program

SigmaSize+

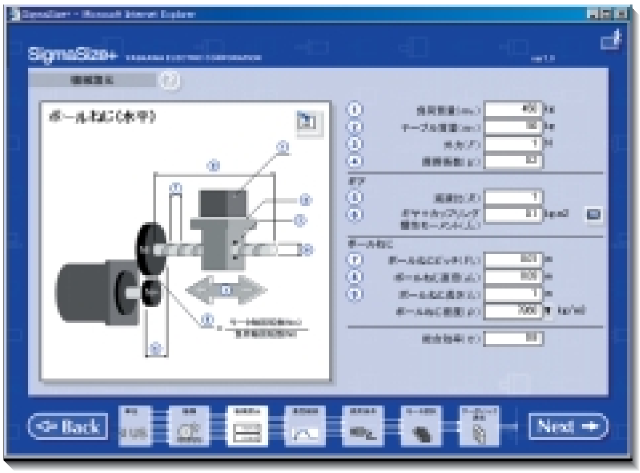
The SigmaSize+ is CD-ROM based application software to select the optimal YASKAWA servomotor drive for your machinery.

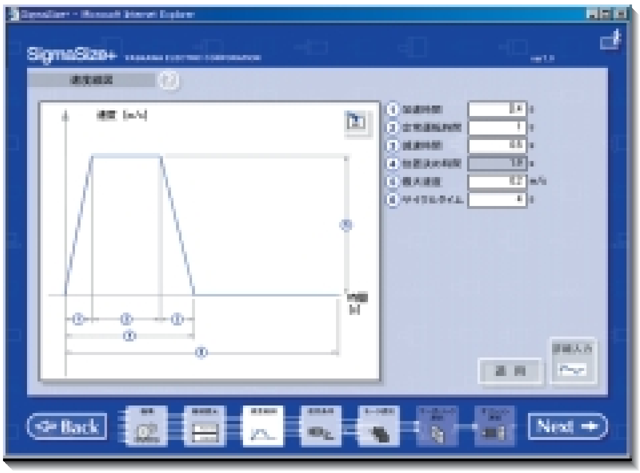
〈Features〉

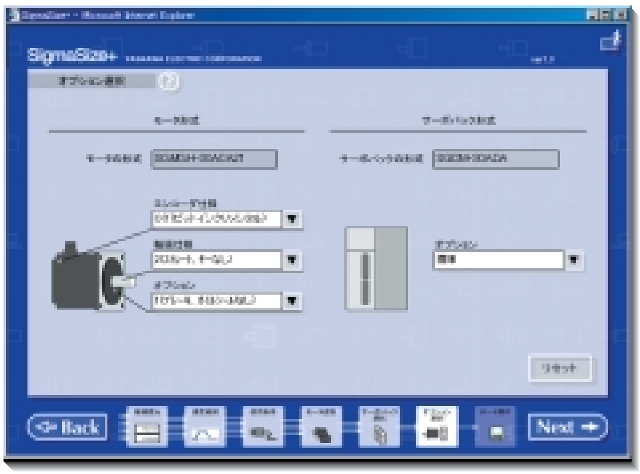
1 A host of product information
2 A wizard system with conversational mode to select optimal servomotors
3 References and reuses previously input and stored data.

(The SigmaSize+ will be available in 2002.)

■Servomotor Selection Screen (Screens below are for the Japanese version SigmaSize+. The English version will be available in 2002.)







PC Software for AC Servomotor Drive Control

SigmaWin+

The SigmaWin+ is Windows-based, engineering PC tools with a host of functions for setup and tuning that you can use to make YASKAWA servo drives easier than ever. By using a wizard to help you, each setting for the servo drives is made in conversational mode.
The SigmaWin+ can be used to make the optimum settings for the servo drives for your machines. It has functions such as mechanical analysis, dynamic simulation, and automatic tuning for servo drives (for the SGMAS, SGMPS, and SGMSS models).
Note: The SigmaWin+ will soon be available. Specifications may change without notices in future releases due to product improvements.

■Functions

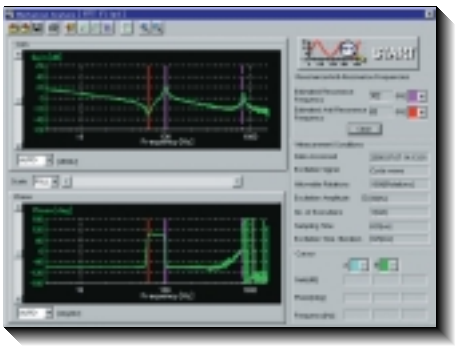
SigmaWin+	Basic Functions		Parameter editing	Edit, download/upload, save/load
			Monitoring	Status, I/O, motion monitor
			Alarm display	Alarms, reset, history, clear
	Trial Operation		Jog operation	Jog setting and operation
	Tuning		Trace display	Trace data display in SERVOPACK
			Real-time trace display	Trend display of trace data
			Setting of real-time parameter	Edit
	Setup	Analog Adjustment	Automatic adjustment of reference offset	Adjustment or setting of amount of offset
			Automatic adjustment of motor current detection offset	
			Manual adjustment of speed reference offset	
			Manual adjustment of torque reference offset	
			Manual zero adjustment of analog monitor	
			Manual gain adjustment of analog monitor	
			Manual adjustment of motor current offset	
		Absolute Encoder	Absolute encoder setting	Encoder reset, multi-turn settings
		Origin Search	Origin search	Movement to the origin (Phase C)
		Normal Autotuning	Setting of machine rigidity	Setting of autotuning
			Setting of identified moment of inertia ratio	
		Password Setting	Password setting	Password to prohibit writing by end-users
	Solution Functions		Moment of inertia setting	Identification of moment of inertia ratio
			Mechanical analysis (FFT)	Frequency response analysis
			Dynamic simulation	Motion simulation using mechanical model
			Gain tuning	Optimal control selection with actual references

Dynamic Simulation

The machine model is used for total simulation, including the control system, through run references such as positioning and speed. Now you can evaluate performance for different motors and loads in advance.

Mechanical analysis

The motor is activated from the PC, which measures and displays transmission functions, determining the specific vibration frequency of the system.



▲FFT Analysis Screen

Advanced Autotuning

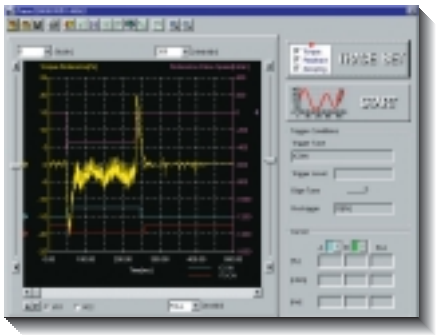
Using SigmaWin+, set the servo drive to run so that you can tune the parameters, and the optimum settings for the load moment of inertia, the servo gains, and the filter for the connected machine will be automatically set.

Servo setup

Edit parameters from the PC, and download them to multiple machines. Monitoring and offset adjustment are simple, too, for faster set-up.

Trace

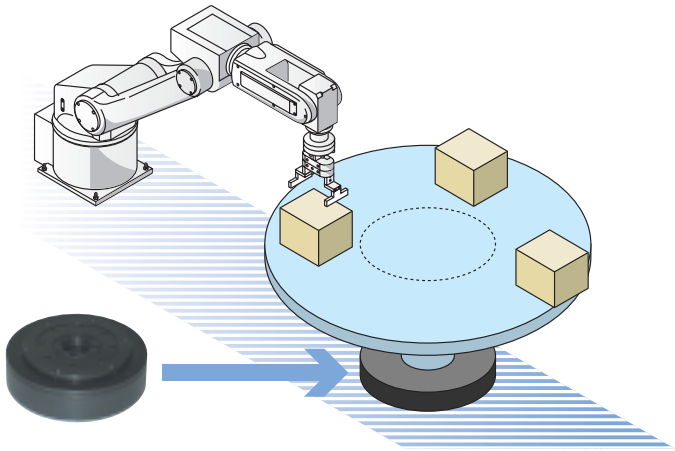
Display data stored in SERVOPACK memory right on the PC, just like an oscilloscope. Graphed data can be printed and stored, too.



▲Trace Screen

High-precision and Compact Turning Table

By combining a SERVOPACK from the Σ- III series with a flat and hollow SGMCS servomotor, a gearless direct drive is possible.
Using the direct drive with a turning table not only improves the positioning accuracy but also simplifies your machine's structure and maintenance.



●Direct Drive Systems

Feature 1 Powerful

More powerful with higher positioning accuracy

High-torque and High-speed

- A high-torque operation is realized without gears.
  Instantaneous maximum torque: **6 N·m to 105 N·m**
- A high-speed operation reduces tact time.
  Maximum motor speed: **250 min^{-1} to 500 min^{-1}**

High-precision

- High-precision indexing of 1,000,000 pulses per rotation (P/R) is available.
  High-resolution encoder: **1,048,576P/R**
- No backlash means that a high-precision, high-speed operation with shorter setting times is possible.

Feature 2 Simple

Simplified machine structure, adjustment, and maintenance

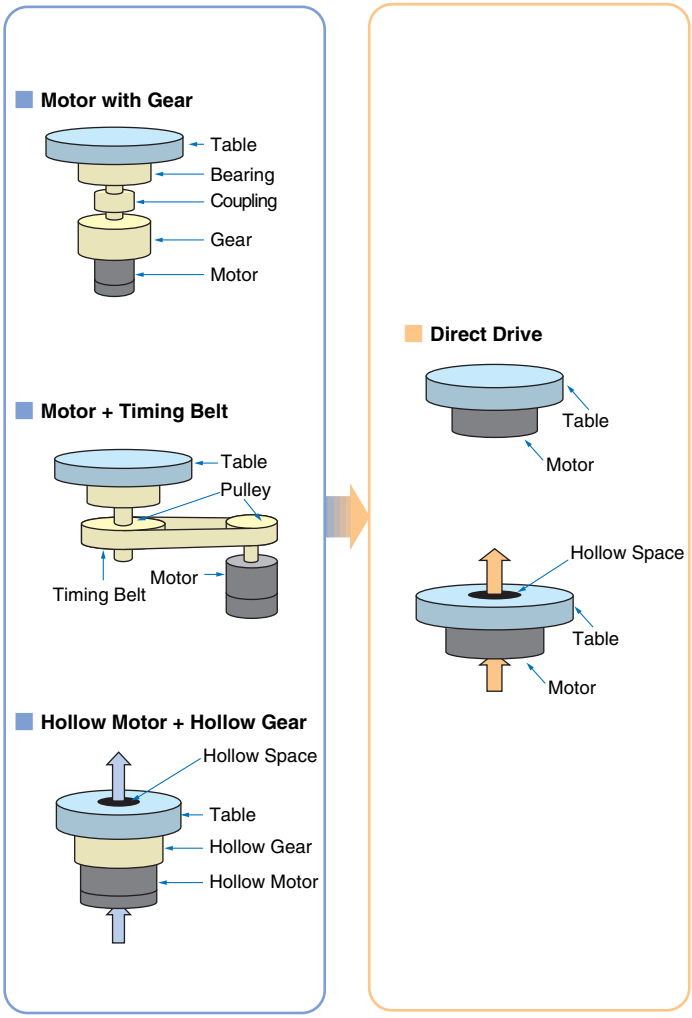
Compact

- The size of the machine's drive section is reduced because of the flat, thin motor's design.
- The hollow space in the motor can be used for wiring and piping so less space is required for installation.

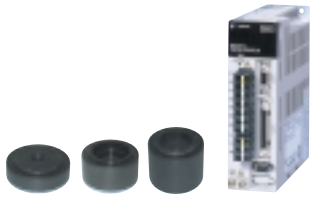
Easy

- Smooth and noiseless drive
  Maximum cogging torque: 0.3%
- The gearless drive requires no maintenance for wear and tear or for lubrication.

Drive System Comparison



Product Lineup



Servomotor		SERVOPACK Type SGDS-		
Type	Capacity	Single-Phase 100V	Single-Phase 200V	Three-Phase 200V
SGMAS-A5A	50W	A5F	A5A	–
SGMAS-01A	100W	01F	01A	–
SGMAS-C2A	150W	02F	02A	–
SGMAS-02A	200W	02F	02A	–
SGMAS-04A	400W	04F	04A	–
SGMAS-06A	600W	–	08A	–
SGMAS-08A	750W	–	08A	–
SGMPS-01A	100W	01F	01A	–
SGMPS-02A	200W	02F	02A	–
SGMPS-04A	400W	04F	04A	–
SGMPS-08A	750W	–	08A	–
SGMSS-10A	1000W	–	–	10A

Servomotor		SERVOPACK Type SGDS-	
Type	Capacity	Single-Phase 100V	Single-Phase 200V
SGMCS-02B	42W	02F	02A
SGMCS-05B	105W	02F	02A
SGMCS-07B	147W	02F	02A
SGMCS-04C	84W	04F	04A
SGMCS-10C	209W	04F	04A
SGMCS-14C	293W	04F	04A
SGMCS-08D	168W	04F	04A
SGMCS-17D	356W	04F	04A
SGMCS-25D	393W	04F	04A
SGMCS-16E	335W	–	08A
SGMCS-35E	550W	–	08A

●Type Designation

Servomotor

SGMAS – 01 A C A 2 1

Σ-Ⅲ Servomotor Series
SGMAS: Super High Power Rate Series
SGMPS: Flat Series
SGMSS: Super High Power Rate Series

Rated Output

Code	Output W	Code	Output W
A5	50	04	400
01	100	06	600
C2	150	08	750
02	200	10	1000

Supply Voltage
A: 200VAC Note: 200 VAC of supply voltage can be used for motors even when 100 VAC is used for SERVOPACKs

Serial Encoder Specifications
2: 17-bit Absolute (Standard)
C: 17-bit Incremental (Standard)

Design Revision Order
A: SGMAS, SGMPS, SGMSS
E: IP67 (only for SGMPS)

Shaft End Specifications

Code	Specifications	SGMAS	SGMPS	SGMSS
2	Straight,No key	Standard		Standard
3	Taper 1/10,Key	–		Option
4	Straight,Key	Option		–
5	Taper 1/10,Woodruff key	–		Option
6	Straight,Key,Tap	Option		
8	Straight,Tap			–

Options
1: No Option
B: 90-VDC Brake
C: 24-VDC Brake
D: Oil Seal,90-VDC Brake
E: Oil Seal,24-VDC Brake
S: Oil Seal

SGMCS – 02 B 3 A 1 1

Σ-Ⅲ SGMCS Servomotor

Rated Output, Motor Outer Diameter

Code	Rated Output N·m	Outer Diameter mm			
		B(135 dia.)	C(175 dia.)	D(230 dia.)	E(290 dia.)
02	2.0	○			
04	4.0		○		
05	5.0	○			
07	7.0	○			
08	8.0			○	
10	10.0		○		
14	14.0		○		
16	16.0				○
17	17.0			○	
25	25.0			○	
35	35.0				○

Serial Encoder Specifications
3: 20-bit Absolute (Standard) (Within one rotation)
D: 20-bit Incremental (Option)

Design Revision Order
A: Standard

Flange Specifications
1: Face-mounted

Brake Specification
1: No Brake

SERVOPACK

SGDS – 02 A 01 A □

Σ-Ⅲ SGDS SERVOPACK

Rated Output

Code	Output W	Code	Output W
A5	50	04	400
01	100	08	750
02	200	10	1000

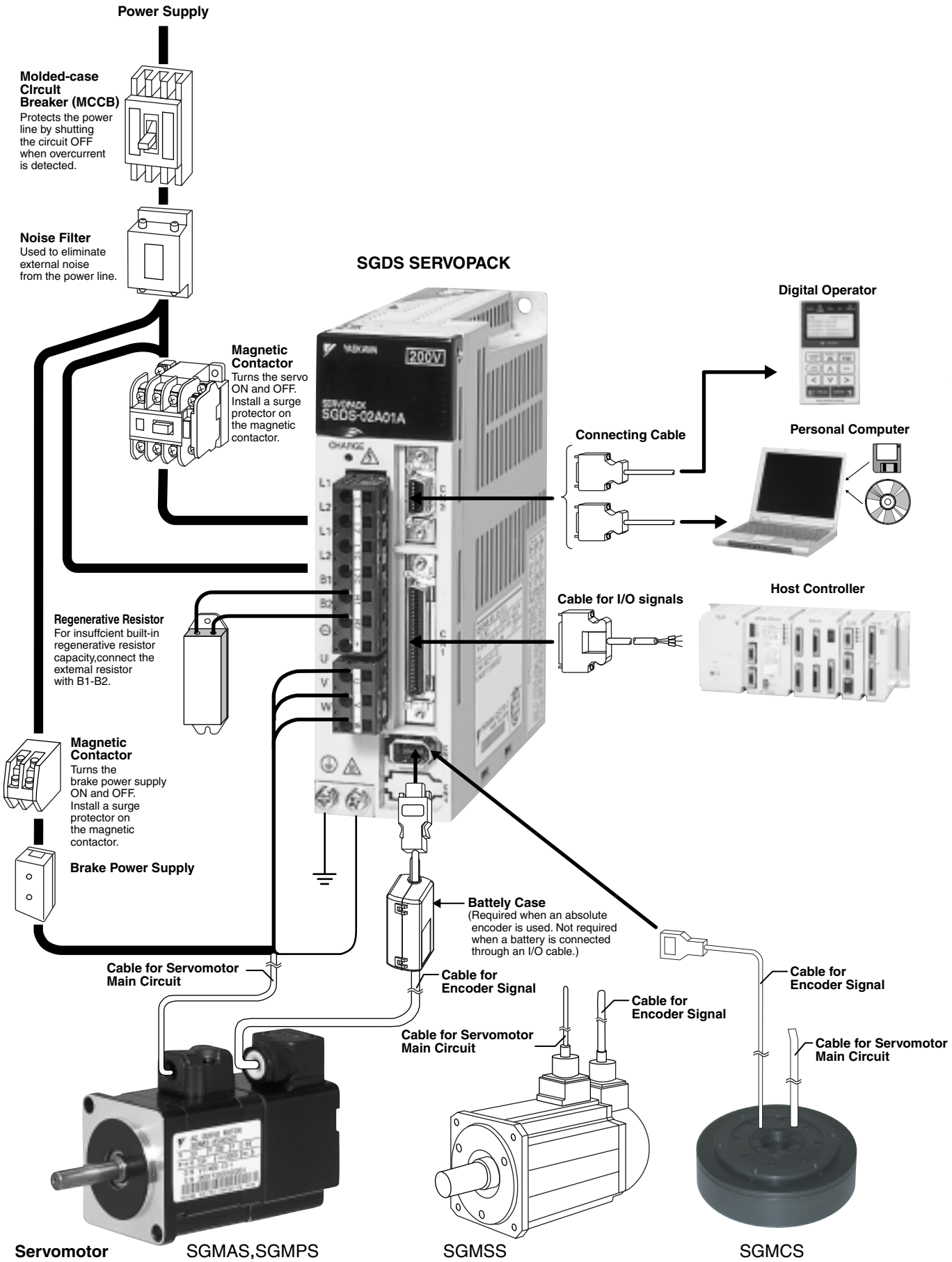
Supply Voltage
A: 200VAC
F: 100VAC

Mouting Method
Blank: Base-mounted
R: Rack-mounted

Design Revision Order
A, B···

Interface Specifications
01: Standard (Analog and pulse train)

System Configuration



Servomotor

SGMAS,SGMPS

Note: The motors do not include the connectors shown. The SGMPS servomotor is different in appearance from the figure above.

SGMSS

Note: The SGMSS servomotor and connectors are different from the figure above in appearance.

SGMCS

Note: Servomotors with brakes are not provided.

Servomotors

●Ratings and Specifications

SGMAS, SGMPS, SGMSS

Time Rating	: Continuous	**Mounting Method**	: Flange-mounted	**Excitation Format**	: Permanent magnet
Vibration Resistance	: V15	**Thermal Class**	: B (SGMAS, SGMPS) F (SGMSS)	**Drive Method**	: Direct drive
Insulation Resistance	: 500VDC,10MΩ or more				
Ambient Temperature	: 0 to +40℃	**Insulation Withstand Voltage**	: 1500VAC at 200V, 1min		
Ambient Humidity	: 20 to 80%RH (non-condensing)	**Enclosure**	: Totally-enclosed,self-cooled IP55 (Through part of the shaft not included)		

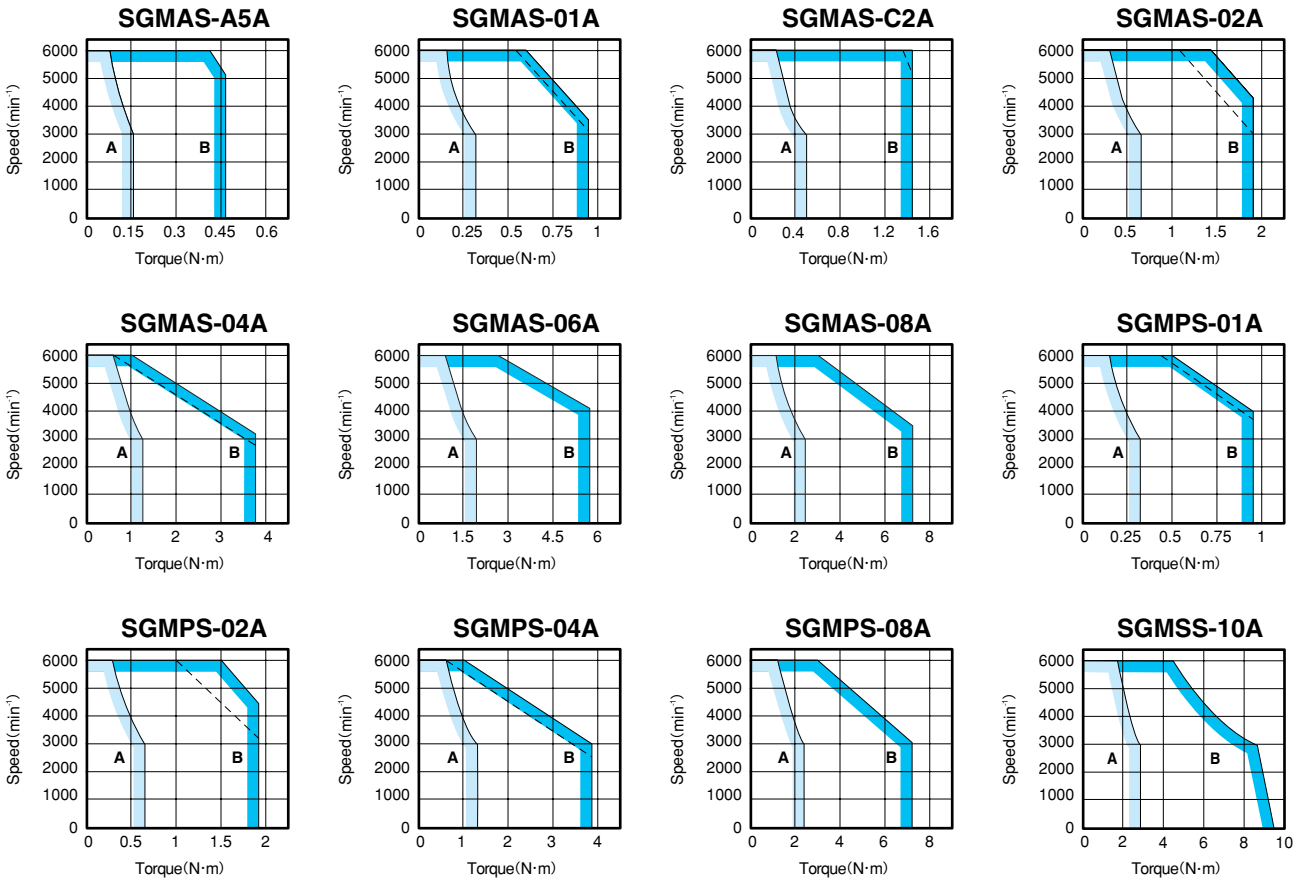
Servomotor Type		SGMAS-							SGMPS-				SGMSS-
		A5A	01A	C2A	02A	04A	06A	08A	01A	02A	04A	08A	10A
Rated Output*1	W	50	100	150	200	400	600	750	100	200	400	750	1000
Rated Torque*1, *2	N·m	0.159	0.318	0.477	0.637	1.27	1.91	2.39	0.318	0.637	1.27	2.39	3.18
Instantaneous Peck Torque*1	N·m	0.477	0.955	1.43	1.91	3.82	5.73	7.16	0.955	1.91	3.82	7.16	9.54
Rated Current*1	Arms	0.66	0.91	1.8	1.9	2.6	4.3	5.4	0.86	2.0	2.6	5.4	5.7
Instantaneous Max.Current*1	Arms	2.1	2.8	5.7	6.5	8.5	13.6	16.9	2.8	6.4	8.4	16.5	17
Rated Speed*1	min^{-1}	3000							3000				3000
Max. Speed*1	min^{-1}	6000							6000				6000
Torque Constant	N·m/Arms	0.265	0.375	0.284	0.375	0.527	0.496	0.487	0.401	0.361	0.524	0.474	0.636
Rotor Moment of Inertia	$kg·m^2×10^{-4}$	0.0242 (0.0312)	0.0380 (0.0450)	0.0531 (0.0601)	0.116 (0.180)	0.190 (0.254)	0.326 (0.390)	0.769 (0.940)	0.0592 (0.0892)	0.263 (0.415)	0.409 (0.561)	2.10 (2.98)	1.74 (2.07)
Rated Power Rate*1	kW/s	10.4 (8.10)	26.6 (22.5)	42.8 (37.9)	35.0 (22.5)	84.9 (63.5)	112 (93.5)	74.1 (60.8)	17.1 (11.3)	15.4 (9.78)	39.6 (28.8)	27.2 (19.2)	57.9 (48.6)

*1 : These values and the Torque/Speed characteristics listed here are representative of the values obtained when the motor is driven from the SERVOPACK and the coil temperature is at 100℃(20℃ for the SGMSS servomotor). All others are for a coil temperature of 20℃.

*2 : These values for the Rated Torque are for the continuous allowable torque with the following heatsinks at an ambient temperature of 40℃.
Heatsink dimensions: 250×250×6 mm : SGMAS-A5A, 01A, C2A, 02A, 04A, 08A
SGMPS-01A, 02A, 04A
300×300×12mm : SGMAS-06A, SGMPS-08A, SGMSS-10A

Note: Values in parentheses are for servomotors with a brake. Contact us for more information about servomotors with gears.

Torque / Speed Characteristics



Note: Dashed lines in the Intermittent Duty Zone show torque/speed characteristics when used with a SERVOPACK for 100VAC.

A : Continuous Duty Zone B : Intermittent Duty Zone

SGMCS

Time Rating	: Continuous	**Mounting Method**	: Flange-mounted	**Excitation Format**	: Permanent magnet
Vibration Resistance	: V15	**Thermal Class**	: A	**Drive Method**	: Direct drive
Insulation Resistance	: 500VDC,10MΩ or more	**Insulation Withstand Voltage**	1500VAC, 1min		
Ambient Temperature	: 0 to +40℃	**Enclosure**	: Totally-enclosed,self-cooled IP42		
Ambient Humidity	: 20 to 80%RH (non-condensing)		: (Through part of the shaft not included)		

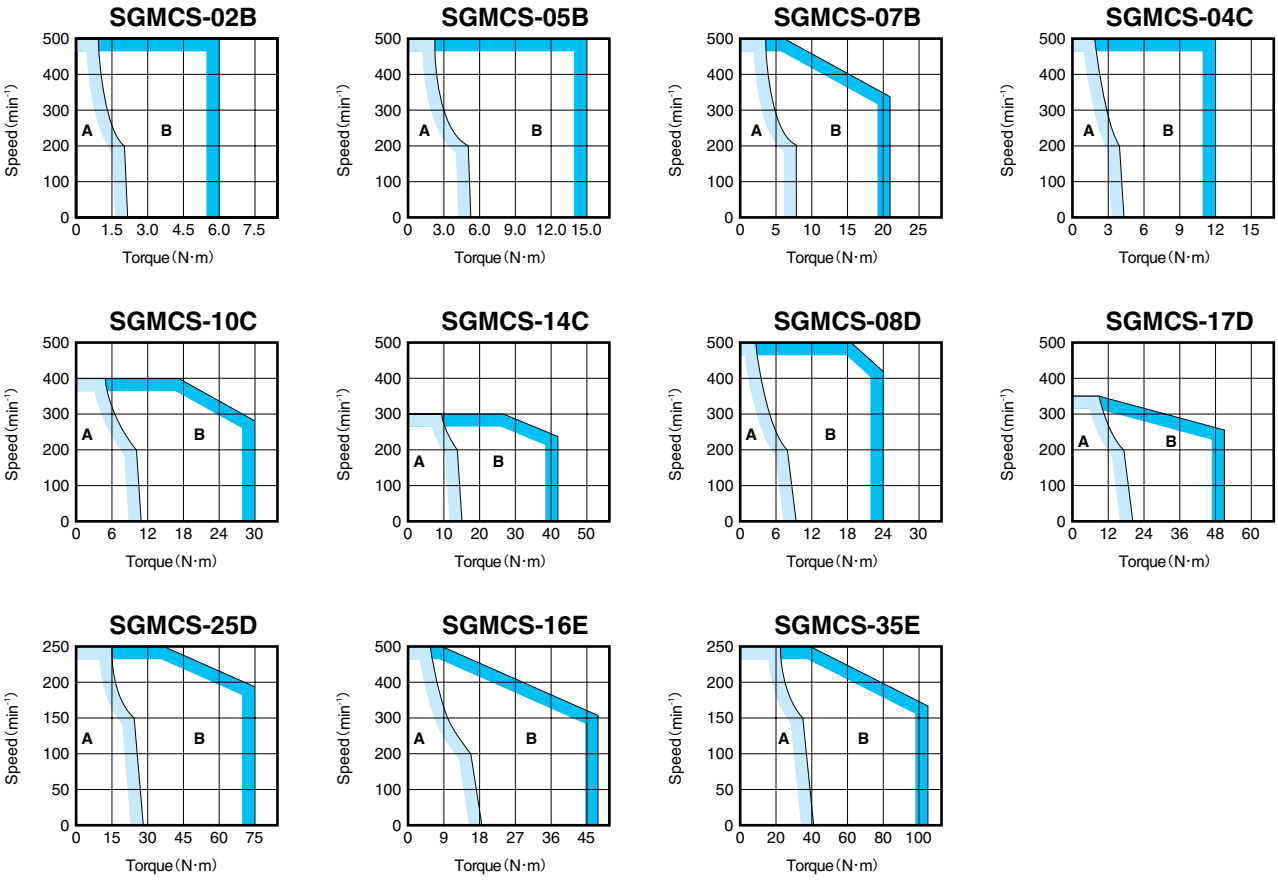
Servomotor Type		SGMCS-			SGMCS-			SGMCS-			SGMCS-	
		02B	05B	07B	04C	10C	14C	08D	17D	25D	16E	35E
Rated Output*1	W	42	105	147	84	209	293	168	356	393	335	550
Rated Torque*1, *2	N·m	2.00	5.00	7.00	4.00	10.0	14.0	8.00	17.0	25.0	16.0	35.0
Instantaneous Peck Torque*1	N·m	6.00	15.0	21.0	12.0	30.0	42.0	24.0	51.0	75.0	48.0	105
Stall Torque*1 (60min^{-1})	N·m	2.19	5.33	7.58	4.23	10.4	15.0	8.86	19.6	27.2	19.0	41.3
Rated Current*1	Arms	1.9	1.8	1.4	2.1	2.0	2.0	2.1	2.3	2.7	3.5	3.6
Instantaneous Max.Current*1	Arms	5.4	5.2	4.2	6.1	5.8	6.1	5.9	6.7	7.9	9.8	10.2
Rated Speed*1	min^{-1}	200			200			200		150	200	150
Max. Speed*1	min^{-1}	500			500	400	300	500	350	250	500	250
Torque Constant	N·m/Arms	1.28	3.12	5.51	2.16	5.56	7.60	3.30	6.33	10.3	5.58	11.1
Rotor Moment of Inertia	kg·m^2×10^{-4}	25.0	61.0	99.0	67.0	167	266	338	621	909	1080	1490
Rated Power Rate*1	kW/s	1.60	4.10	4.95	2.39	5.99	7.37	1.89	4.65	6.88	2.38	8.24
Rated Angular Acceleration*1	rad/s^2	800	820	710	600	600	530	240	270	280	150	240

*1 : These values and the Torque/Speed characteristics listed here are representative of the values obtained when the motor is driven from the SERVOPACK and the coil temperature is at 100℃. All others are for a coil temperature of 20℃.

*2 : These values for the Rated Torque are for the continuous allowable torque with the following heatsinks at an ambient temperature of 40℃.
Heatsink dimensions: 350×350×12mm : SGMCS-□□B
450×450×12mm : SGMCS-□□C
550×550×12mm : SGMCS-□□D
650×650×12mm : SGMCS-□□E

Note: Servomotors with brakes are not provided.

Torque / Speed Characteristics



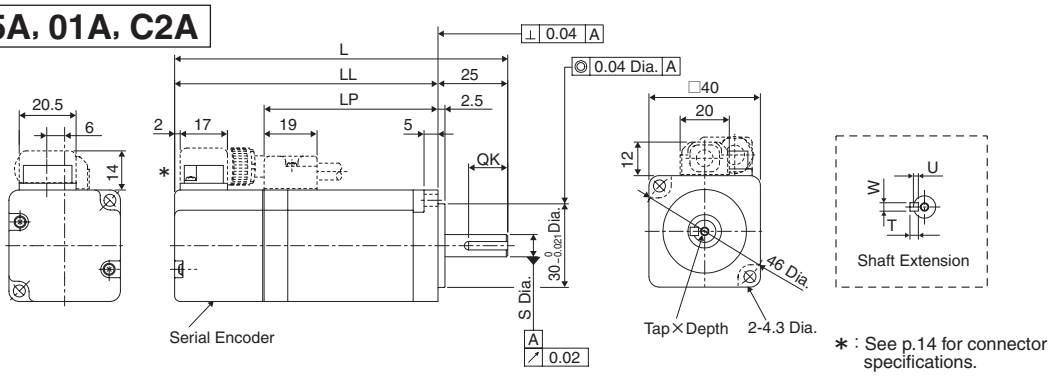
A : Continuous Duty Zone B : Intermittent Duty Zone

Servomotors (cont'd)

● Dimensions Units : mm

SGMAS-A5A, 01A, C2A

50W to 150W



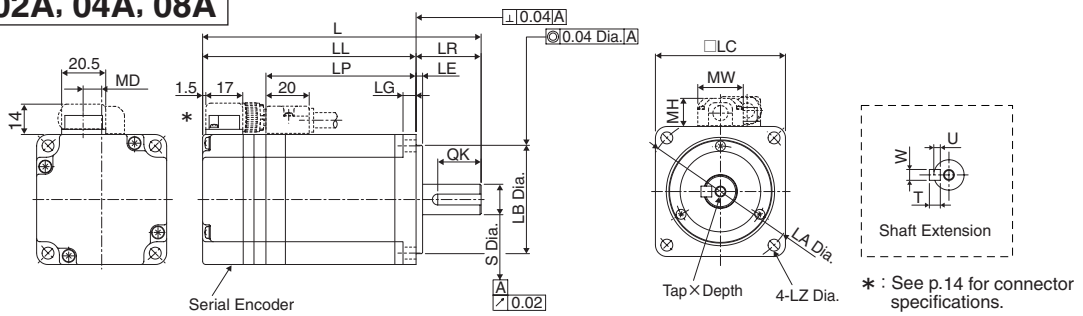
∗ : See p.14 for connector specifications.

Servomotor Type SGMAS-□	L	LL	LP	S	Tap×Depth	QK	U	W	T	Approx.Mass kg
A5A□A2□	95.5 (141.5)	70.5 (116.5)	38.5	6 0 -0.008	No tap	No key				0.3 (0.6)
A5A□A4□						14	1.2	2	2	
A5A□A6□					M2.5×5L					
01A□A2□	107.5 (153.5)	82.5 (128.5)	50.5	8 0 -0.009	No tap	No key				0.4 (0.7)
01A□A4□						14	1.8	3	3	
01A□A6□					M3×6L					
C2A□A2□	119.5 (176.5)	94.5 (151.5)	62.5	8 0 -0.009	No tap	No key				0.5 (0.8)
C2A□A4□						14	1.8	3	3	
C2A□A6□					M3×6L					

Note: Values in parentheses are for servomotors with a brake.

SGMAS-02A, 04A, 08A

200W to 750W



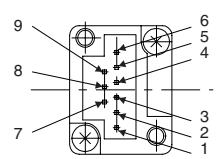
∗ : See p.14 for connector specifications.

Servomotor Type SGMAS-□	L	LL	LP	LR	LE	LG	LC	LA	LB	LZ	S	Tap×Depth	QK	U	W	T	MD	MW	MH	Approx.Mass kg
02A□A2□	110 (150)	80 (120)	51	30	3	6	60	70	50 0 -0.025	5.5	14 0 -0.011	No tap	No key				8.5	21	13	0.9 (1.5)
02A□A4□													20	3	5	5				
02A□A6□												M5×8L								
04A□A2□	128.5 (168.5)	98.5 (138.5)	69.5									No tap	No key							1.2 (1.8)
04A□A4□													20	3	5	5				
04A□A6□												M5×8L								
06A□A2□	154.5 (202)	124.5 (172)	95.5									No tap	No key							1.7 (2.4)
06A□A4□													20	3	5	5				
06A□A6□												M5×8L								
08A□A2□	155 (200)	115 (160)	85	40	3	8	80	90	70 0 -0.030	7	16 0 -0.011	No tap	No key				14	27	15	2.3 (3.2)
08A□A4□													30	3	5	5				
08A□A6□												M5×8L								

Note: Values in parentheses are for servomotors with a brake.

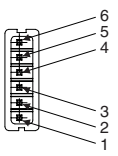
Connector Specifications [SGMAS and SGMPS-01A to 04A]

Encoder Connector



Absolute Encoder				Incremental Encoder			
1	—	6	PG5V	1	—	6	PG5V
2	—	7	—	2	—	7	—
3	PG0V	8	0BAT	3	PG0V	8	—
4	DATA+	9	BAT	4	DATA+	9	—
5	DATA−	Shell	FG	5	DATA−	Shell	FG

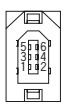
Motor Connector



	Without Brake	With Brake
1	FG	FG
2	Phase W	Phase W
3	Phase V	Phase V
4	Phase U	Phase U
5	—	Brake Terminal
6	—	Brake Terminal

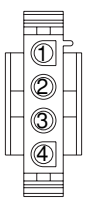
Connector Specifications [SGMPS-08A]

Encoder Connector

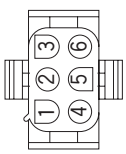


	Absolute Encoder	Incremental Encoder
1	PG5V	PG5V
2	PG0V	PG0V
3	BAT	—
4	0BAT	—
5	DATA+	DATA+
6	DATA-	DATA-
Shell	FG	FG

Motor Connector (Standard)



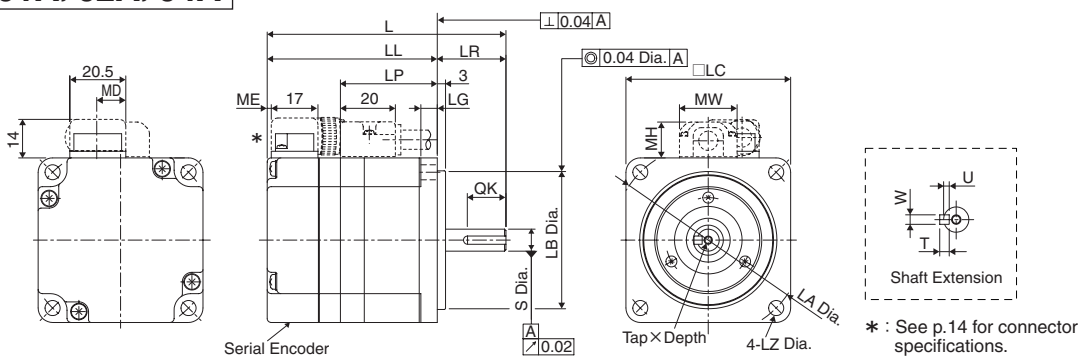
1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
4	FG	Green/Yellow



1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
4	FG	Green/Yellow
5	Brake Terminal	Red
6	Brake Terminal	Black

SGMPS-01A, 02A, 04A

100W to 400W

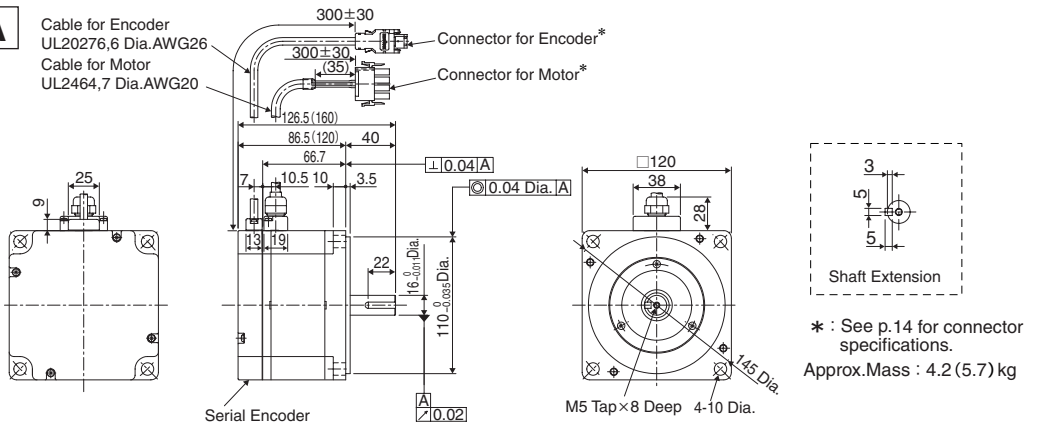


Servomotor Type SGMPS-□	L	LL	LP	LR	LC	LA	LB	LZ	LG	S	Tap×Depth	QK	U	W	T	MD	ME	MH	MW	Approx. Mass kg
01A□A2□	87 (116)	62 (91)	35	25	60	70	$50^{0}_{-0.025}$	5.5	6	$8^{0}_{-0.009}$	No Tap	No Key				9	1	12	20	0.5 (0.9)
01A□A4□												14	1.8	3	3					
01A□A6□											M3×6L									
02A□A2□	97 (128.5)	67 (98.5)	42.5	30	80	90	$70^{0}_{-0.030}$	7	8	$14^{0}_{-0.011}$	No Tap	No Key				14	1.5	13	21	1.1 (1.6)
02A□A4□												16	3	5	5					
02A□A6□											M5×8L									
04A□A2□	107 (148.5)	77 (118.5)	52.5								No Tap	No Key								1.4 (1.9)
04A□A4□												16	3	5	5					
04A□A6□											M5×8L									

Note: Values in parentheses are for servomotors with a brake.

SGMPS-08A

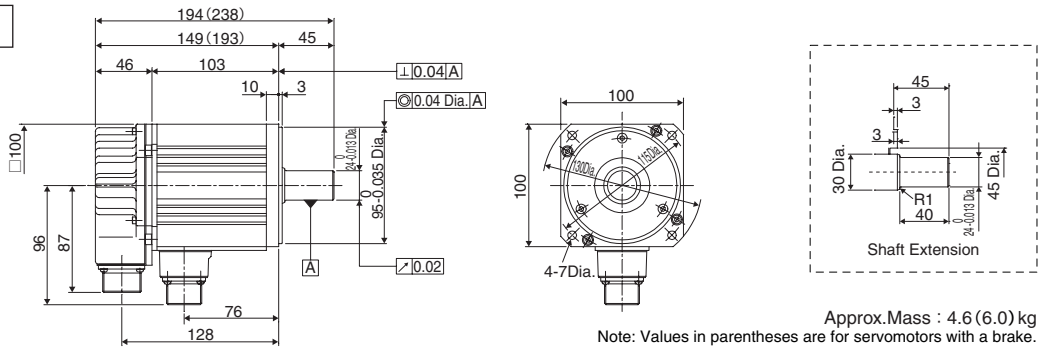
750W



Note: Values in parentheses are for servomotors with a brake.

SGMSS-10A

1.0kW



Note: Values in parentheses are for servomotors with a brake.

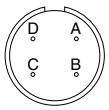
Connector Specifications

[SGMSS-10A]

Encoder Connector

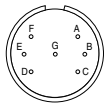
Absolute Encoder				Incremental Encoder			
A	—	K	—	A	—	K	—
B	—	L	—	B	—	L	—
C	DATA+	M	—	C	DATA+	M	—
D	DATA−	N	—	D	DATA−	N	—
E	—	P	—	E	—	P	—
F	—	R	—	F	—	R	—
G	0V	S	BATT−	G	0V	S	—
H	+5VDC	T	BATT+	H	+5VDC	T	—
J	FG			J	FG		

Motor Connector (Standard)



A	Phase U
B	Phase V
C	Phase W
D	FG

(With brake)



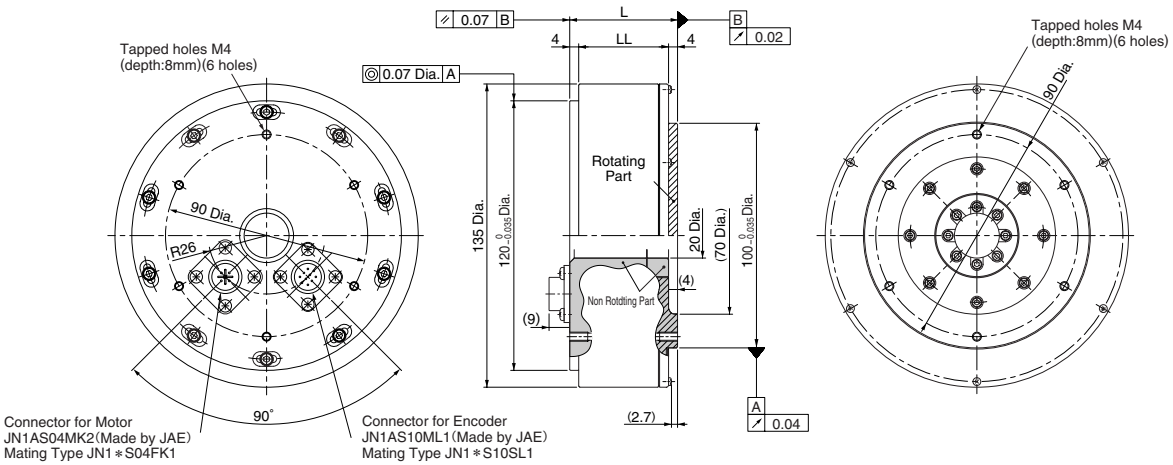
A	Phase U
B	Phase V
C	Phase W
D	FG
E	Brake Terminal
F	Brake Terminal
G	–

Servomotors (cont'd)

● Dimensions Units : mm

SGMCS-02B, 05B, 07B

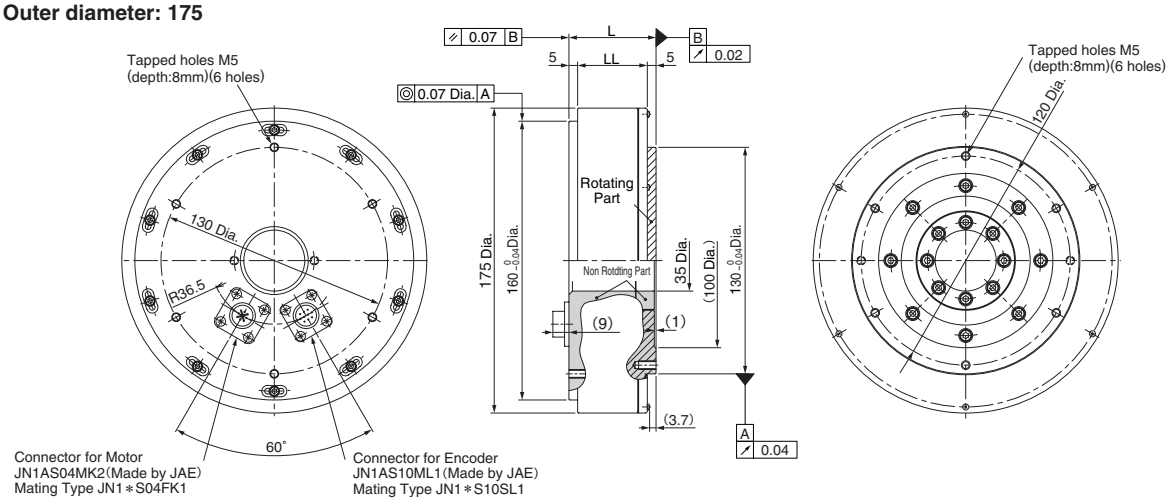
Outer diameter: 135



Servomotor Type SGMCS-□	L	LL	Approx.Mass kg	Allowable Thrust Load(Fa) N	Allowable Moment Load(M) N・m
02B□A11	48	40	4.0	1500	13
05B□A11	88	80	6.5		
07B□A11	128	120	9.0		

SGMCS-04C, 10C, 14C

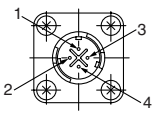
Outer diameter: 175



Servomotor Type SGMCS-□	L	LL	Approx.Mass kg	Allowable Thrust Load(Fa) N	Allowable Moment Load(M) N・m
04C□A11	50	40	6.0	3300	60
10C□A11	90	80	10.0		
14C□A11	130	120	14.0		

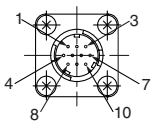
Connector Specifications [SGMCS]

Motor Connector



1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
4	FG	Green/Yellow

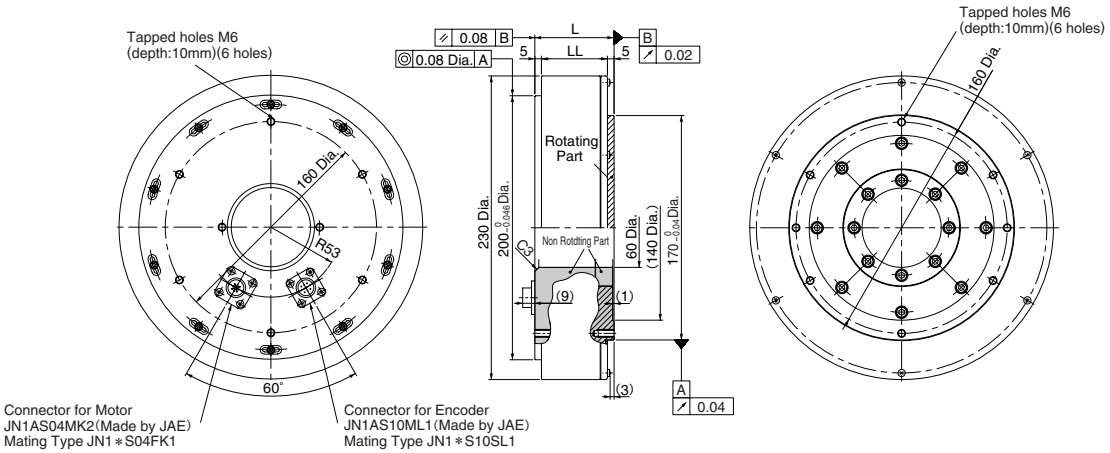
Encoder Connector



1	DATA+	Light Blue
2	DATA-	Light Blue/White
3	–	–
4	PG5V	Red
5	–	–
6	–	–
7	FG (Frame Ground)	Shield
8	–	–
9	PG0V	Black
10	–	–

SGMCS-08D, 17D, 25D

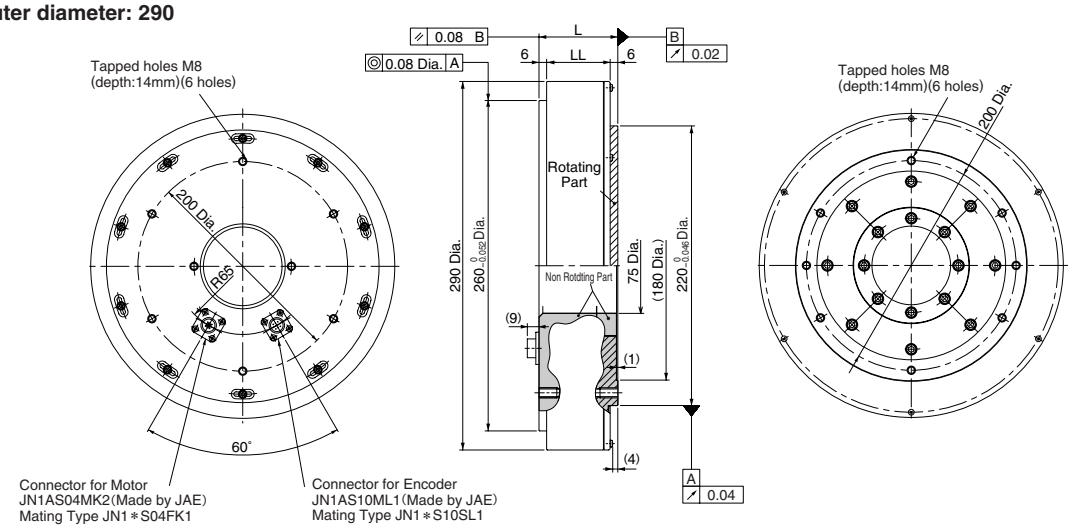
Outer diameter: 230



Servomotor Type SGMCS-□	L	LL	Approx.Mass kg	Allowable Thrust Load(Fa) N	Allowable Moment Load(M) N・m
08D□A11	60	50	12.5	5500	220
17D□A11	110	100	20.5		
25D□A11	160	150	28.0		

SGMCS-16E, 35E

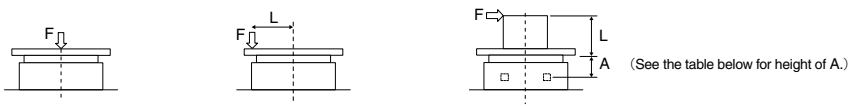
Outer diameter: 290



Servomotor Type SGMCS-□	L	LL	Approx.Mass kg	Allowable Thrust Load(Fa) N	Allowable Moment Load(M) N・m
16E□A11	62	50	25.5	11000	300
35E□A11	112	100	34.5		

Load Capacity

The following figures show the load capacity during motor operation.
Design motors so as not to exceed the values in the table for thrust and moment loading.



Force: F
Thrust Loading: Fa=Load's Mass
Moment Loading: M=F×L

Force: F
Thrust Loading: Fa=Load's Mass
Moment Loading: M=0

Force: F
Thrust Loading: Fa=Load's Mass
Moment Loading: M=F×(L+A)

Servomotor Type SGMCS-□	02B	05B	07B	04C	10C	14C	08D	17D	25D	16E	35E
A mm	16.5	56.5	96.5	15.0	55.0	95.0	19.0	69.0	119.0	23.5	73.5

SERVOPACKS

● Ratings and Specifications

SERVOPACK Type **SGDS-**				**A5※**	**01※**	**02※**	**04※**	**08※**	**10※**
Basic Specifications	Max. Applicable Motor Capacity W			50	100	200	400	750	1000
	100V	Continuous Output Current Arms		0.66	0.91	2.1	2.8	—	—
		Max. Output Current Arms		2.1	2.8	6.5	8.5	—	—
	200V	Continuous Output Current Arms		0.66	0.91	2.1	2.8	5.5	7.6
		Max. Output Current Arms		2.1	2.8	6.5	8.5	16.9	17.0
	Input Power Supply	Capacity Range		Sigle-phase 100VAC/Sigle-phase 200VAC				Sigle-phase 200VAC	Three-phase 200VAC
		Main Circuit		Three-phase (or Sigle-phase) 200 to 230 VAC +10 to −15% 50/60 Hz Sigle-phase 100 to 115 VAC +10 to −15% 50/60 Hz					
		Control Circuit		Sigle-phase 200 to 230 VAC +10 to −15% 50/60 Hz Sigle-phase 100 to 115 VAC +10 to −15% 50/60 Hz					
	Control Method			Sigle-phase or three-phase Full-wave rectification (Single-phase voltage doubler rectifier at 100V), IGBT, PWMcontrol, Sin wave power drive system					
	Feedback			17-bit serial encoder (incremental/absolute value)					
	Conditions	Usage/Strage Temperature		0 to +55℃ / −20 to +85℃					
		Usage/Strage Humidity		90% RH or less (non-condensing)					
		Vibration/Shock Resistance		4.9 m/s^2 / 19.6 m/s^2					
	Structure			Base-mounted type (Rack-mounted type is also available.)					
	Performance	Speed Control Range		1 : 5000 (The lower limit is within the range not to stop at the torque load.)					
		Speed Variance	Load Variance	During 0 to 100 load: ±0.01% max. (at rated speed)					
			Voltage Variance	Rated voltage ±10%: ±0.01%max. (at rated speed)					
			Temperature Variance	25±25℃ : ±0.1%max. (at rated speed)					
		Frequency Characteristics		600 Hz (at $J_L = J_M$)					
		Torque Control Accuracy (Reproducbility)		±1%					
		Soft Start Time Setting		0 to 10s (Acceleration, deceleration can each be set.)					
Torque Control Mode	Input Signals	Reference Voltage		±3VDC (±1V to ±10VDC: Variable setting range) At rated torque (Forward rotation if positive reference) Input voltage: ±12V max.					
		Input Impedance		Approx. 14kΩ or more					
		Circuit Time Constant		30μs					
Speed Control Mode	Performance	Soft Start Time Setting		0 to 10s (Acceleration, deceleration can each be set.)					
	Input Signals	Reference Voltage		±6VDC (±2VDC to ±10VDC: Variable setting range) At rated speed (Forward rotation if positive reference) Input voltage: ±12V max.					
		Input Impedance		Approx. 14kΩ or more					
		Circuit Time Constant		30μs					
	Contact Speed Reference	Rotation Direction		Selected by P control Signal.					
		Speed Selection		Selected the speed (1st to 3rd) by forward/reverse current control signal. When both signal are OFF, other control mode is selected.					
Positioning Control Mode	Performance	Bias Setting		0 to 450 min^{-1} (setting resolution 1 min^{-1})					
		Feed Forward		0 to 100% (setting resolution 1%)					
		Positioning Completion Width Setting		0 to 1073741824 reference unit (setting resolution 1reference unit)					
	Input Signals	Reference Pulse	Pulse Type	Select one signal from: sign+pulse train, CCW+CW pulse train, and 90° phase difference 2-phase pulse (phase A + phase B)					
			Pulse Form	Non-isolated line driver (+5V level)					
			Pulse Frequency	Max.1Mpps (Non-isolated line driver)					
		Control Signal		CLEAR (input pulse form is identical to photocoupler)					
I/O Signals	Position Output	Output Form		Phase A, phase B, phase C: Line driver output					
		Frequency Dividing Ratio		Arbitrary dividing (16 to 262144)					
	Sequence Input Signal	Signal Allocation		Servo ON, P control (or control mode switching, forward/reverse run control by internal speed setting, zero clamp, reference pulse block), forward/reverse run prohibit (P-OT/N-OT), alarm reset, forward/reverse current limit (or internal speed switching), gain switching					
	Sequence Output Signal	Fixing Signal		Servo alarm, alarm code (3-bit output)					
		Signal Allocation		Select three signals from: positioning completed (speed agree), running, servo ready, current limit, speed warning, and NEAR signal.					
Integrated Functions	Analog Monitor (CN5)			Analog monitor connector for supervision of speed and torque reference signals, etc. integrated Speed : 1V/1000 min^{-1} Torque : 1V/at rated torque 100% Accumlated pulse : 0.05V/1 reference unit ※Can be changed to other monitors by parameter setting.					
	Indicators (LED Display)			CHARGE, 7segment-LED×5 (Integrated digital operator function)					
	Communications	Interface		Digital operator (hand-held type)					
		Functions		Status display, parameter settings, monitor display, alarm traceback display, JOG run, etc.					
	Dynamic Brake (DB)			Automatic built-in DB motivates at main power OFF, servo alarm, servo OFF, and overtravel					
	Regeneration			External regenerative resister					Built-in regenerative resister
	Overtravel (OT) Prevention			DB stop, deceleration stop, or coast to stop at P-OT or N-OT					
	Electronic Gear			0.001 ≦ B/A ≦ 1000					
	Protective Functions			Overcurrent, overvoltage, undervoltage, regeneration error, main circuit detection error, heatsink overheating, power phase loss, overflow, overspeed, encoder error, overrun protection, CPU error, parameter error, etc.					
	Others			Reverse connection, zero search, automatic motor discrimination function					

Note: ※ in the SERVOPACK type should be F or A.
F=Input power supply is 100VAC.Input power supply for applicable motor is 200VAC.
A=Input power supply is 200VAC.

● Dimensions Units : mm

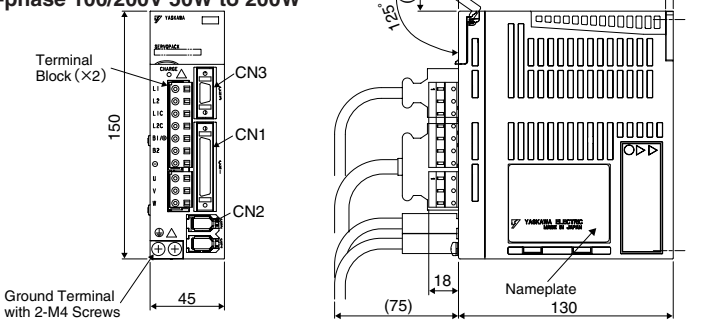
Connectors on SERVOPACK Side（Common for all types）

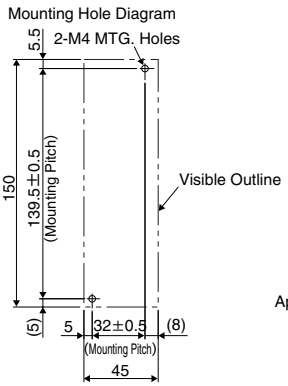
Connector Code	Type	Manufacture
CN1	10250-52A2JL	SUMITOMO 3M Ltd.
CN2	53460-0611	Molex Japan Co., Ltd.
CN3	10214-52A2JL	SUMITOMO 3M Ltd.

Note: Use connectors above or equivalent.

SGDS-A5, 01, 02

Single-phase 100/200V 50W to 200W

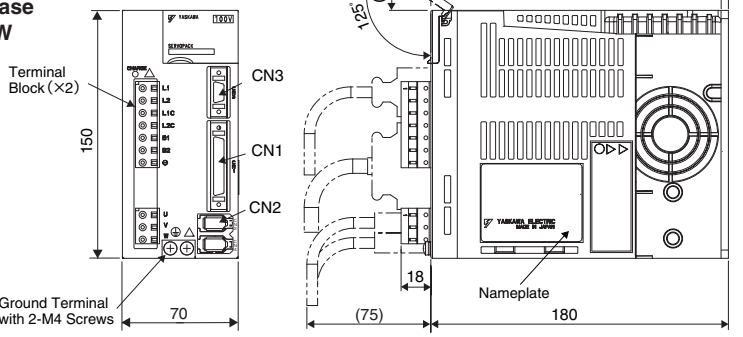


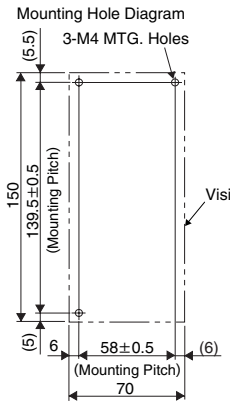


Approx.mass:0.7kg

SGDS-04F

Single-phase 100V 400W

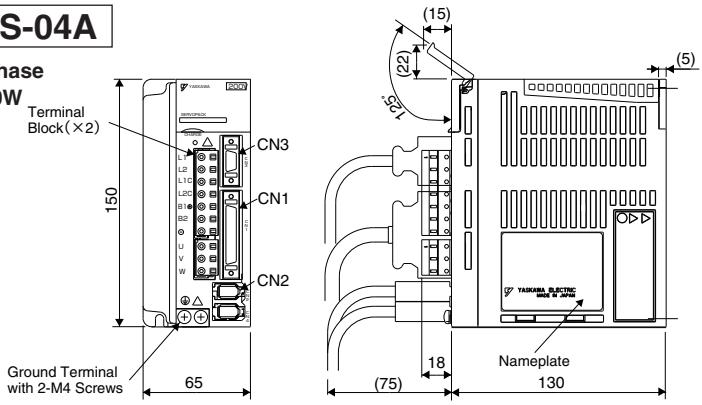


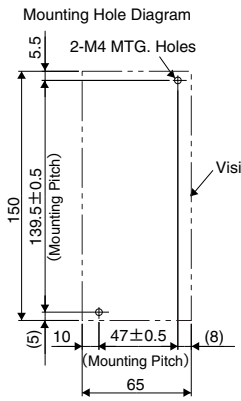


Approx.mass:1.4kg

SGDS-04A

Single-phase 200V 400W



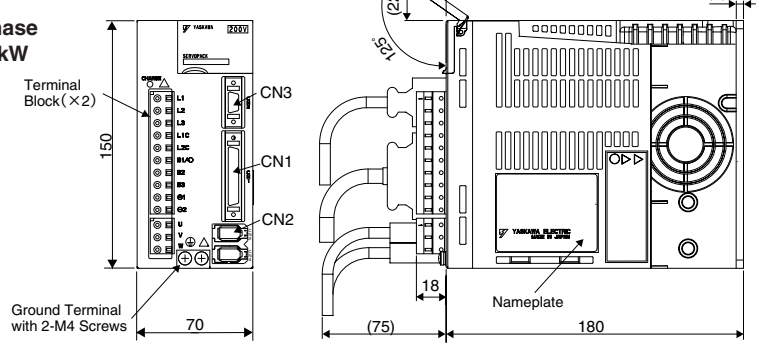


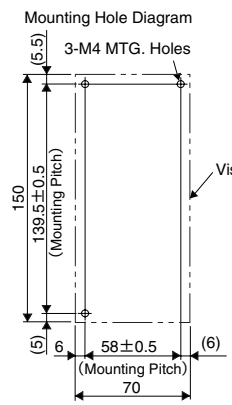
Approx.mass:0.9kg

SGDS-08, 10

Single-phase 200V 750W

Three-phase 200V 1.0kW

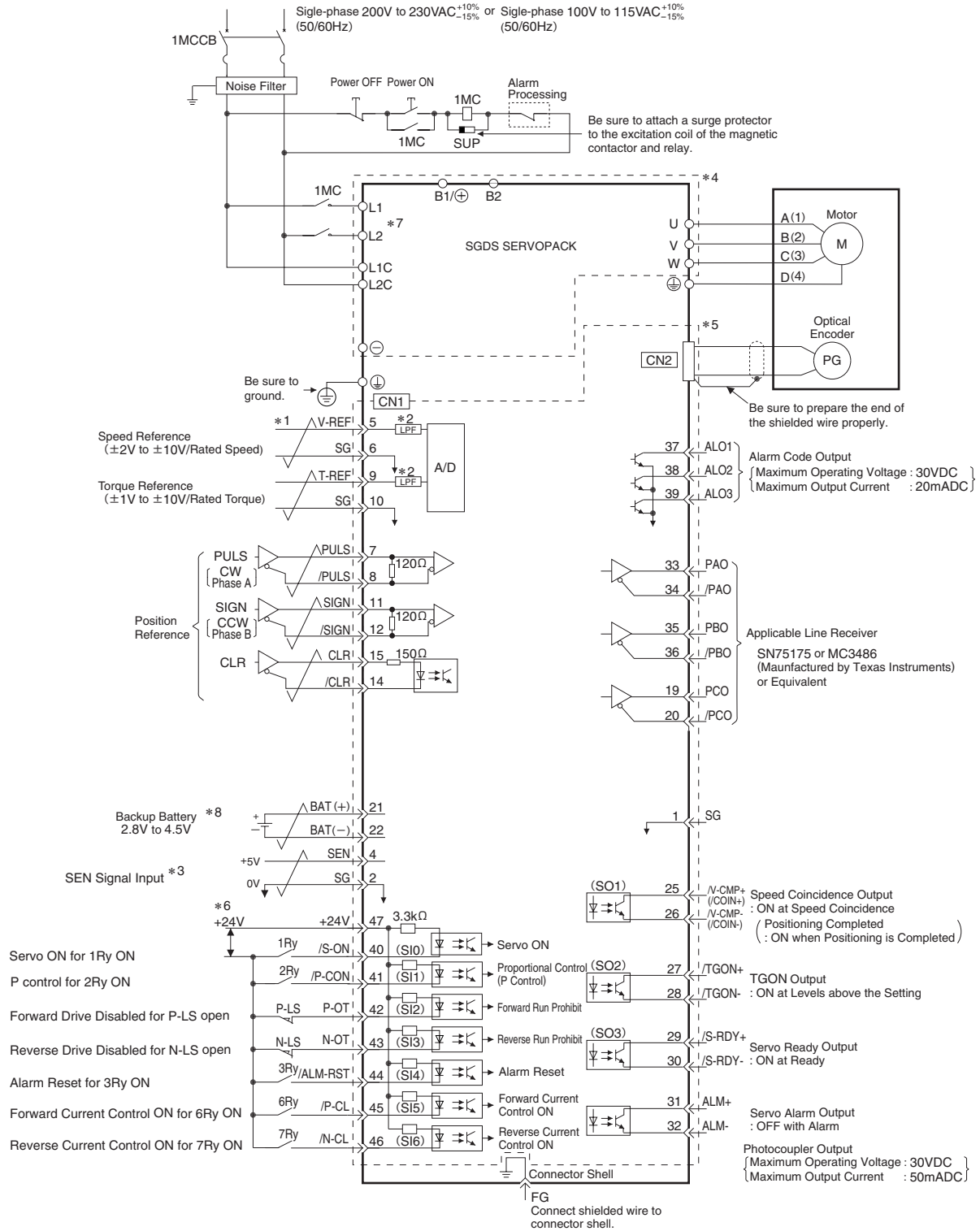




Approx.mass:1.4kg

Connection Diagrams

● Single-phase（100V/200VAC）

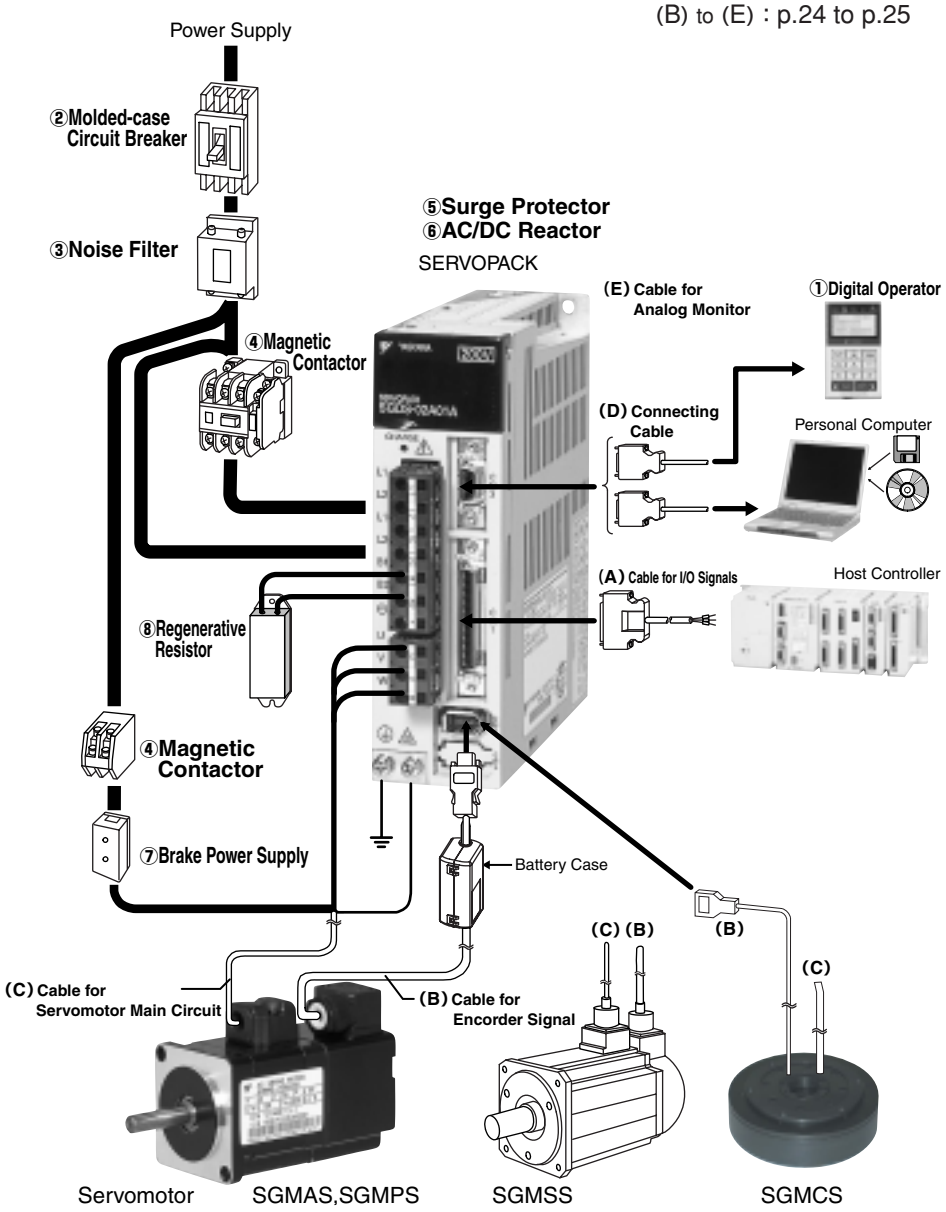


∗1 : ⫽ represents twisted-pair wire.
∗2 : Primary filter. The time constant is 30 μs
∗3 : Reguired when using an absolute encoder.
∗4 : This circuit is electrically separated from the outside to prevent electrical shock.
∗5 : This is a SELV circuit separated from other circuit by double insulation or reinforced insulation.
∗6 : Use a double insulated 24VDC power supply.
∗7 : Terminal L3 is required when three-phase power supply is used.
∗8 : Disconnect the battery when using a cable with a battery case.

Ordering Reference

● System Configuration

Refer to the following pages for ordering.
- Servo drives : p.21
- Peripheral Devices ① to ⑦ : p.22 to p.23
- Cables and Connectors (A) : p.22
  (B) to (E) : p.24 to p.25



Note: The motors do not include the connectors shown. The SGMPS servomotor is different in appearance from the figure above.

Note: The SGMSS servomotor and connectors are different from the figure above in appearance.

Note: Servomotors with brakes are not provided.

● Order List : Servo Drives

Servomotor		SERVOPACK Type SGDS-		
Type	Capacity	Single-phase 100V	Single-phase 200V	Three-phase 200V
SGMAS-A5A	50W	A5F	A5A	–
SGMAS-01A	100W	01F	01A	–
SGMAS-C2A	150W	02F	02A	–
SGMAS-02A	200W	02F	02A	–
SGMAS-04A	400W	04F	04A	–
SGMAS-06A	600W	–	08A	–
SGMAS-08A	750W	–	08A	–
SGMPS-01A	100W	01F	01A	–
SGMPS-02A	200W	02F	02A	–
SGMPS-04A	400W	04F	04A	–
SGMPS-08A	750W	–	08A	–
SGMSS-10A	1000W	–	–	10A

Servomotor		SERVOPACK Type SGDS-	
Type	Capacity	Single-phase 100V	Single-phase 200V
SGMCS-02B	42W	02F	02A
SGMCS-05B	105W	02F	02A
SGMCS-07B	147W	02F	02A
SGMCS-04C	84W	04F	04A
SGMCS-10C	209W	04F	04A
SGMCS-14C	293W	04F	04A
SGMCS-08D	168W	04F	04A
SGMCS-17D	356W	04F	04A
SGMCS-25D	393W	04F	04A
SGMCS-16E	335W	–	08A
SGMCS-35E	550W	–	08A

Ordering reference (cont'd)

● Order List : Peripheral Devices

①Digital Operator : JUSP-OP05A [A cable (1m) is provided.]

②Molded-case Circuit Breaker

Power Supply Voltage	SERVOPACK Rated Output W	SERVOPACK SGDS-⬚	Power Supply capacity per SERVOPACK kVA	Current Capacity for Molded-case Circuit Breakers or Fuses(Note3) Arms
Single-phase 100V	50	A5F	0.25	4
	100	01F	0.40	
	200	02F	0.60	6
	400	04F	1.2	16
Single-phase 200V	50	A5A	0.25	4
	100	01A	0.40	
	200	02A	0.75	
	400	04A	1.2	8
	750	08A	2.2	16
Three-phase 200V	1000	10A	2.3	7

Note: 1 Values are at a rated load. Select an appropriate fuse after derating. Operating characteristics (25℃) are 2s min. for 200% and 0.01s min. for 700%.
2 A fast-blow fuse cannot be selected because the SGDS SERVOPACK uses the power supply built in a condenser. Therefore, The fast-blow fuse may trip when power is ON.
3 Because the SGDS SERVOPACK has no protective circuit for grounding, prepare a ground fault interrupter for overload and short-circuit, or that for ground fault protection in combination with a molded-case circuit breaker.

③Noise Filter, ④Magnetic Contactor, ⑤Surge Protector ⑥AC/DC Reactor

Power Supply Voltage	SERVOPACK Rated Output W	SERVOPACK SGDS-⬚	Noise Filter Type	Noise Filter Specifications	Magnetic Contactor	Surge Protector	AC/DC Reactor
Single-phase 100V	50	A5F	FN2070-6/07	Single-phase 250 VAC, 6 A	HI-11J (20A)	R・C・M -601BQZ-4	X5053
	100	01F					
	200	02F	FN2070-10/07	Single-phase 250 VAC, 10 A			X5054
	400	04F	FN2070-16/07	Single-phase 250 VAC, 16 A	HI-15J (35A)		X5056
Single-phase 200V	50	A5A	FN2070-6/07	Single-phase 250 VAC, 6 A	HI-11J (20A)		X5052
	100	01A					
	200	02A					X5053
	400	04A	FN2070-10/07	Single-phase 250 VAC, 10 A			X5054
	750	08A	FN2070-16/07	Single-phase 250 VAC, 16 A	HI-15J (35A)		X5056
Three-phase 200V	1000	10A	FN258L-16/07	Three-phase 480 VAC, 16 A	HI-11J (20A)		X5061

Note: Contact the following companies for more information about devices.

- Noise Filter made by Schaffner EMC Inc.
  Where to call: YASKAWA Controls Co., Ltd
- Magnetic Contactor made by YASKAWA Siemens Automation & Drives Corp.
  Where to call: YASKAWA Controls Co., Ltd
- Surge Protector made by Okaya Electric Industries Co., Ltd
  Where to call: Okaya Electric Industries Co., Ltd
- AC/DC Reactor made by YASKAWA Controls Co., Ltd
  Where to call: YASKAWA Controls Co., Ltd

⑦Brake Power Supply Unit, ⑧Regenerative Resistor

Power Supply Voltage	SERVOPACK Rated Output W	SERVOPACK SGDS-⬚	Brake Power Supply Unit	Regenerative Resistor Built-in Resistance Value Ω	Regenerative Resistor Built-in Rated Output W	Regenerative Resistor Externally installed
Single-phase 100V	50	A5F	・For 100 VAC input LPDE-1H01 ・For 200 VAC input LPSE-2H01	—	—	—
	100	01F				
	200	02F				
	400	04F				
Single-phase 200V	50	A5A		—	—	—
	100	01A				
	200	02A				
	400	04A				
	750	08A		50	60	
Three-phase 200V	1000	10A		50	60	

Note : A brake power supply unit is made by YASKAWA Controls Co.,Ltd.

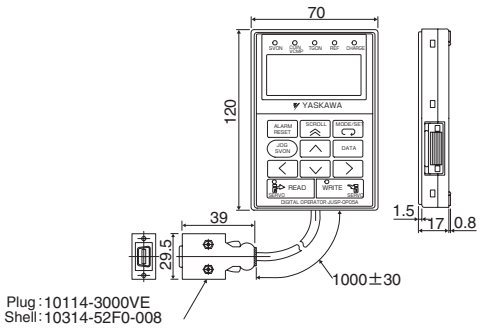
● Order List : Cables and Connectors

(A) CN1 For I/O Signals

Name	Type	Specifications	Qty.
Connector to Terminal Conversion Unit	JUSP-TA50P	Terminal block and cable (0.5m) 	
Cable with Single Connector (can be used for Σ-Ⅱ series)	JZSP-CSI01-1	1m 	
	JZSP-CSI01-2	2m	
	JZSP-CSI01-3	3m	

Dimensions for Peripheral Devices Unit : mm

①Digital Operator



③Noise Filter

Figure1

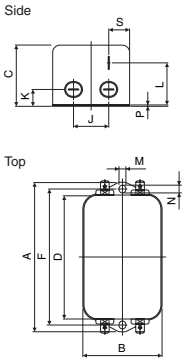
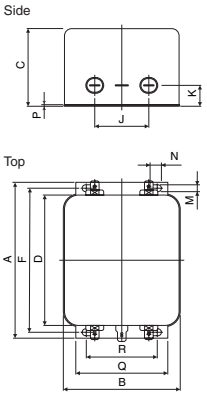
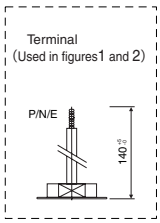


Figure2



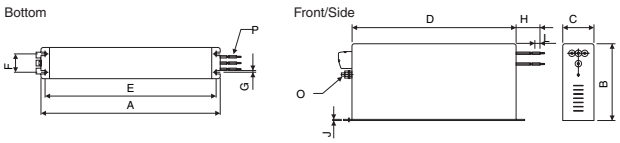


Code	Tolerances	Type		
		FN2070-6/07	FN2070-10/07	FN2070-16/07
		Figure1		Figure2
A	±1	113.5	156	119±0.5
B	±1	57.5		85.5
C	±1	45.4±1.2		57.6
D	±1	94	130.5	98.5
F	±0.3	103	143	109
J	±0.2	25		40
K	±0.5	8.4		8.6
L	±0.5	32.4		–
M	±0.1	4.4	5.3	4.4
N	±0.1	6		7.4
P	±0.1	0.9		1.2
Q	±0.3	–		66
R	±0.2	–		51
S	±0.5	38		–
Spec.*1		250VAC,6A	250VAC,10A	250VAC,16A

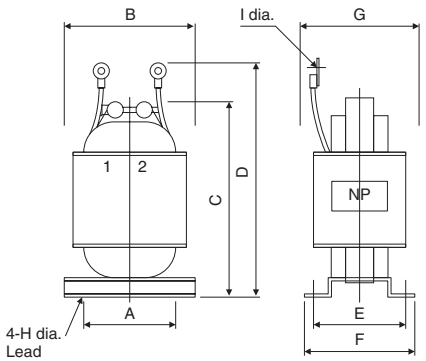
Code	Tolerances	Type
		FN258L-16/07
		Figure3
A	±1	305
B	±1.5	142±0.8
C	±0.6	55
D	±1	275±0.8
E	±0.5	290
F	±0.3	30
G	±0.2	6.5
H	±10	300
J	±0.2	1±0.1
L	±1	9
O	–	M5
P	–	AWG14
Spec.*2		480VAC,16A

*1.The rated current is +40℃
*2.The rated current is +50℃.

Figure3

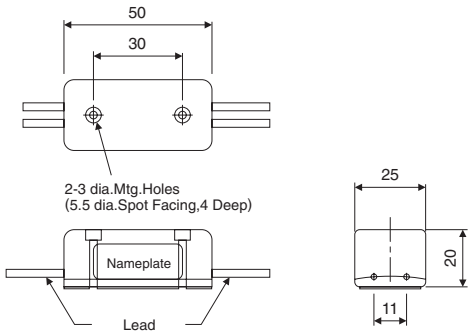


⑥AC/DC Reactor



Reactor Type	Inductance mH	Rated Current mH	Dimensions in mm									Mass kg
			A	B	C	D	E	F	G	H	I	
X5052	45.0	1.0	35	52	80	95	30	40	45	4	4.3	0.4
X5053	20.0	2.0	35	52	90	105	35	45	50	4	4.3	0.6
X5054	5.0	5.0	35	52	80	95	30	40	45	4	4.3	0.4
X5056	2.0	5.0	35	52	80	95	30	40	45	4	4.3	0.4
X5061	2.0	4.8	35	52	80	95	35	45	50	4	4.3	0.5

⑦Brake Power Supply Unit



- Lead length : 500mm each
- Ambient temperature : 60℃ max
- Lead connection : Distinguished by color

AC Input Side		Brake Side
100V	200V	
Blue,White	Yellow,White	Red,Blue

- Output voltage : 90VDC
- Output current : 1.0ADC

Ordering reference (cont'd)

● Order List : Cables and Connectors (Cont'd)

(B) CN2 For Encoder Signals

For SGMAS, SGMPS, SGMCS

Name	Motor Type	Type	Specifications	Qty
Cable with Both End Connectors (For Incremental/ Absolute)	SGMAS 50W to 750W, SGMPS 100W to 400W	JZSP-CSP01-03	3m	
		JZSP-CSP01-05	5m SERVOPACK Side Incremental Encoder Side	
		JZSP-CSP01-10	10m	
		JZSP-CSP01-15	15m	
		JZSP-CSP01-20	20m	
	SGMPS 750W	JZSP-CMP00-03	3m	
		JZSP-CMP00-05	5m SERVOPACK Side Incremental Encoder Side	
		JZSP-CMP00-10	10m	
		JZSP-CMP00-15	15m	
		JZSP-CMP00-20	20m	
	SGMCS 42W to 550W	JZSP-CMP60-03	3m	
		JZSP-CMP60-05	5m SERVOPACK Side Incremental Encoder Side	
		JZSP-CMP60-10	10m	
		JZSP-CMP60-15	15m	
		JZSP-CMP60-20	20m	
Cable with Both End Connectors (With Battery Case for Absolute)	SGMAS 50W to 750W, SGMPS 100W to 400W	JZSP-CSP05-03	3m	
		JZSP-CSP05-05	5m SERVOPACK Side Absolute Encoder Side	
		JZSP-CSP05-10	10m Battery Case	
		JZSP-CSP05-15	15m	
		JZSP-CSP05-20	20m	
	SGMPS 750W	JZSP-CSP19-03	3m	
		JZSP-CSP19-05	5m SERVOPACK Side Absolute Encoder Side	
		JZSP-CSP19-10	10m Battery Case	
		JZSP-CSP19-15	15m	
		JZSP-CSP19-20	20m	
Cable with Single Connector on SERVOPACK Side (For Incremental/ Absolute)	SGMAS 50W to 750W, SGMPS 100W to 750W	JZSP-CMP03-03	3m	
		JZSP-CMP03-05	5m SERVOPACK Side Incremental Encoder Side	
		JZSP-CMP03-10	10m	
		JZSP-CMP03-15	15m	
		JZSP-CMP03-20	20m	
Cable with Single Connector on SERVOPACK Side (With Battery Case for Absolute)	SGMAS 50W to 750W, SGMPS 100W to 750W	JZSP-CSP04-03	3m	
		JZSP-CSP04-05	5m SERVOPACK Side Absolute Encoder Side	
		JZSP-CSP04-10	10m Battery Case	
		JZSP-CSP04-15	15m	
		JZSP-CSP04-20	20m	
Connector Kit on SERVOPACK Side	SGMAS SGMPS SGMCS	JZSP-CMP9-1	Solder Type	
Connector Kit on Encoder Side	SGMAS 50W to 750W, SGMPS 100W to 400W	JZSP-CSP9-2	Calking Type	
	SGMPS 750W	JZSP-CMP9-2	Solder Type	
	SGMCS 42W to 550W	Order from Japan Aviation Electronics Industry, Ltd.	Straight Connector JN1DS10SL1(Calking Type) Socket Contact JN1-22-22S-PKG100	
Cable		JZSP-CMP09-05	5m	
		JZSP-CMP09-10	10m 20 m max.	
		JZSP-CMP09-15	15m	
		JZSP-CMP09-20	20m	

For SGMSS

Name	Type	Specifications	Qty
Cable with Single Connector on SERVOPACK Side (For Incremental/ Absolute)	JZSP-CMP03-03	3m	
	JZSP-CMP03-05	5m SERVOPACK Side Encoder Side	
	JZSP-CMP03-10	10m	
	JZSP-CMP03-15	15m	
	JZSP-CMP03-20	20m	
Cable with Single Connector on SERVOPACK Side (With Battery Unit for Absolute)	JZSP-CSP04-03	3m	
	JZSP-CSP04-05	5m SERVOPACK Side Encoder Side	
	JZSP-CSP04-10	10m	
	JZSP-CSP04-15	15m Battery Case	
	JZSP-CSP04-20	20m	
Cable with Both End Connectors on SERVOPACK Side (For Incremental/ Absolute)	JZSP-CMP01-03	3m With Straight Connector	
	JZSP-CMP01-05	5m SERVOPACK Side Encoder Side	
	JZSP-CMP01-10	10m	
	JZSP-CMP01-15	15m	
	JZSP-CMP01-20	20m	
	JZSP-CMP02-03	3m With Angle Connector	
	JZSP-CMP02-05	5m SERVOPACK Side Encoder Side	
	JZSP-CMP02-10	10m	
	JZSP-CMP02-15	15m	
	JZSP-CMP02-20	20m	
Cable with Both End Connectors on SERVOPACK Side (With Battery Unit for Absolute)	JZSP-CSP06-03	3m With Straight Connector	
	JZSP-CSP06-05	5m SERVOPACK Side Encoder Side	
	JZSP-CSP06-10	10m	
	JZSP-CSP06-15	15m Battery Case	
	JZSP-CSP06-20	20m	
	JZSP-CSP07-03	3m With Angle Connector	
	JZSP-CSP07-05	5m SERVOPACK Side Encoder Side	
	JZSP-CSP07-10	10m	
	JZSP-CSP07-15	15m Battery Case	
	JZSP-CSP07-20	20m	
Connector Kit on SERVOPACK Side	JZSP-CMP9-1	Solder Type	
Connector on Encoder Side (Standard Enviroment)	MS3106B20-29S	Straight Connector	
	MS3108B20-29S	Angle Connector	
	MS3057-12A	Cable Clamp	
Connector on Encoder Side (Protective Construction)	CE02-20BS-S	Straight Connector	
	CE02-20BA-S	Angle Connector	
	CE3057-12A-1	Cable Size: 12.5 to 16 Cable Clamp	
	CE3057-12A-2	Cable Size: 9.5 to 13	
	CE3057-12A-3	Cable Size: 6.8 to 10	
Cable	JZSP-CMP09-05	5m	
	JZSP-CMP09-10	10m 20 m max.	
	JZSP-CMP09-15	15m	
	JZSP-CMP09-20	20m	

(C) For Servomotor Main Circuit

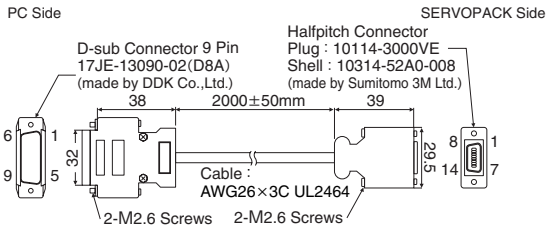
For SGMAS, SGMPS, SGMCS (The user must prepare cables for the SGMSS servomotor.)

Name	Motor Type	Type	Specifications	Qty
Cable for Motor without Brake	SGMAS 50W to 150W, SGMPS 100W	JZSP-CSM01-03	3m	
		JZSP-CSM01-05	5m	
		JZSP-CSM01-10	10m	
		JZSP-CSM01-15	15m	
		JZSP-CSM01-20	20m	
	SGMAS 200W to 600W, SGMPS 200W to 400W	JZSP-CSM02-03	3m	
		JZSP-CSM02-05	5m	
		JZSP-CSM02-10	10m	
		JZSP-CSM02-15	15m	
		JZSP-CSM02-20	20m	
	SGMAS 750W	JZSP-CSM03-03	3m	
		JZSP-CSM03-05	5m	
		JZSP-CSM03-10	10m	
		JZSP-CSM03-15	15m	
		JZSP-CSM03-20	20m	
	SGMPS 750W	JZSP-CMM00-03	3m	
		JZSP-CMM00-05	5m	
		JZSP-CMM00-10	10m	
		JZSP-CMM00-15	15m	
		JZSP-CMM00-20	20m	
	SGMCS 42W to 550W	JZSP-CMM60-03	3m	
		JZSP-CMM60-05	5m	
		JZSP-CMM60-10	10m	
		JZSP-CMM60-15	15m	
		JZSP-CMM60-20	20m	
Cable for Motor with Brake	SGMAS 50W to 150W, SGMPS 100W	JZSP-CSM11-03	3m	
		JZSP-CSM11-05	5m	
		JZSP-CSM11-10	10m	
		JZSP-CSM11-15	15m	
		JZSP-CSM11-20	20m	
	SGMAS 200W to 600W, SGMPS 200W to 400W	JZSP-CSM12-03	3m	
		JZSP-CSM12-05	5m	
		JZSP-CSM12-10	10m	
		JZSP-CSM12-15	15m	
		JZSP-CSM12-20	20m	
	SGMAS 750W	JZSP-CSM13-03	3m	
		JZSP-CSM13-05	5m	
		JZSP-CSM13-10	10m	
		JZSP-CSM13-15	15m	
		JZSP-CSM13-20	20m	
	SGMPS 750W	JZSP-CMM10-03	3m	
		JZSP-CMM10-05	5m	
		JZSP-CMM10-10	10m	
		JZSP-CMM10-15	15m	
		JZSP-CMM10-20	20m	
Connector Kit on Motor Side	SGMAS 50W to 150W SGMPS 100W	JZSP-CSM9-1		
	SGMAS 200W to 600W, SGMPS 200W to 400W	JZSP-CSM9-2		
	SGMAS 750W	JZSP-CSM9-3		

Name	Motor Type	Type	Specifications	Qty
Connector Kit on Motor Side	SGMPS 750W (Without Brake)	JZSP-CMM9-1		
	SGMPS 750W (With Brake)	JZSP-CMM9-2		
	SGMCS 42W to 550W	JN1DS04 FK1(Solder Type) Made by Japan Aviation Electronics Industry, Ltd.		
Cable	SGMAS 50W to 600W, SGMPS 100W to 400W, SGMCS-□B,C,D	JZSP-CSM90-05	5m	
		JZSP-CSM90-10	10m	
		JZSP-CSM90-15	15m	
		JZSP-CSM90-20	20m	20 m max.
	SGMAS 750W SGMPS 750W SGMCS-□E	JZSP-CSM91-05	5m	
		JZSP-CSM91-10	10m	
		JZSP-CSM91-15	15m	
		JZSP-CSM91-20	20m	

(D) CN3 For PC

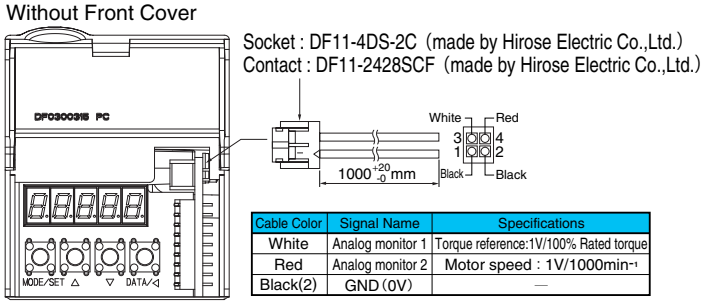
●Type : JZSP-CMS02 (2m)



(E) CN5 For Analog Monitor

●Type : JZSP-CA01 (1m)
(Can be used for Σ and Σ-Ⅱ series.)

Without Front Cover



Cable Color	Signal Name	Specifications
White	Analog monitor 1	Torque reference:1V/100% Rated torque
Red	Analog monitor 2	Motor speed : 1V/1000min⁻¹
Black(2)	GND (0V)	—

● Order List : Options

Type	Specifications	Qty.
JUSP-BA01	Battery Case (See the following for ordering cable and battery)	
JZSP-BA01	Cable and Battery for Battery Case ⊖ ⊕ 2⊖Black 1⊕Red Connector Battery ER3V	

Ordering Reference

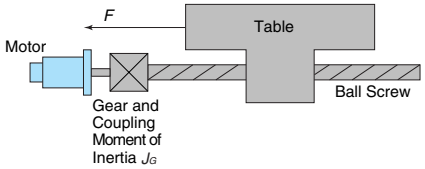
Appendix

● Servomotor Selection

Load Date

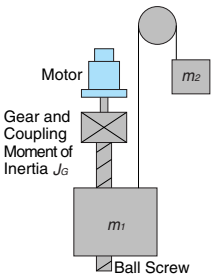
①Ball Screw Horizontal Axis

Load weight	m		kg
Thrust	F		N
Friction coefficient	μ		
Mechanical efficiency	η		
Reduction ratio	R(=n_M/n_L)		
Gear + Coupling	J_G		kg·cm^2
Ball screw lead	P_B		mm
Ball screw diameter	d_B		mm
Ball screw length	ℓ_B		mm



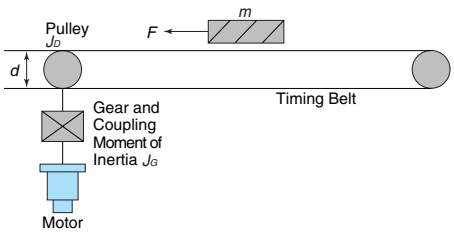
②Ball Screw Vertical Axis

Load weight	m_1		kg
Counterweight	m_2		kg
Friction coefficiency	μ		
Mechanical efficiency	η		
Reduction ratio	R(=n_M/n_L)		
Gear + Coupling	J_G		kg·cm^2
Ball screw lead	P_B		mm
Ball screw diameter	d_B		mm
Ball screw length	ℓ_B		mm



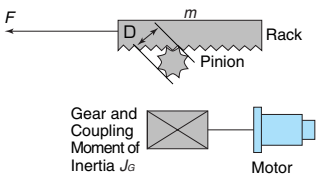
③Timing Belt

Load weight	m		kg
Thrust	F		N
Friction coefficiency	μ		
Mechanical efficiency	η		
Reduction ratio	R(=n_M/n_L)		
Gear + Coupling	J_G		kg·cm^2
Pulley	J_P		kg·cm^2
Pulley diameter	d_P		mm



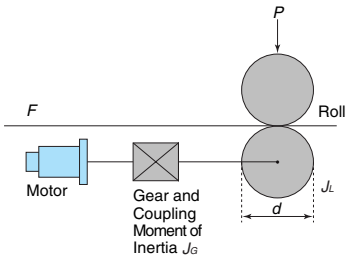
④Rack & Pinion

Load weight	m		kg
Thrust	F		N
Friction coefficiency	μ		
Mechanical efficiency	η		
Reduction ratio	R(=n_M/n_L)		
Gear + Coupling	J_G		kg·cm^2
Pinion diameter	d		mm
Pinion Thickness	t		mm



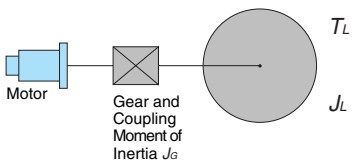
⑤Roll Feeder

Load Moment of Inertia	J_L		kg·cm^2
Tension	F		N
Pressure	P		N
Roll diameter	d		mm
Friction coefficiency	μ		
Mechanical efficiency	η		
Reduction ratio	R(=n_M/n_L)		
Gear + Coupling	J_G		kg·cm^2



⑥Rotor

Load Moment of Inertia	J_L		kg·cm^2
Load Torque	T_L		kg·cm
Mechanical efficiency	η		
Reduction ratio	R(=n_M/n_L)		
Gear + Coupling	J_G		kg·cm^2

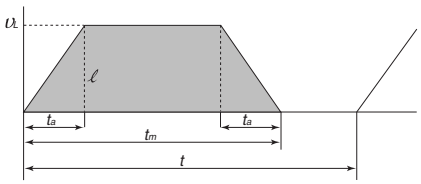


Driving Pattern

・Duty Cycle

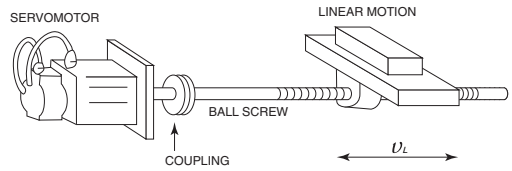
DUTY	t		s
Positioning distance	ℓ		m
Speed	v_L		m/s
Positioning time	t_m		s
Accel/decel time	t_a		s

Note : Fill in either Vℓ or ts. If both are filled in,specify the prior one.



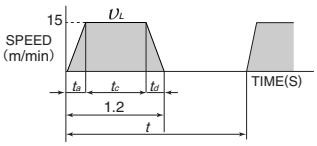
● Servomotor Selection Example

MECHANICAL SPECIFICATIONS



・Load Speed	: v_L	=15 m/min	・Coupling Outer Diameter	: d_C	=0.03 m
・Linear Motion Weight	: m	=80 kg	・Nunber of Feeds	: n	=40/min
・Ball Screw Length	: ℓ_B	=0.8 m	・Feed Stroke	: ℓ	=0.275 m
・Ball Screw Diameter	: d_B	=0.016 m	・Feed Time	: t_m	=1.2 s or less
・Ball Screw Lead	: P_B	=0.005 m	・Friction Coefficient	: μ	=0.2
・Coupling Weight	: m_C	=0.3 kg	・Mechanical Efficiency	: η	=0.9(90 %)

(1)Speed Diagram



$$t = \frac{60}{n} = \frac{60}{40} = 1.5 \text{ s}$$

Where, $t_a = t_d$

$$t_a = t_m - \frac{60 \times \ell}{v\ell} = 1.2 - \frac{60 \times 0.275}{15} = 0.1 \text{ s}$$

$$t_c = 1.2 - 0.1 \times 2 = 1.0 \text{ s}$$

(2)Speed

・Driven Motor Speed $n_L = \frac{v_L}{P_B} = \frac{15}{0.005} = 3000 \text{ min}^{-1}$

・Motor Speed Because of direct coupling, gear ratio : $1/R = 1/1$
Therefore, $n_M = n_L \cdot R = 3000 \times 1 = 3000 \text{ min}^{-1}$

(3)Load Torque

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

(4)Load Moment of Inertia

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

・Ball Screw $J_B = \frac{\pi}{32}\rho \cdot \ell_B \cdot d_B^4 = \frac{\pi}{32} \times 7.87 \times 10^3 \times 0.8 \times (0.016)^4$
$= 0.405 \times 10^{-4} \text{ kg·m}^2$

・Coupling $J_C = \frac{1}{8} m_C \cdot d_C^2 = \frac{1}{8} \times 0.3 \times (0.03)^2 = 0.338 \times 10^{-4} \text{ kg·m}^2$

・Load Moment of Inertia at Motor Shaft $J_L = J_{L1} + J_B + J_C = 1.25 \times 10^{-4} \text{ kg·m}^2$

(5)Load Moving Power

$$P_O = \frac{2\pi n_M \cdot T_L}{60} = \frac{2\pi \times 3000 \times 0.139}{60} = 43.7 \text{ W}$$

(6)Load Acceleration Power

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

(7)Temporary Servomotor Selection

Selection Condition ・$T_L \leqq$ Motor Rated Torque
・$P_a + P_o = (1 \text{ to } 2) \times$ Motor Rated Output
・$n_M \leqq$ Motor Rated Speed
・$J_L \leqq$ Allowable Load Moment of Inertia of SERVOPACK

From the above condition,the following are temporarily selected :
・Servomotor: SGMAS-02ACA21
・SERVOPACK: SGDS-02A01A

<Ratings>

・Rated Output	: 200 W
・Rated Speed	: 3000 min^{-1}
・Rated Torque	: 0.637 N·m
・Instantaneous Peak Torque	: 1.91 N·m
・Motor Moment of Inertia	: 0.116×10^{-4} kg·m^2
・Allowable Load Inertia of SERVOPACK	: 3.48×10^{-4} kg·m^2

(8)Servomotor Checking

① Required Starting Torque

$$T_P = \frac{2\pi n_M (J_M + J_L)}{60 t_a} + T_L$$
$$= \frac{2\pi \times 3000 \times (0.116 + 1.25) \times 10^{-4}}{60 \times 0.1} + 0.139$$
$$\fallingdotseq 0.568 \text{ N·m} < \text{Peak Torque} \cdots \text{Satisfactory}$$

②Required Braking Torque

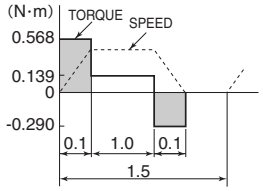
$$T_S = \frac{2\pi n_M (J_M + J_L)}{60 t_a} - T_L$$
$$= \frac{2\pi \times 3000 \times (0.116 + 1.25) \times 10^{-4}}{60 \times 0.1} - 0.139$$
$$\fallingdotseq 0.290 \text{ N·m} < \text{Peak Torque} \cdots \text{Satisfactory}$$

③Torque Efficiency

$$T_{rms} = \sqrt{\frac{T_P^2 \cdot t_a + T_L^2 \cdot t_c + T_S^2 \cdot t_d}{t}}$$
$$= \sqrt{\frac{(0.568)^2 \times 0.1 + (0.139)^2 \times 1.0 + (0.290)^2 \times 0.1}{1.5}}$$
$$\fallingdotseq 0.200 \text{ N·m} < \text{Rated Torque} \cdots \text{Satisfactory}$$

(9)Final Selection of Servomotor

Temporarily selected SERVOPACK,
servomotor suitable for position control can be used.
The graph below is the torque diagram.



Appendix

Σ-Ⅲ SERIES

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