SGM7A Series 400V Servo Motor

The SGM7A Series of motor is a 400V 3-phase motor that is highly efficient and has an integrated 24-bit high-resolution encoder. This particular range is designed for low inertia, high speed applications, however, this range is extremely versatile and lends itself well to a wide variety of applications. Whether it's for high load/slow speed or low load/high speed, the SGM7A offers a wide operating window.

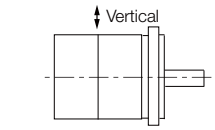
Specifications

Voltage		400V			
Model SGM7A-		**10D**	**15D**	**20D**	**30D**
Time Rating		Continuous			
Thermal Class		B	F		
Insulation Resistance		500 VDC, 10 MΩ min.			
Withstand Voltage		1,800 VAC for 1 minute			
Excitation		Permanent magnet			
Mounting		Flange-mounted			
Drive Method		Direct drive			
Rotation Direction		Counterclockwise (CCW) for forward reference when viewed from the load side			
Vibration Class*1		V15			
Environmental Conditions	Surrounding Air Temperature	0 °C to 40 °C (With derating, usage is possible between 40 °C and 60 °C)			
	Surrounding Air Humidity	20% to 80% relative humidity (with no condensation)			
	Installation Site	• Must be indoors and free of corrosive and explosive gases. • Must be well-ventilated and free of dust and moisture. • Must facilitate inspection and cleaning. • Must have an altitude of 1,000 m or less. (With derating, usage is possible between 1,000 m and 2,000 m.) • Must be free of strong magnetic fields.			
	Storage Environment	Store the Servomotor in the following environment if you store it with the power cable disconnected. Storage Temperature: -20 °C to 60 °C (with no freezing) Storage Humidity: 20% to 80% relative humidity (with no condensation)			
Shock Resistance*2	Impact Acceleration Rate at Flange	490 m/s²			
	Number of Impacts	2 times			
Vibration Resistance*3	Vibration Acceleration Rate at Flange	49 m/s² (Models 15A to 30D: 24.5 m/s² front to back)			
Applicable SERVOPACKs	SGD7S-	5R4D		8R4D	120D
	SGD7W-	5R4D	5R4D	–	

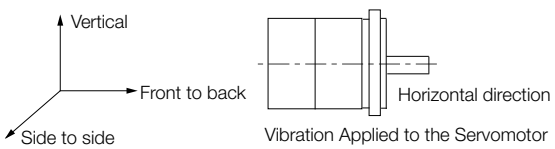
*1 A Vibration class of V15 indicates a vibration amplitude of 15 µm maximum on the Servomotor without a load at the rated motor speed.

*2 The shock resistance for shock in the vertical direction when the Servomotor is mounted with the shaft in a horizontal position is given in the above table.

*3 The vertical, side-to-side, and front-to-back vibration resistance for vibration in three directions when the Servomotor is mounted with the shaft in a horizontal position is given in the above table. The strength of the vibration that the Servomotor can withstand depends on the application. Always check the vibration acceleration rate that is applied to the Servomotor with the actual equipment.



Shock Applied to the Servomotor



Vibration Applied to the Servomotor

Servomotor Ratings

Voltage			400V			
Model SGM7A-			**10D**	**15D**	**20D**	**30D**
Rated Output *1		W	1,000	1,500	2,000	3000
Rated Torque *1, *2		Nm	3.18	4.90	6.36	9.80
Instantaneous Maximum Torque *1		Nm	11.1	14.7	19.1	29.4
Rated Current *1		Arms	3.2	4.7	6.1	8.9
Instantaneous Maximum Current *1		Arms	12	14	20	28
Rated Motor Speed *1		min^{-1}	3000			
Maximum Motor Speed *1		min^{-1}	6000			
Torque Constant		Nm/Arms	1.07	1.23	1.18	1.16
Motor Moment of Inertia		$\times 10^{-4}$ kg m^2	0.971 (1.15)	2.00 (2.25)	2.47 (2.72)	7.00 (9.20)
Rated Power Rate *1		kW/s	104 (87.9)	120 (106)	164 (148)	137 (104)
Rated Angular Acceleration Rate *1		rad/s^2	32,700 (27,600)	24,500 (21,700)	25,700 (23,300)	14,000 (10,600)
Derating Rate for Servomotor with Dust Seal		%	95	100		
Heat Sink Size		mm	300 × 300 × 12			400 x 400 x 20
Protective Structure *3			Totally enclosed, self-cooled, IP67			
Holding Brake Specifications *4	Rated Voltage	V	24 VDC ± 10%			
	Capacity	W	6.5	12		10
	Holding Torque	Nm	2.39 / 3.18	7.84	7.84	10
	Coil Resistance	Ω (at 20°C)	88.6 ± 10%	48 ± 10%		59 ± 10%
	Rated Current	A (at 20°C)	0.27	0.5		0.41
	Time required to release Brake	ms	80	170		100
	Time required to brake	ms	100	80		
Allowable Load Moment of Inertia (Motor Moment of Inertia Ratio)	Standard		20 times	10 times		5 times
	With External Regenerative Resistor and Dynamic Brake Resistor Connected		30 times	20 times		15 times
Allowable Shaft Load *5	LF	mm	35	45		63
	Allowable Radial Load	N	392	686		980
	Allowable Thrust Load	N	147	196		392

Note: The values in parentheses are for Servomotors with Holding Brakes.

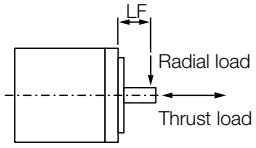
*1. For the SGM7A-10D, these values are for operation in combination with a SERVOPACK when the temperature of the armature winding is 100°C. The values for other items are at 20°C. For the SGM7A-15D to SGM7A-30D, these values are for operation in combination with a SERVOPACK when the temperature of the armature winding is 20°C. These are typical values.

*2. The rated torques are the continuous allowable torque values at a surrounding air temperature of 40°C with an aluminium heat sink of the dimensions given in the table.

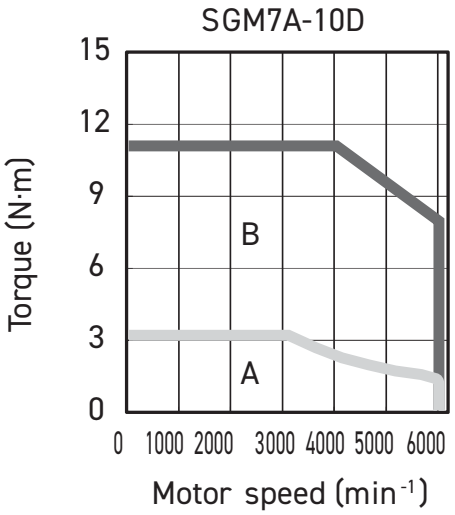
*3. This does not apply to the shaft opening. Protective structure specifications apply only when the special cable is used.

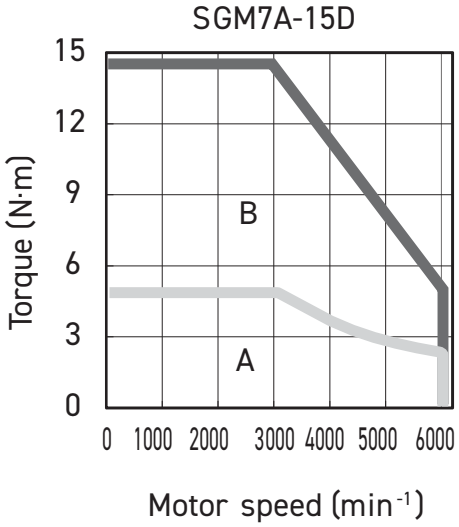
*4. Observe the following precautions if you use a Servomotor with a Holding Brake.
- The holding brake cannot be used to stop the Servomotor.
- The time required to release the brake and the time required to brake depend on which discharge circuit is used.
  Confirm that the operation delay time is appropriate for the actual equipment.
- The 24-VDC power supply is not provided by YASKAWA.

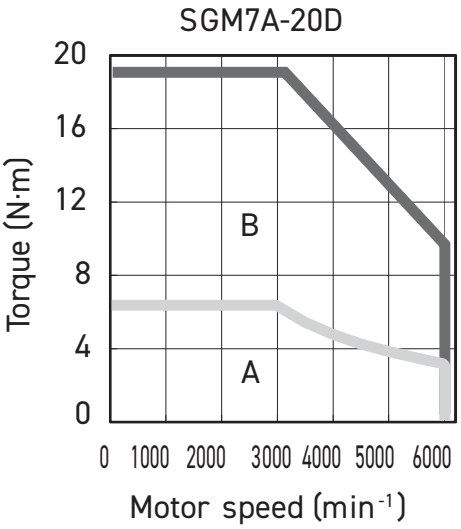
*5. The allowable shaft loads are illustrated in the following figure. Design the mechanical system so that the thrust and radial loads applied to the Servomotor shaft end during operation do not exceed the values given in the table.

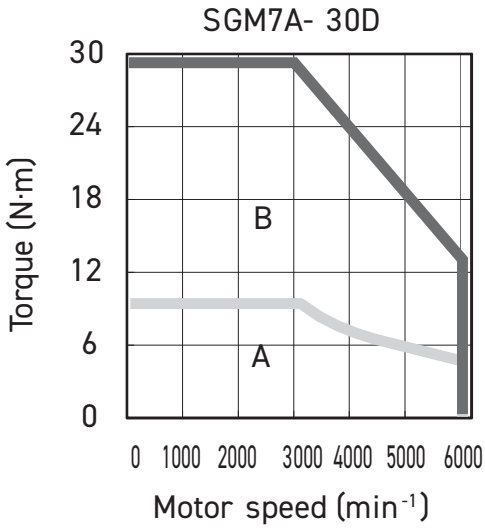


Motor Speed-Torque Characteristics







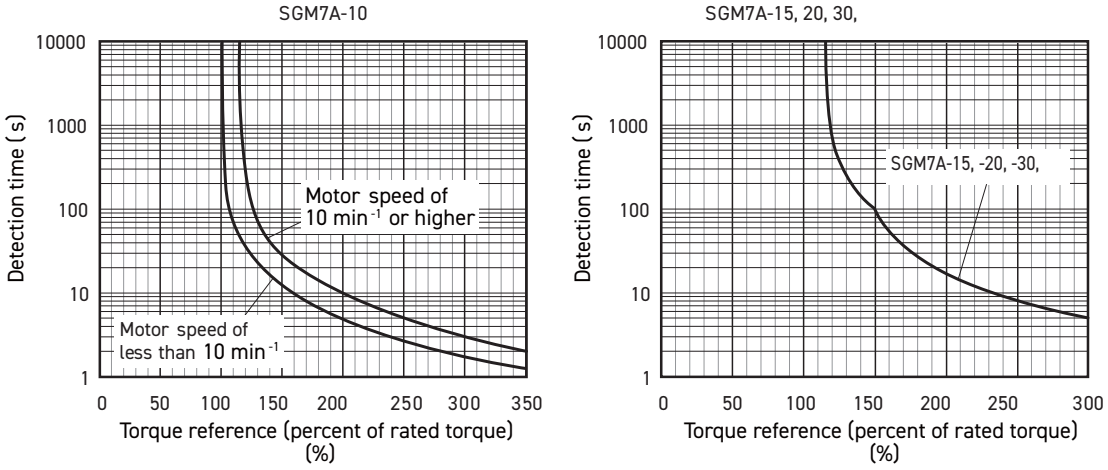


Note:

1. For the SGM7A-10D, these values are for operation in combination with a SERVOPACK when the temperature of the armature winding is 100°C.
   For the SGM7A-15D to SGM7A-25D, these values are for operation in combination with a SERVOPACK when the temperature of the armature winding is 20°C. These are typical values.
2. The characteristics in the intermittent duty zone depend on the power supply voltage. The intermittent duty zones in the graphs show the characteristics when a three-phase, 400-VAC power supply voltage is used.
3. If the effective torque is within the allowable range for the rated torque, the Servomotor can be used within the intermittent duty zone.
4. If you use a Servomotor Main Circuit Cable that exceeds 20 m, the intermittent duty zone in the torque-motor speed characteristics will become smaller because the voltage drop increases.

Servomotor Overload Protection Characteristics

The overload detection level is set for hot start conditions with a Servomotor surrounding air temperature of 40 °C.



Note:
The above overload protection characteristics do not mean that you can perform continuous duty operation with an output of 100% or higher. Use the Servomotor so that the effective torque remains within the continuous duty zone given in Motor Speed-Torque Characteristics.

Load Moment of Inertia

The load moment of inertia indicates the inertia of the load. The larger the load moment of inertia, the worse the response. If the moment of inertia is too large, operation will become unstable.

The allowable size of the load moment of inertia (J_L) for the Servomotor is restricted. Refer to Ratings of Rotary Serovmotors SGM7J. This value is provided strictly as a guideline and results depend on Servomotor driving conditions.

An Overvoltage Alarm (A.400) is likely to occur during deceleration if the load moment of inertia exceeds the allowable load moment of inertia. SERVOPACKs with a built-in regenerative resistor may generate a Regenerative Overload Alarm (A.320).

Perform one of the following steps if this occurs.

- Reduce the torque limit.
- Reduce the deceleration rate.
- Reduce the maximum motor speed.
- Install an external regenerative resistor if the alarm cannot be cleared using the above steps.

Servomotor Heat Dissipation Conditions

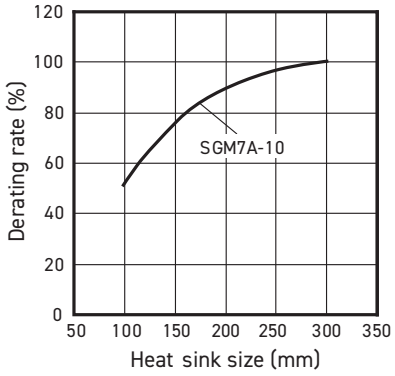
The Servomotor ratings are the continuous allowable values at a surrounding air temperature of 40°C when a heat sink is installed on the Servomotor. If the Servomotor is mounted on a small device component, the Servomotor temperature may rise considerably because the surface for heat dissipation becomes smaller. Refer to the following graphs for the relation between the heat sink size as it will reduce the power rating (derating rate).

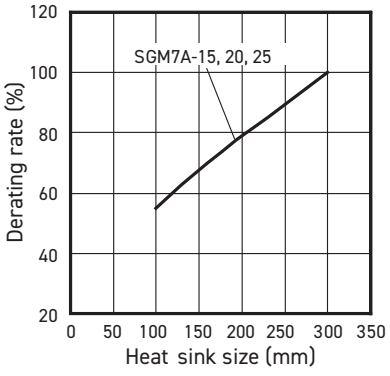
Also, change the overload warning and overload alarm detection timing in advance based on the overload detection level of the motor.

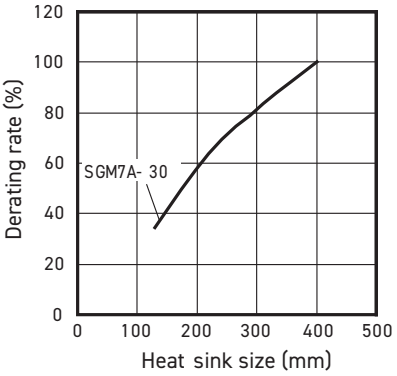
Note:
The derating rates are applicable only when the average motor speed is less than or equal to the rated motor speed. If the average motor speed exceeds the rated motor speed, consult with your Matara representative.

Important:

The actual temperature rise depends on how the heat sink (i.e., the Servomotor mounting section) is attached to the installation surface, what material is used for the Servomotor mounting section, and the motor speed. Always check the Servomotor temperature with the actual equipment.

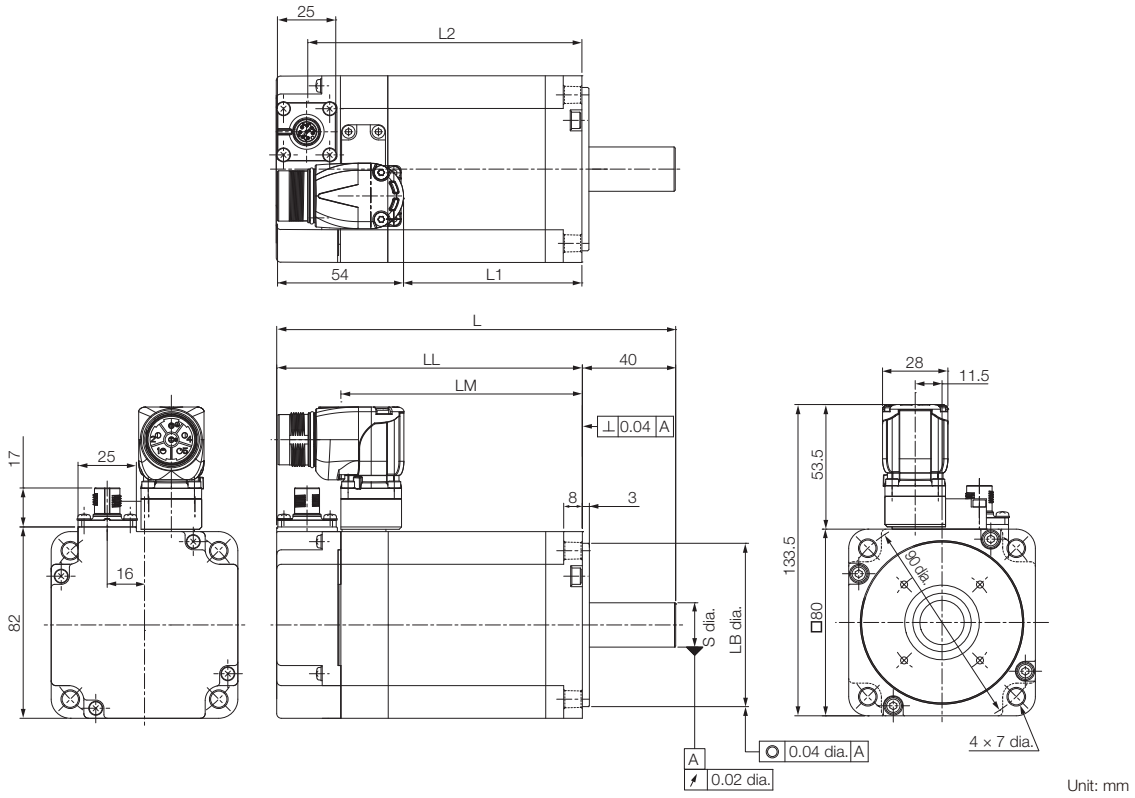






See Servomotor Ratings for more information.

SGM7A-10 Dimensions



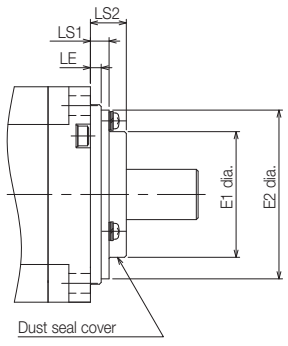
Unit: mm

Model SGM7A-	L	LL	LM	LB	S	L1	L2	Approx. Mass (kg)
10D□F2□	171 (218)	131 (178)	103.5	$70^{0}_{-0.030}$	$19^{0}_{-0.013}$	77	117.5 (164.5)	3.2 (3.8)

Note:
The values in parentheses are for Servomotors with Holding Brakes.

Options

- With Dust Seal



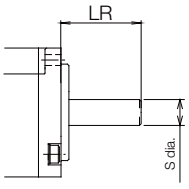
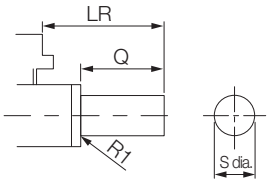
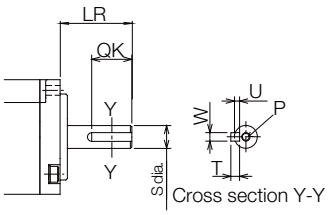
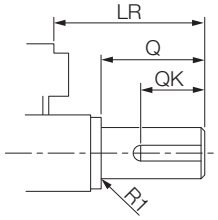
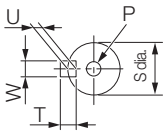
Unit: mm

Model SGM7A-	Dimension with Dust Seal			
	E1	E2	LS1	LS2
10D	47	61	5.5	11

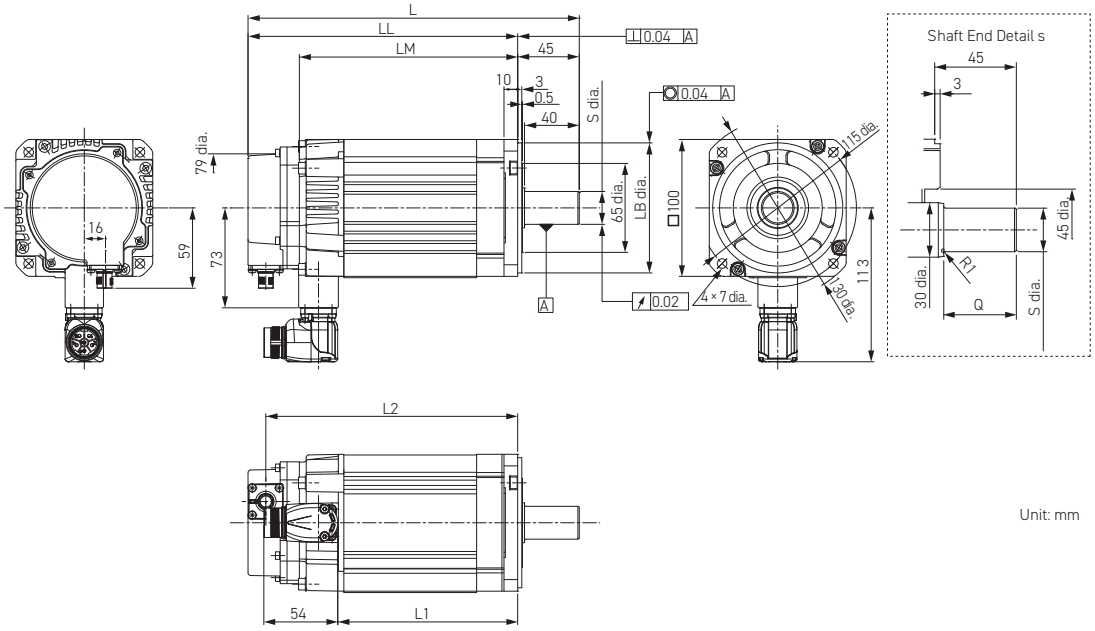
Shaft End Specifications for SGM7A-10 to 30

SGM7A-□□□□□□□

Code	Specification
2	Straight without key
6	Straight with key and tap for one location (Key slot is JIS B1301-1996 fastening type.)

Shaft End Details		Servomotor Model SGM7A-			
		10	15	20	30
Code: 2 (Straight without Key)					
For SGMA7-10 	LR	40	45		63
	Q	—	40		55
For SGMA7-15-30 	S	19 $^{0}_{-0.013}$	24 $^{0}_{-0.013}$		28 $^{0}_{-0.013}$
Code: 6 (Straight with Key and Tap)					
For SGMA7-10 	LR	40	45		
	Q	—	40		
	QK	22	32		
	S	19 $^{0}_{-0.013}$	24 $^{0}_{-0.013}$		
	W	6	8		
	T	6	7		
	U	3.5	4		
	P	M6 × 10L	M8 screw, depth: 16		

SGM7A-15, -20, and -30



Unit: mm

Model SGM7A-	L	LL	LM	L1	L2	LB	Shaft End Dimensions		Approx. Mass (kg)
							S	Q	
15D☐F2☐	204 (245)	159 (200)	121 (162)	90	145 (187)	$95^{0}_{-0.035}$	$24^{0}_{-0.013}$	40	4.7 (6.1)
20D☐F2☐	220 (261)	175 (216)	137 (178)	106	161 (203)	$95^{0}_{-0.035}$	$24^{0}_{-0.013}$	40	5.5 (6.9)
30D☐F2☐	259 (295)	196 (232)	158 (194)	131	183 (219)	$110^{0}_{-0.035}$	$28^{0}_{-0.013}$	55	10.6 (13.1)

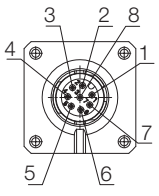
Note:
1. The values in parentheses are for Servomotors with Holding Brakes.
2. Servomotors with Dust Seals have the same dimensions.
3. Refer to Shaft End Specifications for SGM7A-15 to -70 for details.

Refer to the section Connector Specifications.

Connector Specifications

SGM7A-10 to -30

- Encoder Connector Specifications

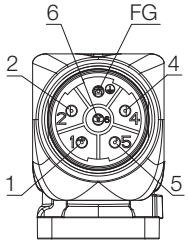


Receptacle
Size: M12
Part number: 1419959
Model: SACC-MSQ-M12MS-25-3,2 SCO
Manufacturer: Phoenix Contact

1	PG 5V
2	PG 0V
3	FG
4	BAT (+)
5	BAT (-)
6	Data (+)
7	Data (-)
8	Empty
Housing	Shield

SGM7A-10 to -30

- Servomotor Connector Specifications



Receptacle
Size: M23
Part number: 1617905
Model: ST-5EP1N8AAD00S
Manufacturer: Phoenix Contact

1	V
2	(Brake)
4	(Brake)
5	U
6	W
FG	FG
Housing	Shield

SGM7A Order Example

Code:	SGM7A	-	20	D	-	F	-	F	-	6	-	1
Options:	1		2	3		4		5		6		7

Options		Selection			
1	Series	SGM7A			
2	Rated Output	10: 1.0 kW	15: 1.5 kW	20: 2.0 kW	30: 3.0 kW
3	Power Supply Voltage	D: 400 VAC			
4	Serial Encoder	7: 24-bit Absolute **F: 24-bit Incremental**			
5	Design Revision Order	F: Standard Model			
6	Shaft End	2: Straight without Key **6: Straight with Key and Tap**			
7	Options	**1: Without Options** C: With Holding Brake (24 VDC) F: With Dust Seal H: With Dust Seal and holding Brake (24 VDC)			

Note:
The **bolded** options are standard stock.