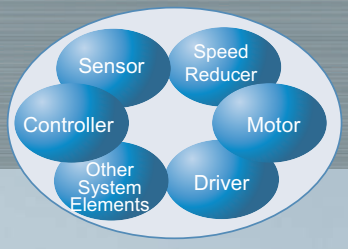
HarmonicDrive® New Product News Vol.25



HarmonicDrive®
AC Servo Actuator
SHA Series

+

Yaskawa Electric Corporation
AC Servo Drive
Σ-7 series

Collaborative Success

HarmonicDrive® AC servo actuator SHA series
now can be combined with "Σ-7 series" of AC Servo Drive manufactured by Yaskawa Electric Corporation, to comply to the MECHATROLINK-III communication.
Further expanding the options for network connectivity.
There are two types of option; SHA-SG type that has compact shape feature or SHA-CG type that has improved output flange runout accuracy.

HarmonicDrive®

MECHATROLINK

- The AC Servo Actuator combines HarmonicDrive® reducer for precision control and a flat AC servo motor.
- The new products achieve almost identical accuracy and resolution as those of Direct Drive Motors and are remarkably compact and lightweight.
- The hollow shaft design allows piping and cabling to pass directly through the axis of rotation, and achieves a simple machine design.
- 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 type)
- Torque to Volume ratio is more than 5 times greater than Direct Drive Motors.
- The SHA-Y series actuators are easy to use with the machine built with the "Σ-7 series" MECHATROLINK-III communication.

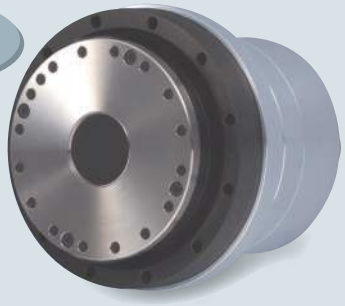
Contact: AC Servo Actuator SHA-Y series (Harmonic Drive Systems Inc.)
AC Servo Drive Σ-7 series (Yaskawa Electric Corporation)

Select the Suitable Model for Your Device from Our Wide-Range Product Lineup

SHA-SG type

SHA-SG type featuring compact-shape

Compact



The SHA Servo Actuator combines precision Harmonic Drive® gearing with a flat AC servo motor.
The unique compact shape and Hollow Shaft actuator design allow a simple design of machine and device.
Select from 5 types of sizes: 25,32,40,58, and 65. For the sizes of 25 and 32, combinations with planetary gear reducer Harmonic Planetary®can also be selected.

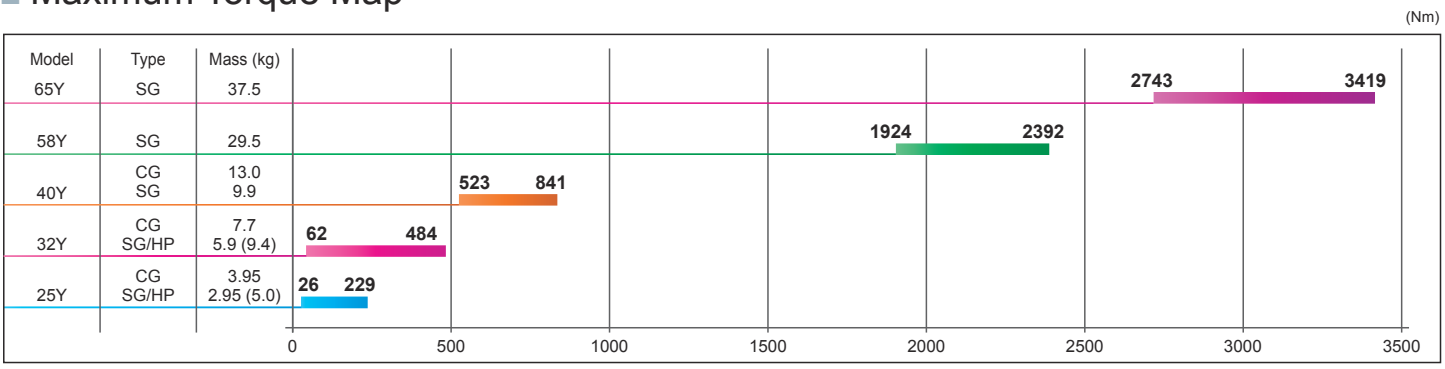
SHA-CG type

SHA-CG type with improved output flange runout accuracy

High Accuracy

Products with the output flange runout accuracy are considerably improved by changing type of HarmonicDrive® gearing inside an actuator.
The SHA-CG type can be provided in an easy-to-use manner for the table swivel drive and alignment adjusting functions, which require higher mechanical accuracy.
The size can be selected from three types of 25, 32, and 40.

Maximum Torque Map



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

Selection From Various Options

■ Speed reducer model

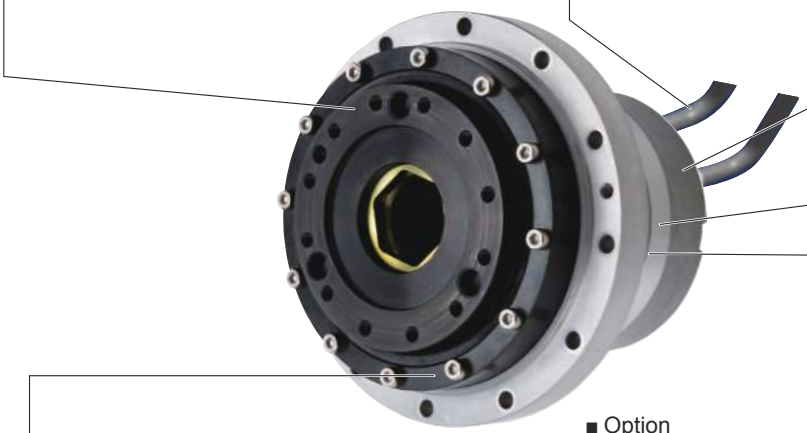
Standard	HarmonicDrive® SHG series (Type SG) HarmonicDrive® CSG series (Type CG) HarmonicPlanetary® HPF series (Type HP)

■ Cable orientation

Standard	Rear exit
Variation	Side exit is available

■ Encoder

Standard	Absolute encoder (17-bit) Multi turn (16-bit) (Conforming to the Yaskawa Electric Corporation format)



■ Holding brake

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

■ AC servo motor

Standard:	AC200V

■ Output bearing

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

■ Option

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

■ Environment specification

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

Yaskawa Electric Corporation's AC Servo Drive Σ-7 Series

MECHATROLINK-III Compatible AC Servo Drive SGD7S-□□□A20A***F81

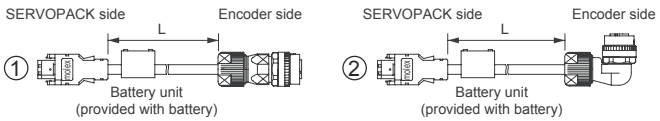
Thanks to the combination of the servo drive realizing 3.1 kHz response frequency and MECHATROLINK- III communication at 125μs shortest transmission cycle, full performance is delivered from the SHA series actuator.

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

Combination List Proper combinations of Actuator, SERVOPACK, and Relay Cables are shown below.

SHA Series	Speed Reducer Types	SERVOPACK	Relay Cable Model Note 2		
			Motor	Encoder Cable	
				Standard Cable	Flex Cable
25Y	SG/HP/CG	SGD7S-3R8A20A□□□ Note 1 F81	EWD-MB * * -A06-TN-Y	JZSP-CSP19- * * -E	JZSP-CSP29- * * -E
32Y	SG/HP/CG	SGD7S-120A20A□□□F81			
40Y	SG/CG	SGD7S-180A20A□□□F81	EWD-MB * * -A06-TMC-Y		
58Y	SG	SGD7S-330A20A□□□F81	EWD-MB * * -D09-TMC (EWD-MB * * -D09-TMC-Y) Note 3	(1) JZSP-CVP06- * * -E (2) JZSP-CVP07- * * -E	(3) JZSP-CVP26- * * -E (2) JZSP-CVP27- * * -E
58Y	SG				

Note 1: "□□□" in the SERVOPACK model code indicates with/without a dynamic resistor (without: 000, with: 020).
Note 2: "**" in the relay cable model code indicates the cable length in meters. Please select: (03=2m, 05=5m, 10=15m).]
Note 3: The model code in parentheses () indicates cables of 15m length.
Note 4: For the encoder relay cables of 5 8Y and 6 5Y, you can select from two types of connector shape.



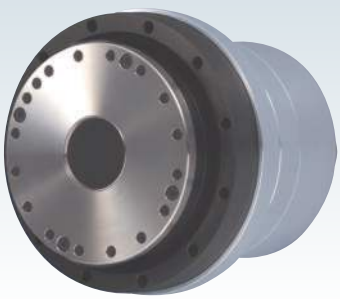
MECHATROLINK- III System Image

MECHATROLINK- III Compatible Controller
MP-3300 series

SGD7S-□□□A20A***F81
SHA-Y compatible SERVOPACK
Σ-7-FT81 series

SGD7S-□□□A20A
Σ-7 series standard
SERVOPACK

HarmonicDrive®
SHA-Y series



Yaskawa Electric Corporation
Σ-7 motor (standard)

Compatibility with the MECHATROLINK- III communication enables the establishment of communication easily and the selection of options!

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)

(1) Model: SHA series AC servo actuator

(2) Size

SG	25,32, 40,58, 65
HP	25,32
CG	25,32, 40

(3) Design Version:

Y	Yaskawa Electric Corporation format compatible

(4) Reduction Ratio: (1/R)

SG	
51	1/51
81	1/81
101	1/101
121	1/121
161	1/161

CG	
50	1/50
80	1/80
100	1/100
120	1/120
160	1/160

HP	
11	1/11

(5) Gear Reducer

SG	SHG Series
HP	HPF Series
CG	CSG Series

(6) Motor Version

A	Size: 58, 65
B	Size: 25, 32, 40

(7) Motor Size

09	Size 25
12	Size 32
15	Size 40
21	Size: 58, 65

(8) Brake

A	Without Brake
B	With Brake

(9)Voltage Rating

200	200V

(10) Encoder Format

17	Yaskawa Electric Corporation format

(11) Encoder Type / Resolution

S17b	17-bit absolute encoder 131072 counts / revolution

(12) Encoder Offset Angle
Phase difference between the motor U phase and the encoder origin

A	0 Degrees

(13) Connector Specification

C	With Standard Connector
N	Without Connector
D	With Special Connector

(14) Special Options

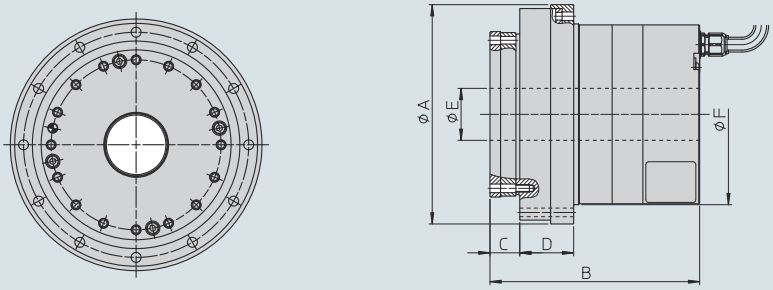
L	Origin and Limit Sensor
Y	Side Exiting Cable
V	With Stand (for the CG type only)
S	Output Single Turn Absolute Function

(15) SP designates Custom Specification, (Leave blank for standard product)

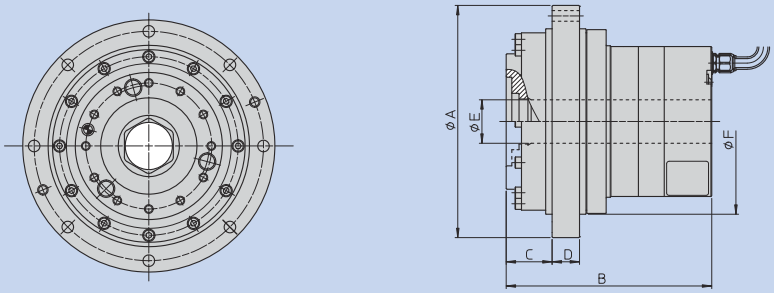
* Reduction ratio 1:11 is used in combination with the hollow planetary speed reducer HPF series.

External Dimensions

SHA-SG/H type



SHA-CG type



(Unit: mm)

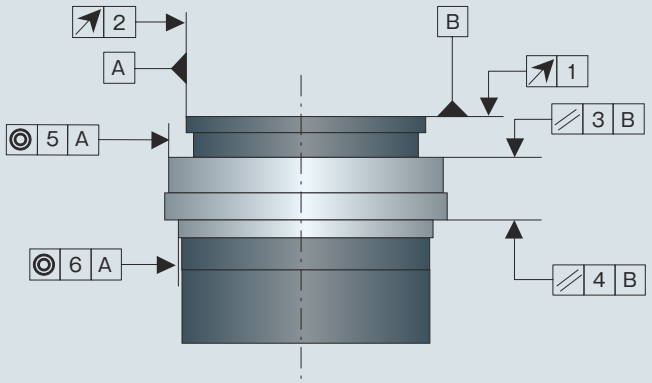
Dimension	SHA25Y			SHA32Y			SHA40Y		SHA58Y	SHA65Y
	Type HP	Type SG	Type CG	Type HP	Type SG	Type CG	Type SG	Type CG	Type SG	Type SG
φA	136	114	144	167	146	175	175	225	247	284
B	144.8	109	127.5	161.5	125	144	148	170	213	222
C	38.3	15.5	28.5	44.5	20	34	26	40	37	42.5
D	12.5	28	17	15	34.5	20	42	22	74	77.5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

Note) For the detailed dimensions, for example, tolerance, please check the confirmation drawing for each product

Mechanical Accuracy

The SHA-Y series mechanical accuracy of the actuator output flange and the mounting flange are shown below:

SHA-SG/H type

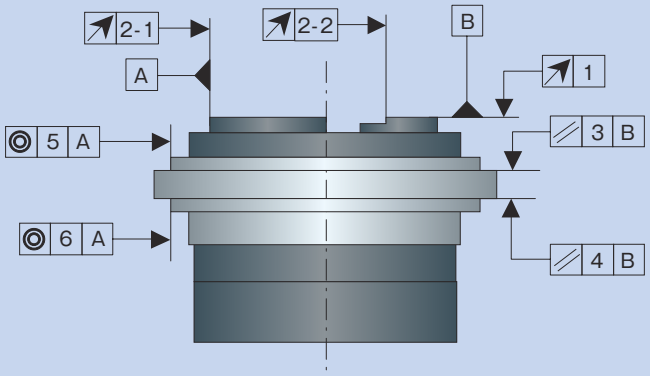


(Unit: mm)

Accuracy Item	SHA25Y	SHA32Y	SHA40Y	SHA58Y	SHA65Y
1. Output flange axial runout	0.035 (0.020)	0.040 (0.020)	0.045	0.050	0.050
2. Output flange radial runout	0.035	0.040	0.045	0.050	0.050
3. Parallelism between output flange and mounting surface	0.035	0.040	0.045	0.050	0.050
4. Parallelism between output flange and mounting surface	0.050	0.055	0.060	0.070	0.070
5. Concentricity between the output flange and pilot	0.035	0.040	0.045	0.050	0.050
6. Concentricity between the output flange and pilot	0.060	0.065	0.070	0.080	0.080

Note) Values in parentheses () show those of HP type.

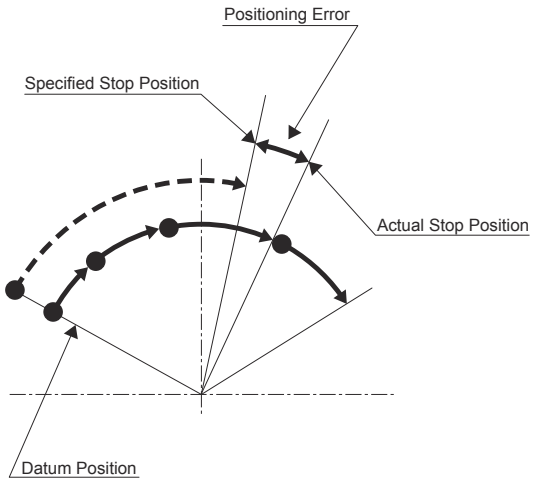
SHA-CG type



(Unit: mm)

Accuracy Item	SHA25Y	SHA32Y	SHA40Y
1. Output flange axial runout	0.010	0.010	0.010
2-1. Output flange radial runout (External pilot)	0.010	0.010	0.010
2-2. Output flange axial runout (Internal pilot)	0.015	0.015	0.015
3. Parallelism between output flange and mounting surface	0.030	0.035	0.035
4. Parallelism between output flange and mounting surface	0.040	0.045	0.045
5. Concentricity between the output flange and pilot	0.050	0.055	0.060
6. Concentricity between the output flange and pilot	0.060	0.065	0.070

One-way Positioning Accuracy



"One-way Positioning Accuracy" refers to the maximum value in one revolution of the values that are calculated from the difference between datum position and the actually revolved angle at each of the positioning points made in a rotational direction. (JIS B-6201-1987)

Impact to the positioning error at a motor shaft is 1 n(gear-ratio)th times (1/gear-ratio time) because the SHA-Y series engaged reducer for precision control HarmonicDrive® inside.

SHA-SG/HP Type

(Unit: arc-sec)

Type / Reduction ratio	SHA25Y	SHA32Y	SHA40Y	SHA58Y	SHA65Y
1:11 (HP)	120	120	-	-	-
1:51	50	50	50	-	-
1:81 or more	40	40	40	40	40

SHA-CG Type

(Unit: arc-sec)

Type / Reduction ratio	SHA25Y	SHA32Y	SHA40Y
1:50	50	40	40
1:80 or more	40	30	30

SHA-SG/HP Type Specification

Item \ Type			SHA25Y						SHA32Y					
			11	51	81	101	121	161	11	51	81	101	121	161
Combination SERVOPACK			SGD7S-3R8A20A * * * F81*3						SGD7S-120A20A * * * F81*3					
Maximum Torque*1		Nm	26	127	178	204	217	229	62	281	395	433	459	484
Continuous Torque*1*2		Nm	9.0	41	67	81	81	81	20	92	153	178	178	178
Maximum Speed*1		r/min	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*1*2		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
Reduction ratio			1:11	1:51	1:81	1:101	1:121	1:161	1:11	1:51	1:81	1:101	1:121	1:161
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 Type			Magnetic Type Absolute Encoder						Magnetic Type 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					

Item \ Type			SHA40Y					SHA58Y				SHA65Y			
			51	81	101	121	161	81	101	121	161	81	101	121	161
Combination SERVOPACK			SGD7S-180A20A * * * F81*3					SGD7S-330A20A * * * F81*3							
Maximum Torque*1		Nm	523	675	738	802	841	1924	2067	2236	2392	2743	2990	3263	3419
Continuous Torque*1*2		Nm	160	263	330	382	382	714	905	969	969	921	1149	1236	1236
Maximum Speed*1		r/min	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*1*2		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
Reduction ratio			1:51	1:81	1:101	1:121	1:161	1:81	1:101	1:121	1:161	1:81	1:101	1:121	1:161
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 Type			Magnetic Type Absolute Encoder					Magnetic Type 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 x1 8mm, Size 32: 400 x 400 x 20 mm, Size 58,65: 650 x 650 x 25 mm)

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

SHA-CG Type Specification

Item \ Type			SHA25Y					SHA32Y				
			50	80	100	120	160	50	80	100	120	160
Combination SERVOPACK			SGD7S-3R8A20A * * * F81*3					SGD7S-120A20A * * * 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		r/min	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
Reduction ratio			1:50	1:80	1:100	1:120	1:160	1:50	1:80	1:100	1:120	1:160
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
Repeatability		arc-sec	±5					±4				
Bi-directional Repeatability		arc-sec	60	25	25	25	25	60	25	25	25	25
Encoder Type			Magnetic Type Absolute Encoder					Magnetic Type 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 \ Type			SHA40Y				
			50	80	100	120	160
Combination SERVOPACK			SGD7S-180A20A * * * F81*3				
Maximum Torque*1		Nm	523	675	738	802	841
Continuous Torque*1*2		Nm	157	260	327	382	382
Maximum Speed*1		r/min	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
Reduction ratio			1:50	1:80	1:100	1:120	1:160
Max. Moment Load		Nm	849				
Moment Stiffness		Nm/rad	179×10^4				
One-way Positioning Accuracy		arc-sec	40	30	30	30	30
Repeatability		arc-sec	±4				
Bi-directional Repeatability		arc-sec	50	20	20	20	20
Encoder Type			Magnetic Type 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 x1 8mm, Size 32: 400 x 400 x 20 mm, Size 40: 500 x 500 x 25 mm)

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

SHA Series Option (Sold Separately)

Origin and end limit sensors (Symbol for option: L)

The revolution sensor is installed and directly connected to the output shaft on the opposite side of the actuator output. Use this sensor when the origin of mechanical operation is required (when there is a problem in using the virtual origin of the absolute encoder) or when the operation range is preferably defined for the safety measure.

Side exiting cable (Symbol for option: Y)

Cables (motor wire and encoder wire) are exited from the side of the actuator. Use this option when there is not enough space in the rear direction of the housing when installing an actuator in the device. (This cannot be applied to the SHA58Y and SHA65Y series.)

Mounting stand (Symbol for option: V, for CG type only)

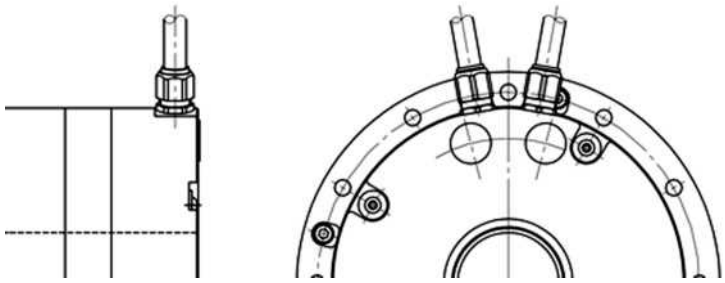
Output single turn absolute function (for the CG type only)

Single Turn Absolute Function of Output Shaft: A position within one rotation of the output shaft is output in the absolute value from the encoder.

Please order this option in the case of the application for the identical rotation, for example, the use in index motors.

Note this specification applies to the CG type only.

Side Exiting Cable



SHA-CG type with mounting stand

* Please contact our sales representative or distributor office for more information.

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