

HarmonicDrive®
AC Servo Actuator
SHA Series



Yaskawa Corporation
AC Servo Drive
Σ-7 series

Join Together for Complete Solution

HarmonicDrive® SHA Series AC Servo Actuators now connect directly with Σ-7 servo drives from Yaskawa to communicate with EtherCAT or MECHATROLINK-III. SHA Series Actuators are available in two series, SG and CG.

HarmonicDrive®



EtherCAT®
Technology Group

MECHATROLINK

- The AC Servo Actuator combines our HarmonicDrive® reducer with a flat AC servo motor.
- Same accuracy and resolution as direct drive motors in a lightweight, compact configuration.
- The hollow shaft design allows piping and cabling to pass directly through the axis of rotation.
- Flat configuration enables compact machine designs.
- One-way positioning accuracy: Gear Ratio 50:1 = 40 arc-sec (0.014 degrees)
Gear Ratio 80:1 and higher = 30 arc-sec (0.011 degrees) (SHA-32Y/40Y-CG)
- Torque to Volume ratio is more than 5 times greater than Direct Drive Motors.
- The SHA-Y series actuators are easy to use with "Σ-7 series" EtherCAT or MECHATROLINK-III communication.

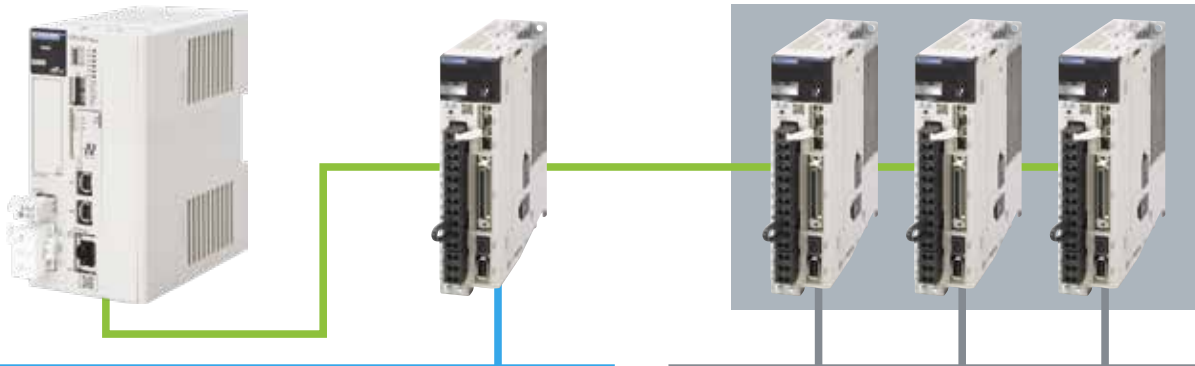
Contact: Harmonic Drive Systems LLC for AC Servo Actuator SHA-Y series
Yaskawa for AC Servo Drive Σ-7 series

■ Harmonic Drive Servo Actuator on Yaskawa BUS (EtherCAT or MECHATROLINK-III)

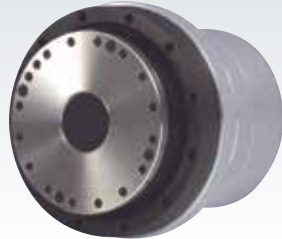
EtherCAT or
MECHATROLINK-III (MP-3300)
series controller

SGD7S-□□□A□0A***F81
SHA-Y compatible SERVOPACK
Σ-7-FT81 series

SGD7S-□□□A□0A
Standard SERVOPACK
Σ-7 series



HarmonicDrive®
SHA-Y series



Yaskawa
Σ-7 motor (standard)



EtherCAT and MECHATROLINK-III communication. Simple selection and connection!

■ Yaskawa AC Servo Drive Σ-7 Series

- EtherCAT Compatible AC Servo Drive
SGD7S-□□□AA0A△△△F81
- MECHATROLINK-III Compatible AC Servo Drive
SGD7S-□□□A20A△△△F81

Delivers full performance from the SHA series actuator.

* "△△△" indicates with/without dynamic brake resistor (without: 000, with: 020).




■ SERVOPACK Drive Selection for Harmonic Drive SHA Actuators

SHA Series	Speed Reducer	SERVOPACK EtherCAT	SERVOPACK MECHATROLINK-III
25Y	SG/HP/CG	SGD7S-3R8AA0A□□□ ^{Note 1} F81	SGD7S-3R8A20A□□□ ^{Note 1} F81
32Y	SG/HP/CG	SGD7S-120AA0A□□□F81	SGD7S-120A20A□□□F81
40Y	SG/CG	SGD7S-180AA0A□□□F81	SGD7S-180A20A□□□F81
58Y	SG	SGD7S-330AA0A□□□F81	SGD7S-330A20A□□□F81
65Y	SG		

Note 1: "□□□" in the SERVOPACK model code indicates with/without a dynamic resistor (without: 000, with: 020).

Options



■ Gearhead

Standard	HarmonicDrive® SHG series (Type SG) HarmonicDrive® CSG series (Type CG) HarmonicPlanetary® HPF series (Type HP)
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■ Cable orientation

Standard	Rear exit
Option	Side exit

■ Encoder

Standard	Absolute encoder (17-bit) Multi turn (16-bit) (Yaskawa format)
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■ Brake

Standard:	Without Brake
Option	With brake (No change in dimension, enabling installation)

■ AC servo motor

Standard:	AC200V
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■ Output bearing

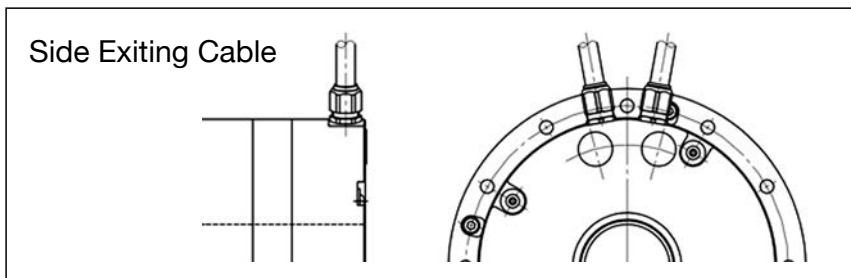
Standard	Cross roller bearing
Option	Larger size bearing for higher load capacities

■ Option

Origin & End limit sensor
Mounting stand (CG only)
Output single turn absolute function (CG only)

■ Environment specification

Standard	Protection: IP54 Operating temperature: 0 °C to +40 °C UL, CE marking, RoHS
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Ordering Code

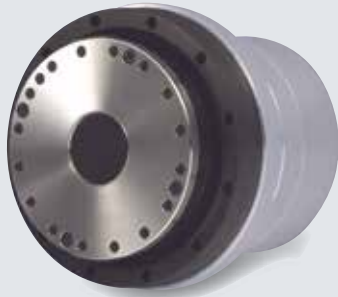
SHA 32 Y 101 SG - B 12 A 200 - 17 S17b A - C □ - SP
 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15)

<p>(1) Model: SHA series AC servo actuator</p> <p>(2) Size</p> <table border="1"> <tr><td>SG</td><td>25,32, 40,58, 65</td></tr> <tr><td>HP</td><td>25,32</td></tr> <tr><td>CG</td><td>25,32, 40</td></tr> </table> <p>(3) Design Version:</p> <table border="1"> <tr><td>Y</td><td>Yaskawa compatible</td></tr> </table> <p>(4) Ratio:</p> <table border="1"> <thead> <tr><th colspan="2">SG</th><th colspan="2">CG</th></tr> </thead> <tbody> <tr><td>51</td><td>51:1</td><td>50</td><td>50:1</td></tr> <tr><td>81</td><td>81:1</td><td>80</td><td>80:1</td></tr> <tr><td>101</td><td>101:1</td><td>100</td><td>100:1</td></tr> <tr><td>121</td><td>121:1</td><td>120</td><td>120:1</td></tr> <tr><td>161</td><td>161:1</td><td>160</td><td>160:1</td></tr> <tr><td colspan="2">HP</td><td colspan="2"></td></tr> <tr><td>11</td><td>11:1</td><td colspan="2"></td></tr> </tbody> </table> <p>(5) Gearhead</p> <table border="1"> <tr><td>SG</td><td>SHG Series</td></tr> <tr><td>HP</td><td>HPF Series</td></tr> <tr><td>CG</td><td>CSG Series</td></tr> </table>	SG	25,32, 40,58, 65	HP	25,32	CG	25,32, 40	Y	Yaskawa compatible	SG		CG		51	51:1	50	50:1	81	81:1	80	80:1	101	101:1	100	100:1	121	121:1	120	120:1	161	161:1	160	160:1	HP				11	11:1			SG	SHG Series	HP	HPF Series	CG	CSG Series	<p>(6) Motor Version</p> <table border="1"> <tr><td>A</td><td>Size: 58, 65</td></tr> <tr><td>B</td><td>Size: 25, 32, 40</td></tr> </table> <p>(7) Motor Size</p> <table border="1"> <tr><td>09</td><td>Size 25</td></tr> <tr><td>12</td><td>Size 32</td></tr> <tr><td>15</td><td>Size 40</td></tr> <tr><td>21</td><td>Size: 58, 65</td></tr> </table> <p>(8) Brake</p> <table border="1"> <tr><td>A</td><td>Without Brake</td></tr> <tr><td>B</td><td>With Brake</td></tr> </table> <p>(9) Voltage Rating</p> <table border="1"> <tr><td>200</td><td>200V</td></tr> </table> <p>(10) Encoder Format</p> <table border="1"> <tr><td>17</td><td>Yaskawa format</td></tr> </table> <p>(11) Encoder / Resolution</p> <table border="1"> <tr><td>S17b</td><td>17-bit absolute encoder 131072 counts / revolution</td></tr> </table>	A	Size: 58, 65	B	Size: 25, 32, 40	09	Size 25	12	Size 32	15	Size 40	21	Size: 58, 65	A	Without Brake	B	With Brake	200	200V	17	Yaskawa format	S17b	17-bit absolute encoder 131072 counts / revolution	<p>(12) Encoder Offset Angle</p> <p>Phase difference between the motor U phase and the encoder origin</p> <table border="1"> <tr><td>A</td><td>0 Degrees</td></tr> </table> <p>(13) Connector Specification</p> <table border="1"> <tr><td>C</td><td>With Standard Connector</td></tr> <tr><td>N</td><td>Without Connector</td></tr> <tr><td>D</td><td>With Special Connector</td></tr> </table> <p>(14) Special Options</p> <table border="1"> <tr><td>L</td><td>Origin and Limit Sensor</td></tr> <tr><td>Y</td><td>Side Exiting Cable</td></tr> <tr><td>V</td><td>With Stand (for the CG only)</td></tr> <tr><td>S</td><td>Output Single Turn Absolute Function</td></tr> </table> <p>(15) SP designates Custom Specification, (Leave blank for standard product)</p> <p><small>* Reduction ratio 1:11 is used in combination with the hollow Harmonic Planetary® HPF gearhead.</small></p>	A	0 Degrees	C	With Standard Connector	N	Without Connector	D	With Special Connector	L	Origin and Limit Sensor	Y	Side Exiting Cable	V	With Stand (for the CG only)	S	Output Single Turn Absolute Function
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SHA-SG

SHA-SG featuring compact-shape

Compact



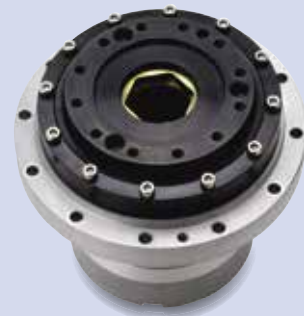
The SHA Servo Actuator combines precision Harmonic Drive® gearing with a flat AC servo motor. It has a unique compact shape and Hollow Shaft actuator design. Five sizes are available: 25, 32, 40, 58, and 65. Sizes 25 and 32 can also be combined with HarmonicPlanetary® gearing.

SHA-CG

SHA-CG with improved output flange runout accuracy

High Accuracy

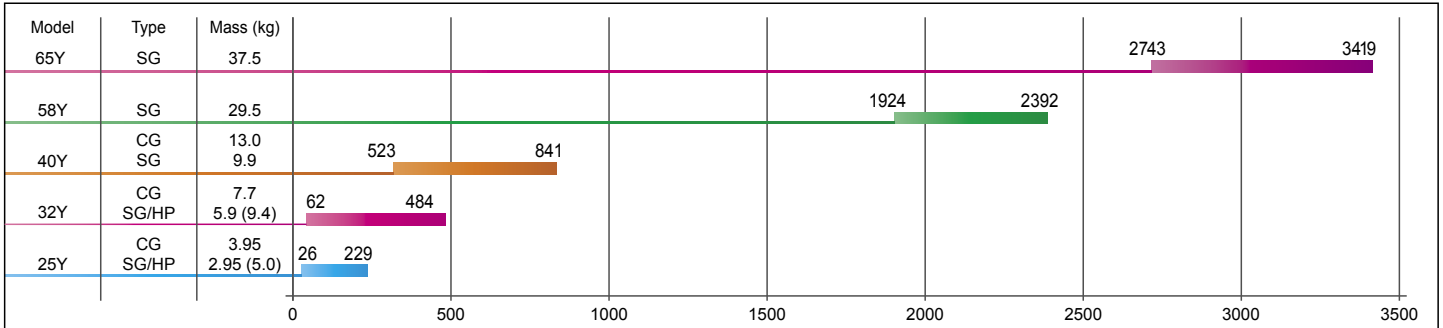
Even Ratios



The SHA-CG delivers high precision with improved positioning accuracy and surface runout. These actuators are ideal for high precision rotary applications such as indexing tables. Three sizes are available: 25, 32, and 40.

Maximum Torque Map

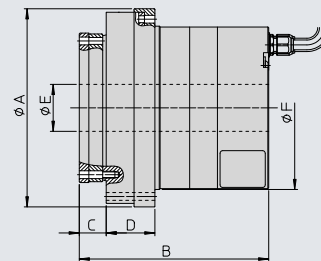
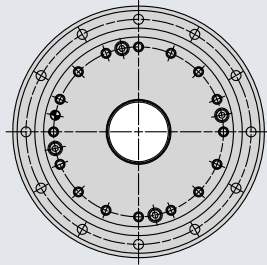
(Nm)



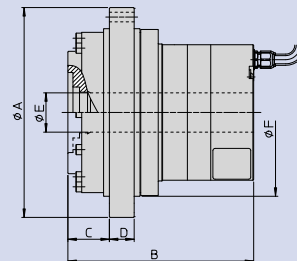
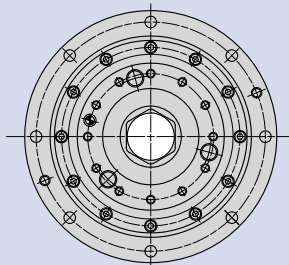
Mass (without brake) The mass value is without brake and the value in brackets is the mass when using a gear ratio of 11:1 (HPF series).

External Dimensions

SHA-SG/HP



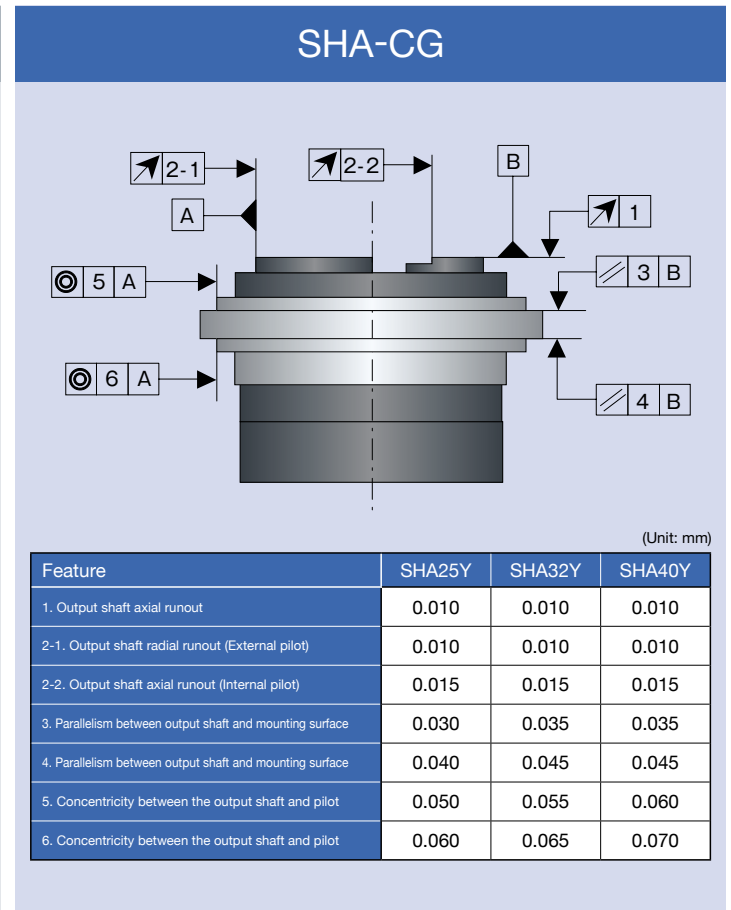
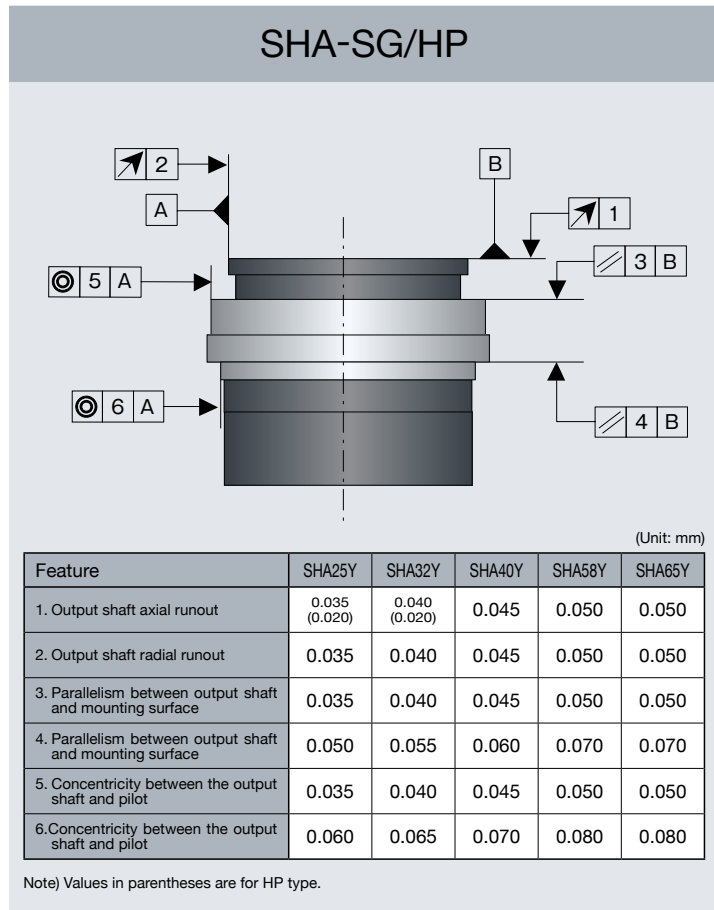
SHA-CG



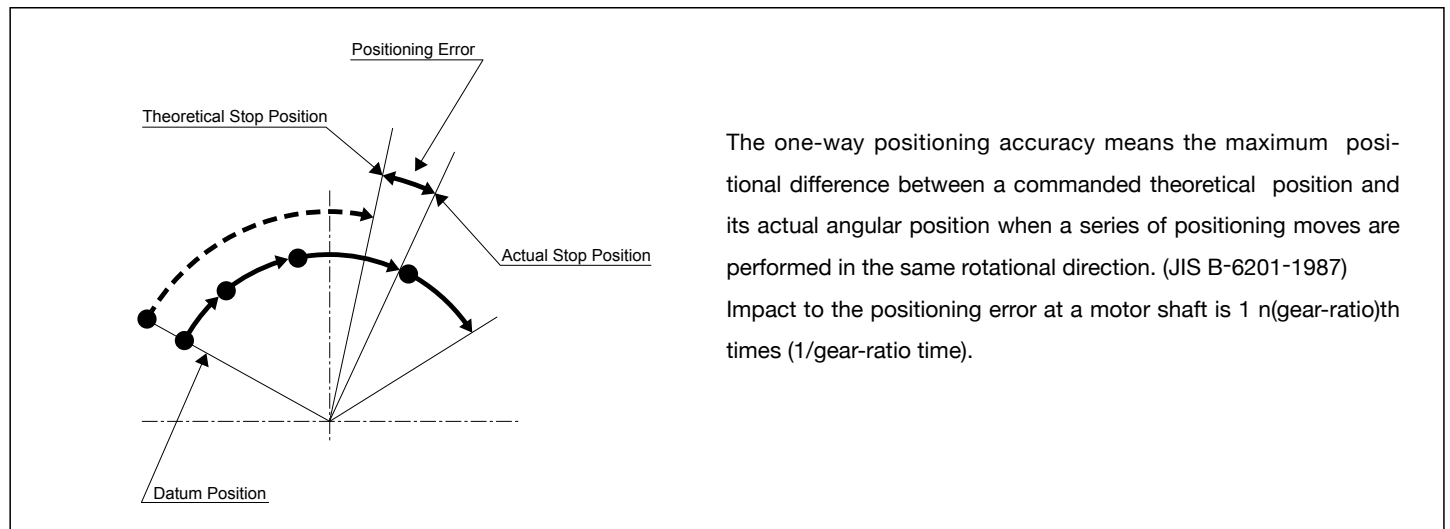
Dimension	SHA25Y			SHA32Y			SHA40Y		SHA58Y	SHA65Y
	HP	SG	CG	HP	SG	CG	SG	CG	SG	SG
ϕA	136	114	144	167	146	175	175	225	247	284
B	144.8	109	127.5	161.5	125	144	148	170	213	222
C	38.3	15.5	28.5	44.5	20	34	26	40	37	42.5
D	12.5	28	17	15	34.5	20	42	22	74	77.5
ϕE	20	27	27	26	35	35	45	45	65	$\phi_{\text{unit: mm}}$
ϕF	118	94	115	147	122	148	145	180	210	236

Mechanical Accuracy

The SHA-Y series mechanical accuracy of the output shaft and mounting flange:



One-way Positioning Accuracy



SHA-SG/HP

(Unit: arc-sec)

Ratio \ Model	SHA25Y	SHA32Y	SHA40Y	SHA58Y	SHA65Y
11:1 (HP)	120	120	-	-	-
51:1	50	50	50	-	-
81:1 or more	40	40	40	40	40

SHA-CG

(Unit: arc-sec)

Ratio \ Model	SHA25Y	SHA32Y	SHA40Y
50:1	50	40	40
80:1 or more	40	30	30

■ Motor Extension Cables (Available from Harmonic Drive)

Use the Motor Cables listed in the following table.

Note: Do not use two or more cables together. Doing so may reduce noise resistance.

Actuator Model	Connector Specifications	Length (L)*1	Extension Cable*1	Appearance
SHA25Y, SHA32Y	Straight	3 m, 5 m, 10 m, 15 m	EWD-MB-□□-A06-TN-Y	
SHA40Y			EWD-MB-□□-A06-TMC-Y	
SHA58Y or SHA65Y	Straight	3 m, 5 m, 10 m	EWD-MB-□□-D09-TMC (EWD-MB-□□-D09-TMC-Y)*2	
	Right-angle			

*1. "□□" in the motor extension cable model code indicates the cable length in meters.
Please select: 03=3m, 05=5m, 10=10m, 15=15m

*2: The model code in parentheses () indicates cable length of 15m.

■ Encoder Extension Cables (Available from Yaskawa)

Use the Encoder Cables listed in the following table.

Note: Do not use two or more cables together. Doing so may reduce noise resistance.

Actuator Model	Connector Specifications	Length (L)*1	Extension Cable*2		Appearance
			Standard Cable	Flexible Cable*3, *4	
SHA25Y, SHA32Y, or SHA40Y	Straight	3 m, 5 m, 10 m, 15 m	JZSP-CSP19-□□-E	JZSP-CSP29-□□-E	
SHA58Y or SHA65Y			JZSP-CVP06-□□-E	JZSP-CVP26-□□-E	
			Right-angle	JZSP-CVP07-□□-E	JZSP-CVP26-□□-E

*1. The maximum cable length is 20 m. Do not use a cable that is longer than 20 m.

*2. Replace the boxes (□□) in the order number with the cable length (03, 05, 10, 15, or 20).

*3. Use Flexible Cables for moving parts of machines, such as robots.

*4. The recommended bending radius (R) is 90 mm or larger.

SHA-SG/HP Specification

Model		SHA25Y						SHA32Y						
		11	51	81	101	121	161	11	51	81	101	121	161	
SERVOPACK		SGD7S-3R8AA0A *** F81 ³						SGD7S-120AA0A *** F81 ³						
Maximum Torque ^{*1}	Nm	26	127	178	204	217	229	62	281	395	433	459	484	
Continuous Torque ^{*12}	Nm	9.0	41	67	81	81	81	20	92	153	178	178	178	
Maximum Speed ^{*1}	rpm	509.1	109.8	69.1	55.4	46.3	34.8	436.4	94.1	59.3	47.5	39.7	29.8	
Maximum Current ^{*1}	A	8.9	8.6	7.5	7.0	6.3	5.2	19	17.3	15.2	13.5	12.2	9.9	
Continuous Current ^{*12}	A	3.0	3.0	3.0	2.9	2.6	2.1	6.0	6.0	6.0	5.7	5.0	4.1	
Moment of Inertia (without Brake)	GD ² /4	kg·m ²	0.029	0.56	1.4	2.2	3.2	5.6	0.091	2.0	5.1	8.0	11	20
Moment of Inertia (with Brake)	GD ² /4	kg·m ²	0.034	0.66	1.7	2.6	3.7	6.6	0.11	2.3	5.9	9.2	13	23
Ratio		11:1	51:1	81:1	101:1	121:1	161:1	11:1	51:1	81:1	101:1	121:1	161:1	
Max. Moment Load	Nm	410	258					932	580					
Moment Stiffness	Nm/rad	37.9×10 ⁴	39.2×10 ⁴					86.1×10 ⁴	100×10 ⁴					
One-way Positioning Accuracy	arc-sec	120	50	40	40	40	40	120	50	40	40	40	40	
Encoder		Absolute Encoder						Absolute Encoder						
Output Resolution	p/r	1,441,792	6,684,672	10,616,832	13,238,272	15,859,712	21,102,592	1,441,792	6,684,672	10,616,832	13,238,272	15,859,712	21,102,592	
Mass (without Brake)	kg	5.0	2.95					9.4	5.9					
Mass (with Brake)	kg	5.1	3.1					9.7	6.2					
Mounting Direction		Can be installed in any direction						Can be installed in any direction						

Model		SHA40Y					SHA58Y				SHA65Y				
		51	81	101	121	161	81	101	121	161	81	101	121	161	
SERVOPACK		SGD7S-180AA0A *** F81 ³					SGD7S-330AA0A *** F81 ³								
Maximum Torque ^{*1}	Nm	523	675	738	802	841	1924	2067	2236	2392	2743	2990	3263	3419	
Continuous Torque ^{*12}	Nm	160	263	330	382	382	714	905	969	969	921	1149	1236	1236	
Maximum Speed ^{*1}	rpm	78.4	49.4	39.6	33.1	24.8	37.0	29.7	24.8	18.6	34.6	27.7	23.1	17.4	
Maximum Current ^{*1}	A	26.7	21.8	19.4	17.9	14.6	45	39	36	30	62	55	51	41	
Continuous Current ^{*12}	A	9.0	9.0	9.0	8.8	7.2	17.7	17.8	16.4	13.4	22.0	21.9	20.1	16.3	
Moment of Inertia (without Brake)	GD ² /4	kg·m ²	5.0	13	20	28	50	96	149	214	379	110	171	245	433
Moment of Inertia (with Brake)	GD ² /4	kg·m ²	6.1	15	24	34	61	106	165	237	420	120	187	268	475
Ratio		51:1	81:1	101:1	121:1	161:1	81:1	101:1	121:1	161:1	81:1	101:1	121:1	161:1	
Max. Moment Load	Nm	849					2180				2740				
Moment Stiffness	Nm/rad	179×10 ⁴					531×10 ⁴				741×10 ⁴				
One-way Positioning Accuracy	arc-sec	50	40	40	40	40	40	40	40	40	40	40	40	40	
Encoder		Absolute Encoder					Absolute Encoder								
Output Resolution	p/r	6,684,672	10,616,832	13,238,272	15,859,712	21,102,592	10,616,832	13,238,272	15,859,712	21,102,592	10,616,832	13,238,272	15,859,712	21,102,592	
Mass (without Brake)	kg	9.9					29.5				37.5				
Mass (with Brake)	kg	10.7					32				40				
Mounting Direction		Can be installed in any direction					Can be installed in any direction								

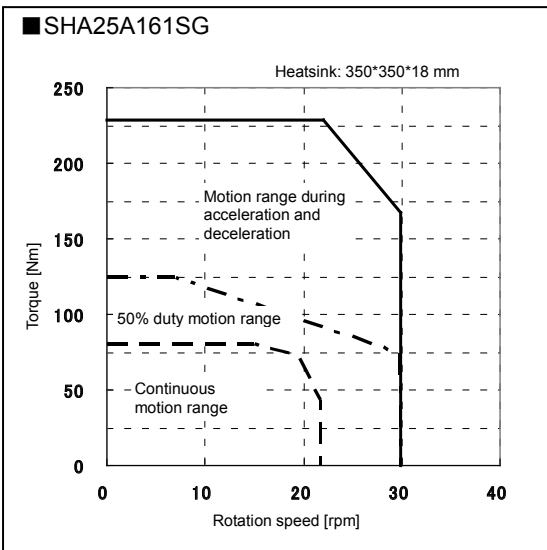
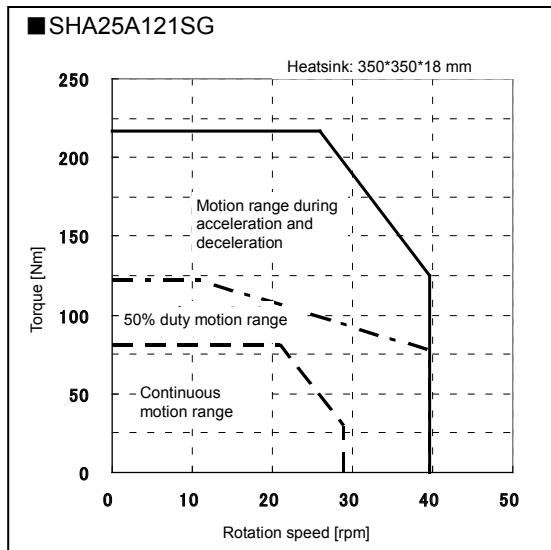
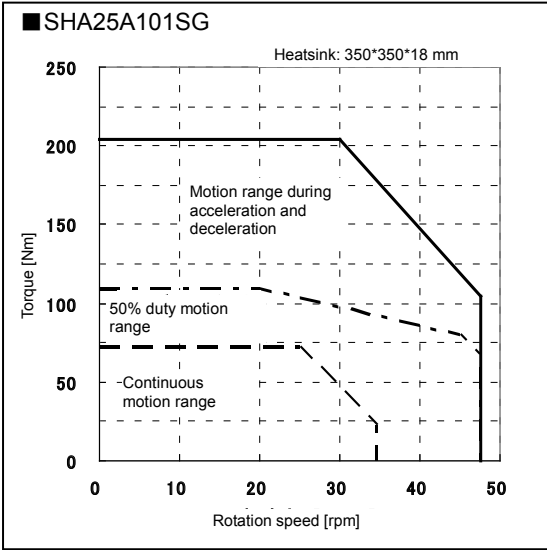
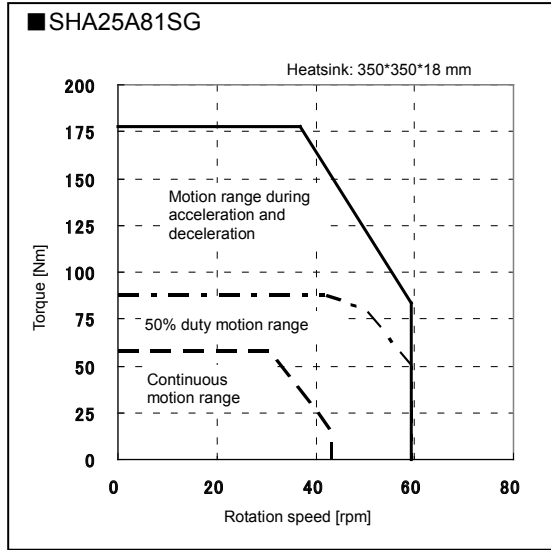
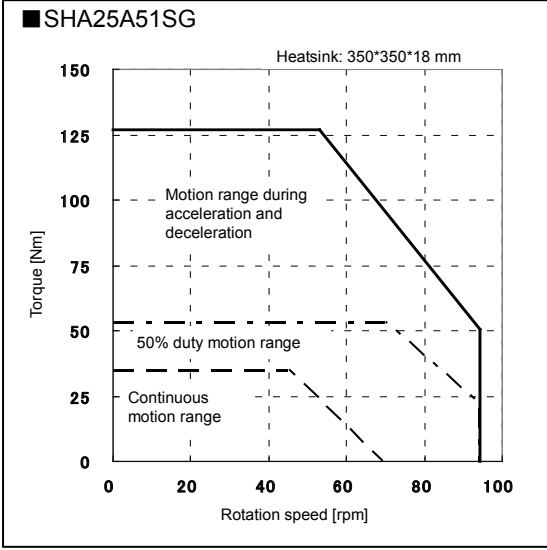
The values in the table above show typical values for the output shaft.

*1: They are typical characteristics in the case of combinations with Σ-7 (driven with the ideal sine wave).

*2: Value for saturated temperature when installed on an aluminum heatsink, of the following size: (Size 25: 350 x 350 x 1 8mm, Size 32: 400 x 400 x 20 mm, Size 58,65: 650 x 650 x 25 mm)

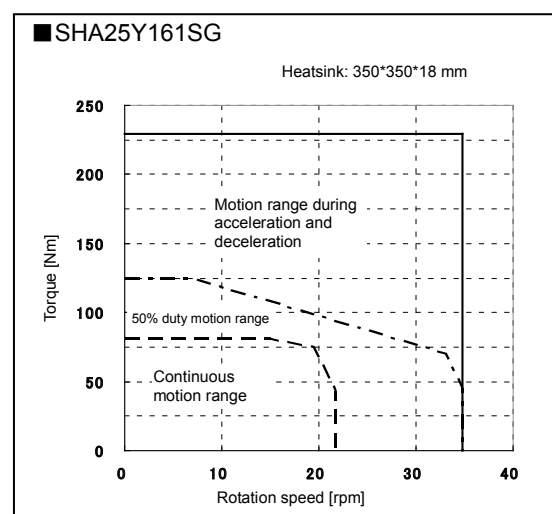
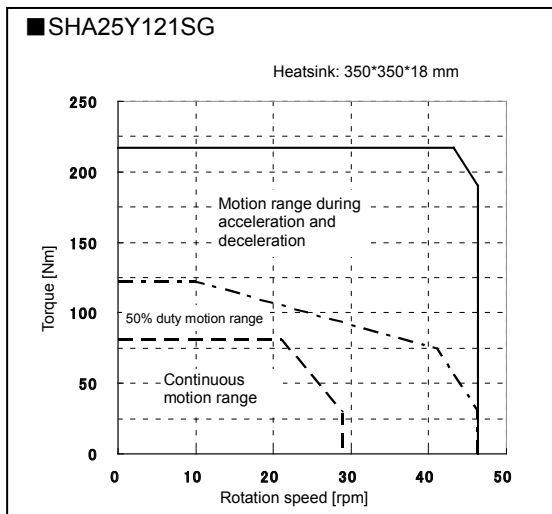
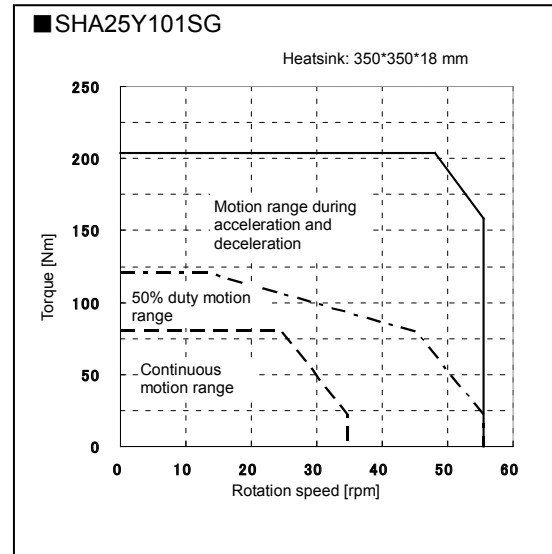
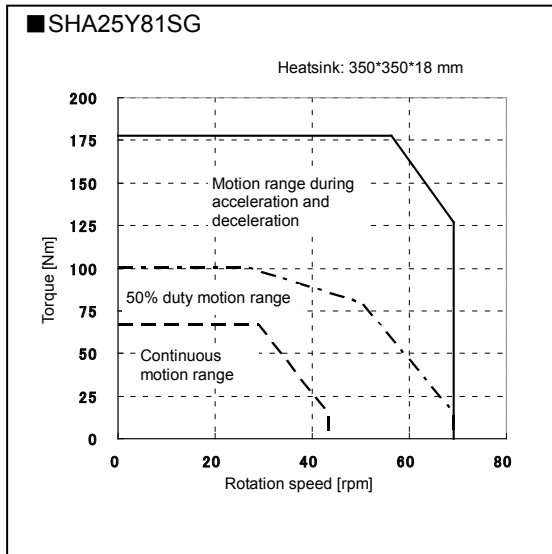
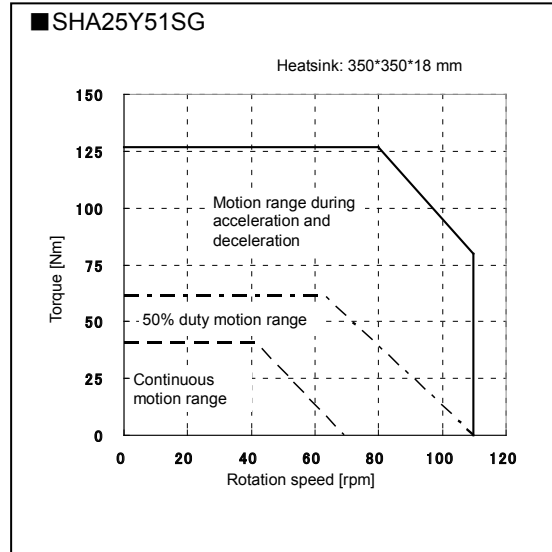
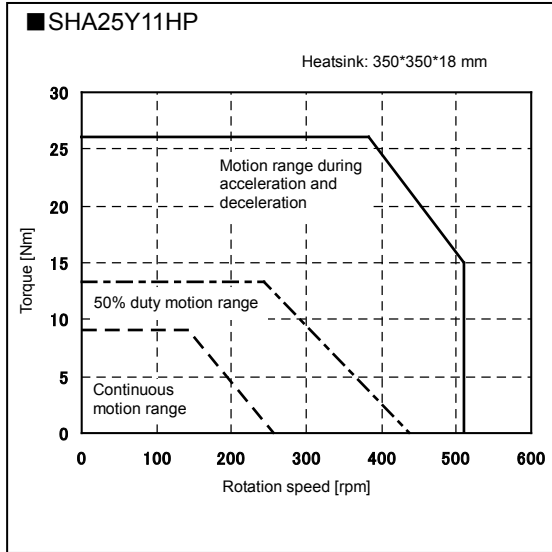
*3: "*****" indicates with/without dynamic brake resistor (without: 000, with: 020).

SG type
SHA25A (Specifications for motor input voltage of 100V)

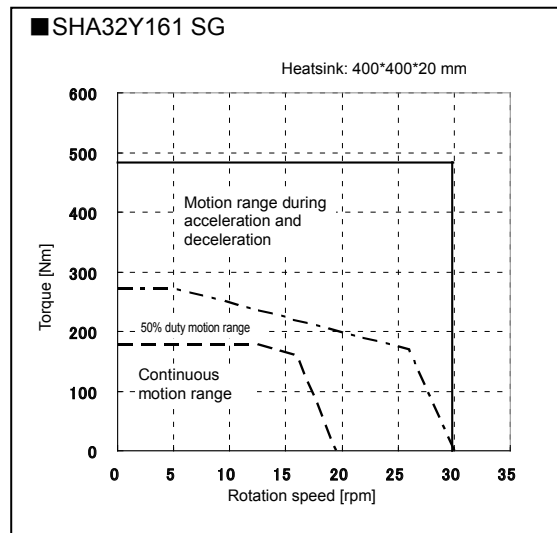
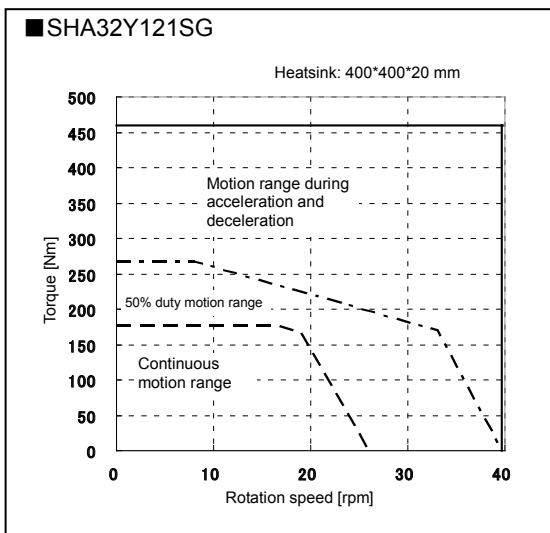
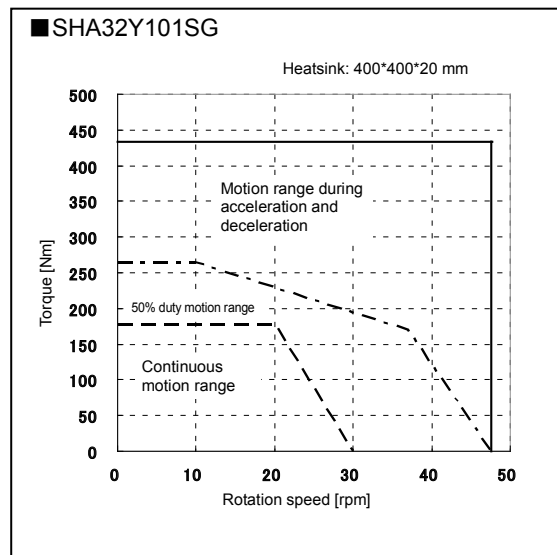
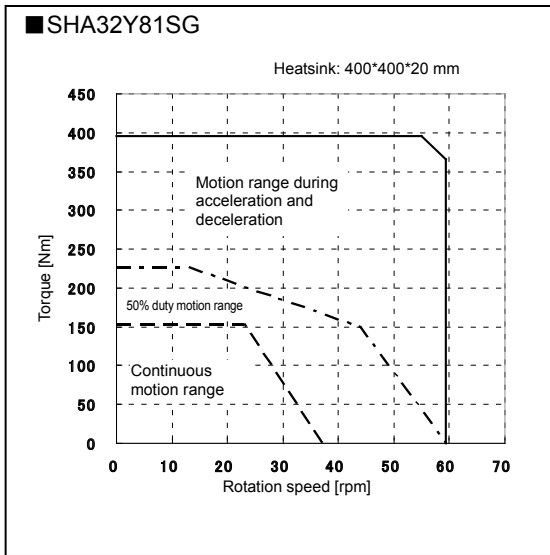
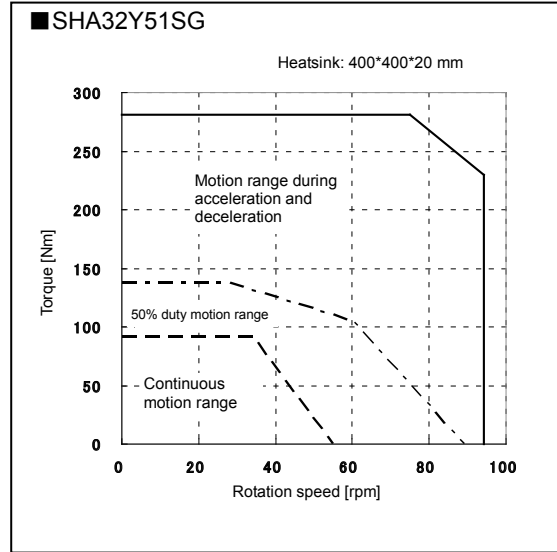
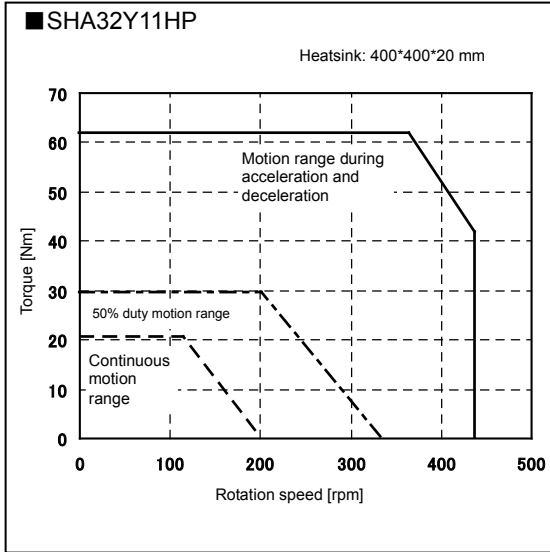


SG/HP type

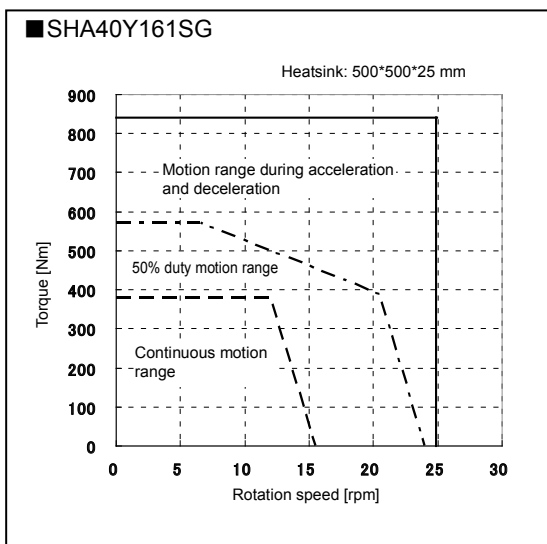
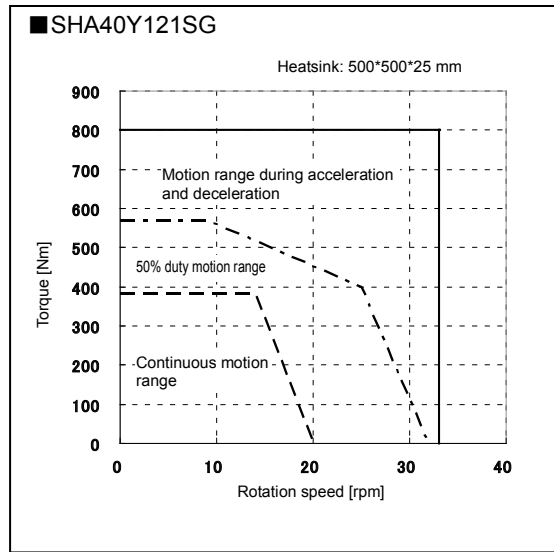
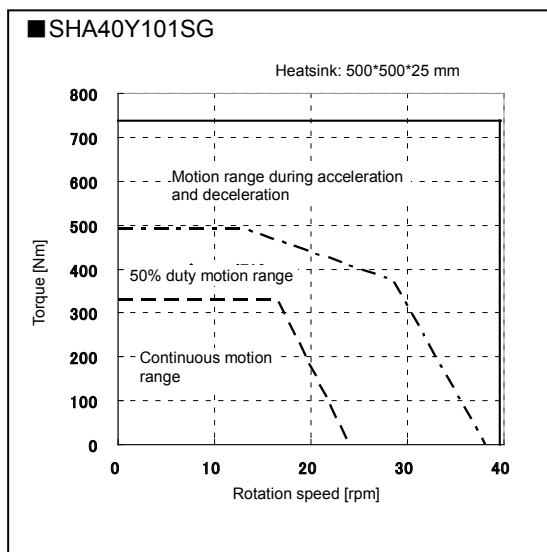
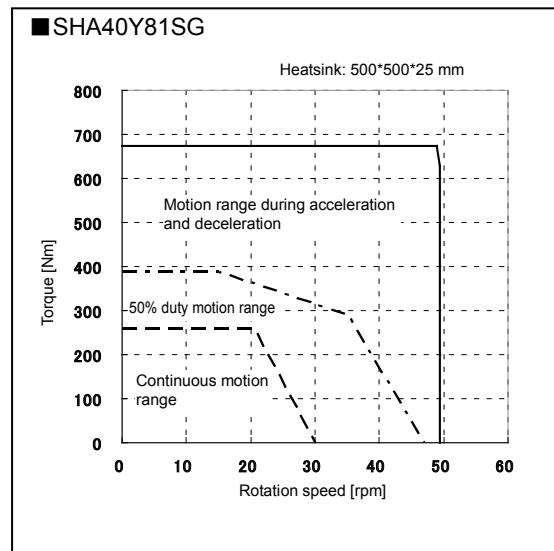
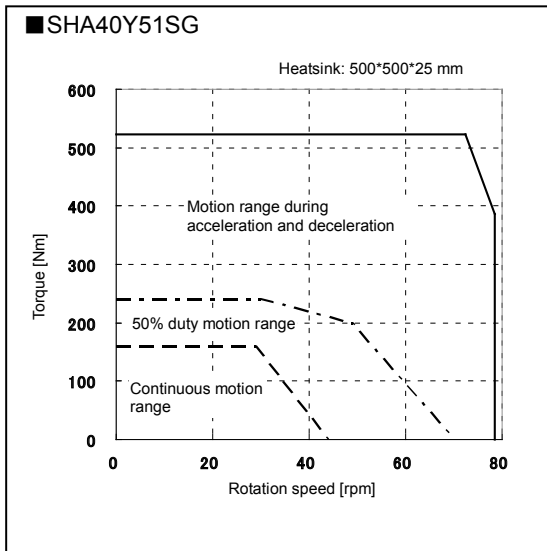
SHA25Y (Specifications for motor input voltage of 200V)



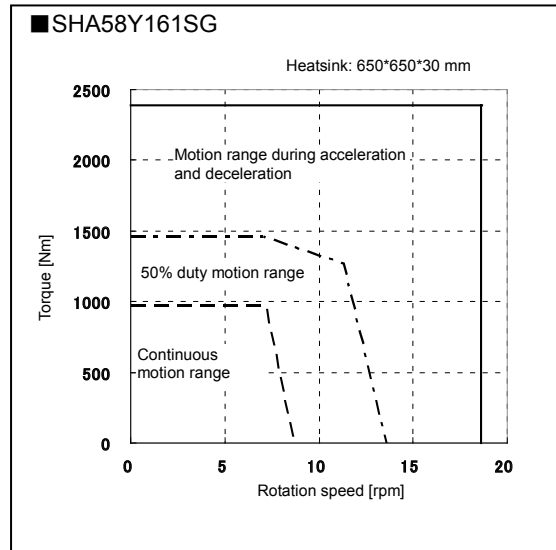
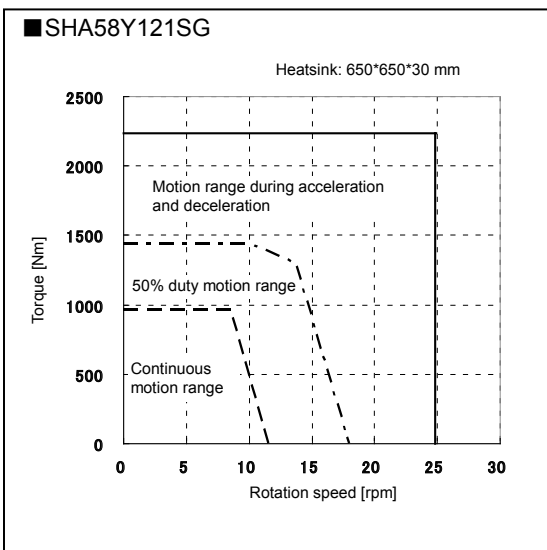
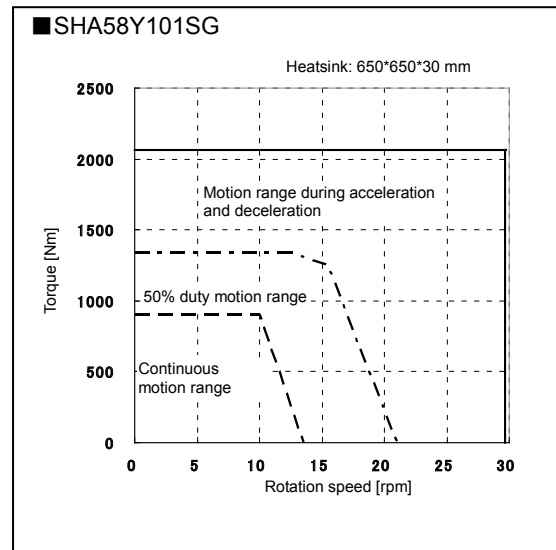
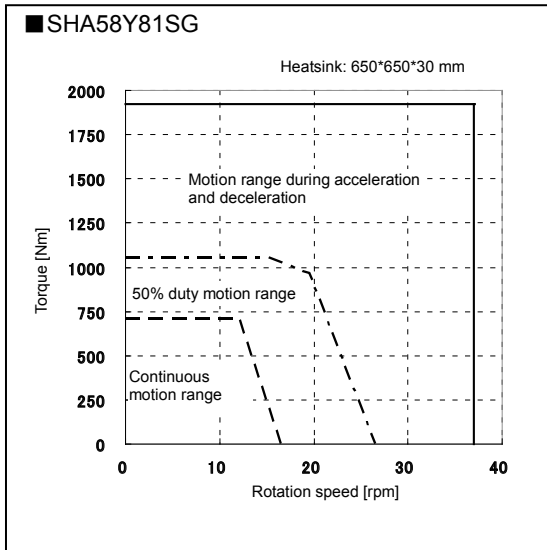
**SG/HP type
SHA32Y**



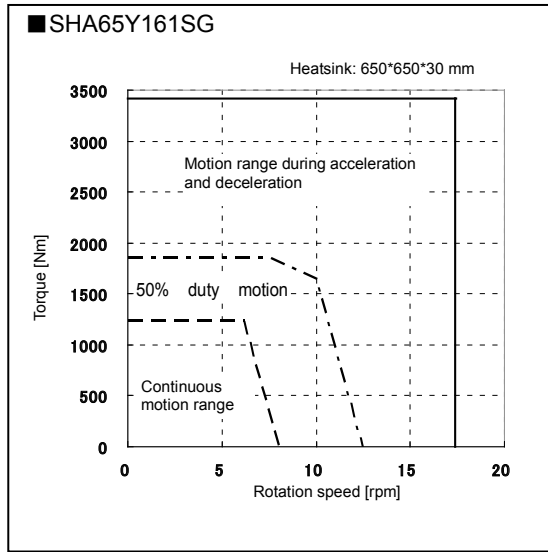
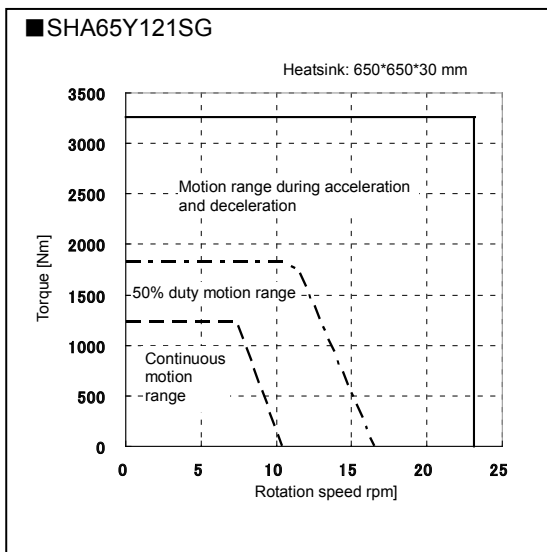
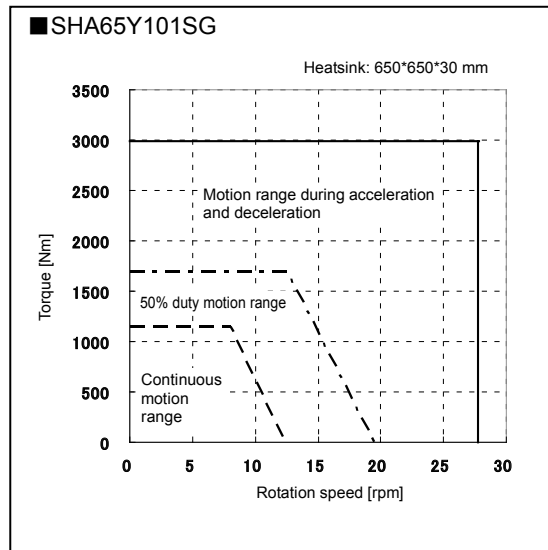
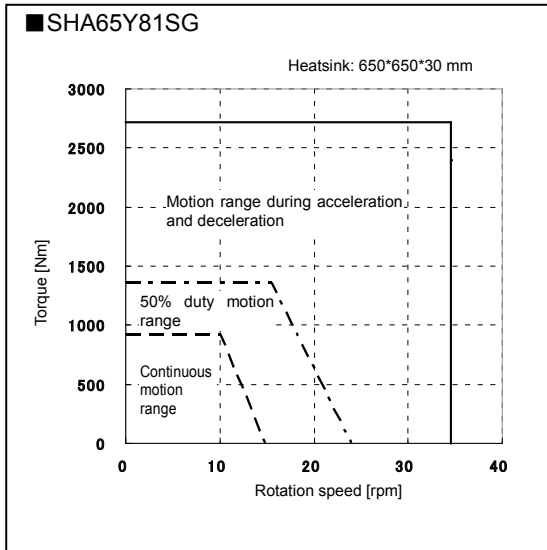
**SG type
SHA40Y**



SG type SHA58Y



SG type SHA65Y



SHA-CG Specification

Item		Model		SHA25Y					SHA32Y				
				50	80	100	120	160	50	80	100	120	160
SERVOPACK		SGD7S-3R8AA0A *** F81 ³					SGD7S-120AA0A *** F81 ³						
Maximum Torque ^{*1}	Nm	127	178	204	217	229	281	395	433	459	484		
Continuous Torque ^{*1,2}	Nm	40	66	81	81	81	90	151	178	178	178		
Maximum Speed ^{*1}	rpm	112	70	56	46.7	35	96	60	48	40	30		
Maximum Current ^{*1}	A	8.7	7.6	7.0	6.3	5.2	17.7	15.4	13.7	12.2	10.0		
Continuous Current ^{*1,2}	A	3.0	3.0	3.0	2.6	2.1	6.0	6.0	5.7	5.0	4.1		
Moment of Inertia (without Brake)	GD ² /4	kg·m ²	0.50	1.3	2.0	2.9	5.1	1.7	4.3	6.7	9.7	17	
Moment of Inertia (with Brake)	GD ² /4	kg·m ²	0.60	1.5	2.4	3.4	6.1	2.0	5.1	7.9	11	20	
Ratio		50:1	80:1	100:1	120:1	160:1	50:1	80:1	100:1	120:1	160:1		
Max. Moment Load	Nm	258					580						
Moment Stiffness	Nm/rad	39.2×10 ⁴					100×10 ⁴						
One-way Positioning Accuracy	arc-sec	50	40	40	40	40	40	30	30	30	30		
One-way Repeatability	arc-sec	±5					±4						
Bi-directional Repeatability	arc-sec	60	25	25	25	25	60	25	25	25	25		
Encoder		Absolute Encoder					Absolute Encoder						
Output Resolution	p/r	6,553,600	10,485,760	13,107,200	15,728,640	20,971,520	6,553,600	10,485,760	13,107,200	15,728,640	20,971,520		
Mass (without Brake)	kg	3.95					7.7						
Mass (with Brake)	kg	4.1					8.0						
Mounting Direction		Can be installed in any direction					Can be installed in any direction						

Item		Model		SHA40Y				
				50	80	100	120	160
SERVOPACK		SGD7S-180AA0A *** F81 ³						
Maximum Torque ^{*1}	Nm	523	675	738	802	841		
Continuous Torque ^{*1,2}	Nm	157	260	327	382	382		
Maximum Speed ^{*1}	rpm	80	50	40	33.3	25		
Maximum Current ^{*1}	A	27.2	22.0	19.6	18.0	14.7		
Continuous Current ^{*1,2}	A	9.0	9.0	9.0	8.8	7.2		
Moment of Inertia (without Brake)	GD ² /4	kg·m ²	4.8	12	19	27	49	
Moment of Inertia (with Brake)	GD ² /4	kg·m ²	5.8	15	23	33	59	
Ratio		50:1	80:1	100:1	120:1	160:1		
Max. Moment Load	Nm	849						
Moment Stiffness	Nm/rad	179×10 ⁴						
One-way Positioning Accuracy	arc-sec	40	30	30	30	30		
One-way Repeatability	arc-sec	±4						
Bi-directional Repeatability	arc-sec	50	20	20	20	20		
Encoder		Absolute Encoder						
Output Resolution	p/r	6,553,600	10,485,760	13,107,200	15,728,640	20,971,520		
Mass (without Brake)	kg	13.0						
Mass (with Brake)	kg	13.8						
Mounting Direction		Can be installed in any direction						

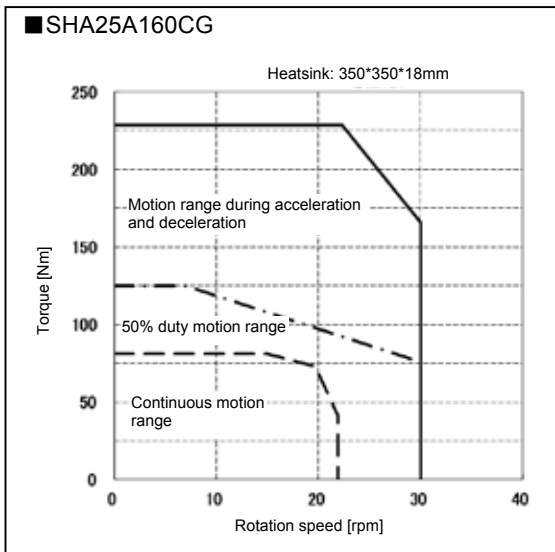
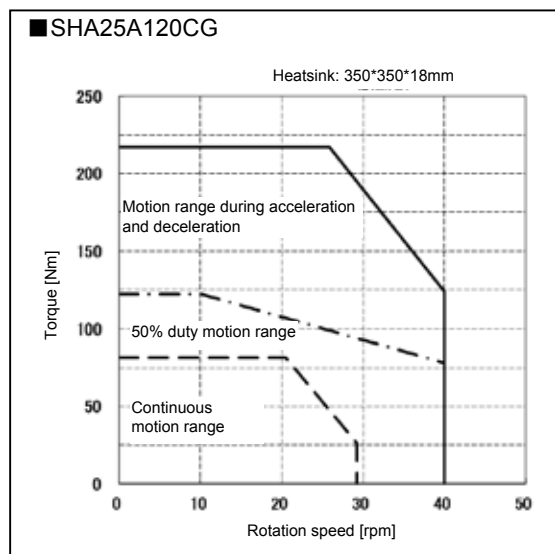
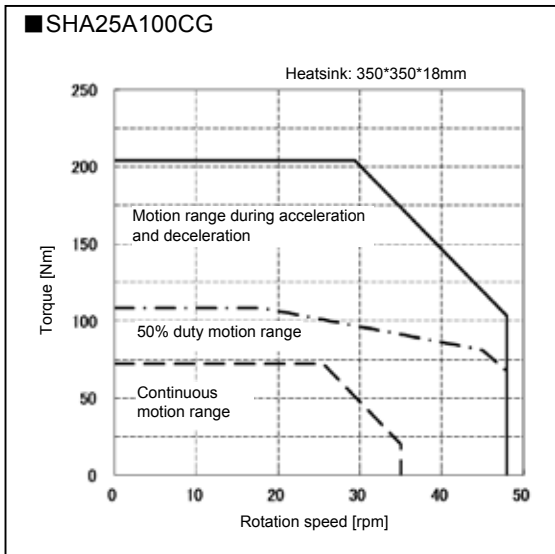
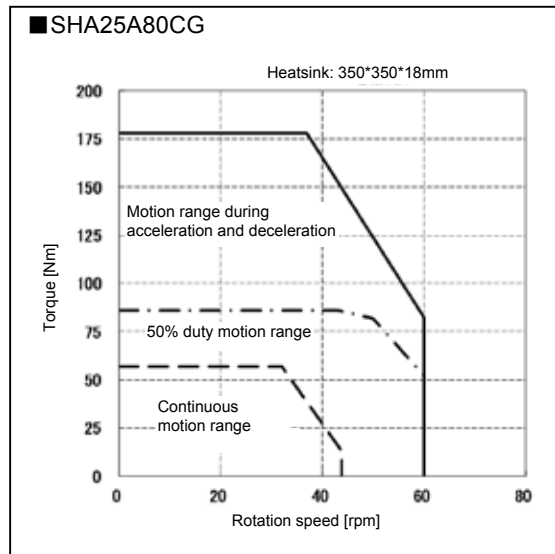
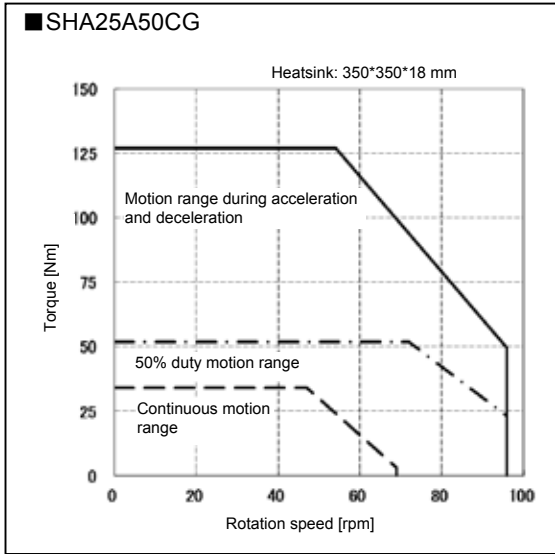
The values in the table above show typical values for the output shaft.

*1: They are typical characteristics in the case of combinations with Σ-7 (driven with the ideal sine wave).

*2: Value for saturated temperature when installed on an aluminum heatsink, of the following size: (Size 25: 350 x 350 x 18 mm, Size 32: 400 x 400 x 20 mm, Size 40: 500 x 500 x 25 mm)

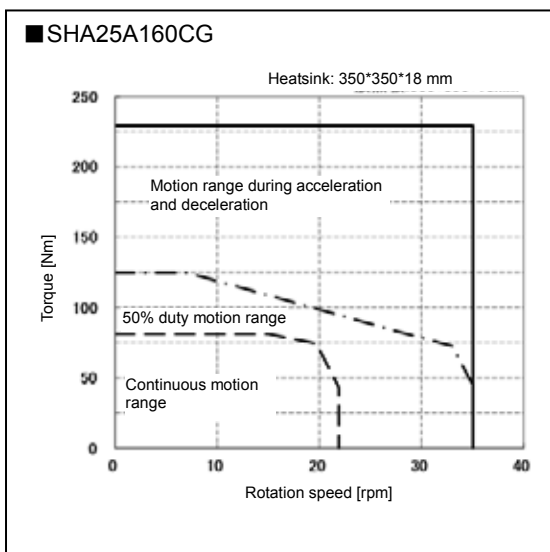
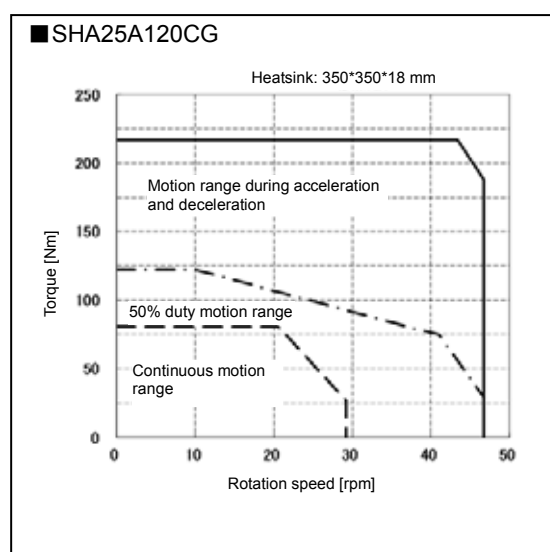
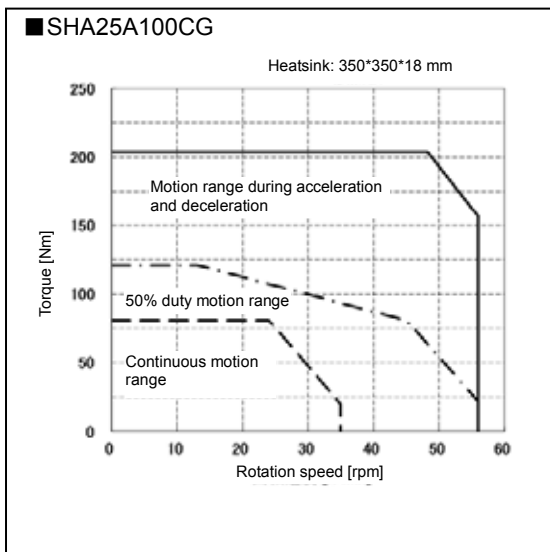
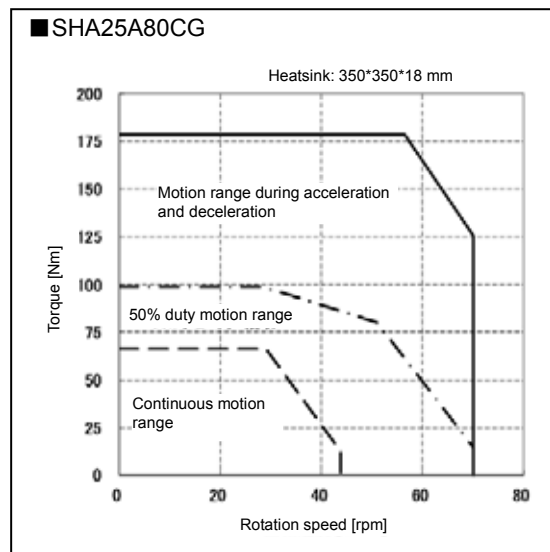
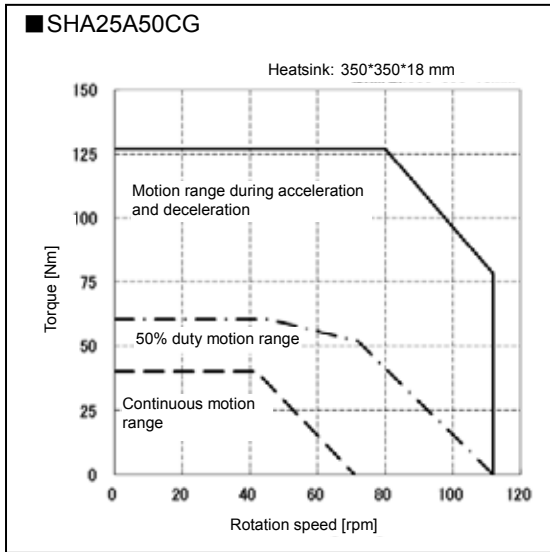
*3: ***** indicates with/without dynamic brake resistor (without: 000, with: 020).

CG type
SHA25A (Motor input voltage 100V)

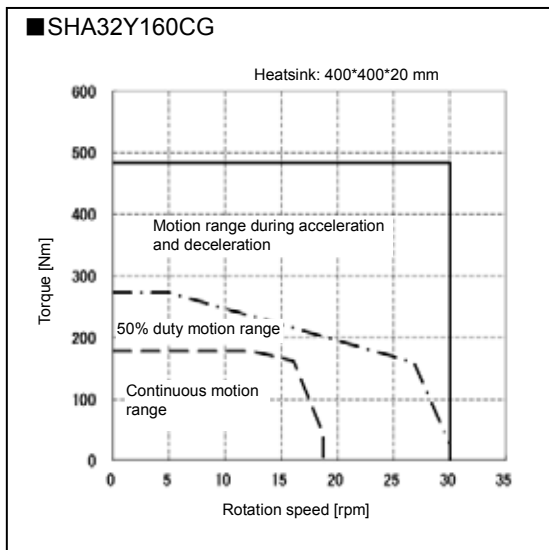
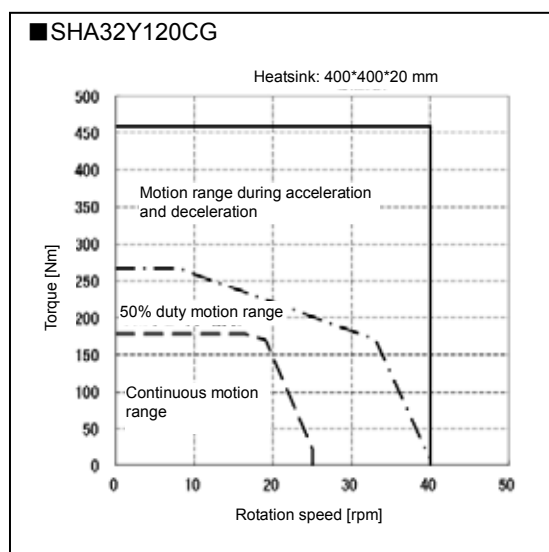
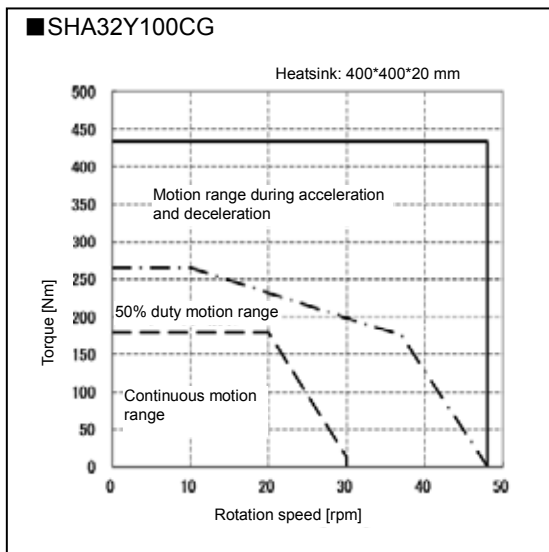
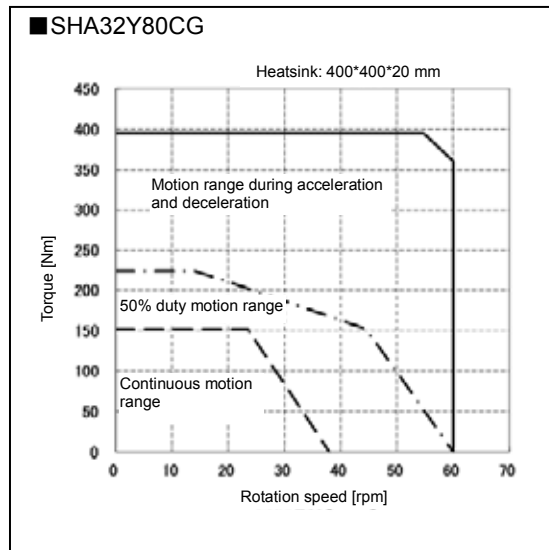
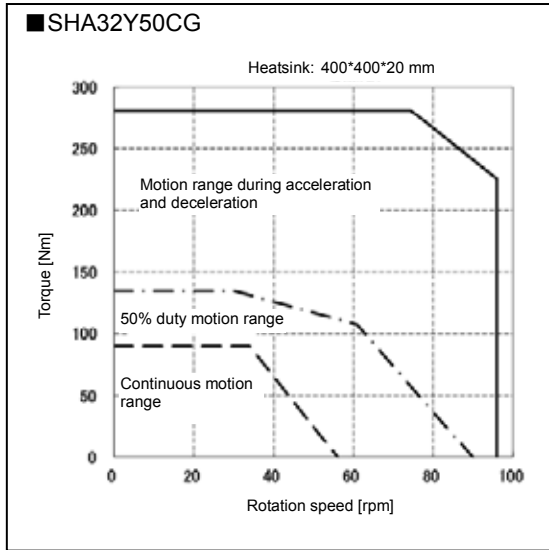


CG type

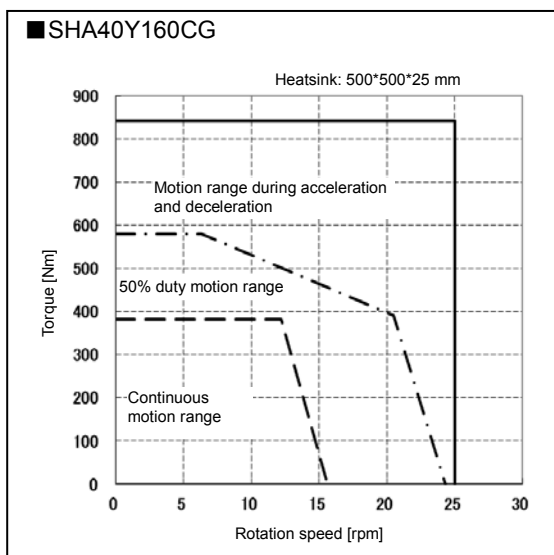
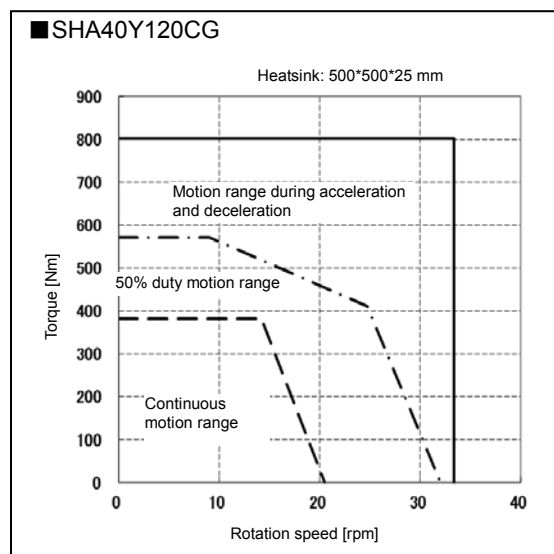
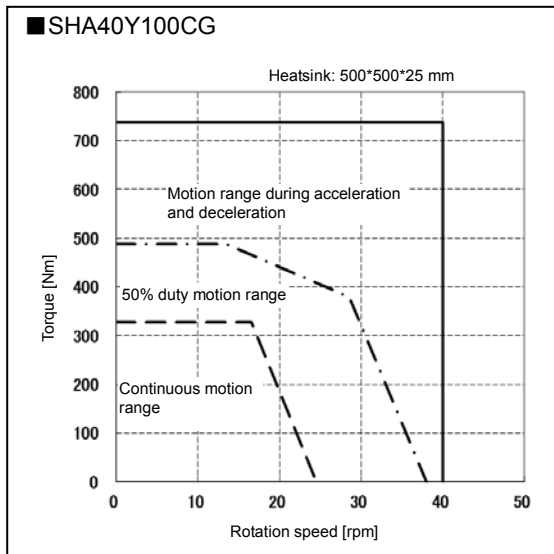
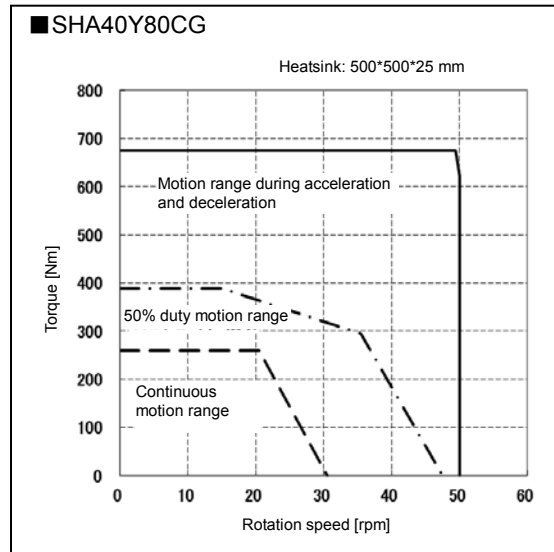
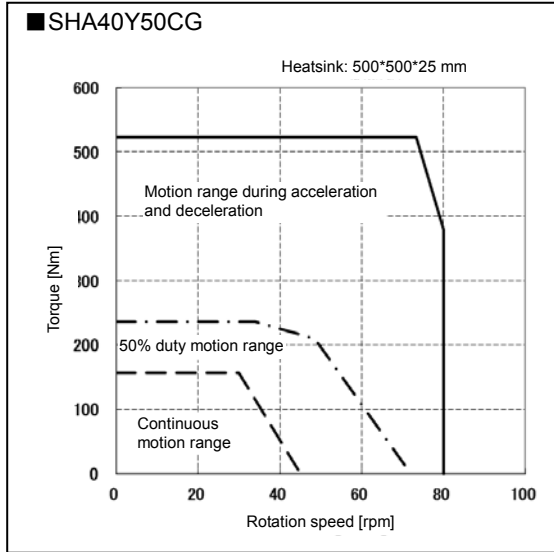
SHA25A (Motor input voltage 200V)



CG type SHA32Y



CG type SHA40Y



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