YASKAWA

AC SERVO DRIVES
DIRECT DRIVE Σ SERIES

SERVOMOTOR MODEL SGMCS
SERVOPACK MODEL SGDS
SGDH

Powerful & Simple

Certified for
ISO9001 and
ISO14001

JQA-0422 JQA-EM0202
JQA-EM0924

With a full product lineup, we have the answer that can meet your needs for compact drive systems with high torque and high accuracy.

For your ideal machine, you need a compact servo drive with high torque and high accuracy.
Your dream can come true with Yaskawa's gearless, direct-drive Σ series.
Use a direct drive to supply high torque at low speeds, obtain precise positioning at high speeds without any slippage and backlash, and simplify your machine's configuration and maintenance. With a wide variety of products in our lineup, you have an expanded range of applications to choose from.
Use Yaskawa's Σ series of gearless direct drives to make your ideal machine a reality.

Powerful & Simple

Advantage 1

More powerful with higher positioning accuracy

High torque and High speed

- A high-torque operation is realized at low speeds without gears.
  Instantaneous peak torque : 6 N·m to 600 N·m
- A high-speed operation reduces cycle 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(20-bit): 1,048,576 P/R
- No backlash means that high-precision operation with shorter settling time is possible with high frequency use.
- A current control algorithm with conversions for the d-q axis realizes higher accuracy in torque control.

Advantage 2

Simplified machine configuration, adjustment, and maintenance

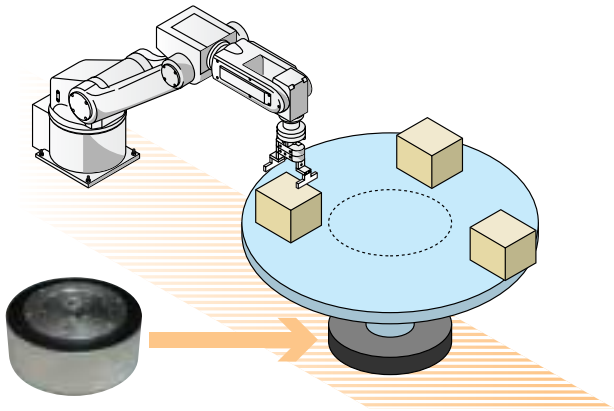
Compact

- The size of the machine's drive section is reduced because of the slim motor design.
- The hollow space in the motor can be used for wiring and piping.

Easy

- Smooth and noiseless drive.
- Use of a serial encoder reduces the amount of wiring.
- The gearless drive requires no maintenance for lubrication or any inspections for wear and tear.
- Parameters are used to change the type of control being used: speed control, torque control, or position control.

Comparison of drive systems for rotary tables

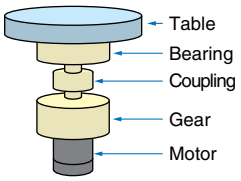


Typical servo drive system

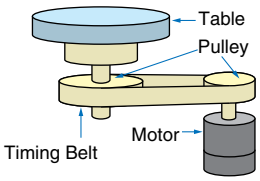
〈Current limitations〉

- Reduced accuracy in positioning with excessive slippage and backlash
- Noise
- Maintenance for wear and tear or for lubrication

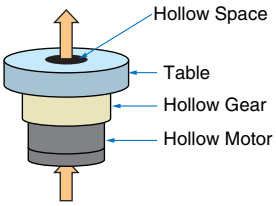
Motor with Gear



Motor + Timing Belt



Hollow Motor + Hollow Gear

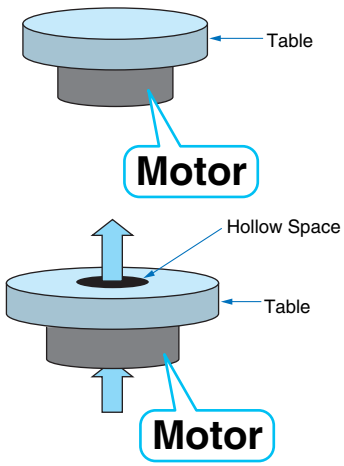


Direct drive system

〈Technical improvements〉

A drive system without reducers, such as gears and pulleys, eliminates practical difficulties and helps make the machine smaller. Some advantages are:

- Improved positioning accuracy with direct connection to a load
- Low noise
- Clean room use (No gear means no lubrication.)
- Reduced number of parts
- Easy wiring and piping based on the motor's hollow design



Applications

- Semiconductor-manufacturing machines
- Machines for the manufacturing of liquid-crystal circuit boards
- Units for inspection and testing
- Electronic parts assembling machines
- IC handlers
- Inspection units for integrated circuits
- Automated machines
- Manipulator

CONTENTS

Product Lineup

Small Capacity

SGMCS Servomotor

SGDS SERVOPACK

SGDH SERVOPACK

Motor Outer Diameter (Inner Diameter) mm	Motor Model	Torque (20 40 60 80 100N·m; Rated torque / Peak torque (Rated torque/Peak torque) Unit: N·m)	SGDS- Single-phase 100 V	SGDS- Single-phase 200 V	SGDH- Single-phase 200 V	SGDH- Three-phase 200 V
φ135 (φ20)	SGMCS-02B	(2.0/6.0)	02F□□A	02A□□A	02AE	–
	SGMCS-05B	(5.0/15.0)				
	SGMCS-07B	(7.0/21.0)				
φ175 (φ35)	SGMCS-04C	(4.0/12.0)	04F□□A	04A□□A	04AE	–
	SGMCS-10C	(10.0/30.0)				
	SGMCS-14C	(14.0/42.0)				
φ230 (φ60)	SGMCS-08D	(8.0/24.0)	04F□□A	04A□□A	04AE	–
	SGMCS-17D	(17.0/51.0)				
	SGMCS-25D	(25.0/75.0)				
φ290 (φ75)	SGMCS-16E	(16.0/48.0)	–	08A□□A	–	08AE
	SGMCS-35E	(35.0/105.0)				

Medium Capacity

SGMCS Servomotor

SGDS SERVOPACK

SGDH SERVOPACK

Motor Outer Diameter (Inner Diameter) mm	Motor Model	Torque (200 400 600N·m; Rated torque / Peak torque (Rated torque/Peak torque) Unit: N·m)	SGDS- Three-phase 200 V	SGDH- Three-phase 200 V
φ280 (φ75)	SGMCS-45M	(45/135)	10A□□A	10AE
	SGMCS-80M	(80/240)	15A□□A	15AE
	SGMCS-1AM	(110/330)	20A□□A	20AE
φ360 (φ118)	SGMCS-80N	(80/240)	15A□□A	15AE
	SGMCS-1EN	(150/450)	30A□□A	30AE
	SGMCS-2ZN	(200/600)	30A□□A	30AE

Model Designations

Servomotor

SGMCS — 04 C 3 C 1 1

Direct Drive Servomotor

Rated Torque

02: 2 N·m	17: 17 N·m
04: 4 N·m	25: 25 N·m
05: 5 N·m	35: 35 N·m
07: 7 N·m	45: 45 N·m
08: 8 N·m	80: 80 N·m
10: 10 N·m	1A: 110 N·m
14: 14 N·m	1E: 150 N·m
16: 16 N·m	2Z: 200 N·m

Motor Outer Diameter

- B: ϕ135 mm
- C: ϕ175 mm
- D: ϕ230 mm
- E: ϕ290 mm
- M: ϕ280 mm
- N: ϕ360 mm

Encoder Specifications

- 3: 20-bit absolute* (Standard)
- D: 20-bit incremental (Optional)

*: No multiturn data

Design Revision Order

- A: Servomotor outer diameter M, N
- B: Servomotor outer diameter E
- C: Servomotor outer diameter B, C, D

Flange Specifications

- 1: C face on the opposite drive end (servomotor outer diameter B, C, D, E) C face on the drive end (servomotor outer diameter M, N)
- 3: C face on the opposite drive end (servomotor outer diameter M, N)
- 4: C face with cable on side (servomotor outer diameter B, C, D, E)

Brake Specifications

- 1: Without brake

SERVOPACK

SGDS

Σ-Ⅲ series SGDS SERVOPACK

SGDS — 02 A 01 A □

Maximum Applicable Servomotor Capacity

A5: 50 W	10: 1.0 kW
01: 100 W	15: 1.5 kW
02: 200 W	20: 2.0 kW
04: 400 W	30: 3.0 kW
08: 750 W	

Power Supply Voltage

- A: 200 VAC
- F: 100 VAC

Interface Specifications

- 01: Standard (analog voltage/pulse train reference type)

Design Revision Order

- A, B, ··· Starts from A

Mounting Method

- Blank: Base mounted
- R : Rack mounted

SGDH

Σ-Ⅱ series SGDH SERVOPACK (extended function)

SGDH — 02 A E

Maximum Applicable Servomotor Capacity

02: 200 W	10: 1.0 kW
04: 400 W	15: 1.5 kW
08: 750 W	20: 2.0 kW
	30: 3.0 kW

Power Supply Voltage

- A: 200 VAC

Control Model

- E: Speed, torque, and position control

Note: SGDH software version must be 32 or later.

System Configuration

Refer to pages 27 to 31 for details of peripheral devices, connectors, and cables.

Power Supply

Molded-case Circuit Breaker (MCCB)
Protects the power line by shutting the circuit OFF when overcurrent is detected.

Noise Filter
Used to eliminate external noise from the power line.

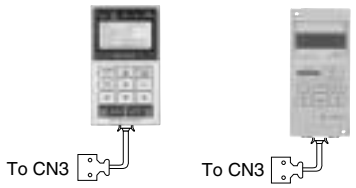
Magnetic Contactor
Turns the servo ON or OFF. Install a surge absorber.

Regenerative Resistor
Connect an external regenerative resistor to terminals B1 and B2 if the regenerative capacity is insufficient.

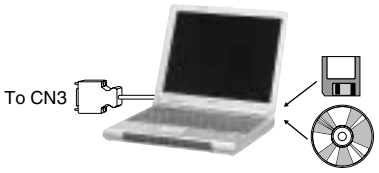
Host Controller

Digital Operator

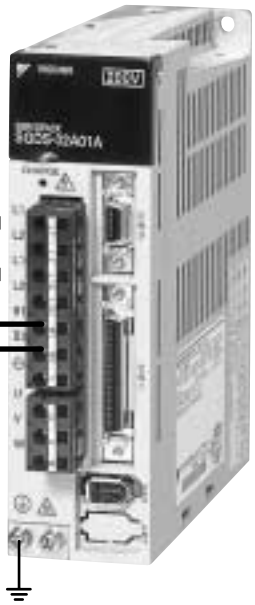
- JUSP-OP05A for SGDS
- JUSP-OP02A-2 for SGDH



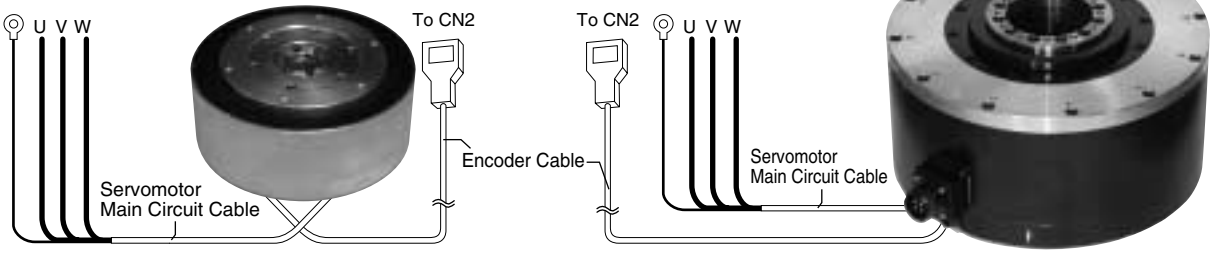
Personal Computer



SGDS SERVOPACK



SGDH SERVOPACK



Servomotor (Small Capacity)
SGMCS-□□B, C, D, E
Note: Servomotors with brakes are not provided.

Servomotor (Medium Capacity)
SGMCS-□□M, N
Note: Servomotors with brakes are not provided.

Servomotors (Small Capacity)

Ratings and Specifications

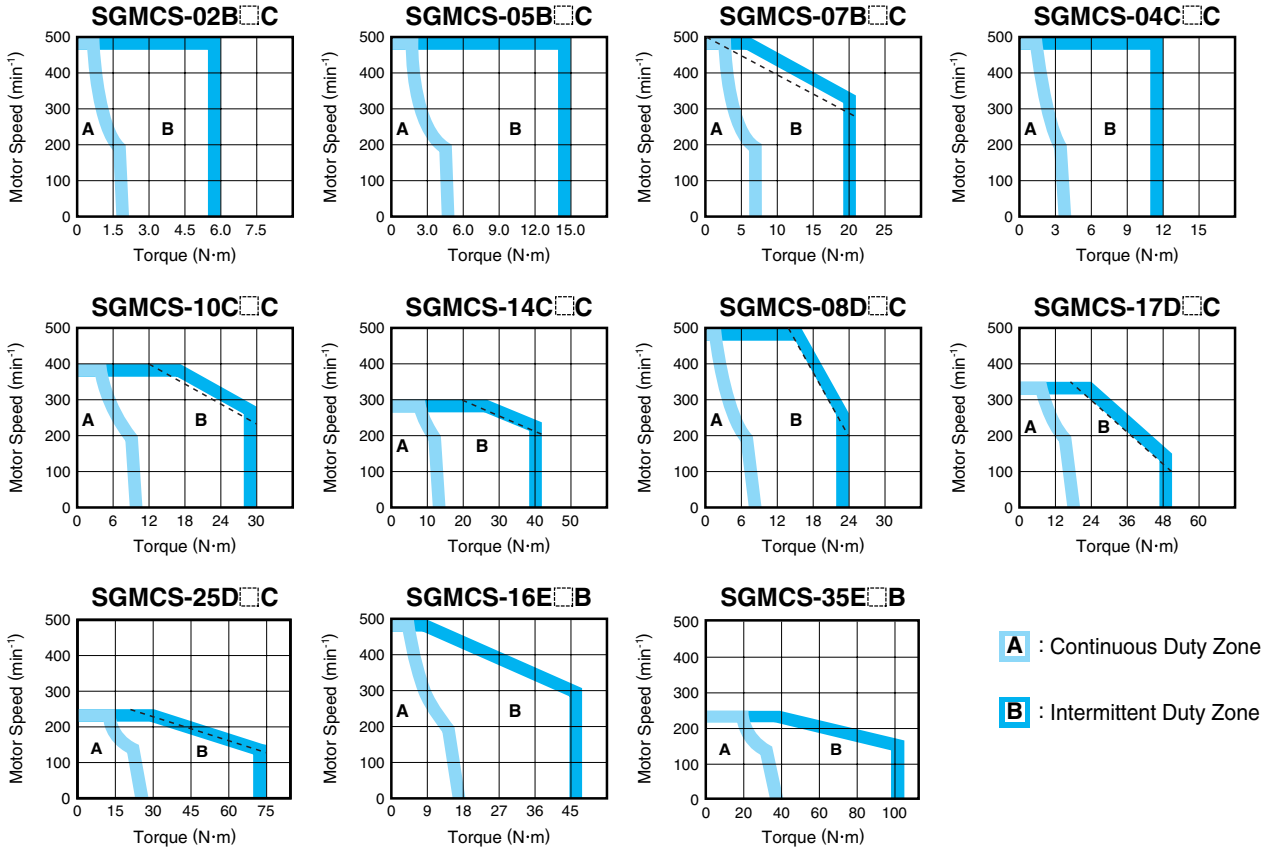
Time Rating : Continuous
Thermal Class : A
Withstand Voltage : 1500 VAC for one minute
Insulation Resistance : 500 VDC, 10 MΩ min.
Enclosure : Totally-enclosed, self-cooled
Vibration Class : V15

Ambient Temperature : 0 to +40℃
Ambient Humidity : 20% to 80% (no condensation)
Excitation : Permanent magnet
Drive Method : Direct drive
Mounting : Flange method

Servomotor Model		SGMCS-□□B□C			SGMCS-□□C□C			SGMCS-□□D□C			SGMCS-□□E□C	
		02	05	07	04	10	14	08	17	25	16	35
Rated Output*1	W	42	105	147	84	209	293	168	356	393	335	550
Rated Torque*1, *2	N·m	2.0	5.0	7.0	4.0	10.0	14.0	8.0	17.0	25.0	16.0	35.0
Instantaneous Peak Torque*1	N·m	6.0	15.0	21.0	12.0	30.0	42.0	24.0	51.0	75.0	48.0	105
Stall Torque*1 (60 min-1)	N·m	2.05	5.15	7.32	4.09	10.1	14.2	8.23	17.4	25.4	17.6	38.3
Rated Current*1	Arms	1.8	1.7	1.4	2.2	2.2	2.8	1.9	2.5	2.6	3.3	3.5
Instantaneous Max.Current*1	Arms	5.4	5.1	4.1	7.0	7.0	8.3	5.6	7.5	8.0	9.4	10.0
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	1.18	3.17	5.44	2.04	5.05	5.39	5.1	7.79	10.8	5.58	11.1
Rotor Moment of Inertia	kg·m²×10⁻⁴	28	51	77	77	140	220	285	510	750	930	1430
Rated Power Rate*1	kW/s	1.4	4.9	6.4	2.1	7.1	8.9	2.25	5.67	8.33	2.75	8.57
Rated Angular Acceleration*1	rad/s²	710	980	910	520	710	640	280	330	330	170	240
Absolute Accuracy	second	±15			±15			±15			±15	
Repeatability	second	±1.3			±1.3			±1.3			±1.3	

*1 : These items and torque-motor speed characteristics quoted in combination with a SERVOPACK are at an armature winding temperature of 100℃. Other values quoted at 20℃.
*2 : Rated torques are continuous allowable torque values at 40℃ with a steel heat sink attached.
Heat sink: SGMCS-□□B: 350 mm × 350 mm × 12 mm SGMCS-□□C: 450 mm × 450 mm × 12 mm
SGMCS-□□D: 550 mm × 550 mm × 12 mm SGMCS-□□E: 650 mm × 650 mm × 12 mm

Torque-Motor Speed Characteristics



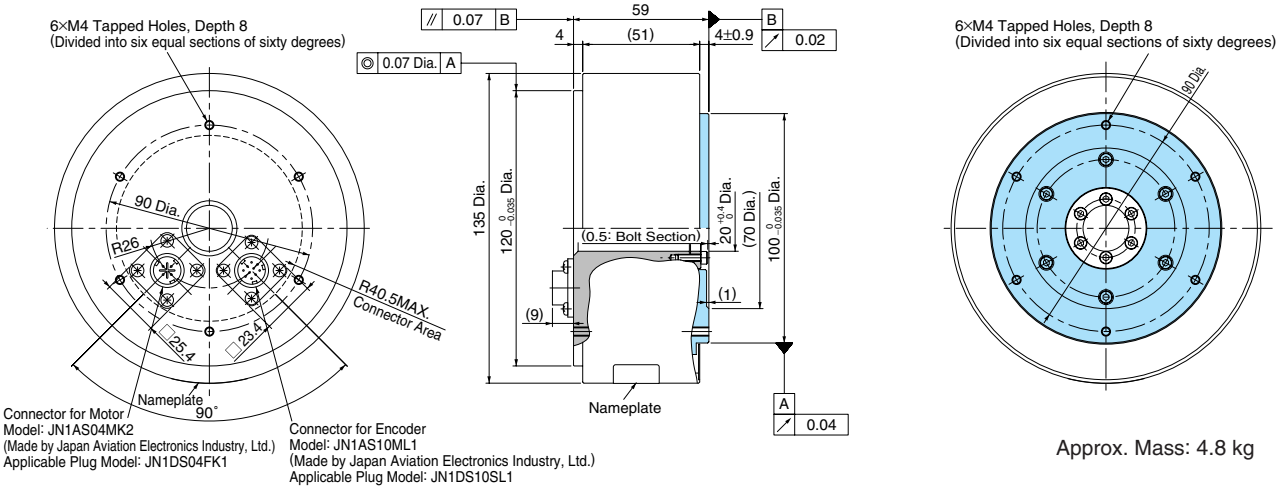
Note : The dotted line of intermittent duty zone indicates the characteristics when a servomotor runs in combination with a SERVOPACK for 100 VAC (only for Σ-Ⅲ series).

Servomotors (Small Capacity)

External Dimensions Units: mm

Rotating part: Non-rotating part:

SGMCS-02B□C11

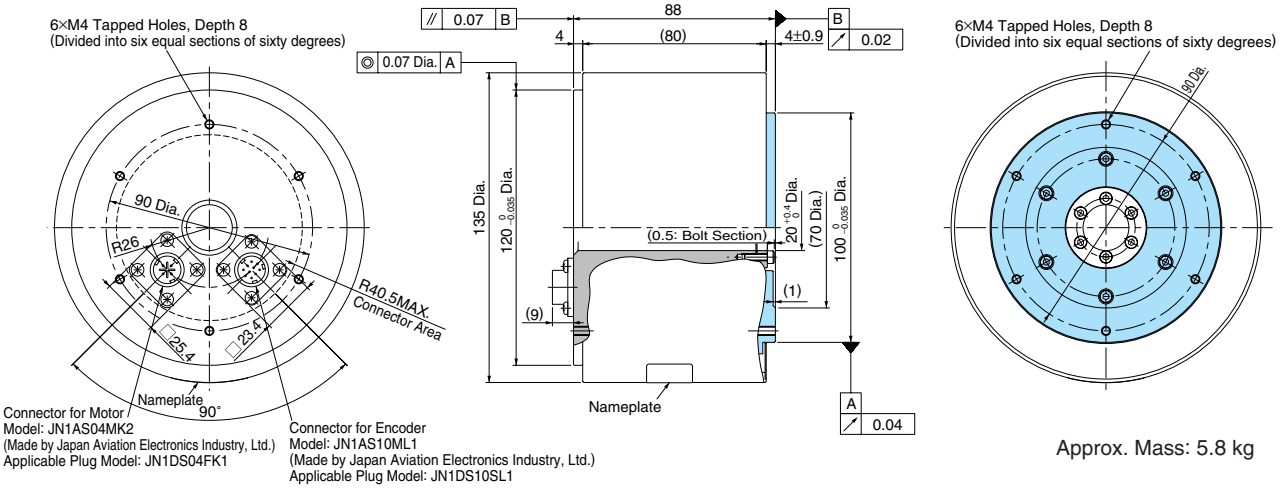


Connector for Motor
Model: JN1AS04MK2
(Made by Japan Aviation Electronics Industry, Ltd.)
Applicable Plug Model: JN1DS04FK1

Connector for Encoder
Model: JN1AS10ML1
(Made by Japan Aviation Electronics Industry, Ltd.)
Applicable Plug Model: JN1DS10SL1

Approx. Mass: 4.8 kg

SGMCS-05B□C11

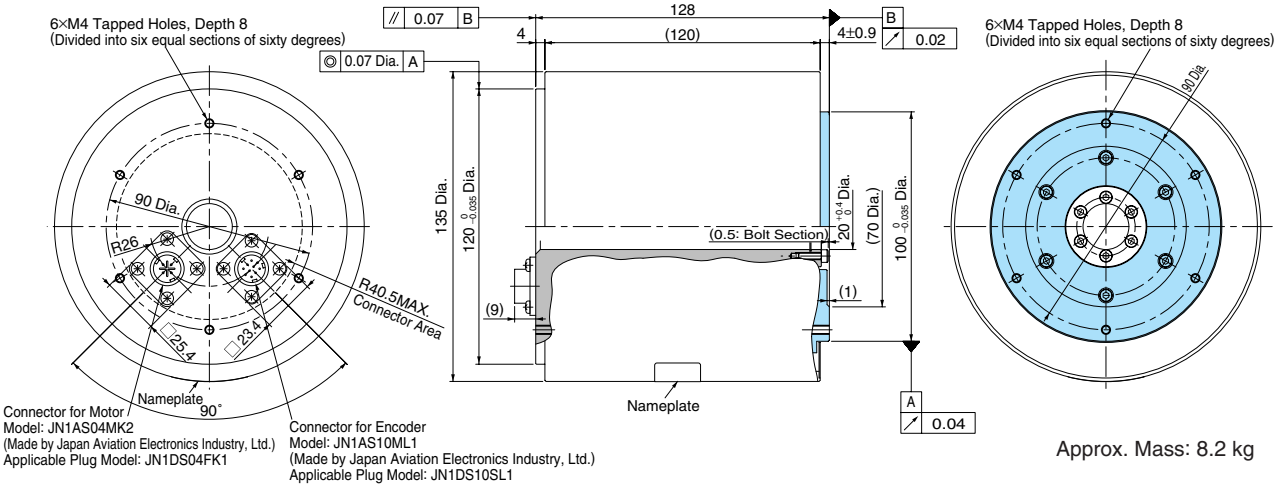


Connector for Motor
Model: JN1AS04MK2
(Made by Japan Aviation Electronics Industry, Ltd.)
Applicable Plug Model: JN1DS04FK1

Connector for Encoder
Model: JN1AS10ML1
(Made by Japan Aviation Electronics Industry, Ltd.)
Applicable Plug Model: JN1DS10SL1

Approx. Mass: 5.8 kg

SGMCS-07B□C11

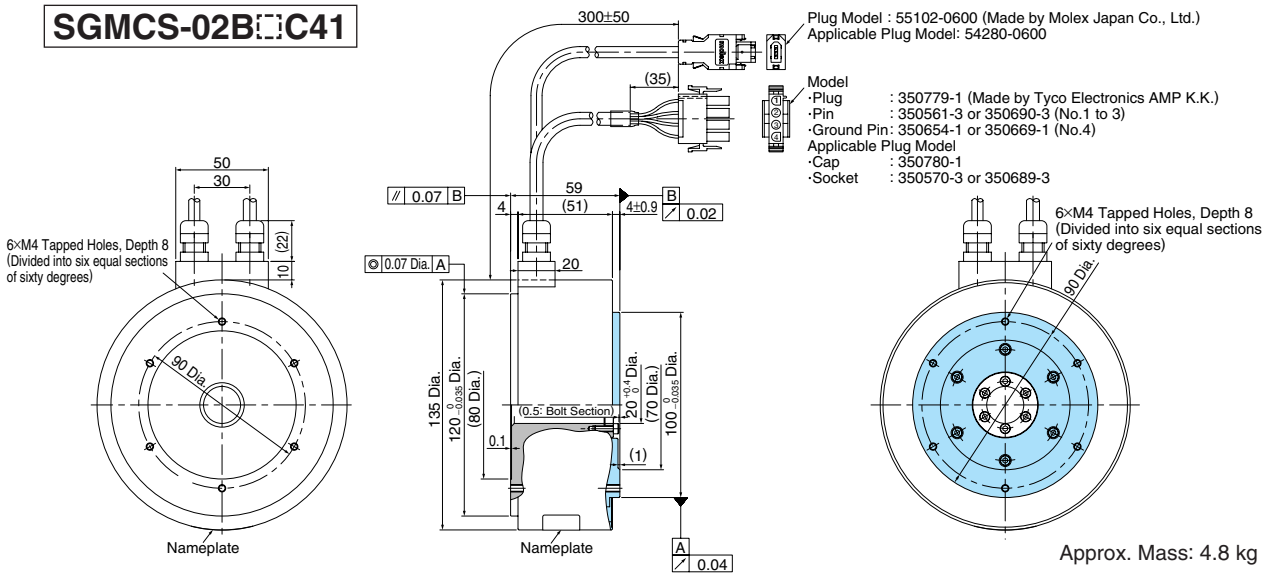


Connector for Motor
Model: JN1AS04MK2
(Made by Japan Aviation Electronics Industry, Ltd.)
Applicable Plug Model: JN1DS04FK1

Connector for Encoder
Model: JN1AS10ML1
(Made by Japan Aviation Electronics Industry, Ltd.)
Applicable Plug Model: JN1DS10SL1

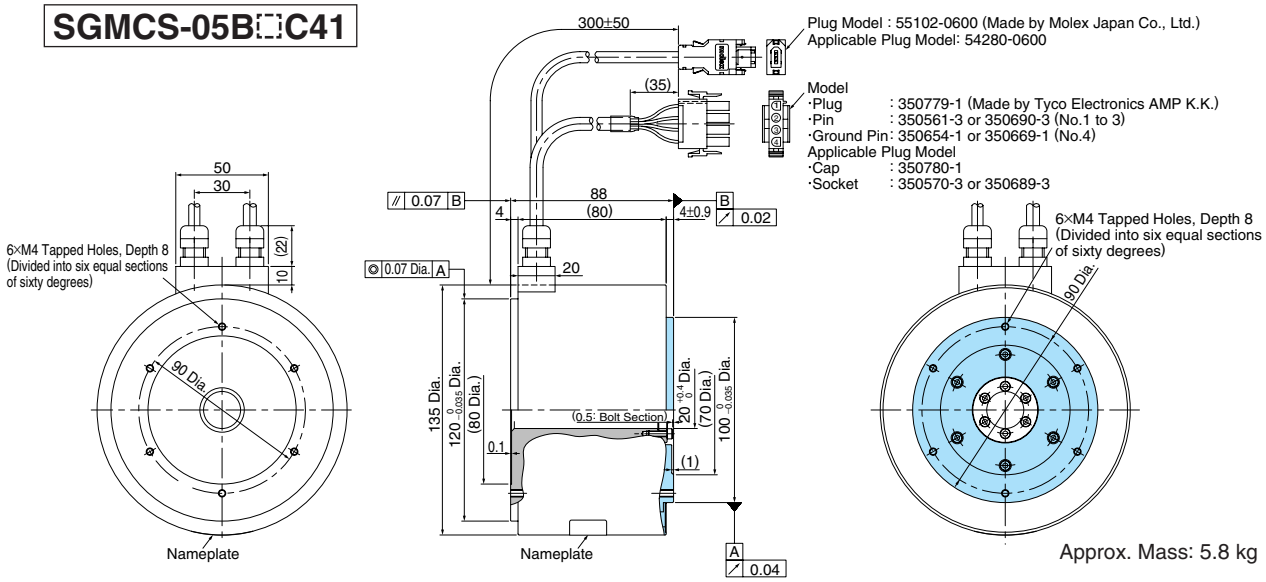
Approx. Mass: 8.2 kg

SGMCS-02B□C41



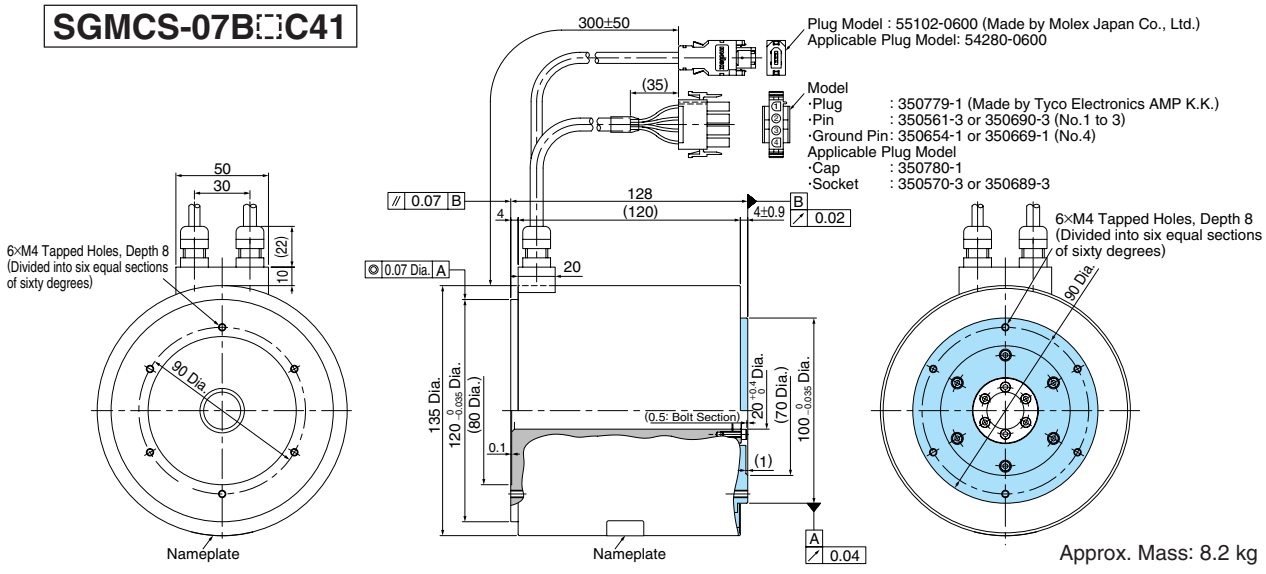
Approx. Mass: 4.8 kg

SGMCS-05B□C41



Approx. Mass: 5.8 kg

SGMCS-07B□C41



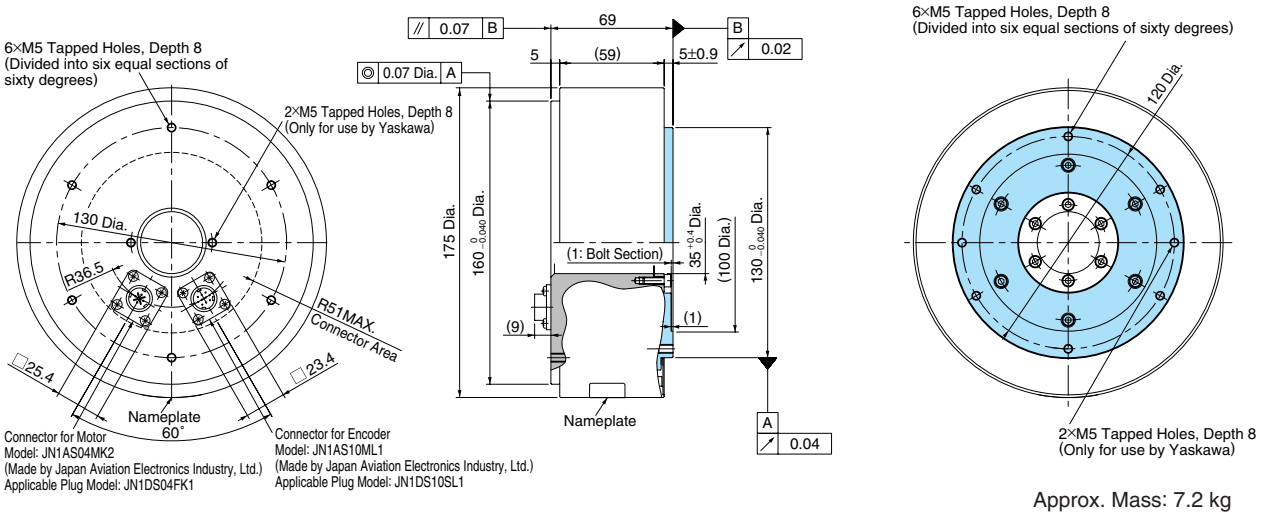
Approx. Mass: 8.2 kg

Servomotors (Small Capacity)

External Dimensions Units: mm

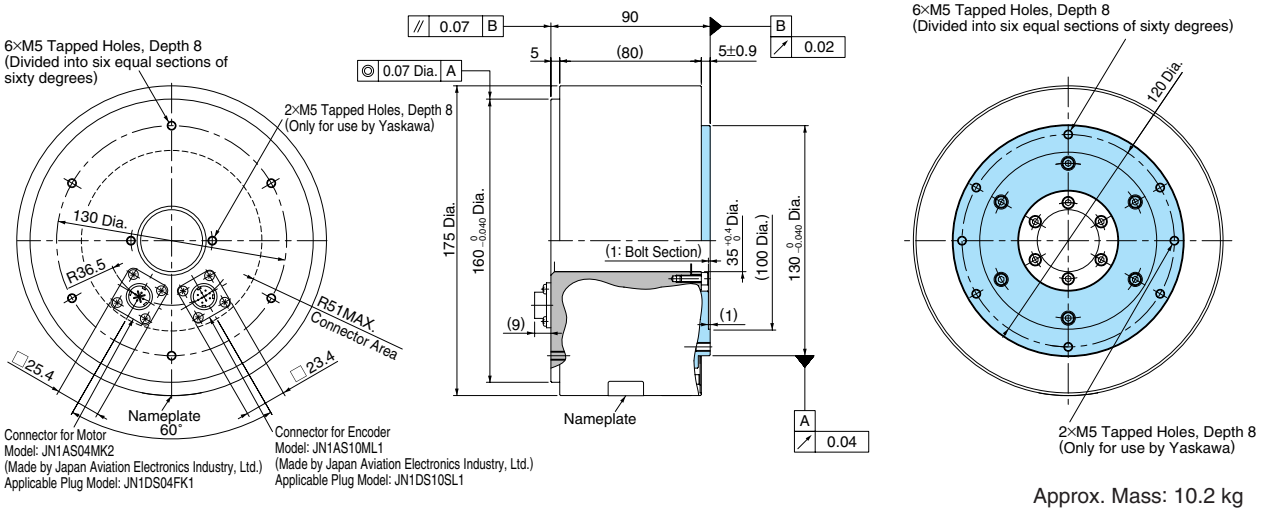
Rotating part: Non-rotating part:

SGMCS-04C□C11



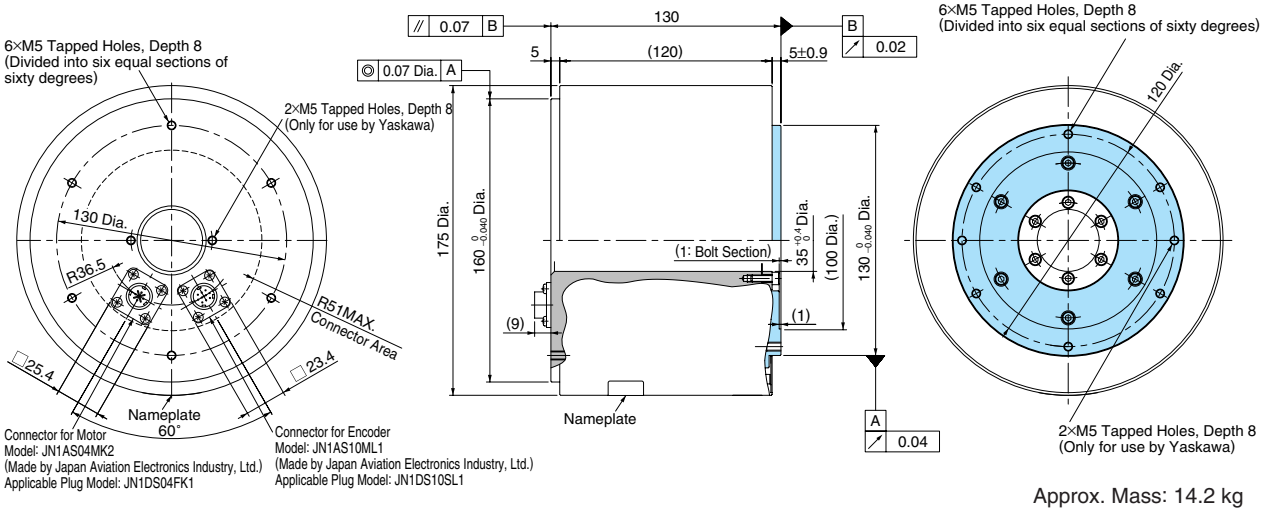
Approx. Mass: 7.2 kg

SGMCS-10C□C11



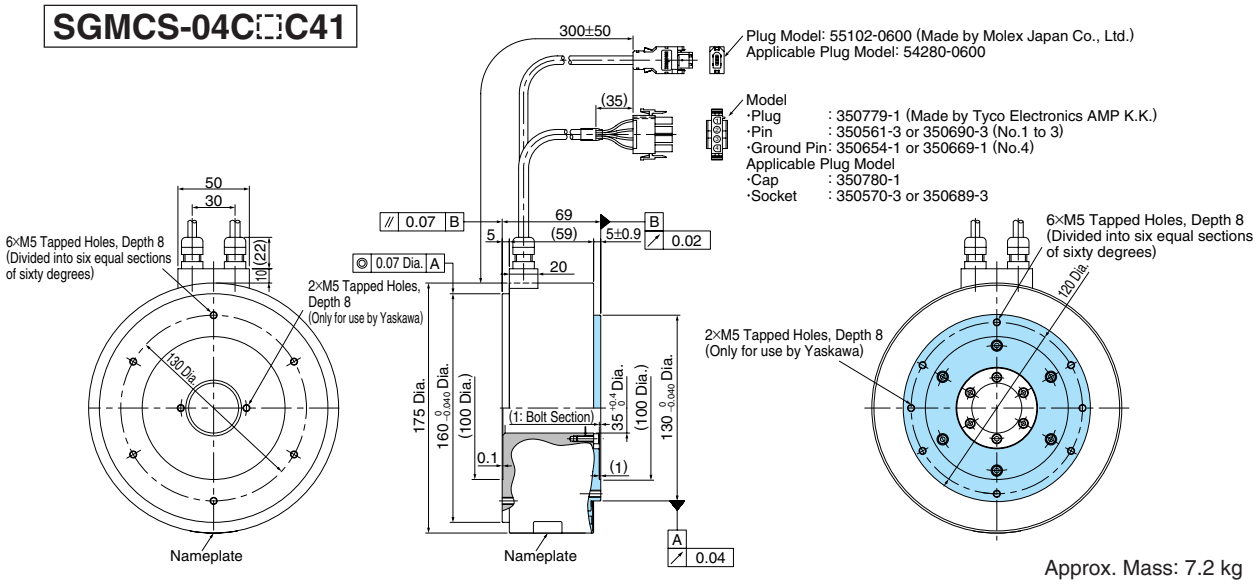
Approx. Mass: 10.2 kg

SGMCS-14C□C11



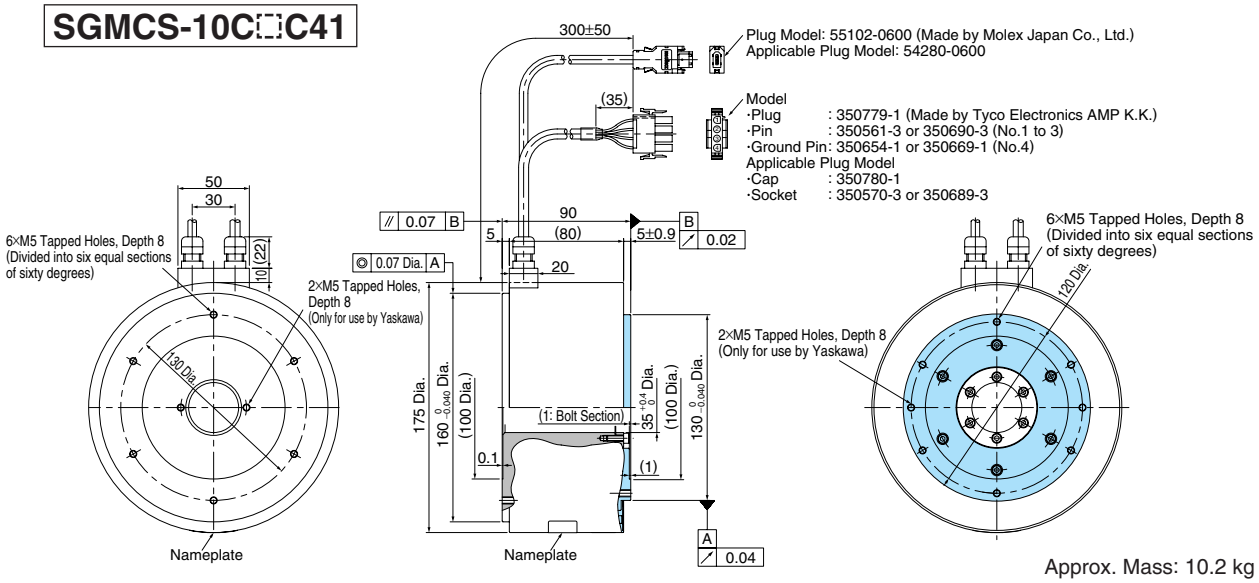
Approx. Mass: 14.2 kg

SGMCS-04C□C41



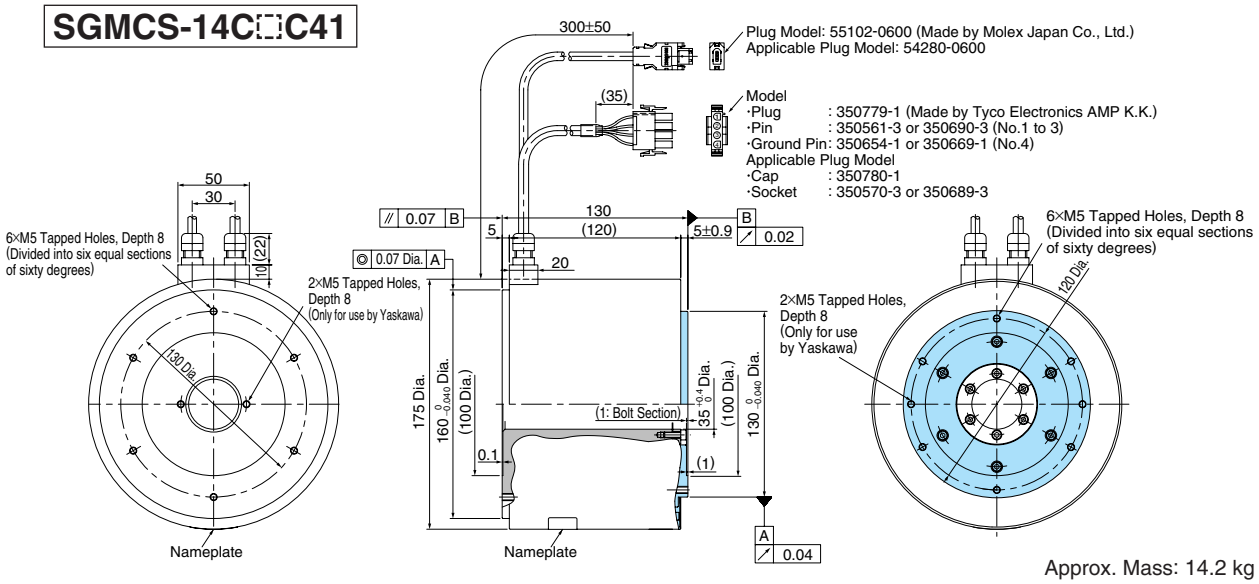
Approx. Mass: 7.2 kg

SGMCS-10C□C41



Approx. Mass: 10.2 kg

SGMCS-14C□C41



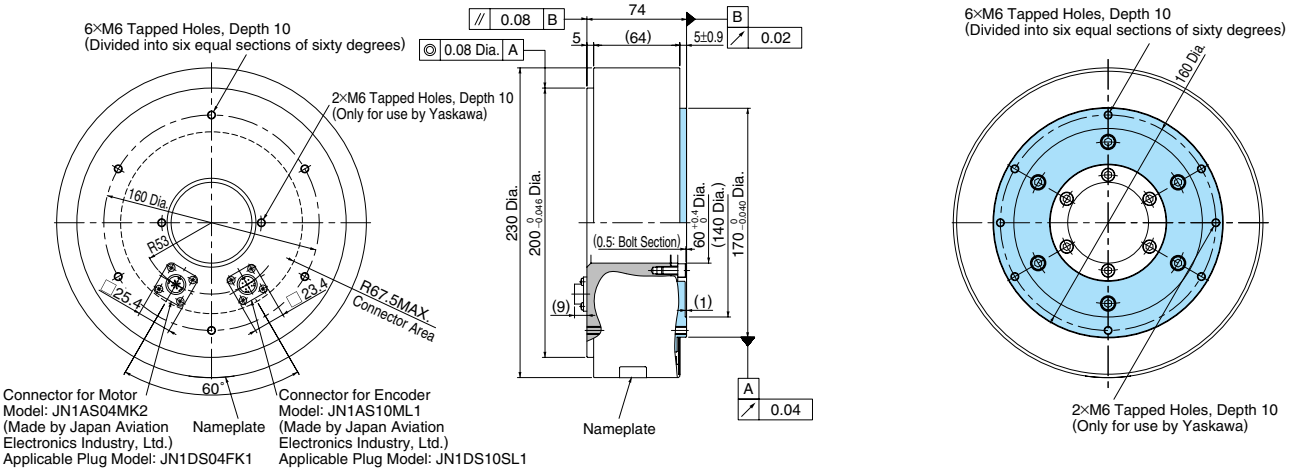
Approx. Mass: 14.2 kg

Servomotors (Small Capacity)

External Dimensions Units: mm

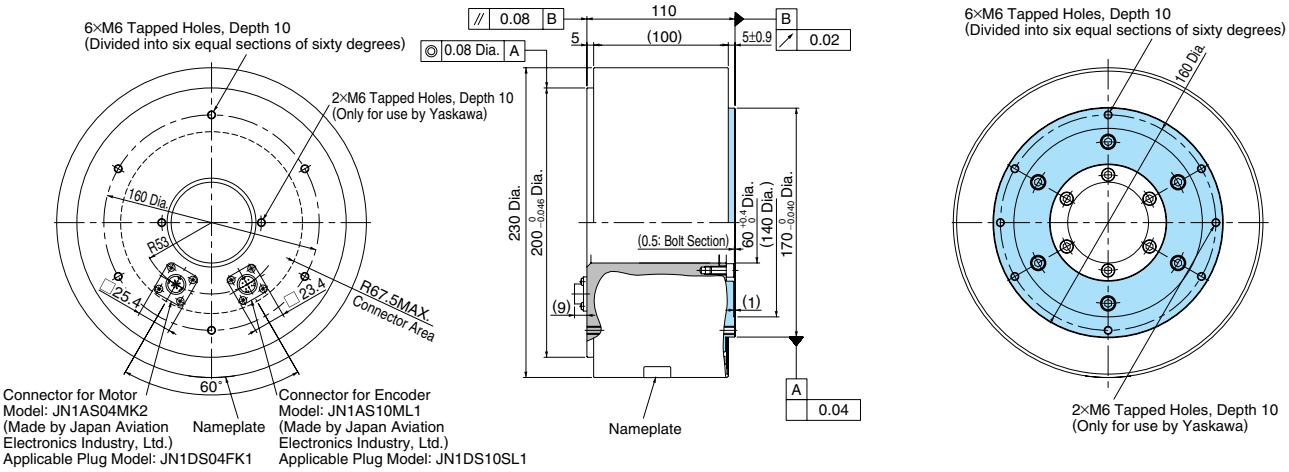
Rotating part: Non-rotating part:

SGMCS-08D□C11



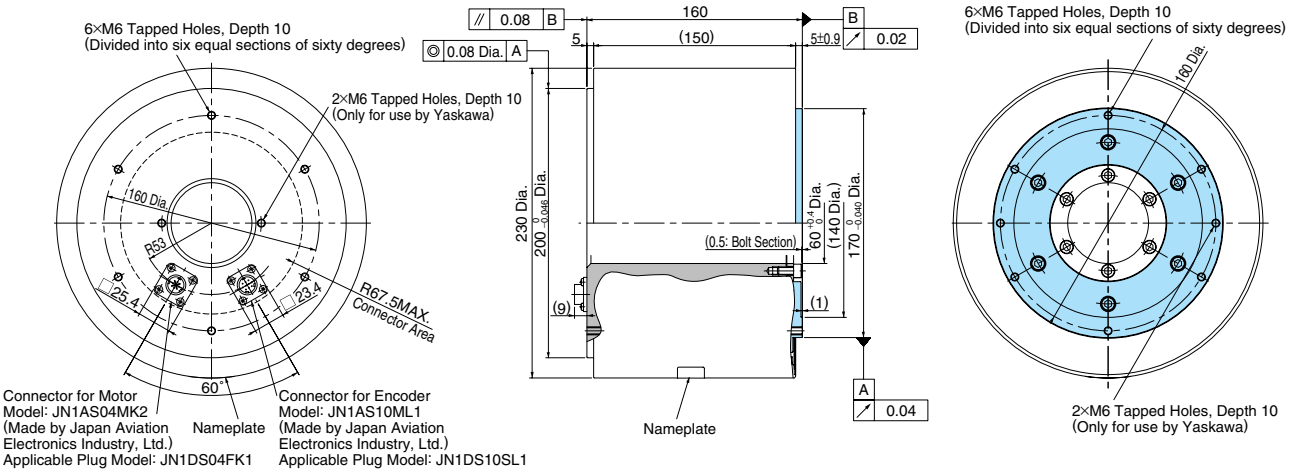
Approx. Mass: 14.0 kg

SGMCS-17D□C11



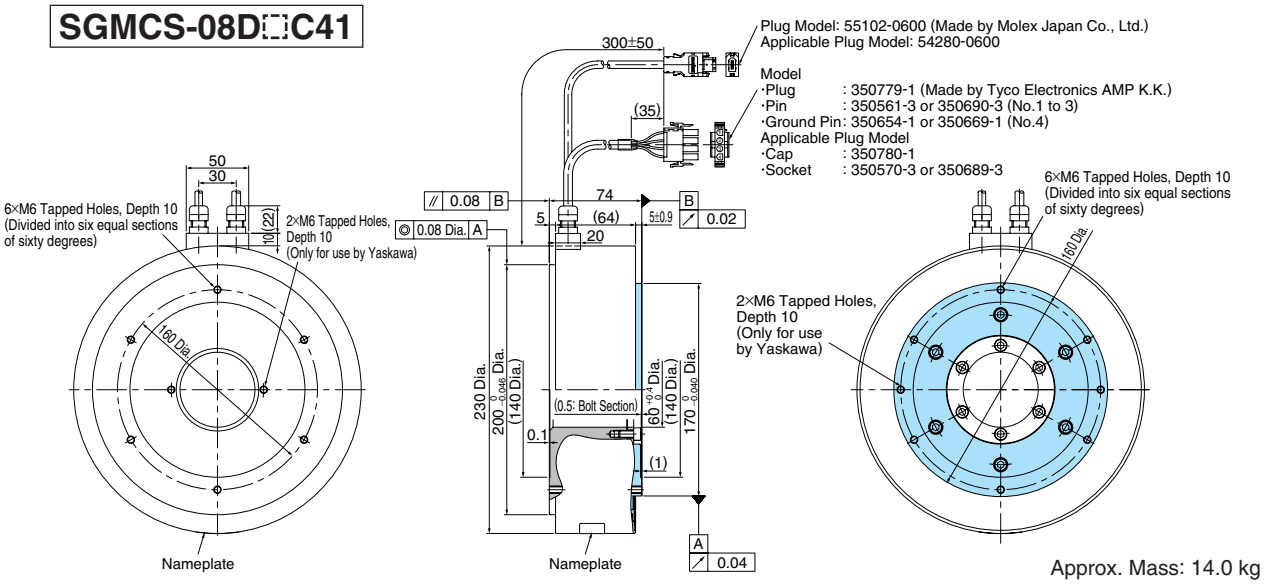
Approx. Mass: 22.0 kg

SGMCS-25D□C11



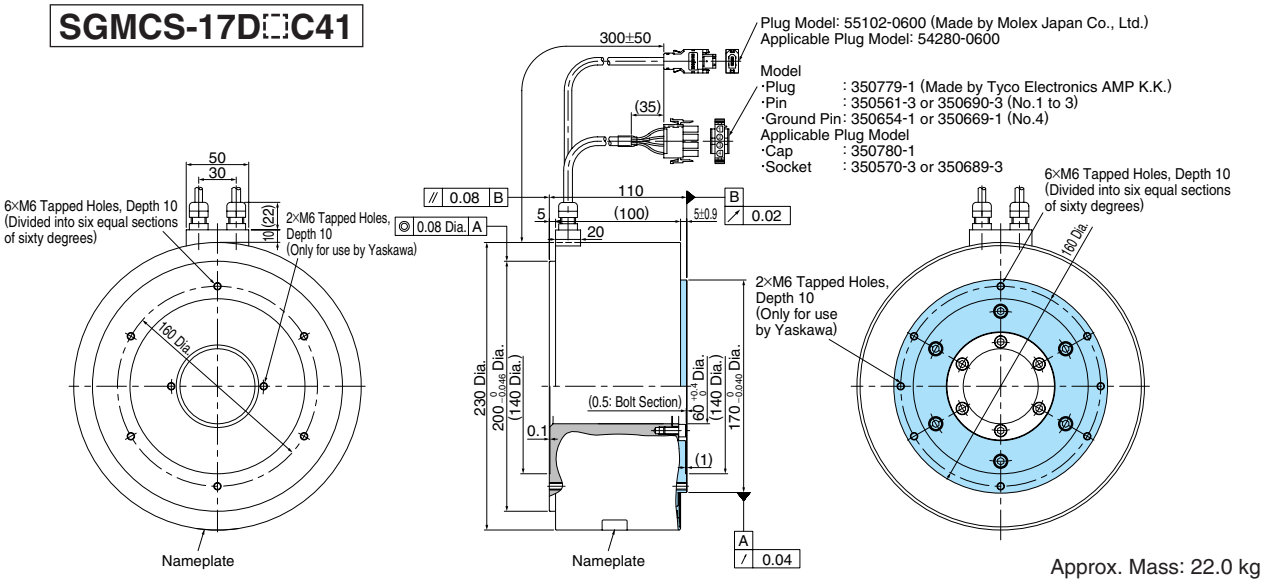
Approx. Mass: 29.7 kg

SGMCS-08D□C41



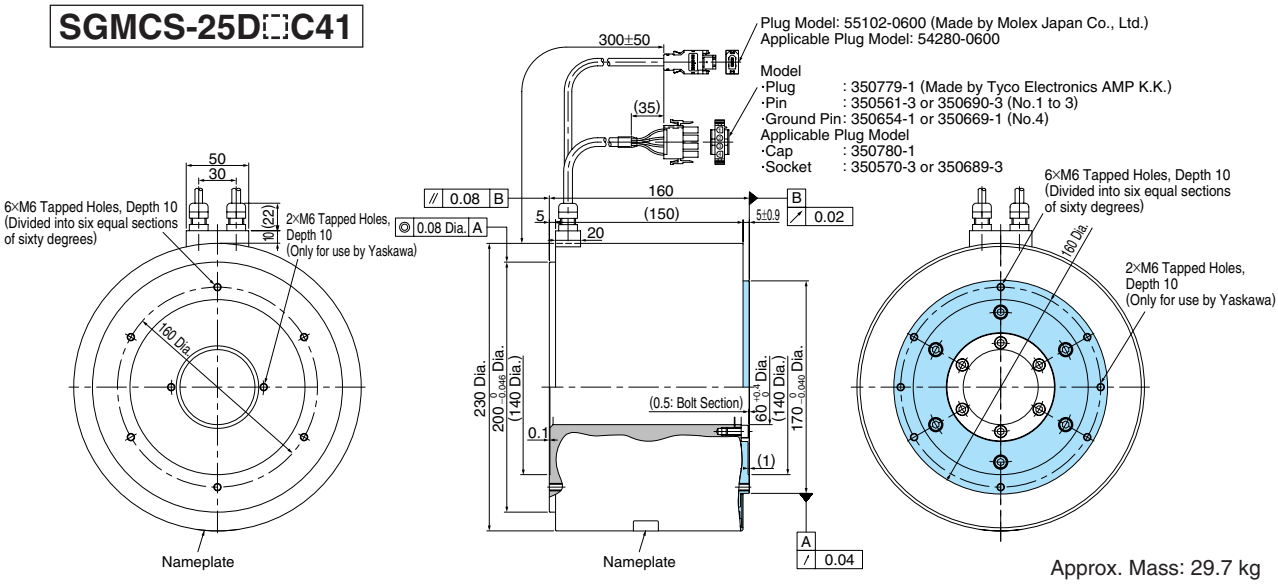
Approx. Mass: 14.0 kg

SGMCS-17D□C41



Approx. Mass: 22.0 kg

SGMCS-25D□C41



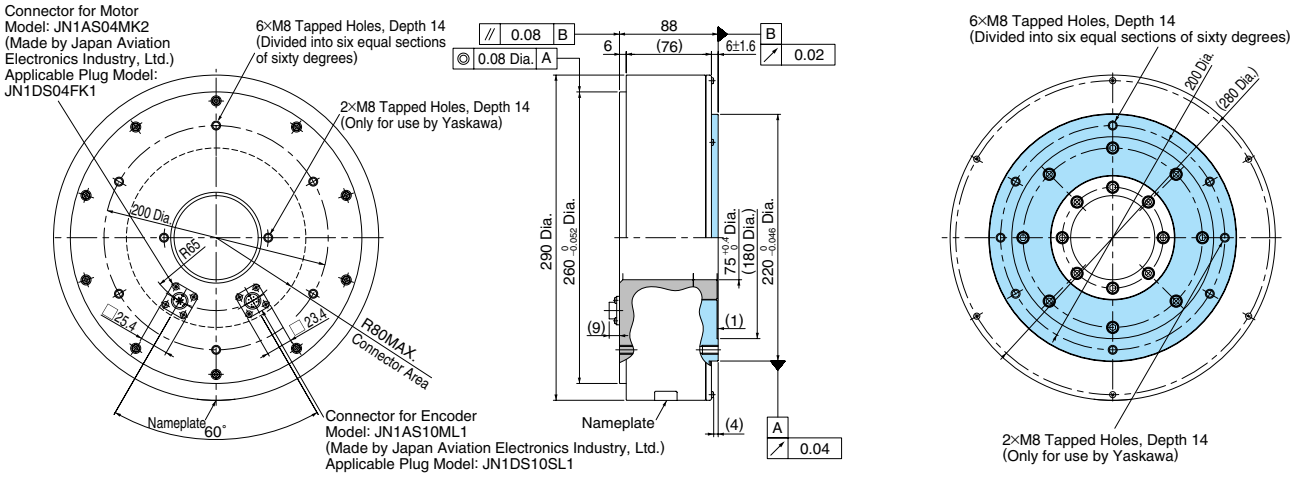
Approx. Mass: 29.7 kg

Servomotors (Small Capacity)

External Dimensions Units: mm

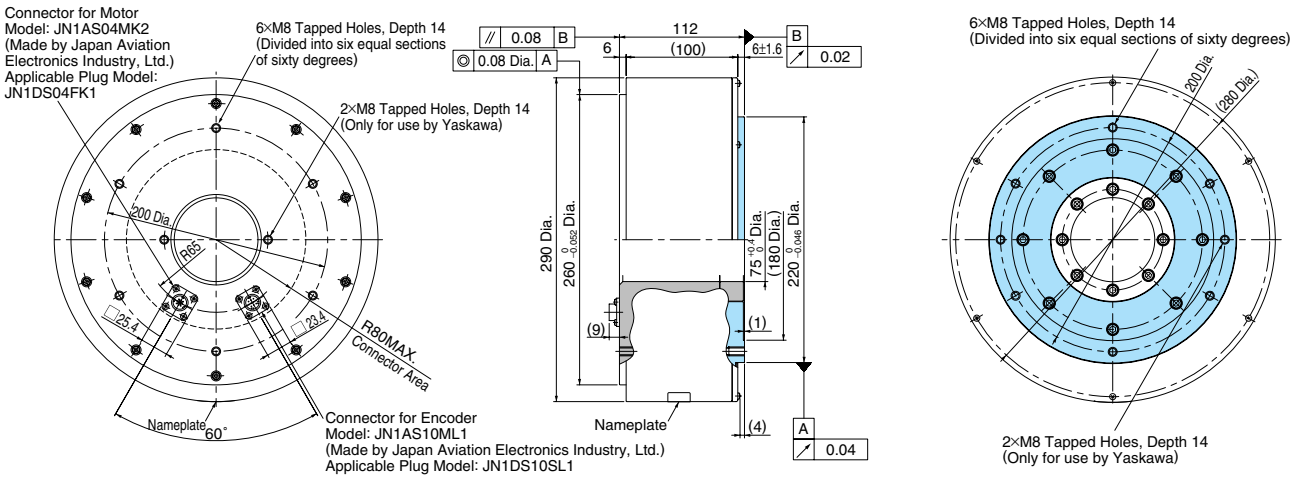
Rotating part: Non-rotating part:

SGMCS-16E□B11



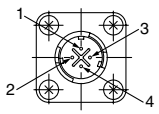
Approx. Mass: 26.0 kg

SGMCS-35E□B11



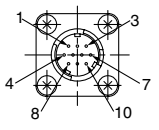
Approx. Mass: 34.0 kg

Motor connector (for small-capacity series)



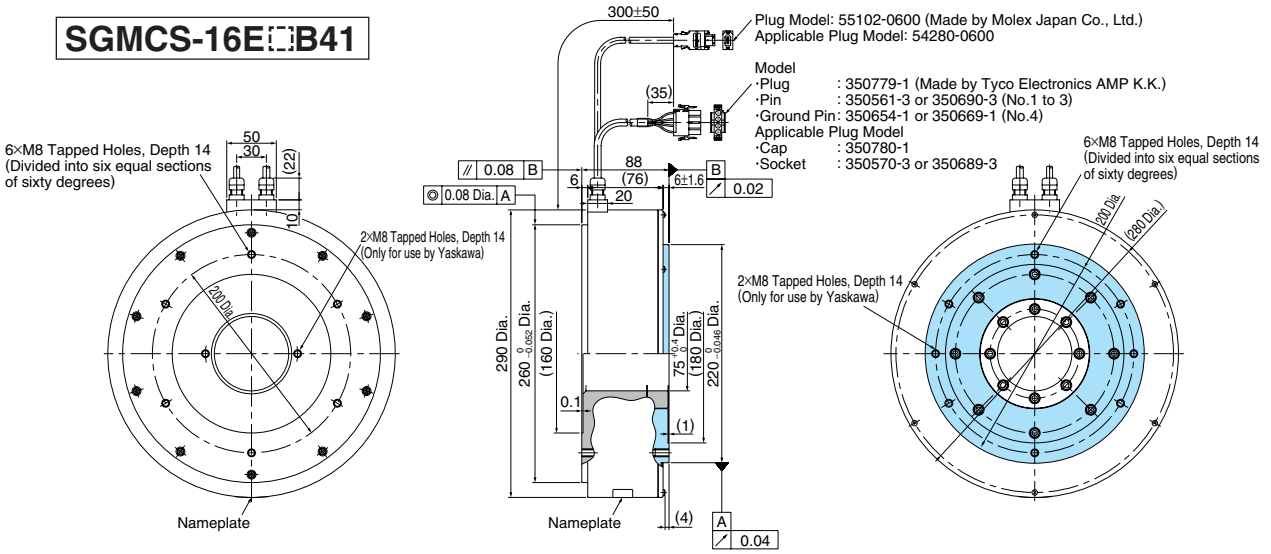
1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
4	FG (Frame Ground)	Green (Yellow)

Encoder connector (for small-capacity series)



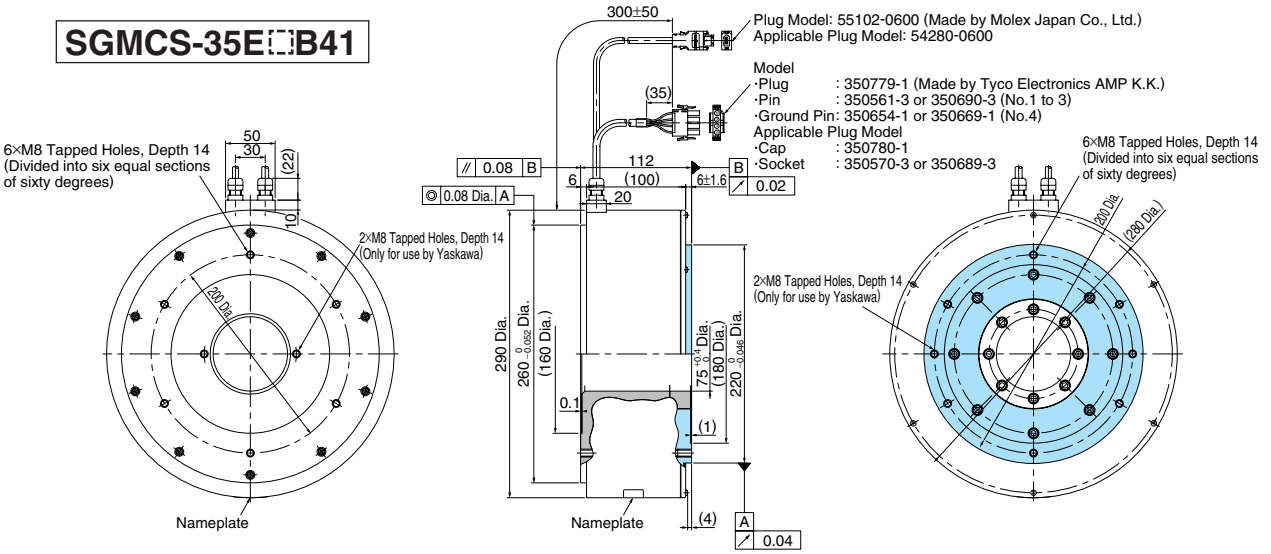
1	PS	Light Blue
2	/PS	Light Blue/White
3	—	—
4	PG5V	Red
5	—	—
6	—	—
7	FG (Frame Ground)	Shield
8	—	—
9	PG0V	Black
10	—	—

SGMCS-16E□B41



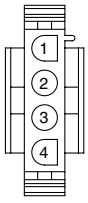
Approx. Mass: 26.0 kg

SGMCS-35E□B41



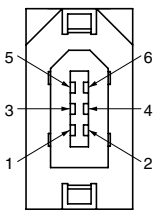
Approx. Mass: 34.0 kg

Motor connector (for small-capacity series)



1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
4	FG (Frame Ground)	Green (Yellow)

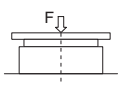
Encoder connector (for small-capacity series)



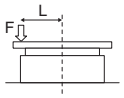
1	PG5V	Red
2	PG0V	Black
3	—	—
4	—	—
5	PS	Light Blue
6	/PS	Light Blue/White
Connector Case	FG (Frame Ground)	Shield

Load Capacity

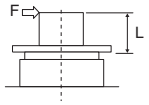
The following figures show the load capacity during motor operation. Design the mechanical system so thrust and moment loads applied to the servomotor shaft end during operation falls within the ranges shown in the table below.



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



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



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

Servomotor Model SGMCS-□	02B□C	05B□C	07B□C	04C□C	10C□C	14C□C	08D□C	17D□C	25D□C	16E□B	35E□B
Allowable Thrust Load Fa N	1500			3300			4000			11000	
Allowable Moment Load M N·m	40	50	64	70	75	90	93	103	135	250	320

Servomotors (Medium Capacity)

Ratings and Specifications

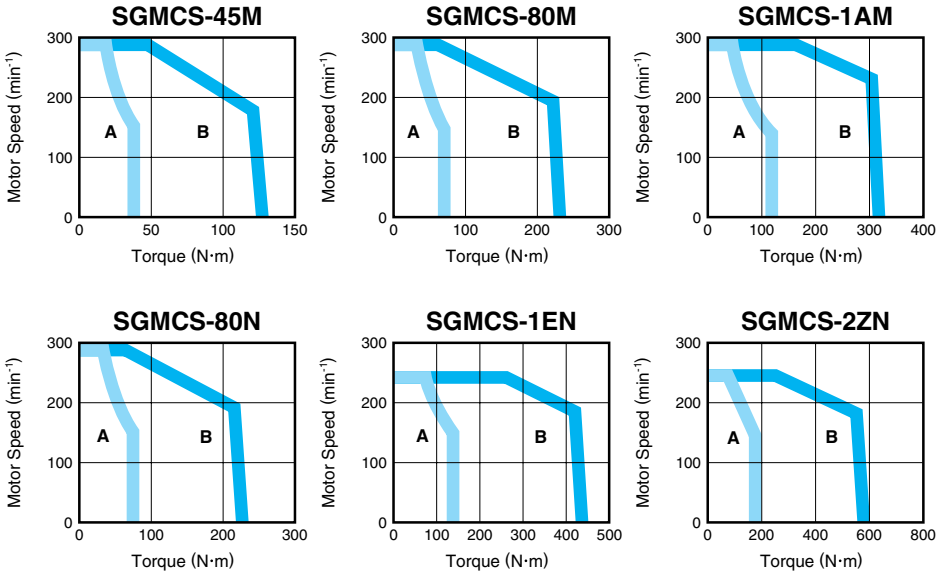
Time Rating : Continuous
Thermal Class : F
Withstand Voltage : 1500 VAC for one minute
Insulation Resistance : 500 VDC, 10 MΩ min.
Enclosure : Totally-enclosed, self-cooled
Vibration Class : V15

Ambient Temperature : 0 to +40℃
Ambient Humidity : 20% to 80% (no condensation)
Excitation : Permanent magnet
Drive Method : Direct drive
Mounting : Flange method

Servomotor Model		SGMCS-□□□					
		45M	80M	1AM	80N	1EN	2ZN
Rated Output*	W	707	1260	1730	1260	2360	3140
Rated Torque*	N·m	45	80	110	80	150	200
Instantaneous Peak Torque*	N·m	135	240	330	240	450	600
Stall Torque*	N·m	45	80	110	80	150	200
Rated Current*	Arms	5.80	9.74	13.4	9.35	17.4	18.9
Instantaneous Max.Current*	Arms	17	28	42	28	56	56
Rated Speed*	min^{-1}	150	150	150	150	150	150
Max. Speed*	min^{-1}	300	300	300	300	250	250
Torque Constant	N·m/Arms	8.39	8.91	8.45	9.08	9.05	11.5
Rotor Moment of Inertia	$kg·m^2×10^{-4}$	388	627	865	1360	2470	3060
Rated Power Rate*	kW/s	52.2	102	140	47.1	91.1	131
Rated Angular Acceleration	Rad/s^2	1160	1280	1270	588	607	654

✻ : These items and torque-motor speed characteristics quoted in combination with a SERVOPACK are at an armature winding temperature of 20℃.
The values listed here are representative of the values obtained when a steel-plate heat sink (750 mm × 750 mm × 45 mm) is used for cooling.

Torque-Motor Speed Characteristics

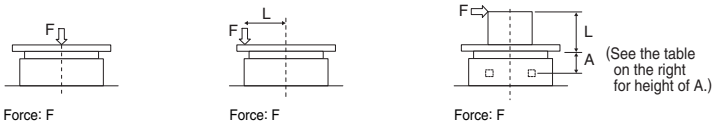


A : Continuous Duty Zone

B : Intermittent Duty Zone

Load Capacity

The following figures show the load capacity during motor operation.
Design the mechanical system so thrust and moment loads applied to the servomotor shaft end during operation falls within the ranges shown in the table below.



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

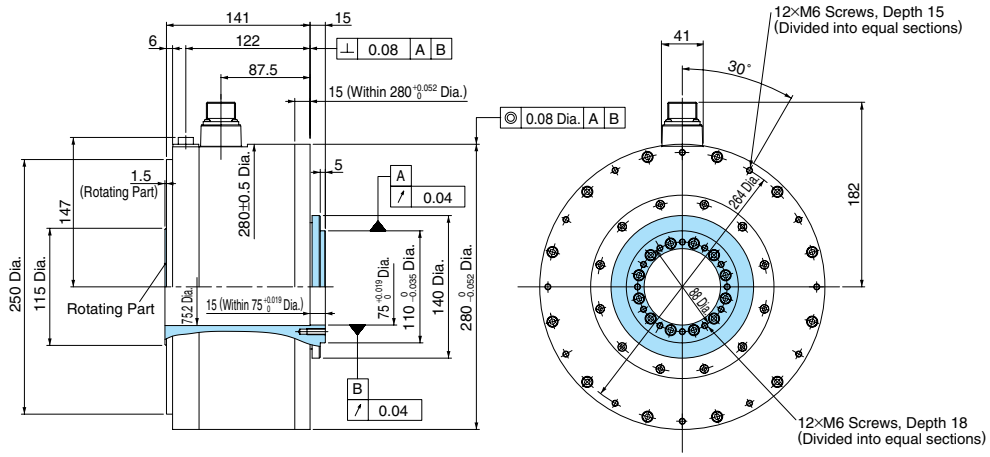
Force: F
Thrust Load : Fa=F+Load's Mass
Moment Load: M=F×L

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

Servomotor Model SGMCS-□□□	45M	80M	1AM	80N	1EN	2ZN
Dimension A mm	33			37.5		
Allowable Thrust Load Fa N	9000			16000		
Allowable Moment Load M N·m	180			350		

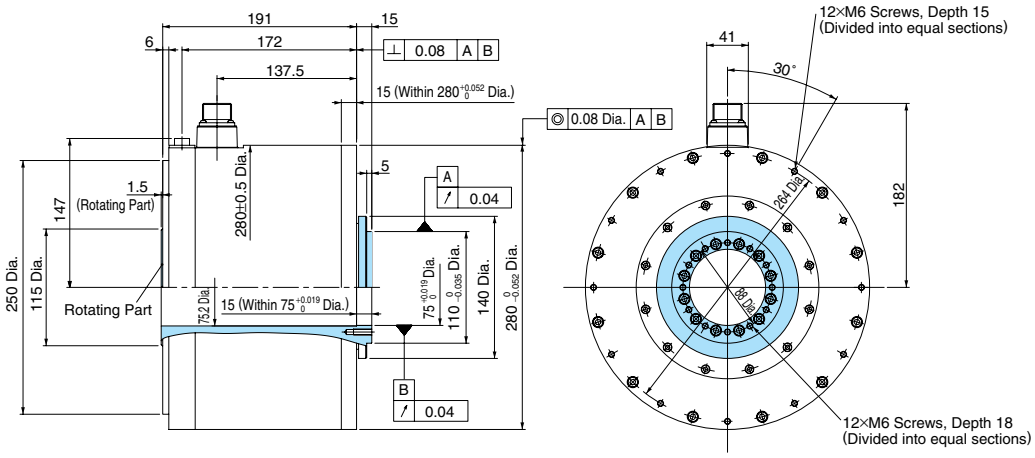
External Dimensions Units: mm Rotating part:

SGMCS-45M□A11



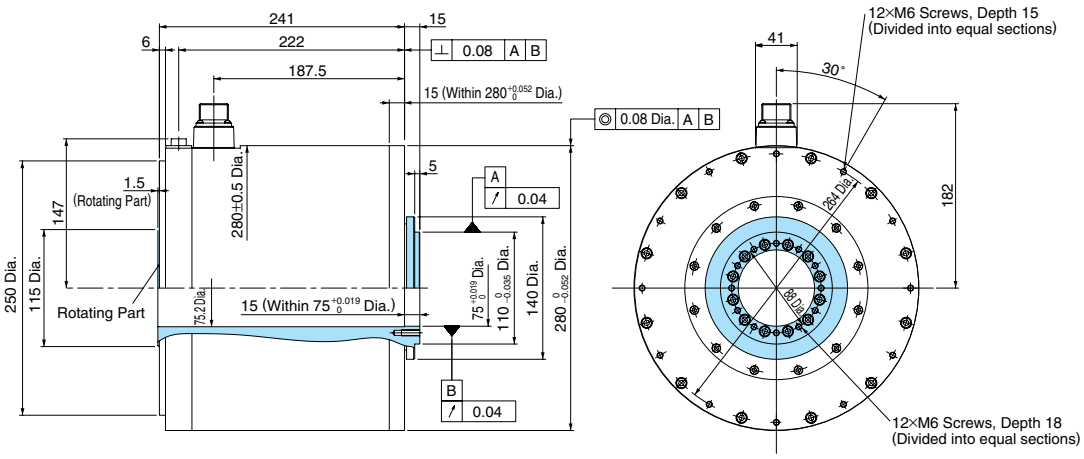
Approx. Mass: 38 kg

SGMCS-80M□A11



Approx. Mass: 45 kg

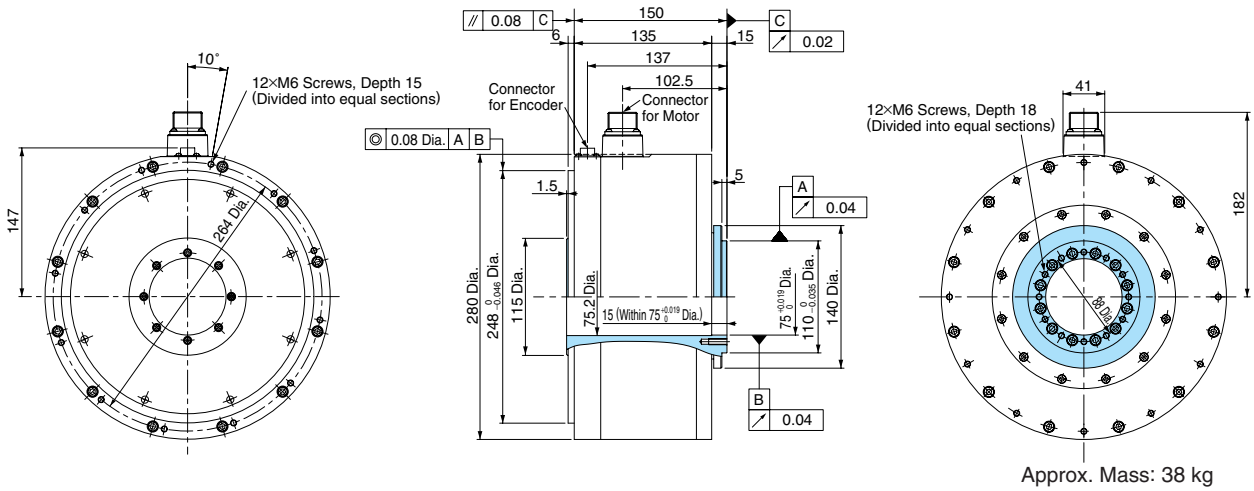
SGMCS-1AM□A11



Approx. Mass: 51 kg

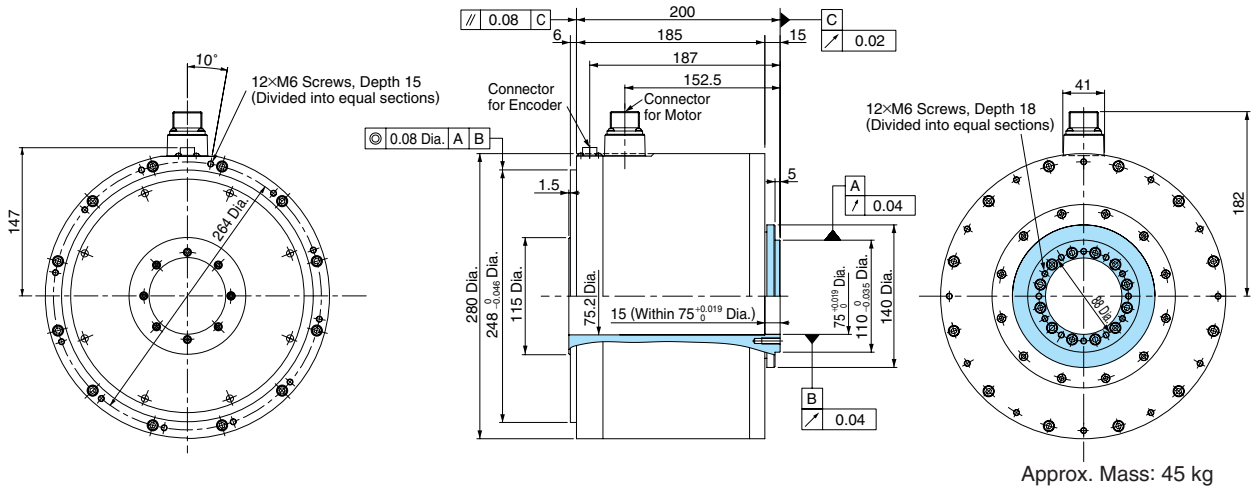
External Dimensions Units: mm Rotating part:

SGMCS-45M□A31



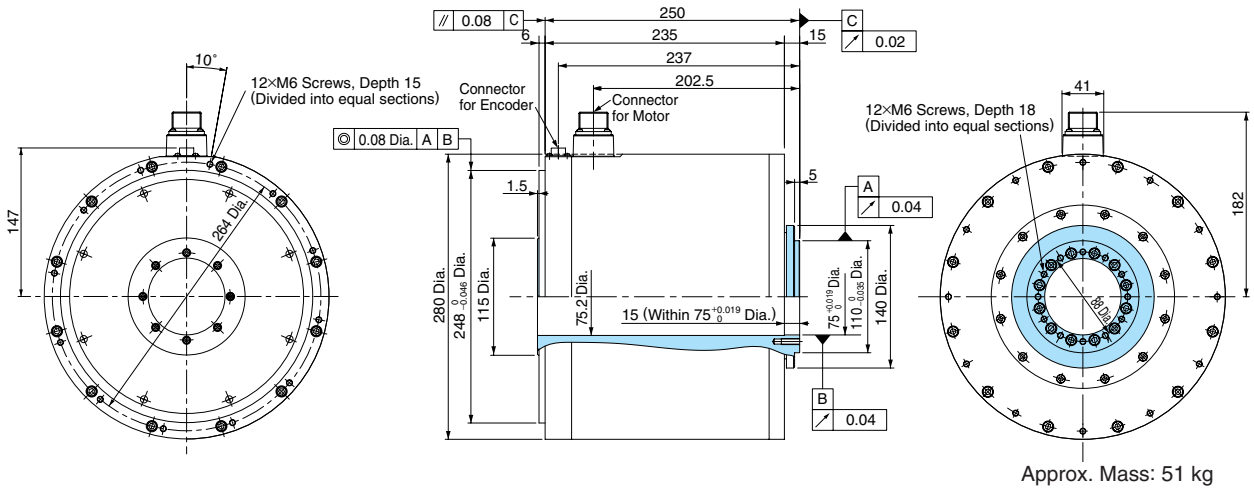
Approx. Mass: 38 kg

SGMCS-80M□A31



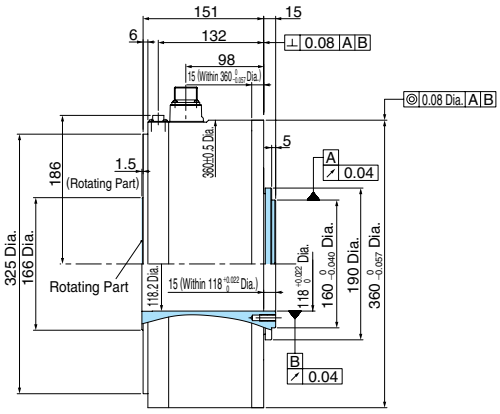
Approx. Mass: 45 kg

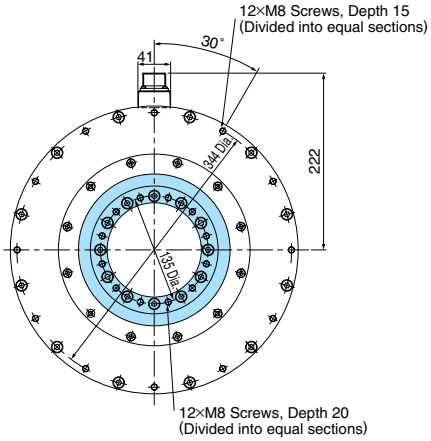
SGMCS-1AM□A31



Approx. Mass: 51 kg

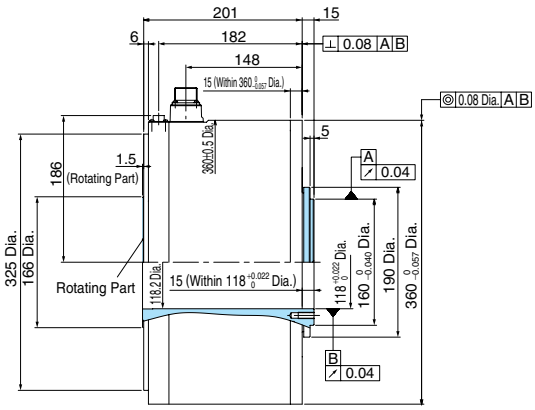
SGMCS-80N□A11

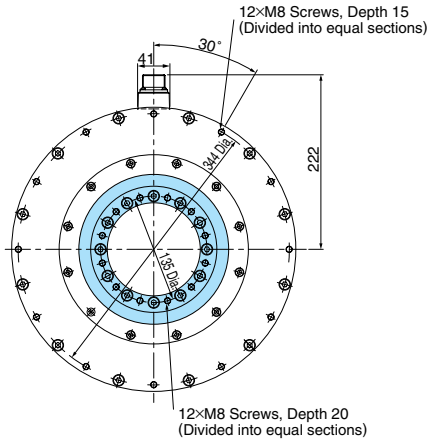




Approx. Mass: 50 kg

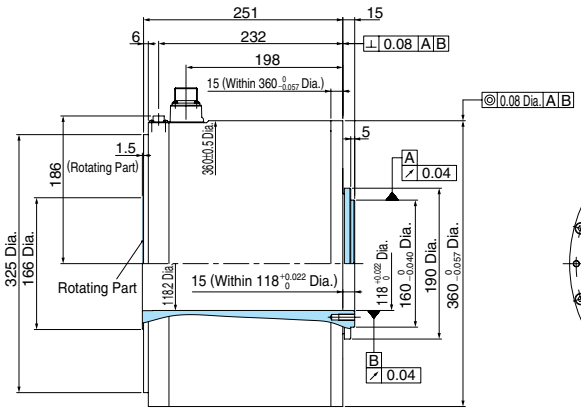
SGMCS-1EN□A11

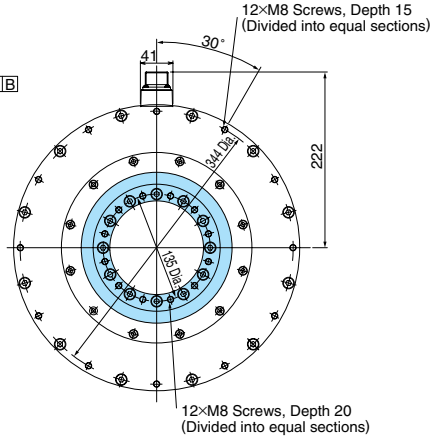




Approx. Mass: 68 kg

SGMCS-2ZN□A11



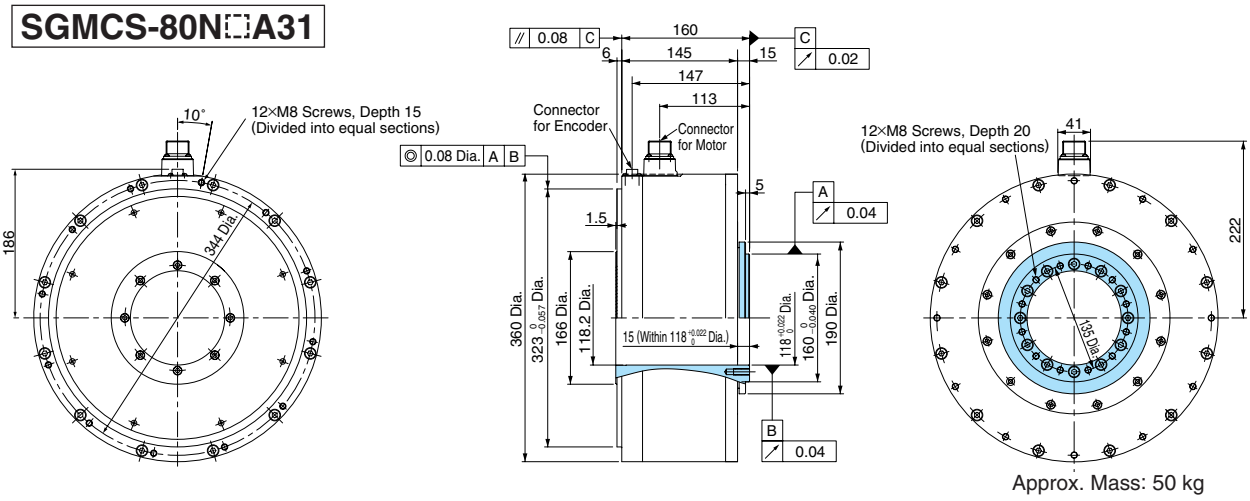


Approx. Mass: 86 kg

Servomotors (Medium Capacity)

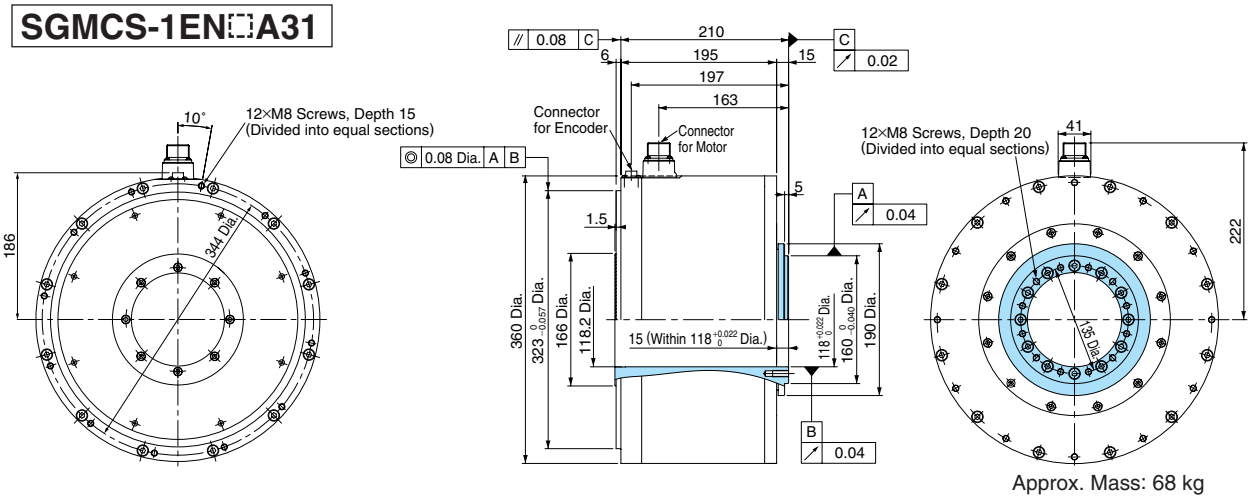
External Dimensions Units: mm Rotating part:

SGMCS-80N□A31



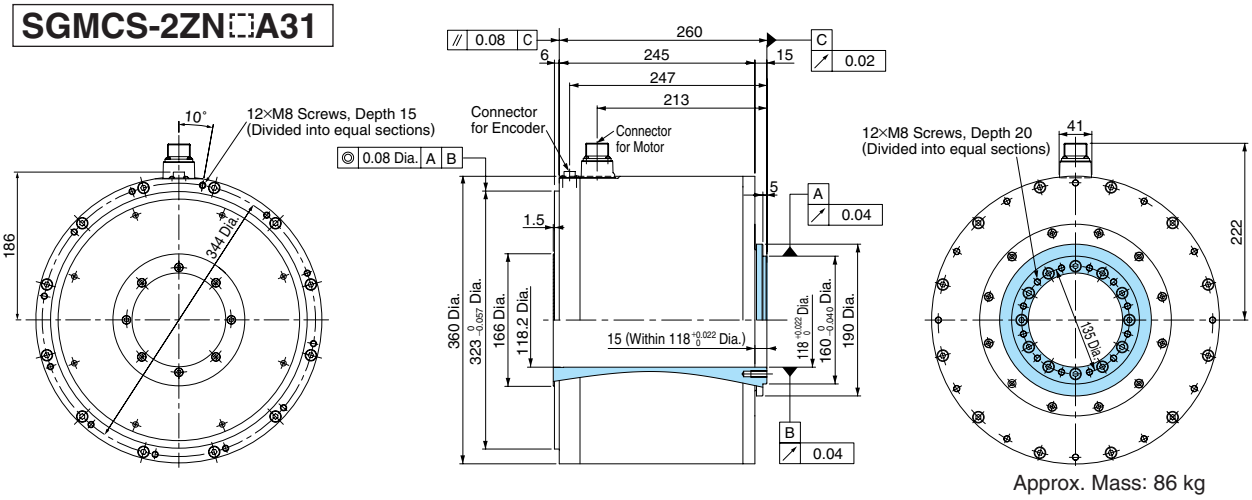
Approx. Mass: 50 kg

SGMCS-1EN□A31



Approx. Mass: 68 kg

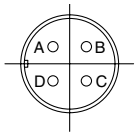
SGMCS-2ZN□A31



Approx. Mass: 86 kg

Motor connector (for medium-capacity series)

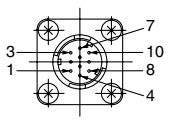
Model: CE05-2A18-10PD (Made by DDK Electronics, Inc.)



A	Phase U
B	Phase V
C	Phase W
D	FG (Frame Ground)

Encoder connector (for medium-capacity series)

Model: JN1AS10ML1 (Made by Japan Aviation Electronics Industry, Ltd.)



1	PS	7	FG (Frame Ground)
2	/PS		
3	—	8	—
4	PG5V	9	PG0V
5	—	10	—
6	—		

SERVOPACKs

Ratings and Specifications

SGDS

SERVOPACK MODEL SGDS-□				02□*	04□*	08A	10A	15A	20A	30A
Basic Specifications	Applicable Servomotor Model SGMCS-□			02B, 05B, 07B	04C, 10C, 14C, 08D, 17D, 25D	16E, 35E	45M	80M, 80N	1AM	1EN, 2ZN
	Max. Applicable Motor Capacity kW			0.2	0.4	0.75	1.0	1.5	2.0	3.0
	100 V	Continuous Output Current Arms		2.1	2.8	–	–	–	–	–
		Max. Output Current Arms		6.5	8.5	–	–	–	–	–
	200 V	Continuous Output Current Arms		2.1	2.8	5.5	7.6	11.6	18.5	18.9
		Max. Output Current Arms		6.5	8.5	16.9	17.0	28.0	42.0	56.0
	Input Power Supply	SERVOPACK Capacity Range		Single-phase 100 VAC/Single-phase 200 VAC		Single-phase 200 VAC	Three-phase 200 VAC			
		Main Circuit		Three-phase (or Single-phase) 200 to 230 VAC +10 to −15%, 50/60 Hz Single-phase 100 to 115 VAC +10 to −15%, 50/60 Hz						
		Control Circuit		Single-phase 200 to 230 VAC +10 to −15%, 50/60 Hz Single-phase 100 to 115 VAC +10 to −15%, 50/60 Hz						
	Control Method			Single-phase or three-phase full-wave rectification (single-phase voltage doubler rectifier at 100V), IGBT, PWM control, sine-wave power drive system						
	Feedback			17-bit serial encoder (incremental/absolute), 20-bit serial encoder (incremental/absolute)						
	Operating Conditions	Ambient/Storage Temperature		0 to +55℃ / −20 to +85℃						
		Ambient/Storage Humidity		90% RH or less (with no condensation)						
		Vibration/Shock Resistance		4.9 m/s² / 19.6 m/s²						
	Configuration			Base mounted (Rack mounted available as an option.)						
	Performance	Speed Control Range		1: 5000 (The lowest speed of the speed control range is the speed at which the servomotor will not stop with a rated torque load.)						
		Speed Regulation	Load Regulation	0% to 100% load: ±0.01% max. (at rated speed)						
			Voltage Regulation	Rated voltage ±10%: ±0.01% max. (at rated speed)						
			Temperature Regulation	25±25℃: ±0.1% max. (at rated speed)						
		Frequency Characteristics		600 Hz (at $J_L = J_M$)						
		Torque Control Tolerance (Repeatability)		±1%						
		Soft Start Time Setting		0 to 10 s (Can be set individually for acceleration and deceleration.)						
Torque Control Mode	Input Signals	Reference Voltage		±3 VDC (Variable setting range: ±1 to ±10 VDC) at rated torque (positive torque reference with positive reference), input voltage: ±12 V max.						
		Input Impedance		Approx. 14kΩ or more						
		Circuit Time Constant		30 μs						
Speed Control Mode	Performance	Soft Start Time Setting		0 to 10 s (Can be set individually for acceleration and deceleration.)						
	Input Signals	Reference Voltage		±6 VDC (Variable setting range: ±2 to ±10 VDC) at rated speed (servomotor forward rotation with positive reference), input voltage: ±12 V max.						
		Input Impedance		Approx. 14kΩ or more						
		Circuit Time Constant		30 μs						
	Contact Speed Reference	Rotation Direction Selection		With P control signal						
		Speed Selection		With forward/reverse current limit signal (speed 1 to 3 selection). Servomotor stops or another control method is used when both are OFF.						
Position Control Mode	Performance	Bias Setting		0 to 450 min⁻¹ (setting resolution: 1 min⁻¹)						
		Feed-forward Compensation		0% to 100% (setting resolution: 1%)						
		Positioning Completion Width Setting		0 to 1073741824 reference units (setting resolution: 1reference unit)						
	Input Signals	Reference Pulse	Type	Select one signal from: Sign+pulse train, CCW+CW pulse train, and 90° phase difference 2-phase pulse (phase A + phase B).						
			Form	Non-insulated line driver (+5V level)						
			Frequency	1 Mpps max. (non-insulated line driver)						
		Control Signal		CLEAR (Input pulse form is identical to photocoupler.)						
I/O Signals	Position Output	Form		Phase A, phase B, phase C: Line driver output						
		Frequency Dividing Ratio		Arbitrary dividing (16 to 262144)						
	Sequence Input Signal	Signal allocation can be modified.		Servo ON, P control (or Control Mode switching, forward/reverse motor rotation by internal speed setting, zero clamping, reference pulse inhibit), forward/reverse run prohibited (P-OT/N-OT), alarm reset, forward/reverse current limit (or internal speed selection), and gain switching						
	Sequence Output Signal	Fixed Output		Servo alarm, alarm code (3-bit output)						
		Signal allocation can be modified.		Select three signals from: Positioning completed (speed coincidence), rotation detection, servo ready, current limit, speed warning, or NEAR signal.						
Built-in Functions	Analog Monitor (CN5)			Analog monitor connector built-in for monitoring speed, torque, and other reference signals. Speed : 1 V/1000 min⁻¹ Torque : 1 V/rated torque 100% Lag pulse: 0.05 V/reference unit ※Can be changed to other monitors by parameter setting.						
	Indicators (LED Display)			CHARGE, five 7-segment LEDs (built-in digital operator functions)						
	Communications	Interface		Digital operator (hand-held type)						
		Functions		Status display, parameter settings, monitor display, alarm traceback display, JOG operation, etc.						
	Dynamic Brake (DB)			Operated at main power OFF, servo alarm, servo OFF, or overtravel.						
	Regenerative Processing			External regenerative resistor				Built-in regenerative resistor		
	Overtravel Prevention (OT)			DB stop, deceleration to a stop, or coasting to a stop at P-OT or N-OT						
	Electronic Gear			0.001 ≦ B/A ≦ 1000						
	Protective Functions			Overcurrent, overvoltage, undervoltage, overload, regeneration error, main circuit sensor error, heat sink overheat, power phase loss, overflow, overspeed, encoder error, overrun protection, CPU error, parameter error, etc.						
	Others			Reverse rotation connection, origin search, automatic motor discrimination function						

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

SERVOPACKs

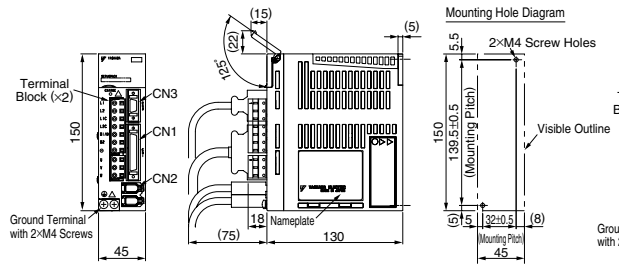
Ratings and Specifications

SGDH

SERVOPACK MODEL SGDH-□□□				02AE	04AE	08AE	10AE	15AE	20AE	30AE
Basic Specifications	Applicable Servomotor Model SGMCS-□□□			02B, 05B, 07B	04C, 10C, 14C, 08D, 17D, 25D	16E, 35E	45M	80M, 80N	1AM	1EN, 2ZN
	Max. Applicable Servomotor Capacity kW			0.2	0.4	0.75	1.0	1.5	2.0	3.0
	Continuous Output Current Arms			2.1	2.8	5.7	7.6	11.6	18.5	24.8
	Max. Output Current Arms			6.2	8.5	13.9	17	28	42	56
	Input Power Supply	Main Circuit		Single-phase 200 to 230 VAC +10 to −15%, 50/60 Hz		Three-phase 200 to 230 VAC +10 to −15%, 50/60 Hz				
		Control Circuit		Single-phase 200 to 230 VAC +10 to −15%, 50/60 Hz						
	Control Method			Single-phase full-wave rectification, IGBT, PWM control, sine-wave power drive system		Three-phase full-wave rectification, IGBT, PWM control, sine-wave power drive system				
	Feedback			20-bit serial encoder (incremental/absolute)						
	Configuration			Base mounted (Rack mounted available as an option.)						
	Approx. Mass kg			0.8	1.1	1.7	1.7	2.8	3.8	3.8
	Conditions	Ambient/Storage Temperature		0 to +55℃ / −20 to +85℃						
		Ambient/Storage Humidity		90% RH or less (with no condensation)						
		Altitude		1000 m or less						
		Vibration/Shock Resistance		4.9m/s² / 19.6m/s²						
Speed/Torque Control Mode	Performance	Speed Control Range		1: 5000 (The lowest speed of the speed control range is the speed at which the servomotor will not stop with a rated torque load.)						
		Speed Regulation	Load Regulation	0% to 100% load: ±0.01% max. (at rated speed)						
			Voltage Regulation	Rated voltage ±10%: 0% (at rated speed)						
			Temperature Regulation	25±25℃: ±0.1% max. (at rated speed)						
		Frequency Characteristics		400 Hz (at $J_L = J_M$)						
		Torque Control Tolerance (Repeatability)		±2%						
		Soft Start Time Setting		0 to 10 s (Can be set individually for acceleration and deceleration.)						
	Input Signals	Speed Reference	Reference Voltage	±6 VDC (Variable setting range: ±2 to ±10 VDC) at rated speed (servomotor forward rotation with positive reference), input voltage: ±12 V max.						
			Input Impedance	Approx. 14kΩ						
			Circuit Time Constant	Approx. 47μs						
		Torque Reference	Reference Voltage	±3 VDC (Variable setting range: ±1 to ±10 VDC) at rated speed (positive torque reference with positive reference), input voltage: ±12 V max.						
			Input Impedance	Approx. 14kΩ						
			Circuit Time Constant	Approx. 47μs						
Position Control Mode	Performance	Bias Setting		0 to 450 min^{-1} (setting resolution: 1 min^{-1})						
		Feed-forward Compensation		0% to 100% (setting resolution: 1%)						
		Positioning Completion Width Setting		0 to 450 reference units (setting resolution: 1reference unit)						
	Input Signals	Reference Pulse	Type	Select one signal from: Sign+pulse train, CCW+CW pulse train, and 90°phase difference 2-phase pulse (phase A + phase B).						
			Form	Line driver (+5 V level), open collector (+5 V or +12 V level)						
			Frequency	0 to 250 kpps, 200 kpps max. when an open collector is used.						
		Control Signal		CLEAR (Input pulse form is identical to reference pulse.)						
I/O Signals	Position Output			Phase A, phase B, phase C, or phase S (phase S used only with an absolute encoder): Line driver output						
	Sequence Input Signal			Servo ON, P control (or Control Mode switching, zero clamping, or reference pulse inhibit), forward/reverse run prohibited (P-OT/N-OT), alarm reset, forward/reverse current limit (or internal speed selection)						
	Sequence Output Signal			Servo alarm, alarm code (3-bit output): Output terminal for CN1 is fixed. Select three signals from: Servo ready, positioning completed (speed coincidence), rotation detection, current limit, speed limit, brake release, warning, or NEAR signal.						
Built-in Functions	Communications	Interface		Digital operator (hand-held type) RS-422A port such as for PCs (RS-232C port under certain conditions)						
		1: N Communications		Up to N=14 for RS-422A port						
		Axis Address Setting		Set with parameters.						
		Functions		Status display, parameter settings, monitor display, alarm traceback display, JOG and autotuning operations, speed, torque reference signal and other drawing functions						
	Autotuning			Position/speed loop gain and integral time constant can be automatically set.						
	Dynamic Brake (DB)			Operated at main power OFF, servo alarm, servo OFF, or overtravel.						
	Regenerative Processing			External regenerative resistor (option): 30 to 400 W; Built-in regenerative resistor: 750 W						
	Overtravel Prevention (OT)			DB stop, deceleration to a stop, or coasting to a stop at P-OT or N-OT						
	Encoder Divider			The number of pulses that can be set is limited.						
	Electronic Gear			0.01 < A/B < 100						
	Internal Speed Setting			Three speeds may be internally set.						
	Protective Functions			Overcurrent, overvoltage, undervoltage, overload, regeneration error, main circuit sensor error, heat sink overheat, power phase loss, overflow, overspeed, encoder error, overrun protection, CPU error, parameter error, etc.						
	Analog Monitor			Analog monitor connector built-in for monitoring speed, torque, and other reference signals.						
	Indicators (LED Display)			CHARGE, POWER, five 7-segment LEDs (built-in digital operator function)						
	Others			Reverse rotation connection, origin search, DC reactor connection terminal for harmonic suppressions, automatic motor discrimination function						

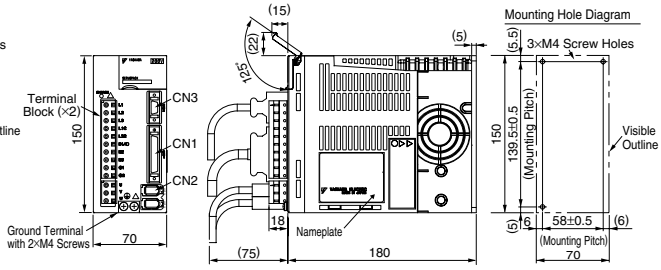
External Dimensions Units: mm

SGDS-02



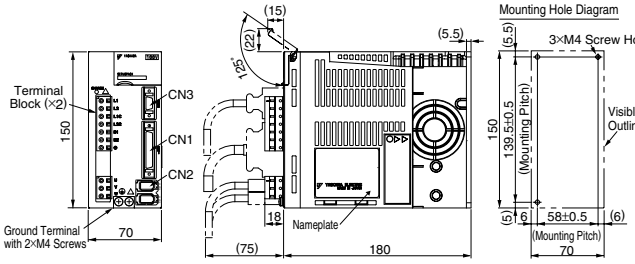
Approx. Mass : 0.7 kg

SGDS-08, 10



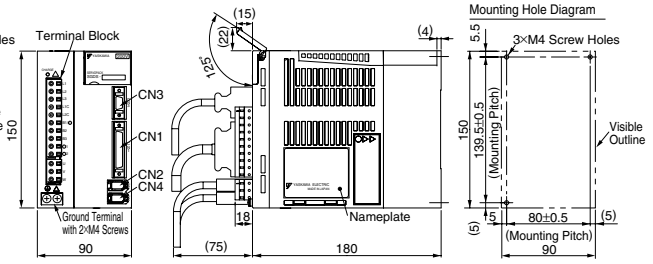
Approx. Mass : 1.4 kg

SGDS-04F



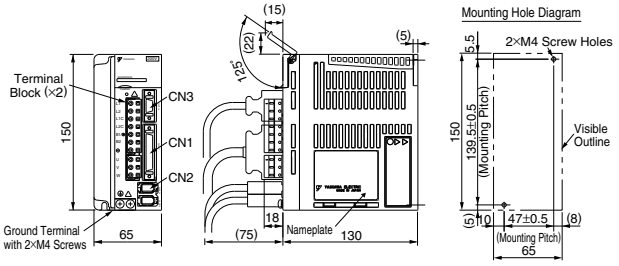
Approx. Mass : 1.4 kg

SGDS-15



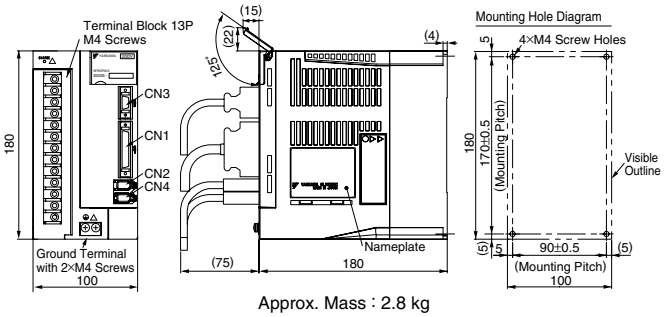
Approx. Mass : 2.1 kg

SGDS-04A



Approx. Mass : 0.9 kg

SGDS-20, 30



Approx. Mass : 2.8 kg

Connectors on SERVOPACK Side (Common for all models)

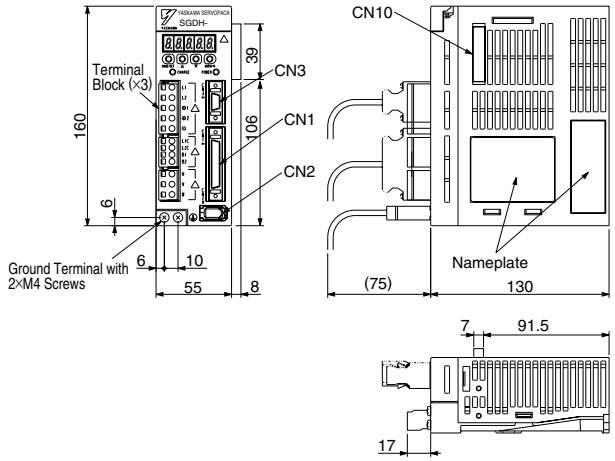
Connector Code	Model	Manufacturer
CN1	10250-52A2JL	SUMITOMO 3M Ltd.
CN2	53460-0611	Molex Japan Co., Ltd.
CN3	10214-52A2JL	SUMITOMO 3M Ltd.

Note: Use connectors above or equivalent.

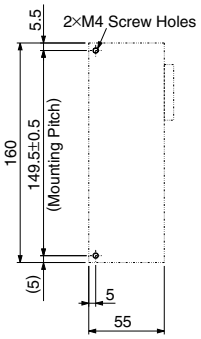
SERVOPACKs

External Dimensions Units: mm

SGDH-02

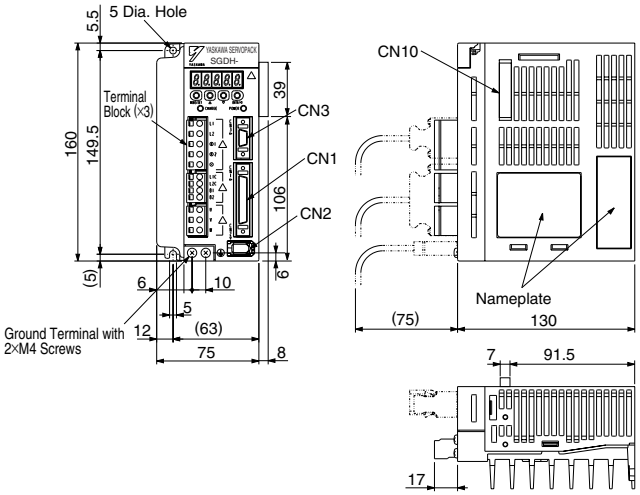


Mounting Hole Diagram

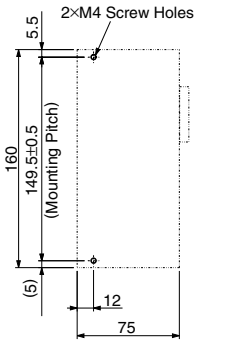


Approx. Mass: 0.8 kg

SGDH-04

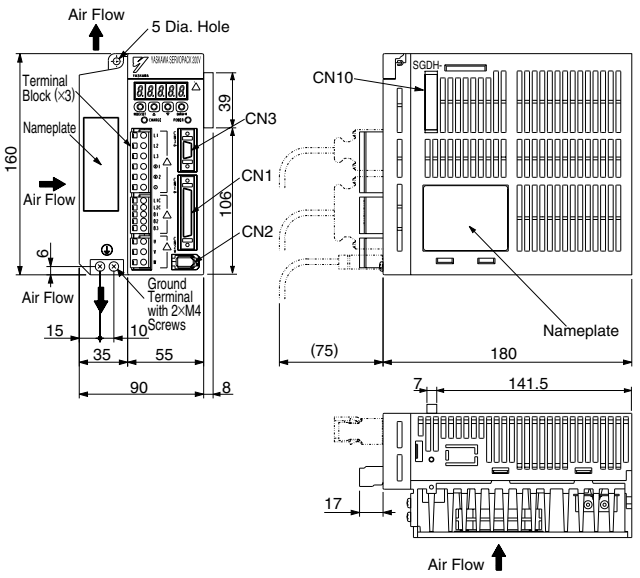


Mounting Hole Diagram

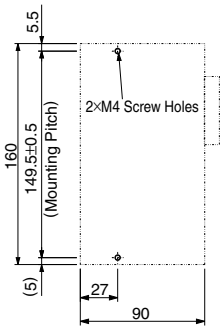


Approx. Mass: 1.1 kg

SGDH-08, -10

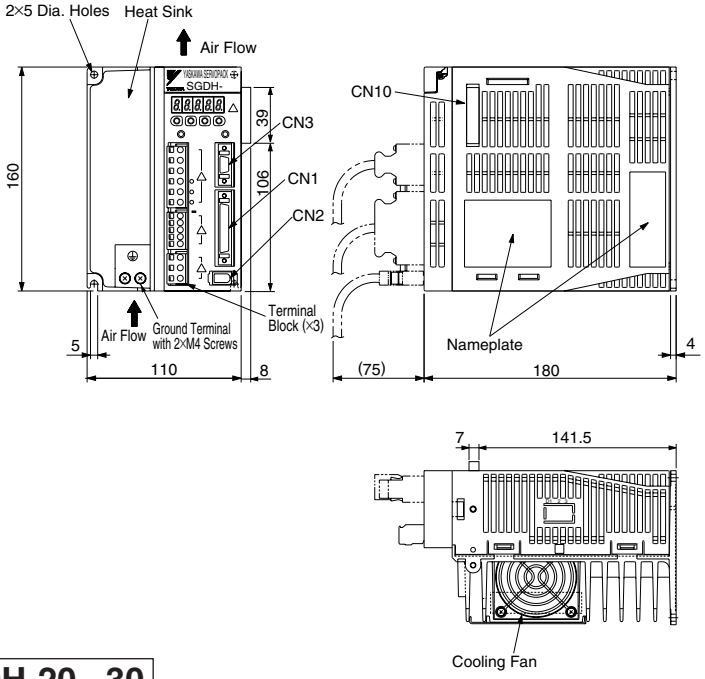


Mounting Hole Diagram

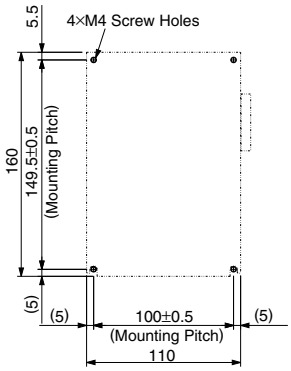


Approx. Mass: 1.7 kg

SGDH-15

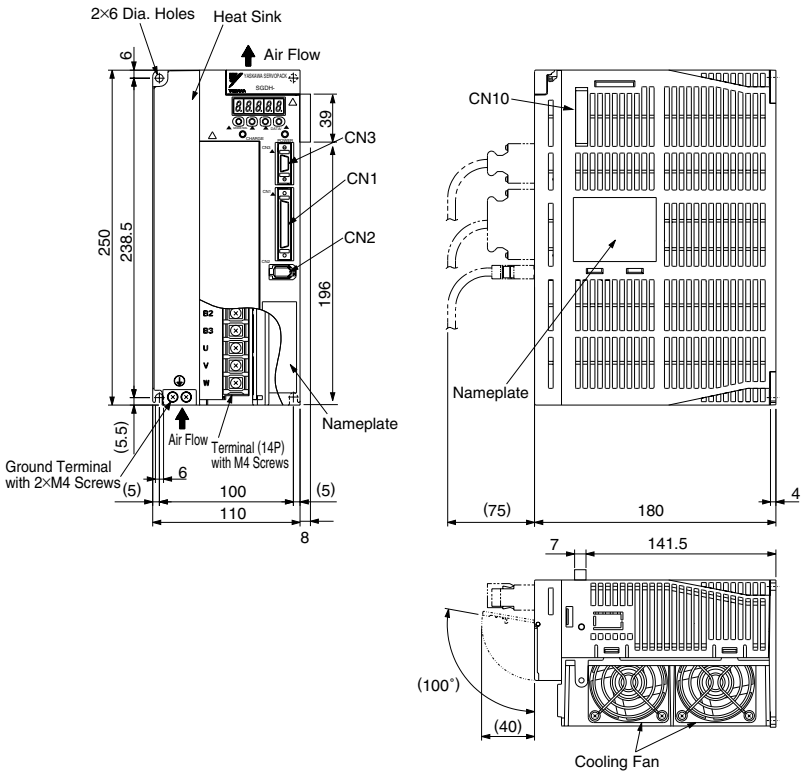


Mounting Hole Diagram

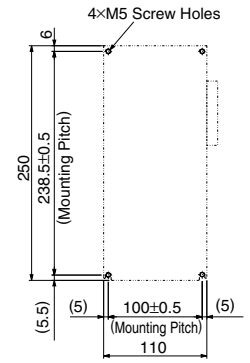


Approx. Mass: 2.8 kg

SGDH-20, -30



Mounting Hole Diagram



Approx. Mass: 3.8 kg

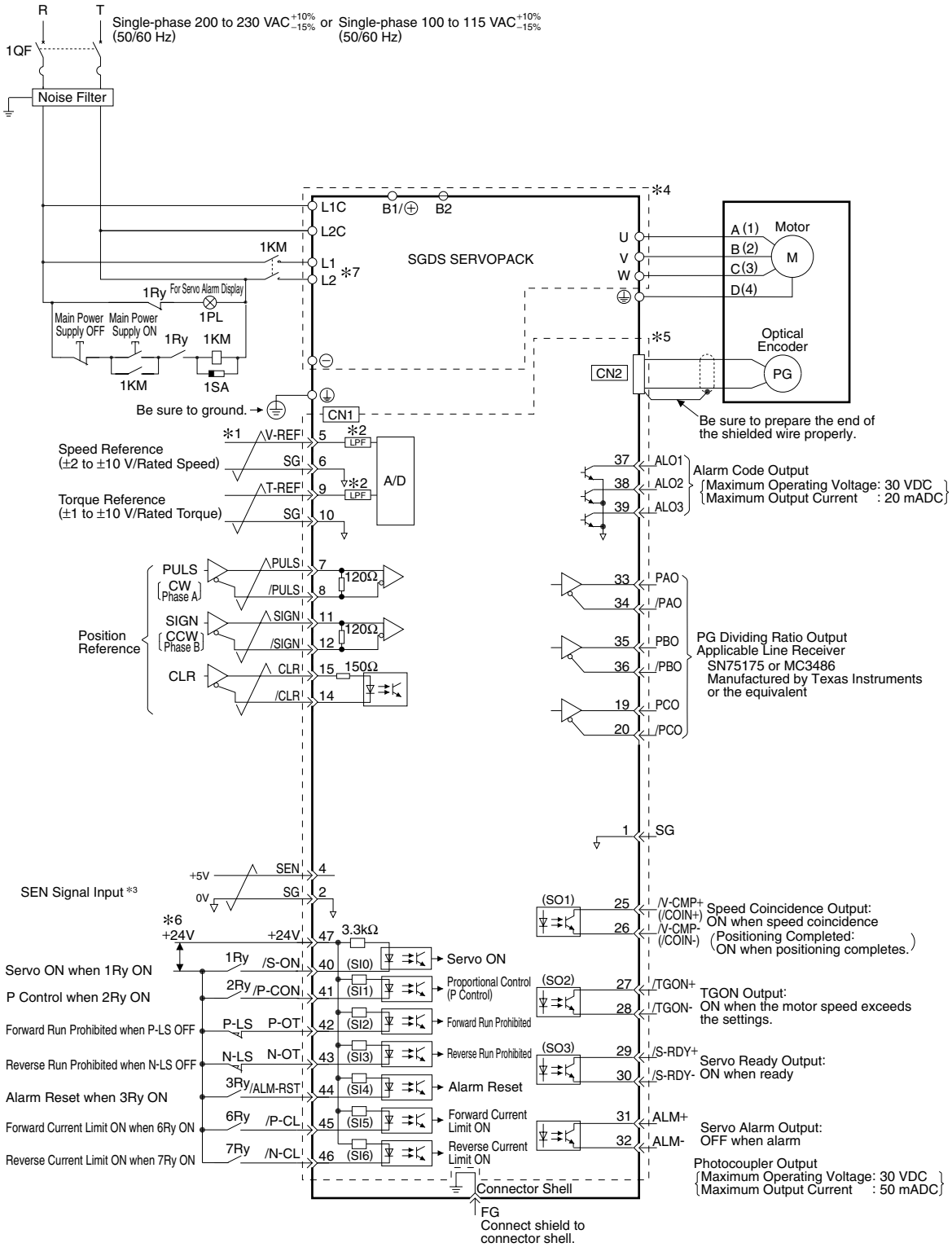
Connectors on SERVOPACK Side (Common for all models)

Connector Code	Model	Manufacturer
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.

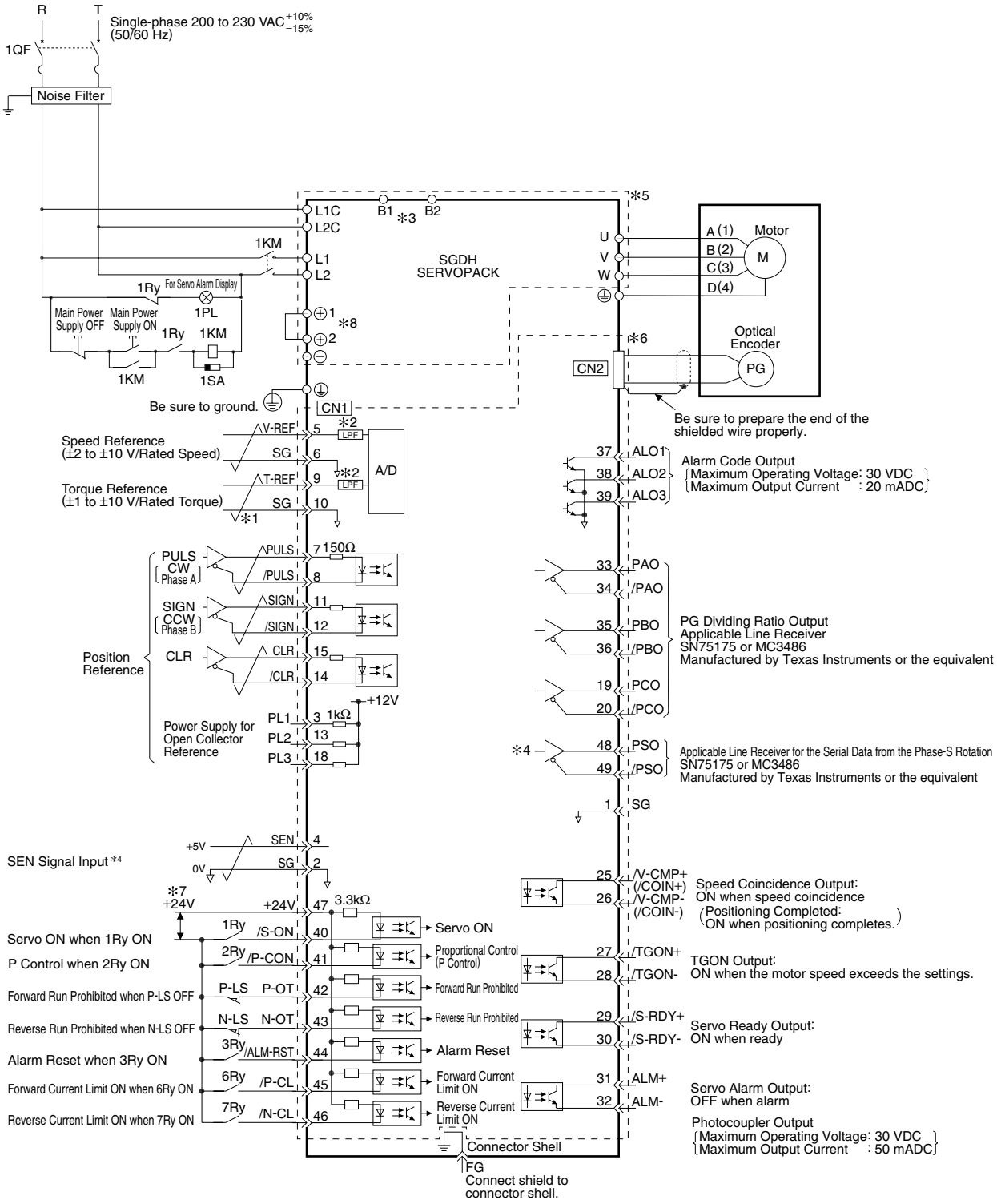
Connection Diagrams

Single-phase 100/200 VAC (When using SGDS SERVOPACK)



∗1 : represents twisted-pair wires.
∗2 : The time constant for the primary filter is 30 μs.
∗3 : Connect when using an absolute encoder.
∗4 : This circuit is electrically separated from the outside to prevent electric shock.
∗5 : This is a SELV circuit separated from other circuits by double or reinforced insulation.
∗6 : Customers must purchase a 24-VDC power supply with double insulation.
∗7 : Add an L3 terminal for three-phase power supply.

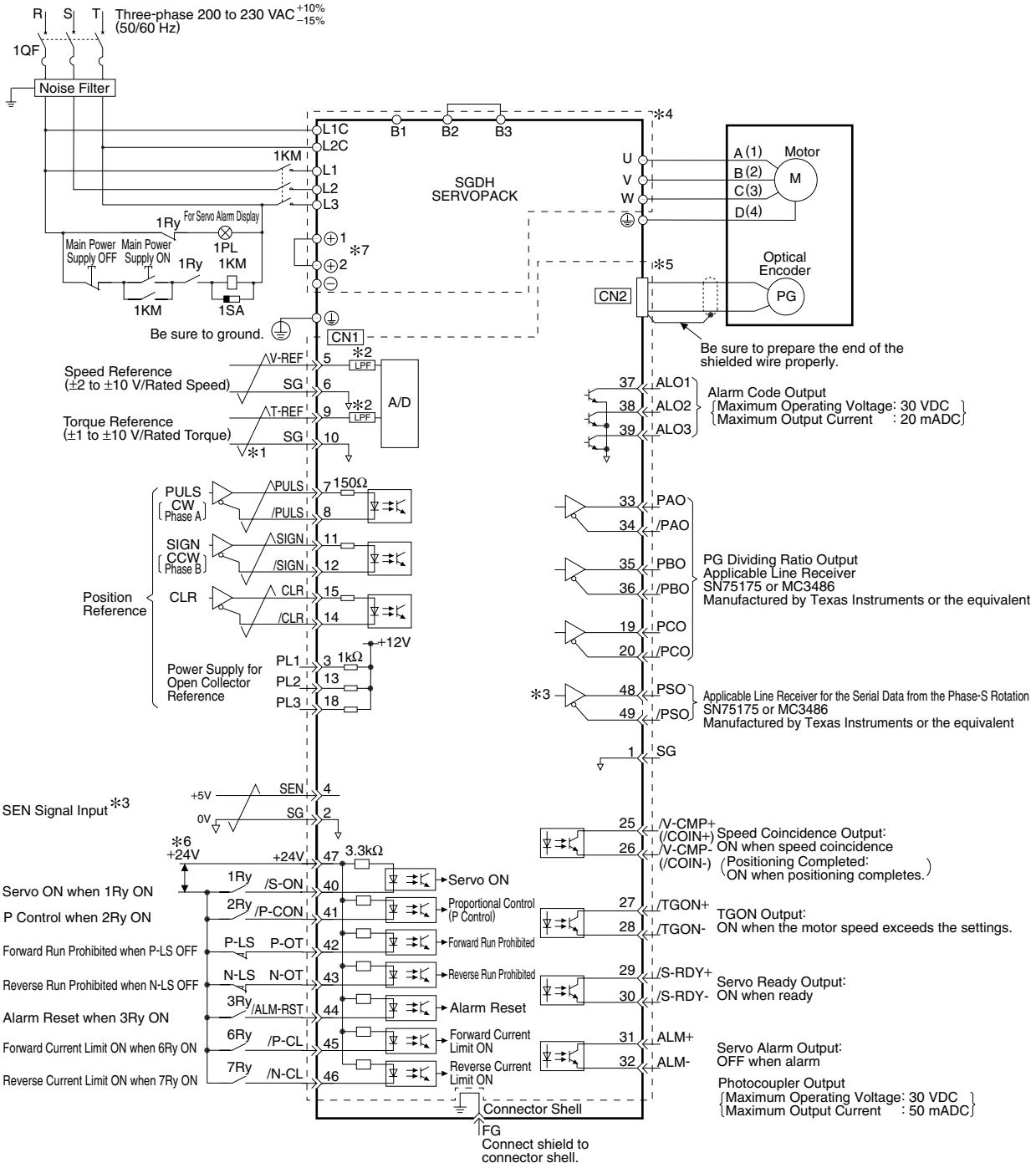
Single-phase 200 VAC (When using SGDH SERVOPACK)



∗1 : ⫽ represents twisted-pair wires.
∗2 : The time constant for the primary filter is 47 μs.
∗3 : A regenerative resistor can be connected between terminals B1 and B2.
∗4 : Connect when using an absolute encoder.
∗5 : This circuit is electrically separated from the outside to prevent electric shock.
∗6 : This is a SELV circuit separated from other circuits by double or reinforced insulation.
∗7 : Customers must purchase a 24-VDC power supply with double insulation.
∗8 : Place a DC reactor between terminals ⊕1 and ⊕2 to suppress high harmonic waves.

Connection Diagrams

● Three-phase 200 VAC (When using SGDH SERVOPACK)

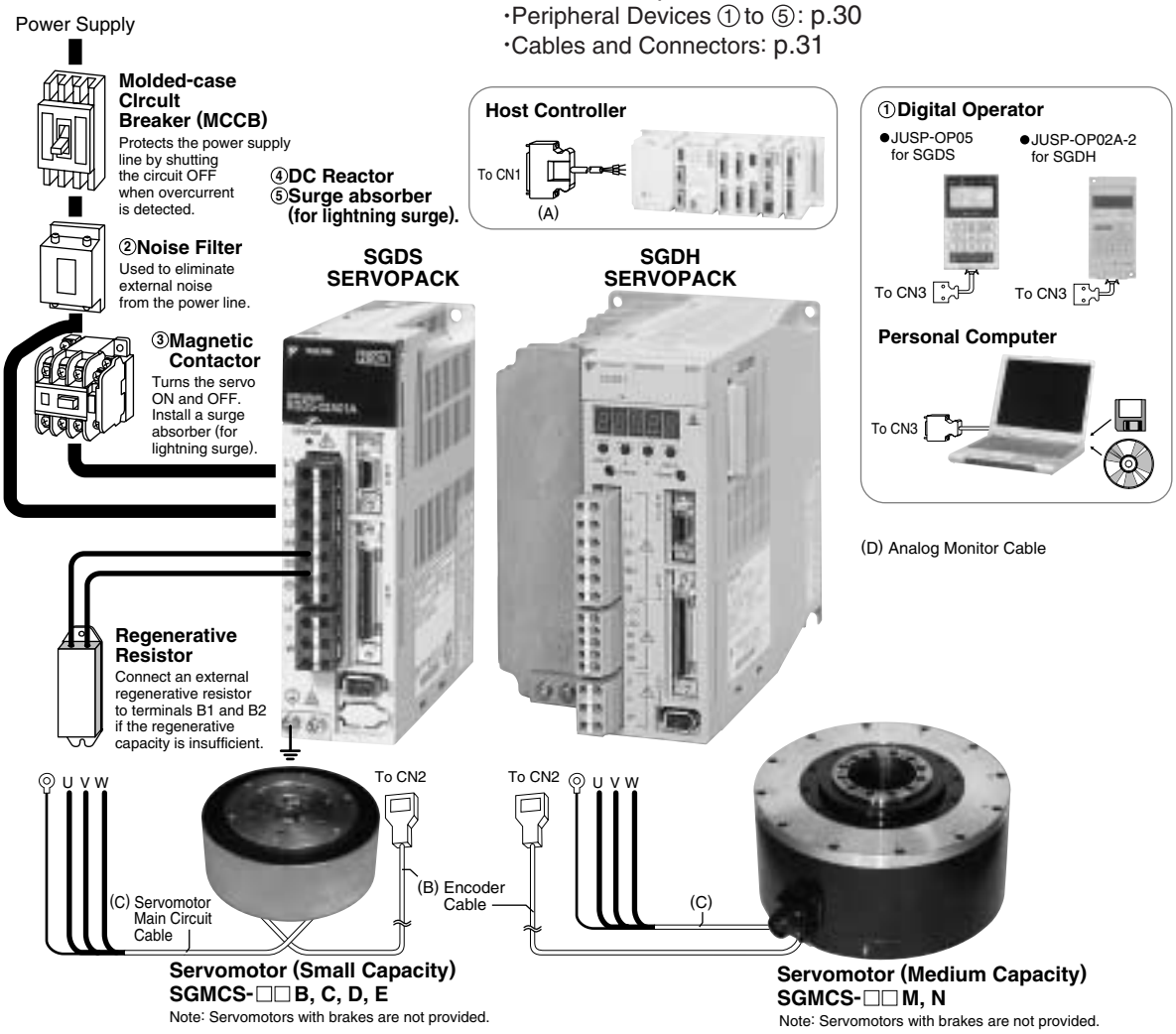


∗1 : ⫽ represents twisted-pair wires.
∗2 : The time constant for the primary filter is 47 μs.
∗3 : Connect when using an absolute encoder.
∗4 : This circuit is electrically separated from the outside to prevent electric shock.
∗5 : This is a SELV circuit separated from other circuits by double or reinforced insulation.
∗6 : Customer must purchase a 24-VDC power supply with double insulation.
∗7 : Place a DC reactor between terminals ⊕1 and ⊕2 to suppress high harmonic waves.

Ordering Reference

System Configuration

Refer to the following pages for ordering.
·Servo drives: p.29
·Peripheral Devices ① to ⑤: p.30
·Cables and Connectors: p.31



Servomotor (Small Capacity)
SGMCS-□□B, C, D, E
Note: Servomotors with brakes are not provided.

Servomotor (Medium Capacity)
SGMCS-□□M, N
Note: Servomotors with brakes are not provided.

Order List

Servo Drives

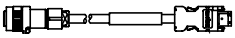
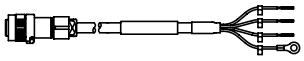
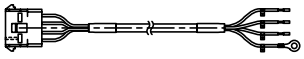
Servomotors				SERVOPACK				
Series		Model SGMCS-	Rated Torque	Σ-Ⅲ Series Model SGDS-			Σ-Ⅱ Series Model SGDH-	
				Single-phase 100 V	Single-phase 200 V	Three-phase 200 V	Single-phase 200 V	Three-phase 200 V
Small Capacity	Outer diameter: 135 mm	02B	2	02F	02A	–	02AE	–
		05B	5	02F	02A	–	02AE	–
		07B	7	02F	02A	–	02AE	–
	Outer diameter: 175 mm	04C	4	04F	04A	–	04AE	–
		10C	10	04F	04A	–	04AE	–
		14C	14	04F	04A	–	04AE	–
	Outer diameter: 230 mm	08D	8	04F	04A	–	04AE	–
		17D	17	04F	04A	–	04AE	–
		25D	25	04F	04A	–	04AE	–
	Outer diameter: 290 mm	16E	16	–	08A	–	–	08AE
		35E	35	–	08A	–	–	08AE
Medium Capacity	Outer diameter: 280 mm	45M	45	–	–	10A	–	10AE
		80M	80	–	–	15A	–	15AE
		1AM	110	–	–	20A	–	20AE
	Outer diameter: 360 mm	80N	80	–	–	15A	–	15AE
		1EN	150	–	–	30A	–	30AE
		2ZN	200	–	–	30A	–	30AE

Ordering Reference

Peripheral Devices

Name	Model	Specifications		Dimensions (P.32)
① Digital Operator	JUSP-OP05A	SGDS	A cable (1m) is provided.	Ⓐ
	JUSP-OP02A-2	SGDH		
Cable	(JZSP-CMS00-1)	1 m	Required when a JUSP-OP02A-1 digital operator for the Σ series is used (only when using SGDH SERVOPACK).	
	(JZSP-CMS00-2)	1.5 m		
	(JZSP-CMS00-3)	2 m		
② Noise Filter (Made by Schaffner EMC Inc.)	FN2070-6/07	Power supply voltages and capacities for applicable SERVOPACKs	Single-phase 200 V 200 W	Ⓑ
	FN2070-10/07		Single-phase 100 V 200 W Single-phase 200 V 400 W	
	FN2070-16/07		Single-phase 100 V 400 W Single-phase 200 V 750 W	
	FN258L-16/07		Three-phase 200 V 0.75 to 2 kW	
	FN258L-30/07		Three-phase 200 V 3 kW	
③ Magnetic Contactor (Made by YASKAWA Siemens Automation & Drives Corp.)	HI-11J (20A)	Power supply voltages and capacities for applicable SERVOPACKs	Single-phase 100 V 200 W Single-phase 200 V 200 W Single-phase 200 V 400 W	–
	HI-15J (35A)		Single-phase 100 V 400 W Single-phase 200 V 750 W	
④ DC reactor for power supply harmonic suppression	X5054	Power supply voltages and capacities for applicable SERVOPACKs (SGDS)	Single-phase 100 V 200 W Single-phase 200 V 400 W	Ⓒ
	X5056		Single-phase 100 V 400 W Single-phase 200 V 750 W	
	X5053		Single-phase 200 V 200 W	
	X5061		Three-phase 200 V 1 kW	
	X5060		Three-phase 200 V 1.5 kW Three-phase 200 V 2.0 kW	
	X5059		Three-phase 200 V 3.0 kW	
	X5070	Power supply voltages and capacities for applicable SERVOPACKs (SGDH)	Single-phase 200 V 200 W	
	X5069		Single-phase 200 V 400 W	
	X5061		Three-phase 200 V 750 W	
	X5060		Three-phase 200 V 1.5 kW, 2 kW	
	X5059		Three-phase 200 V 3 kW	
⑤ Surge Absorber (Made by Okaya Electric Industries Co., Ltd Brand Name: Surge Protector)	R·C·M-601BQZ	–		–

Cables and Connectors [Made by Yaskawa Control Co., Ltd.]

Name		Model	Specifications	Dimensions (p.32, 33)
(A) CN 1 For I/O Signals	Connector Terminal Block Converter Unit	JUSP-TA50P	Terminal block and 0.5-m connection cable 	Ⓓ
	Cable with Loose Wires at One End (SGDH)	JZSP-CKI01-1	1 m (Loose wires at customer end) 	Ⓔ
		JZSP-CKI01-2	2 m	
		JZSP-CKI01-3	3 m	
	Cable with Loose Wires at One End (SGDS)	JZSP-CSI01-1	1 m (Loose wires at customer end) 	–
		JZSP-CSI01-2	2 m	
		JZSP-CSI01-3	3 m	
	Connector Kit for CN1	JZSP-CSI9-1	SGDS Connector and case 	Ⓕ
		JZSP-CKI9	SGDH	
(B) CN 2 ↕ Encoder	Cable with Connectors at Both Ends SGMCS-□□B -□□C -□□D -□□E -□□M -□□N	JZSP-CMP60-03	3 m Applicable flange specifications*: 1, 3 	Ⓖ
		JZSP-CMP60-05	5 m	
		JZSP-CMP60-10	10 m	
		JZSP-CMP60-15	15 m	
		JZSP-CMP60-20	20 m	
		JZSP-CMP00-03	3 m Applicable flange specifications*: 4 	
		JZSP-CMP00-05	5 m	
		JZSP-CMP00-10	10 m	
		JZSP-CMP00-15	15 m	
		JZSP-CMP00-20	20 m	
(C) SERVOPACK ↕ Motor	Servomotor Main Circuit Cable SGMCS-□□B -□□C -□□D -□□E	JZSP-CMM60-03	3 m Applicable flange specifications*: 1 	Ⓗ
		JZSP-CMM60-05	5 m	
		JZSP-CMM60-10	10 m	
		JZSP-CMM60-15	15 m	
		JZSP-CMM60-20	20 m	
		JZSP-CMM00-03	3 m Applicable flange specifications*: 4 	
		JZSP-CMM00-05	5 m	
		JZSP-CMM00-10	10 m	
		JZSP-CMM00-15	15 m	
		JZSP-CMM00-20	20 m	
	Connector for Servomotor Main Circuit Cable at Servomotor Side SGMCS-□□M -□□N	Customers must prepare or assemble the cable.	Applicable flange specifications*: 1, 3 L-Shaped plug: MS3108B18-10S Straight plug: MS3106B18-10S Cable clamp: MS3057-10A	–
(D) CN 5	Analog Monitor Cable	DE9404559	1 m	Ⓘ

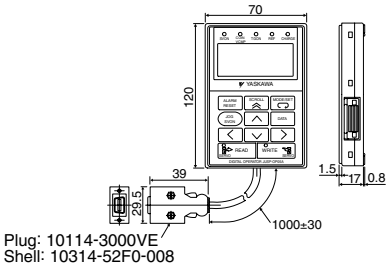
* : Refer to Model Designations on p.5 for flange specifications.

Ordering Reference

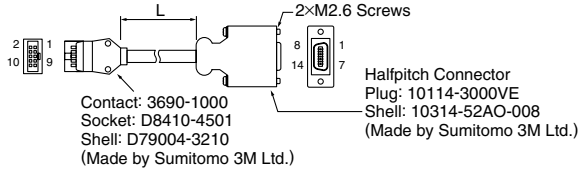
Dimensions for Peripheral Devices and Cables Units: mm

Ⓐ Cable for Digital Operator

JUSP-OP05A + Cable



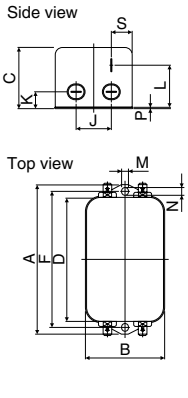
Cable for JUSP-OP02A



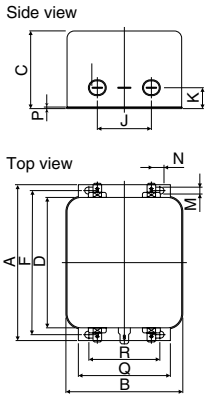
Ⓑ Noise Filter (Screw-terminal type)

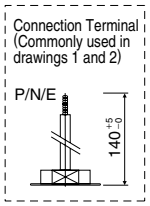
Made by Schaffner EMC Inc.

Drawing 1

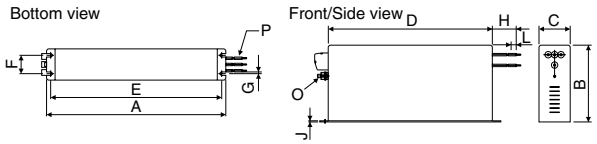


Drawing 2





Drawing 3

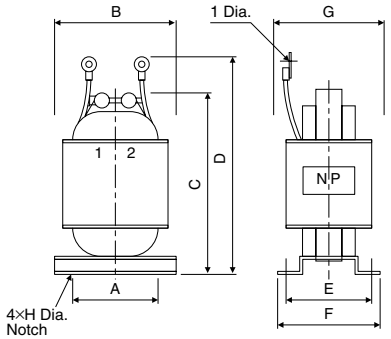


Code	Tolerances	Model			
		FN2070-6/07	FN2070-10/07	FN2070-16/07	
		Drawing 1		Drawing 2	
A	±1	113.5	156	119±0.5	
B	±1	57.5		85.5	
C	–	45.4±1.2		57.6	
D	±1	94	130.5	98.5	
F	±0.3	103	143	109	
J	±0.2	25		40	
K	±0.5	8.4		8.6	
L	±0.5	32.4		–	
M	±0.1	4.4	5.3	4.4	
N	±0.1	6		7.4	
P	±0.1	0.9		1.2	
Q	±0.3	–		66	
R	±0.2	–		51	
S	±0.5	38		–	
Spec.*1		250 VAC,6 A	250 VAC,10 A	250 VAC,16 A	

Code	Tolerances	Model	
		FN258L-16/07	FN258L-30/07
		Drawing 3	
A	±1	305	335
B	–	142±0.8	150±1
C	±0.6	55	60
D	±1	275±0.8	305
E	±0.5	290	320
F	±0.3	30	35
G	±0.2	6.5	6.5
H	±10	300	400
J	±0.2	1±0.1	1.5
L	±1	9	12
O	–	M5	M6
P	–	AWG14	AWG10
Spec.*2		480 VAC,16 A	480 VAC, 30 A

*1: The rated current is the value at +40℃.
*2: The rated current is the value at +50℃.

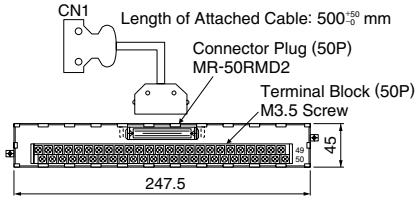
Ⓒ DC Reactor for Power Supply Harmonic Suppression



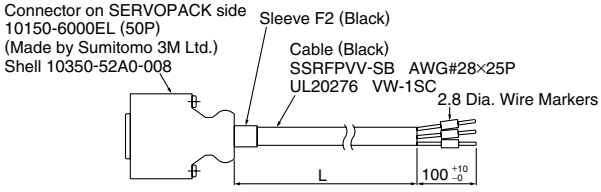
Model*	Inductance mH	Rated Current A	Dimensions mm									Approx. Mass kg
			A	B	C	D	E	F	G	H	I	
X5070	20.0	1.65	40	59	100	120	35	45	50	4	4.3	0.8
X5069	10.0	3.3	40	59	105	125	45	60	65	4	4.3	1.0
X5061	2.0	4.8	35	52	80	95	35	45	50	4	4.3	0.5
X5060	1.5	8.0	40	59	105	125	45	60	65	4	4.3	1.0
X5059	1.0	14.0	50	74	125	140	35	45	60	5	5.3	1.1
X5056	2.0	5.0	35	52	80	95	30	40	45	4	4.3	0.4
X5054	5.0	5.0	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

*: Model used for orders from the Yaskawa Electric Corporation.

Ⓓ Connector Terminal Block Converter Unit (for CN1)



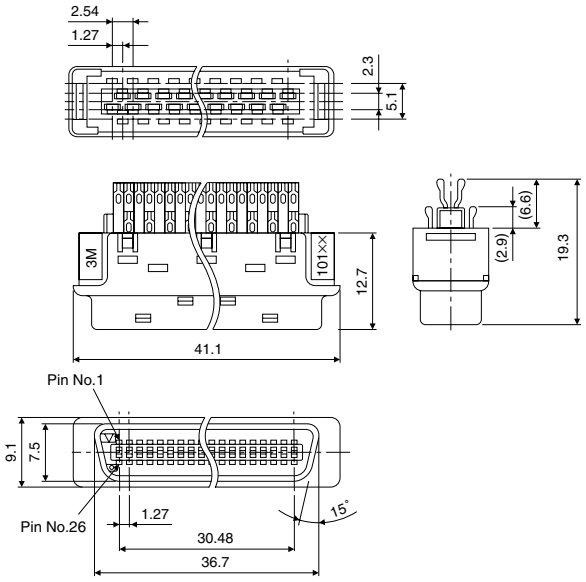
Ⓔ Cable with Loose Wires at One End (for CN1)



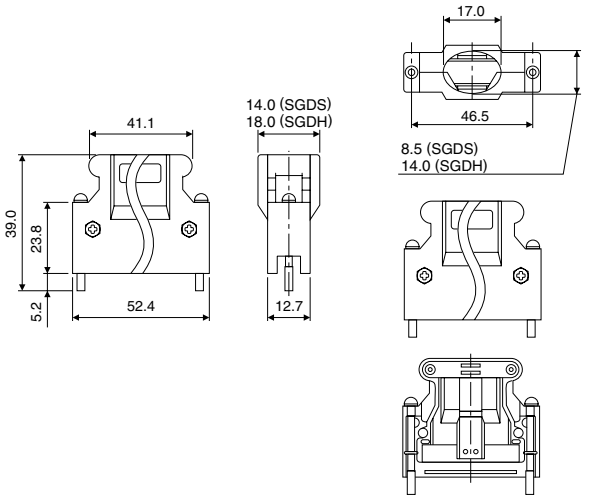
Ⓕ Connector Kit for I/O Signals (for CN1)

Made by SUMITOMO 3M Ltd.

Connector: 10150-3000VE



Case: 10350-52Z0-008 (SGDS)
10350-52A0-008 (SGDH)

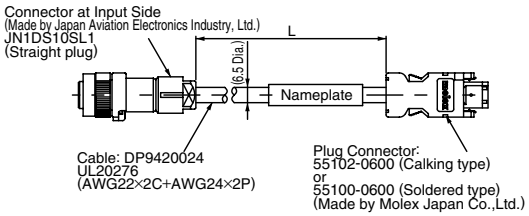


Reference for Assembly

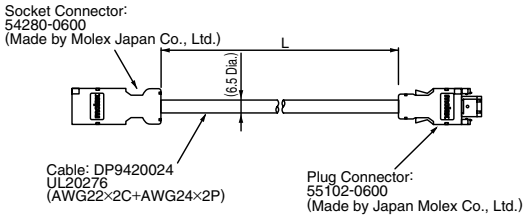
Ⓖ Cable with Both End Connectors (for CN2)

Note: Refer to Model Designations on p.5 for flange specifications.

Applicable Flange Specifications: 1, 3



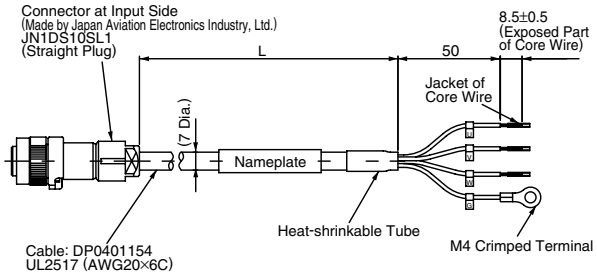
Applicable Flange Specifications: 4



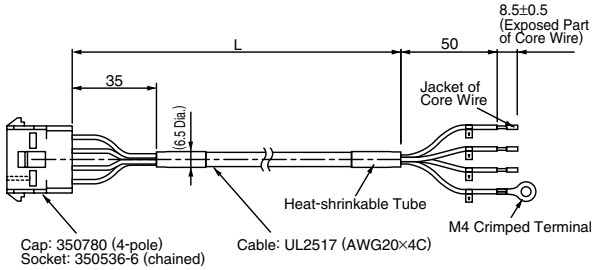
Ⓗ Servomotor Main Circuit Cable

Note: Refer to Model Designations on p.5 for flange specifications.

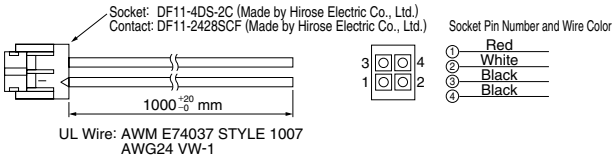
Applicable Flange Specifications: 1



Applicable Flange Specifications: 4



Ⓘ Analog Monitor Cable



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