HarmonicDrive®

Flat, Hollow-Shaft AC Servo Actuator SHA Series

+

RTEX Realtime Express

EtherCAT®

Panasonic MINAS A6N/A6B/A6S

Panasonic

MINAS A6N compatible with RTEX (RealtimeExpress)
MINAS A6B compatible with EtherCAT
MINAS A6S compatible with Pulse/Analog/Modbus

Harmonic Drive and Panasonic Collaboration

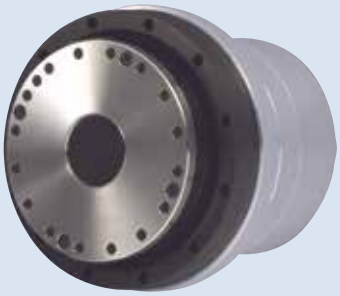
Flat hollow-shaft AC servo actuator SHA series is compatible with the latest servo amplifier MINAS A6 series from Panasonic. The SHA-P actuators connect directly with MINAS A6 series to communicate with RTEX, EtherCAT and general communication (serial, analog I/O, Modbus). SHA actuators from Harmonic Drive are available in two series; SG series features a compact shape and CG series features high output flange runout accuracy.

Contact: Harmonic Drive LLC for SHA AC Servo Actuator
Panasonic for MINAS A6

SHA-SG

SHA-SG featuring a compact shape

Compact



The SHA Servo Actuator combines precision Harmonic Drive® gearing with a fl at AC servo motor. It has a unique compact shape and Hollow Shaft actuator design. Seven sizes are available: 20, 25, 32, 40, 45, 58, and 65.

SHA-CG

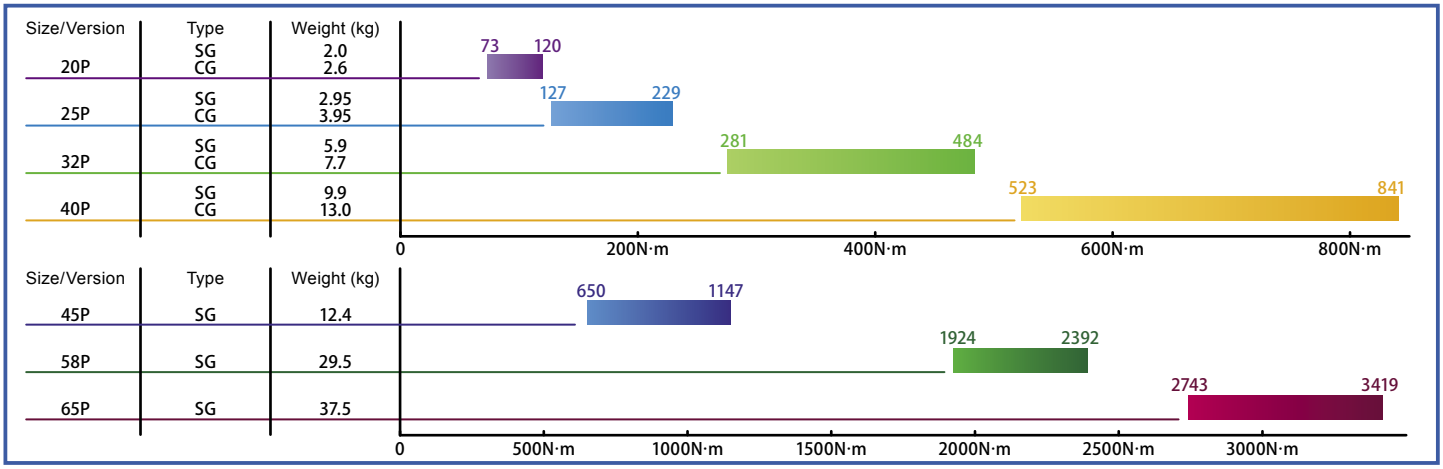
SHA-CG with improved output flange runout

High Accuracy

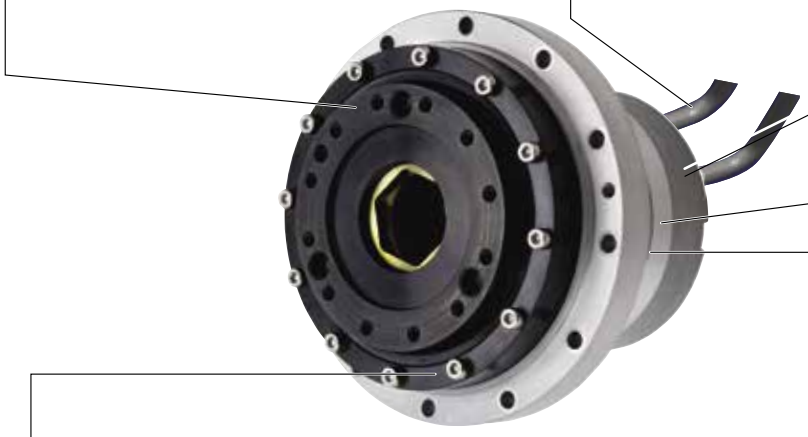
Even Ratios

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. Four sizes are available: 20, 25, 32, and 40.

Maximum Torque Map



Options



■ Gearhead

Standard	HarmonicDrive® SHG series (SG) HarmonicDrive® CSG series (CG)

■ Cable Orientation

Standard	Rear exit
Option	Side exit

■ Encoder

Standard	Absolute encoder (17-bit) Multi turn (16-bit) (Panasonic format)

■ Brake

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

■ AC Servo Motor

Standard:	200VAC

■ Output Bearing

Standard	Cross roller bearing

■ Option

Origin & End limit sensor
Mounting stand (CG only)

■ Environment Specification

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

Panasonic AC Servo Amplifier MINAS A6

The MINAS A6 series is the latest servo amplifier from Panasonic that is compatible with the various types of open networks including Panasonic's Realtime Express.

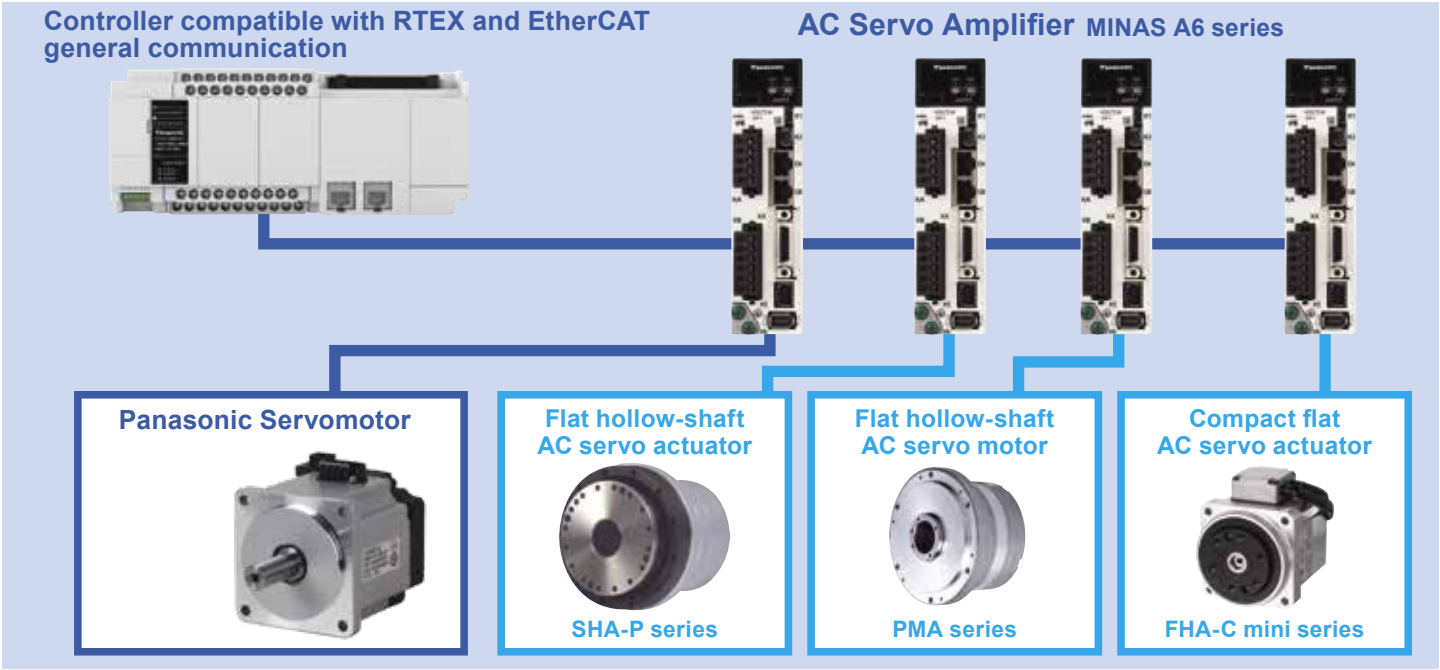
- **High-speed synchronous communication network (100 Mbps)**
  A6N series: RealtimeExpress (RTEX)
  A6B series: EtherCAT
- **General communication network (230 kbps)**
  A6S series: Pulse/Analog/Modbus

Combination of a Servo Amplifier with Extension Cable

SHA Model	Reduction Ratio		Servo Amplifier Model*1*2			Extension Cable Model Number *3	
	SG	CG	A6N series	A6B series	A6S series	Motor (from Harmonic Drive)	Encoder (from Panasonic)
SHA20P	51	50	MBDL■25N□	MBDL■25B□	MBDL■25S□	EWD-MB**-A06-TN-P	MFECA0**0EAE (Equipped with the battery box)
	81	80					
	101	100					
	121	120					
	161	160					
SHA25P	51	50	MCDL■35N□	MCDL■35B□	MCDL■35S□		
	81	80					
	101	100					
	121	120					
	161	160	MBDL■25N□	MBDL■25B□	MBDL■25S□		
SHA32P	51	50	MDDL■55N□	MDDL■55B□	MDDL■55S□		
	81	80					
	101	100					
	121	120	MDDL■45N□	MDDL■45B□	MDDL■45S□		
	161	160	MCDL■35N□	MCDL■35B□	MCDL■35S□		
SHA40P	51	50	MEDL■83N□	MEDL■83B□	MEDL■83S□		
	81	80	MDDL■55N□	MDDL■55B□	MDDL■55S□		
	101	100					
	121	120					
	161	160					
SHA45P	51		MEDL■83N□	MEDL■83B□	MEDL■83S□		
	81						
	101						
	121						
	161		MDDL■55N□	MDDL■55B□	MDDL■55S□		
SHA58P	81		MFDL■A3N□	MFDL■A3B□	MFDL■A3S□	EWD-MB**-D09-TMC-P	MFECA0**0ETE (Equipped with the battery box)
	101						
	121						
	161		MEDL■93N□	MEDL■93B□	MEDL■93S□		
SHA65P	81		MFDL■B3N□	MFDL■B3B□	MFDL■B3S□		
	101						
	121						
	161		MFDL■A3N□	MFDL■A3B□	MFDL■A3S□		

*1: ■ is replaced with the symbol that indicates whether to enable the safety function. T: Compatible with the safety function (Not available in the A6 SE, SG series) N: Without the safety function
*2: □ is replaced with the symbol that indicates the compatible communication. E: Position-control type (combination with the type not equipped with the safety function) F: Multi-function type (combination with the type equipped with the safety function) G: Modbus communication type (only for the A6S series) (combination with the type not equipped with the safety function)
*3: "**" in the model code indicates the cable length (03 = 3 m, 05 = 5 m, 10 = 10 m, 20 = 20 m).
*4: For the servo amplifier and encoder extension cable, contact Panasonic Corporation.

System Image



Ordering Code

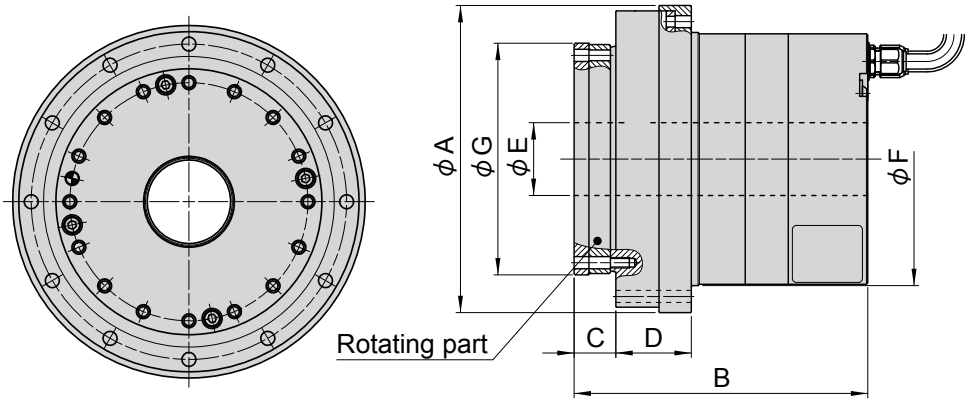
SHA	32	P	101	SG	-	B	12	A	200	-	14	S17b	B	-	C	□	-	A6	-	SP
(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)		(10)	(11)	(12)		(13)	(14)		(15)		(16)

(1)	Model Name		SHA series AC Servo Actuator
(2)	Size	SG	20, 25, 32, 40, 45, 58, 65
		CG	20, 25, 32, 40
(3)	Design Version		P: Panasonic Compatible
(4)	Reduction Ratio	SG	51:1 81:1 101:1 121:1 161:1
		CG	50:1 80:1 100:1 120:1 160:1
(5)	Gearhead	SG	SHG Series
		CG	CSG Series
(6)	Motor Version		A: Sizes 58, 65 B: Sizes 25, 32, 40 C: Size 20 D: Size 45

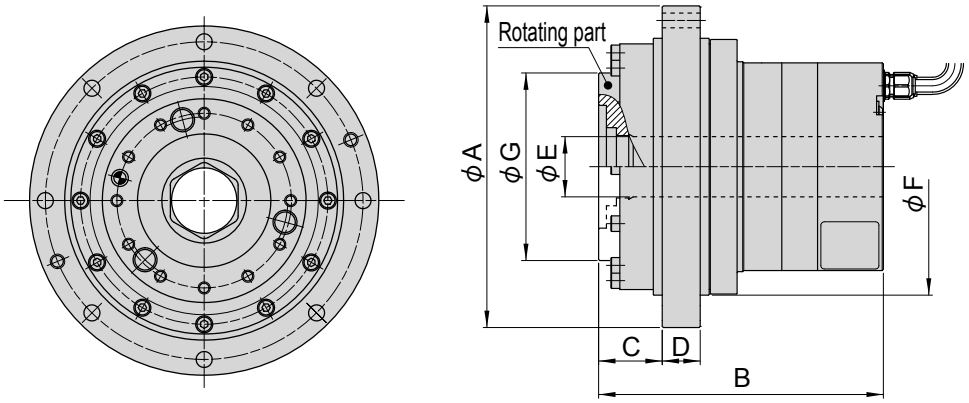
(7)	Motor Size	09: Size 25 12: Size 32 15: Size 40 16: Sizes 4, 5 21: Sizes 58, 65
(8)	Brake	A: Without a brake B: With a brake
(9)	Motor Power Supply Voltage	200: 200 V
(10)	Encoder Format	14: Panasonic's format
(11)	Encoder/Resolution	S17b: 17-bit absolute encoder 131072 pulse/revolution
(12)	Encoder Offset Angle	Phase difference between the motor U phase and the encoder origin A: 30 degrees
(13)	Connector Specification	C: With standard connectors N: Without a connector
(14)	Option Symbols	L: Near-origin detection and end-limit sensor Y: Side exiting cable V: With a stand (for CG only)
(15)	Panasonic Amplifier	A6: MINAS A6 series
(16)	Special Specifications	No symbol: Standard product SP: Special-specification product code

Outline Dimensions

SHA-SG



SHA-CG



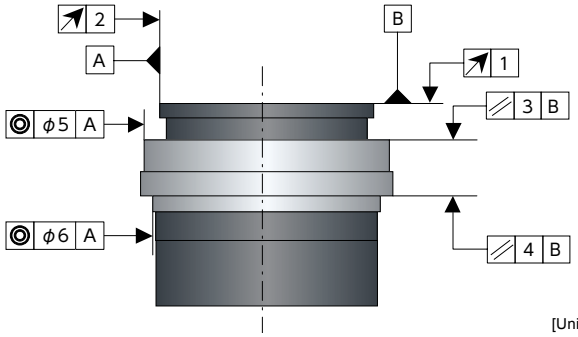
[Unit: mm]

Series / Symbol	SHA20P		SHA25P		SHA32P		SHA40P		SHA45P	SHA58P	SHA65P
	SG	CG	SG	CG	SG	CG	SG	CG	SG	SG	SG
φA	94	117	114	144	146	175	175	225	195	247	284
B	108.5	125.5	109	127.5	125	144	148	170	153.5	213	222
C	12.5	26	15.5	28.5	20	34	26	40	28	37	42.5
D	27	14	28	17	34.5	20	42	22	45.5	74	77.5
φE (hollow diameter)	17	17	27	27	35	35	45	45	45	65	65
φF	77 h7	95 h7	94 h7	115 h7	122 h7	148 h7	145 h7	180 h7	164 h7	210 h7	236 h7
φG	54 h7	69 h7	86 h7	84 h7	114 h7	110 h7	140 h7	132 h7	160 h7	203 h7	223 h7

Mechanical Accuracy

The SHA-P series actuator output shaft and mechanical accuracy of the mounting flange are shown below.

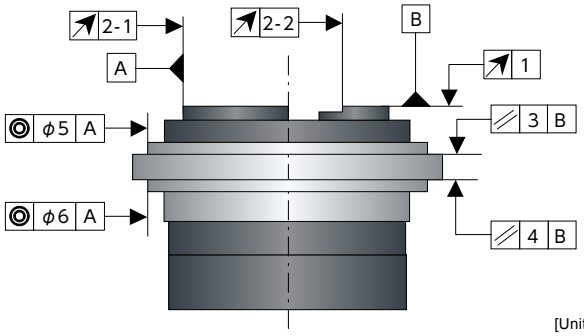
SHA-SG



[Unit: mm]

Accuracy Item	SHA20P	SHA25P	SHA32P	SHA40P	SHA45P	SHA58P	SHA65P
1. Output shaft axial runout	0.030	0.035	0.040	0.045	0.045	0.050	0.050
2. Output shaft radial runout	0.030	0.035	0.040	0.045	0.045	0.050	0.050
3. Parallelism between output shaft and mounting surface	0.030	0.035	0.040	0.045	0.045	0.050	0.050
4. Parallelism between output shaft and mounting surface	0.055	0.050	0.055	0.060	0.060	0.070	0.070
5. Concentricity between output shaft and pilot	0.030	0.035	0.040	0.045	0.045	0.050	0.050
6. Concentricity between output shaft and pilot	0.045	0.060	0.065	0.070	0.070	0.080	0.080

SHA-CG

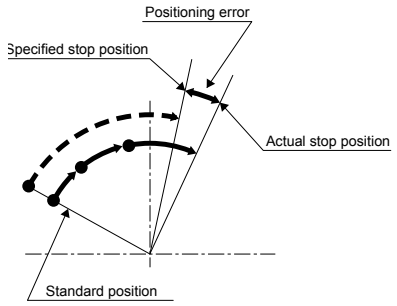


[Unit: mm]

Accuracy Item	SHA20P	SHA25P	SHA32P	SHA40P
1. Output shaft axial runout	0.010	0.010	0.010	0.010
2-1. Output shaft radial runout (external pilot)	0.010	0.010	0.010	0.010
2-2. Output shaft radial runout (internal pilot)	0.015	0.015	0.015	0.015
3. Parallelism between output shaft and mounting surface	0.030	0.030	0.035	0.035
4. Parallelism between output shaft and mounting surface	0.040	0.040	0.045	0.045
5. Concentricity between output shaft and pilot	0.050	0.050	0.055	0.060
6. Concentricity between output shaft and pilot	0.060	0.060	0.065	0.070

Positioning Accuracy

One-Way Positioning Accuracy



The one-way positional accuracy means the maximum positional difference between the actual rotated angle from the datum position and its theoretical rotational angle in one revolution when series of positioning are performed in the same rotation direction. (Refer to JIS B-6201-1987.)
The SHA-P series incorporates a HarmonicDrive® speed reducer or an HPF hollow shaft planetary gear which inherently has high rotational position accuracy. Because of the gearing's high ratio, any rotational error at the input (i.e. motor shaft position error or motor feedback error) is reduced by a factor of the ratio (1/ratio) and typically becomes negligible at the output. Therefore, most of the error is represented by the transmission error of the gear itself.

SHA-SG

[Unit: arc-sec]

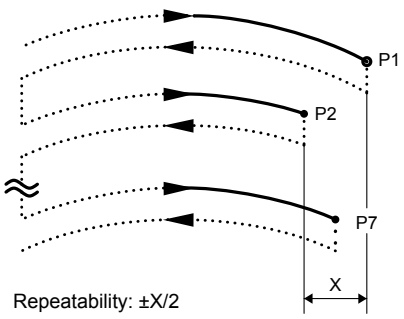
Ratio \ Model	SHA 20P	SHA 25P	SHA 32P	SHA 40P	SHA 45P	SHA 58P	SHA 65P
51:1	60	50	50	50	50	—	—
81:1 or more	50	40	40	40	40	40	40

SHA-CG

[Unit: arc-sec]

Ratio \ Model	SHA20P	SHA25P	SHA32P	SHA40P
50:1	60	50	40	40
80:1 or more	50	40	30	30

Repeatability (CG)



Repeatability: ±X/2

* P1 to P7: Stop position
X: Maximum error

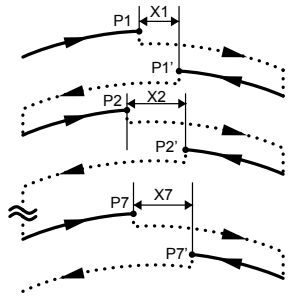
The repeatability is measured by moving to a given theoretical position seven times, each time approaching from the same direction. The actual position of the output shaft is measured each time and repeatability is calculated as the 1/2 of the maximum difference of the seven data points. Measured values are indicated in angles (arc-sec) prefixed with "±". (Refer to JIS B 6201-1987.)

SHA-CG

[Unit: arc-sec]

Ratio \ Model	SHA20P	SHA25P	SHA32P	SHA40P
All gear ratio	±5	±5	±4	±4

Bi-Directional Repeatability (CG)



Bi-directional Repeatability:
- X1 + X2 + ...+ X7 - /7

* P1 to P7: Stop position after forward rotation
P1' to P7': Stop position after

For the "bi-directional repeatability", the shaft is rotated beforehand in the forward (or reverse) direction and the stop position for that rotation is set as the reference position. An instruction is given to rotate the shaft in the same direction and from the stopped position, the same instruction is given in the reverse (or forward) direction and the difference between the stop position after this rotation and the reference position is measured. The average value from repeating this 7 times in each direction is shown and the maximum value measured at the 4 locations on the output shaft is shown. (JIS B 6201-1987)

SHA-CG

[Unit: arc-sec]

Ratio \ Model	SHA20P	SHA25P	SHA32P	SHA40P
50:1	75	60	60	50
80:1 or more	30	25	25	20

Specifications

SHA-SG

Item \ Model		SHA20P					SHA25P					SHA32P				
		51	81	101	121	161	51	81	101	121	161	51	81	101	121	161
Input power supply voltage	V	AC200					AC200					AC200				
Maximum torque*1	N·m	73	96	107	113	120	127	178	204	217	229	281	395	433	459	484
Limit for continuous torque*1*2	N·m	21	35	43	48	48	41	67	81	81	81	92	153	178	178	178
Maximum speed*1	rpm	117.6	74.1	59.4	49.6	37.3	109.8	69.1	55.4	46.3	34.8	94.1	59.3	47.5	39.7	29.8
Maximum current*1	A	6.0	4.9	4.5	4.0	3.4	8.6	7.5	7.0	6.3	5.2	17.3	15.2	13.5	12.2	9.9
Limit for moment load	N·m	187					258					580				
One-way positioning accuracy	arc-sec	60	50	50	50	50	50	40	40	40	40	50	40	40	40	40
Output shaft resolution	Counts/ Revolution	6684672	10616832	13238272	15859712	21102592	6684672	10616832	13238272	15859712	21102592	6684672	10616832	13238272	15859712	21102592
Mass (without brake)	kg	2.0					2.95					5.9				
Mass (with brake)	kg	2.1					3.1					6.2				

Item \ Model		SHA40P					SHA45P				
		51	81	101	121	161	51	81	101	121	161
Input power supply voltage	V	AC200					AC200				
Maximum torque*1	N·m	523	675	738	802	841	650	918	982	1070	1147
Limit for continuous torque*1*2	N·m	160	263	330	382	382	174	290	363	437	523
Maximum speed*1	rpm	78.4	49.4	39.6	33.1	24.8	74.5	46.9	37.6	31.4	23.6
Maximum current*1	A	26.7	21.8	19.4	17.9	14.6	36.5	29.9	25.9	24.5	19.3
Limit for moment load	N·m	849					1127				
One-way positioning accuracy	arc-sec	50	40	40	40	40	50	40	40	40	40
Output shaft resolution	Counts/ Revolution	6684672	10616832	13238272	15859712	21102592	6684672	10616832	13238272	15859712	21102592
Mass (without brake)	kg	9.9					12.4				
Mass (with brake)	kg	10.7					13.2				

Item \ Model		SHA58P				SHA65P			
		81	101	121	161	81	101	121	161
Input power supply voltage	V	AC200				AC200			
Maximum torque*1	N·m	1924	2067	2236	2392	2743	2990	3263	3419
Limit for continuous torque*1*2	N·m	714	905	969	969	921	1149	1236	1236
Maximum speed*1	rpm	37.0	29.7	24.8	18.6	34.6	27.7	23.1	17.4
Maximum current*1	A	45	39	36	30	62	55	51	41
Limit for moment load	N·m	2180				2740			
One-way positioning accuracy	arc-sec	40	40	40	40	40	40	40	40
Output shaft resolution	Counts/ Revolution	10616832	13238272	15859712	21102592	10616832	13238272	15859712	21102592
Mass (without brake)	kg	29.5				37.5			
Mass (with brake)	kg	32				40			

The values in the table above show typical values for the output shaft.
*1: They are typical characteristics in the case of combinations with the standard amplifier (driven with the ideal sine wave).
*2: They are the values produced at the saturation temperature when mounted on the aluminum heat sink.
SHA20P: 320 x 320 x 16 [mm] SHA25P: 350 x 350 x 18 [mm] SHA32P: 400 x 400 x 20 [mm]
SHA40P/45P: 500 x 500 x 25 [mm] SHA58P/65P: 650 x 650 x 30 [mm]

Specifications

SHA-CG

Item \ Model		SHA20P					SHA25P				
		50	80	100	120	160	50	80	100	120	160
Input power supply voltage	V	AC200					AC200				
Maximum torque*1	N·m	73	96	107	113	120	127	178	204	217	229
Limit for continuous torque*1*2	N·m	21	35	43	48	48	40	66	81	81	81
Maximum speed*1	rpm	120	75	60	50	37.5	112	70	56	46.7	35
Maximum current *1	A	6.1	5.0	4.6	4.1	3.4	8.7	7.6	7.0	6.3	5.2
Limit for moment load	N·m	187					258				
One-way positioning accuracy	arc-sec	60	50	50	50	50	50	40	40	40	40
Repeatability	arc-sec	±5					±5				
Bi-directional repeatability	arc-sec	75	30	30	30	30	60	25	25	25	25
Output shaft resolution	Counts/ Revolution	6553600	10485760	13107200	15728640	20971520	6553600	10485760	13107200	15728640	20971520
Mass (without brake)	kg	2.6					3.95				
Mass (with brake)	kg	2.7					4.1				

Item \ Model		SHA32P					SHA40P				
		50	80	100	120	160	50	80	100	120	160
Input power supply voltage	V	AC200					AC200				
Maximum torque*1	N·m	281	395	433	459	484	523	675	738	802	841
Limit for continuous torque*1*2	N·m	90	151	178	178	178	157	260	327	382	382
Maximum speed*1	rpm	96	60	48	40	30	80	50	40	33.3	25
Maximum current *1	A	17.7	15.4	13.7	12.2	10.0	27.2	22.0	19.6	18.0	14.7
Limit for moment load	N·m	580					849				
One-way positioning accuracy	arc-sec	40	30	30	30	30	40	30	30	30	30
Repeatability	arc-sec	±4					±4				
Bi-directional repeatability	arc-sec	60	25	25	25	25	50	20	20	20	20
Output shaft resolution	Counts/ Revolution	6553600	10485760	13107200	15728640	20971520	6553600	10485760	13107200	15728640	20971520
Mass (without brake)	kg	7.7					13.0				
Mass (with brake)	kg	8.0					13.8				

The values in the table above show typical values for the output shaft.
*1: They are typical characteristics in the case of combinations with the standard amplifier (driven with the ideal sine wave).
*2: They are the values produced at the saturation temperature when mounted on the aluminum heatsink.
SHA20P: 320 x 320 x 16 [mm] SHA25P: 350 x 350 x 18 [mm] SHA32P: 400 x 400 x 20 [mm]
SHA40P: 500 x 500 x 25 [mm]

SHA Series Options

With origin and end limit sensors (Symbol for option: L)

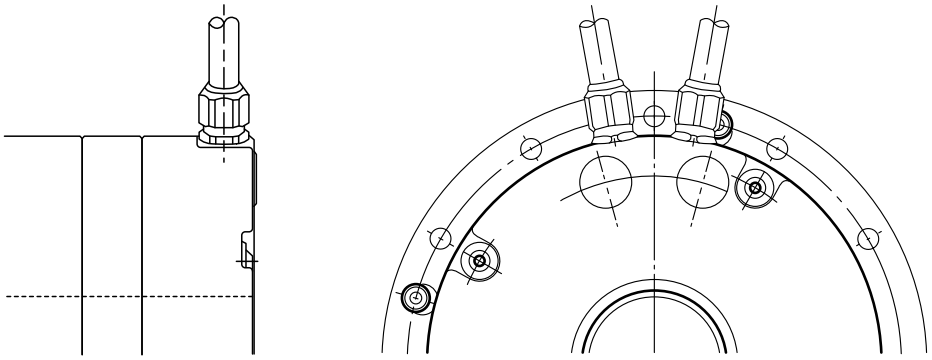
With origin and end limit sensors (Symbol for option: L) The sensor is directly connected to the output shaft and located on the opposite side of the actuator output. This sensor is used when the origin of mechanical operation is desired. It can be used for simplicity, safety redundancy, or when battery dependency is not desired. (Not available with SHA20P.)

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 housing when installing an actuator in the device. (Not available with SHA20P-SG, SHA58P, and SHA65P.)

With a stand (Symbol for option: V) (only for CG)

Side Exiting Cable



SHA-CG with mounting stand

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