SPG MOTOR

Planetary Gearheads

www.spg.co.kr

Precision Planetary Gear Heads – Helical Series

Designed by SPG, development of Helical series precision planetary gear heads is a result of our experience over three decades in manufacturing a variety of gear heads for demanding and critical application.

Applicable to various Servo Motors

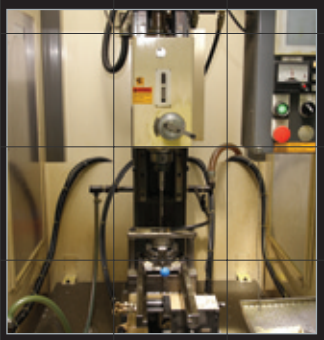
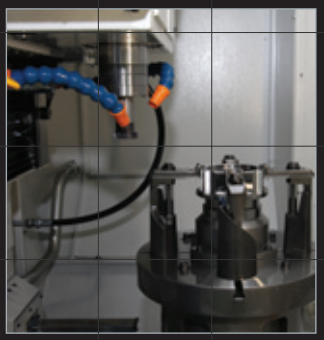
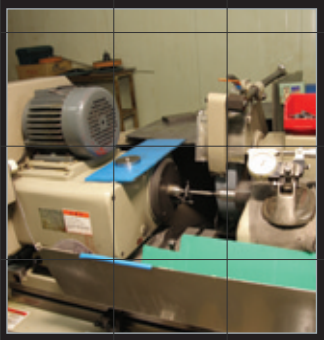
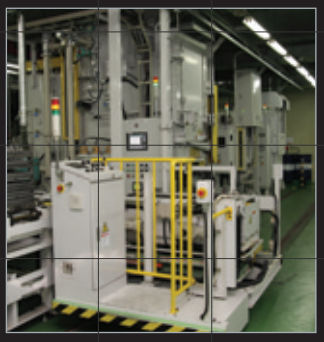
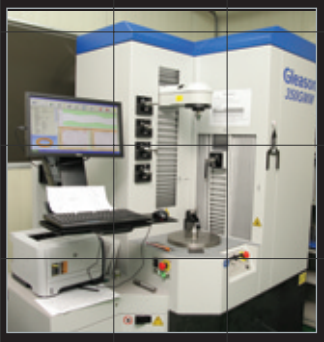
- Higen motors
- LS Mecapion
- Komotek Co., Ltd.
- Mitsubishi Electric Corporation
- Panasonic Corporation
- Nikki Denso Co., Ltd.
- Toshiba Machine Co., Ltd.
- Yaskawa Electric Corporation
- FANUC Corporation
- Omron Corporation
- Sanmei Co., Inc.
- Tamagawa Seiki Co., Ltd.
- Fuji Electric Co., Ltd.
- Sanyo Denki Co., Ltd.
- Nidec Sankyo Corporation
- Allen Bradley
- Parker
- Siemens
- B&R Automation
- Bosch Rexroth
- Oriental Vexta
- Schneider

Quality First & Customer's Satisfaction

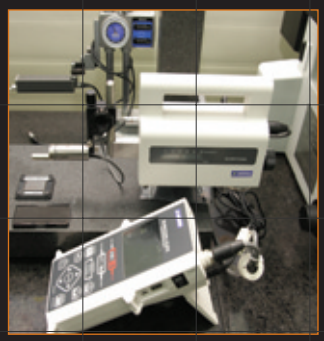
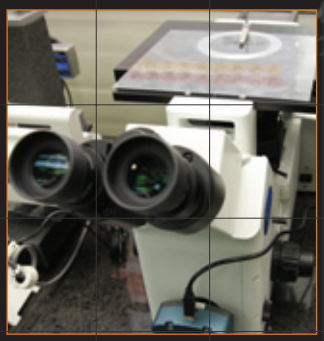
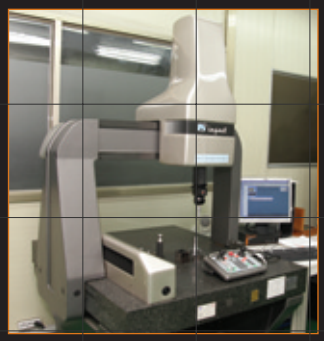
High Precision Performance & Reliability

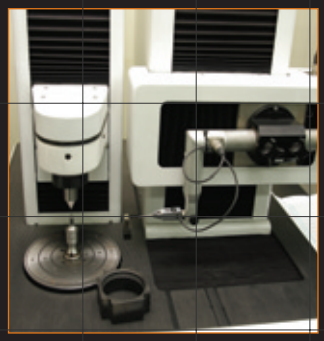
Manufacturing with full range of Automatic processing equipments and Comprehensive quality control equipments.

Processing

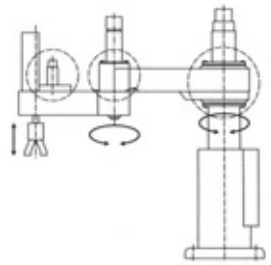
Quality Control

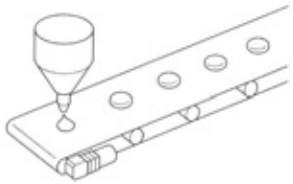



Applications

Scara Robot

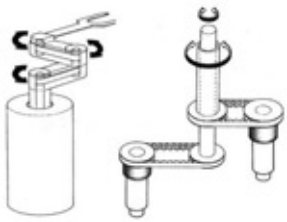


Belt Conveyor

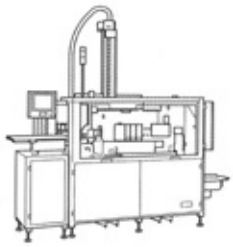


Printing Machine

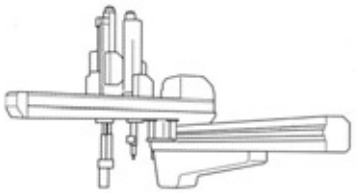
Wafer Transfer Robot



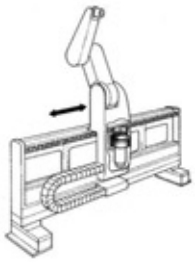
Automated Packing Machine



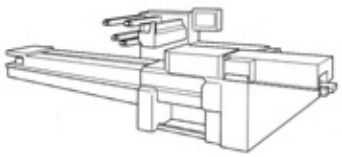
Gantry Robot



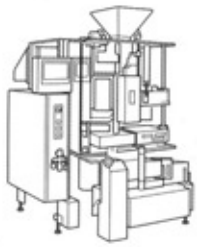
Robot(Rack&Pinion)



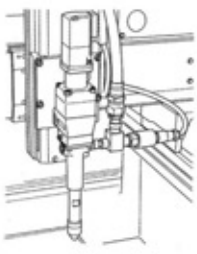
Fill Seal Machine(Horizontal Type)



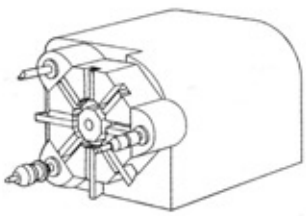
Fill Seal Machine(Vertical Type)



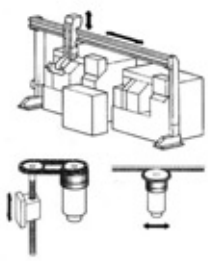
Dispenser Robot



Turret-Head



Loader Robot



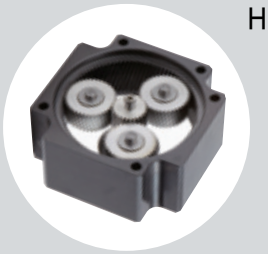
- Parts Transfer Robot Systems
- Robot peripherals
- FA units
- Liquid glass return robots
- Semiconductor manufacturing devices
- Machine tools
- Loader drive shafts

- Printing Machinery
- Woodworking machinery
- Laser processing machinery
- Medical devices(CT)
- Monitoring & security cameras
- Bending Machinery
- Testing devices

- Measuring devices
- Pallet stackers
- Conveyors
- Extrusion machinery, blow-down devices etc. blow-down device etc.

The precision planetary gear head series meet most of specifications which servo applications require.

High torque & low backlash

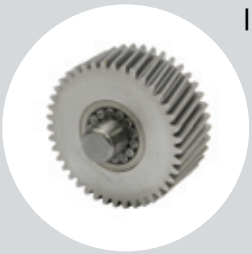


- Helical gear type planetary gearing
- Improvement of wear resistance by gear heat treatment

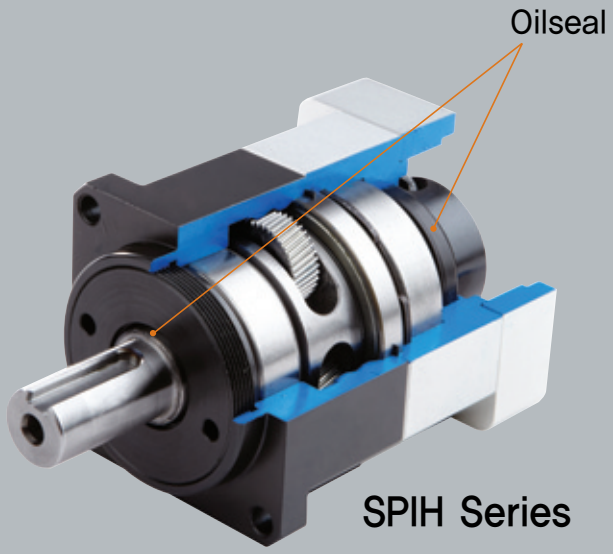
Sealed units

- Viton oilseals provided IP65 protection to prevent leaks and protect against harsh environments.

Increased service life



- Full complement needle planet bearings. (Solid uncaged needle roller bearings)



High stiffness & Higher radial load capacity

- One piece integral ring gear, rigid sun gear and planet carrier output shaft design.

Precision Spiral bevel gears

Dynamic balanced clamp ring mechanism

- Error-free installation and the balanced clamping system allows higher input speeds and no backlash for power transmission.

Universal mounting motor flange

- Quicker deliveries and easier mounting to any servomotor.

Group		Figure	Series Name	Frame Size	* Ratio (i)	Page
Helical Gear Type	In-Line		SPIH	□42 ~ □220	1/3 ~ 1/10	08
					1/15 ~ 1/100	09
			SPIH-D	□60 ~ □220	1/15 ~ 1/100	09
			SPIFH	□42 ~ □220	1/4 ~ 1/10	12
					1/16 ~ 1/100	13
			SPIFH-D	□60 ~ □220	1/16 ~ 1/100	13
	Right Angle		SPLH	□42 ~ □220	1/3 ~ 1/20 (1/3 ~ 1/10)	16
					1/25 ~ 1/100 (1/15 ~ 1/100)	17
			SPLH-D	□60 ~ □220	1/25 ~ 1/100	17
			SPLFH	□42 ~ □220	1/4 ~ 1/20 (1/4 ~ 1/10)	20
					1/25 ~ 1/100 (1/20 ~ 1/100)	21
			SPLFH-D	□60 ~ □220	1/25 ~ 1/100	21

* Ratios in parenthesis are based on □42 model

Group		Figure	Series Name	Frame Size	* Ratio (i)	Page
Spur Gear Type	In-Line		SPI	□42 ~ □115	1/3 ~ 1/10	24
					1/15 ~ 1/100	25
			SPI-D	□60 ~ □115	1/15 ~ 1/100	25
	Right Angle		SPL	□42 ~ □115	1/3 ~ 1/20 (1/3 ~ 1/10)	28
					1/25 ~ 1/100 (1/15 ~ 1/100)	29
			SPL-D	□60 ~ □115	1/25 ~ 1/100	29

* Ratios in parenthesis are based on □42 model

HIGH PRECISION PLANETARY GEARHEADS FOR SERVO MOTORS SPIH Series

- ▶ Helical Gear
- ▶ Compact size
- ▶ High Precision, High Durability
- ▶ High Efficiency
- ▶ Easy Mount
- ▶ Protection grade IP65

■ Specifications

Description	Unit	Stage	Ratio (1)	Model No.												
				SPIH 042	SPIH 060	SPIH 060D	SPIH 090	SPIH 090D	SPIH 115	SPIH 115D	SPIH 142	SPIH 142D	SPIH 180	SPIH 180D	SPIH 220	SPIH 220D
Nominal Output torque T_{2N} (2)	Nm	1	3	16	48	–	117	–	195	–	480	–	750	–	1,600	–
			4	16	36	–	107	–	215	–	635	–	950	–	1,600	–
			5	19	43	–	120	–	250	–	580	–	1,200	–	2,080	–
			6	15	43	–	107	–	215	–	530	–	1,100	–	1,630	–
			7	15	40	–	100	–	213	–	495	–	980	–	1,960	–
			8	10	43	–	106	–	220	–	420	–	870	–	1,700	–
			9	14	35	–	93	–	160	–	390	–	710	–	1,560	–
			10	11	30	–	94	–	215	–	370	–	790	–	1,395	–
		2	15	16	48	48	117	117	195	195	–	480	–	750	–	1,600
			20	16	36	36	107	107	215	215	–	635	–	950	–	1,600
			25	19	43	43	120	120	250	250	–	580	–	1,200	–	2,080
			30	19	43	43	120	120	250	250	–	580	–	1,200	–	2,080
			35	19	43	43	120	120	250	250	–	580	–	1,200	–	2,080
			40	19	43	43	120	120	250	250	–	580	–	1,200	–	2,080
			45	19	43	43	120	120	250	250	–	580	–	1,200	–	2,080
			50	19	43	43	120	120	250	250	–	580	–	1,200	–	2,080
			60	15	43	43	107	107	215	215	–	530	–	1,100	–	1,630
			70	15	40	40	100	100	213	213	–	495	–	980	–	1,960
			80	10	43	43	106	106	220	220	–	420	–	870	–	1,700
			90	14	35	35	93	93	160	160	–	390	–	710	–	1,560
			100	11	30	30	94	94	215	215	–	370	–	790	–	1,395
Max Acceleration torque T_{2B}	Nm	1,2	3~100	3 times of Nominal Output torque												
Nominal Input speed n_1	rpm	1,2	3~100	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Max. Input speed N_1	rpm	1,2	3~100	6,000	6,000	6,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Backlash (Standard class)	arcmin	1	3~10	≤ 5	≤ 5	–	≤ 5	–	≤ 5	–	≤5	–	≤5	–	≤5	–
		2	15~100	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	–	≤7	–	≤7	–	≤7
Backlash (Precision Class)	arcmin	1	3~10	≤ 3	≤ 3	–	≤ 3	–	≤ 3	–	≤ 3	–	≤ 3	–	≤3	–
		2	15~100	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	–	≤ 5	–	≤ 5	–	≤5
Torsional Rigidity	Nm/arcmin	1,2	3~100	2	3	3	12	12	23	23	38	38	110	110	210	210
Max. Radial load Fr max (2)	N	1,2	3~100	400	1,100	1,100	2,400	2,400	4,000	4,000	8,000	8,000	13,000	13,000	18,600	18,600
Max. Axial load Fa max (2)	N	1,2	3~100	300	600	600	1,800	1,800	2,500	2,500	3,000	3,000	6,000	6,000	11,300	11,300
Service life (2)	hr	1,2	3~100	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Noise level (3)	dB(A)	1,2	3~100	≤ 56	≤ 58	≤ 58	≤ 60	≤ 60	≤ 63	≤ 63	≤ 65	≤ 65	≤ 67	≤ 67	≤ 70	≤ 70
Weight	kg	1	3~10	0.5	1.2	–	3.2	–	7.2	–	16	–	30	–	50.5	–
		2	15~100	0.7	1.7	1.3	4.7	3.6	11.0	8.4	–	18.5	–	35	–	62.5
Mass Moments of Inertia (4)	kg ㎠	1	3~10	0.04	0.15	–	0.8	–	2.8	–	11.9	–	23.5	–	54	–
		2	15~100	0.03	0.07	0.07	0.5	0.5	1.5	1.5	–	5.1	–	8.03	–	23.5
Operating Temp. (5)	℃	1,2	3~100	–10 ~ +90												
Lubrication	–	1,2	3~100	High temperature & Extreme pressure Lubricant												
Mounting position	–	1,2	3~100	All directions												
Efficiency η	%	1	3~10	≥ 97												
		2	15~100	≥ 94												
Degree of protection	–	1,2	3~100	IP 65												

(1) Ratio = N_{in} / N_{out} (2) Values were measured at the following conditions : 100 rpm at the output. Load applied to the middle of the output shaft. Load coefficient(Ka) = 1. Continuous operation(S1≒10,000hrs). (3) Noise level : A measurement 1m away from the gear head, 3000 input rpm and at no load condition. (Background noise 21dB(A)) (4) Moment of inertia : A measurement at the input shaft and representatives from each ratio.(i=1/5)
(5) Operating temperature : Surface temperature of gear case in –10˚C~40˚C of ambient temperature.
※ Specifications are subject to change without notice to improve product performances.

■ Coding System

SPI	H	060	(1)	P	020	S[K]	A(2)	A01

Series Name

SPI	I Type

Gear Type

H	Helical

Frame Size

042	□42
060	□60
090	□90
115	□115
142	□142
180	□180
220	□220

Input Frame Size

No symbol	Standard
D	Down Size

Backlash

P	Precision Class	1 Stage : ≤3 arcmin 2 Stage : ≤5 arcmin
S	Standard Class	1 Stage : ≤5 arcmin 2 Stage : ≤7 arcmin

Gear Ratio(i)

1 Stage		2 Stage	
003	1/3	015	1/15
004	1/4	020	1/20
005	1/5	025	1/25
006	1/6	030	1/30
007	1/7	035	1/35
008	1/8	040	1/40
009	1/9	045	1/45
010	1/10	050	1/50
–	–	060	1/60
–	–	070	1/70
–	–	080	1/80
–	–	090	1/90
–	–	100	1/100

Input Adapter Flange (Servo Motors)

A	Mitsubishi, Yaskawa Tamagawa, HIGEN, LS order
B	Panasonic order
C	Rockwell order

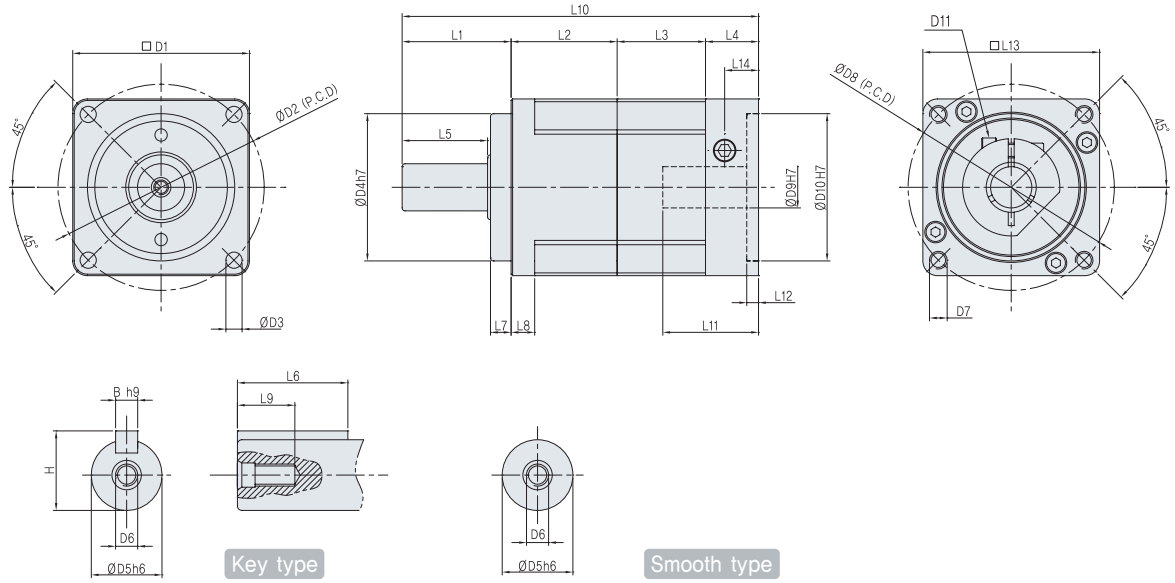
Output Shaft Option

S	Smooth Output Shaft
K	Output Shaft with Key

Customer code

(1) The input flame of down size depends on customer's request.
(2) It is important to verify mounting dimensions of a servo motor along with dimensions of gear head prior to placing purchase order.

■ Dimensions (1 Stage, Ratio(i) = 1/3 ~ 1/10)

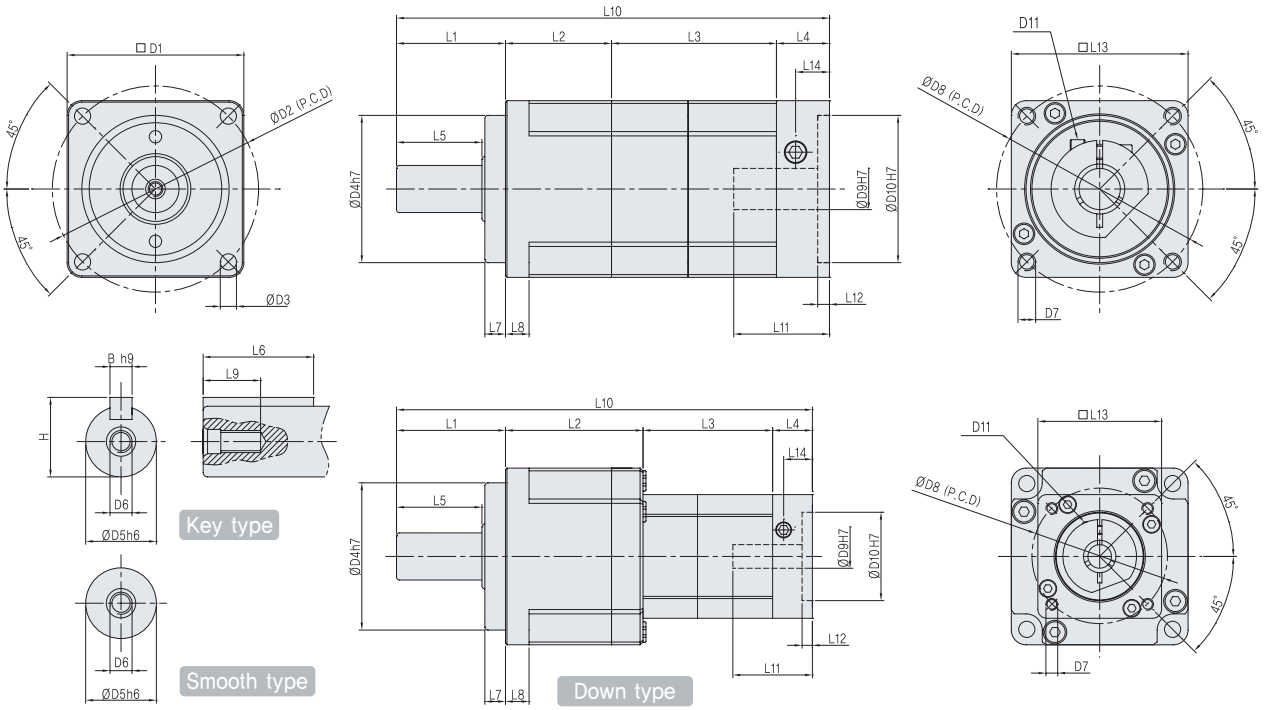


(Unit : mm)

Dimension \ Model		SPIH 042	SPIH 060	SPIH 090	SPIH 115	SPIH 142	SPIH 180	SPIH 220
D1		42	60	90	115	142	180	220
D2		50	70	100	130	165	215	250
D3		3.4	5.5	6.5	9	11	13	17
D4 h7		35	50	80	110	130	160	180
D5 h6		13	16	22	32	40	55	75
D6		M4xP0.7	M5xP0.8	M8xP1.25	M12xP1.75	M16xP2.0	M20xP2.5	M20xP2.5
D7	A	M4 DP8	M5 DP12	M6 DP12	M8 DP20	M12 DP21	M12 DP21	M12 DP21
	B	M3 DP6	M4 DP12	M5 DP12	–	–	–	–
	C	M4 DP8	M5 DP12	M6 DP12	–	–	–	–
D8	A	46	70	90	145	200	200	235
	B	45	70	90	–	–	–	–
	C	46	70	90	–	–	–	–
D9 H7		≤8	≤14	≤19	≤32	≤38	≤48	≤55
D10 H7		30	50	70	110	114.3	114.3	200
D11		M3	M5	M5	M8	M8	M10	M12
L1		24.5	37	46	65	97	105	138
L2		28.5	36	49	59	103	119	136
L3		25.5	30	34	40	29.5	50.5	57
L4	A, B	13.5	18	18	42	42.5	57	30.5
	C	17	22.5	23	–	–	–	–
L5		19.5	29	36.5	51	80	83	105
L6		16	25	32	45	68	76	97
L7		4	7	8	12	15	20	30
L8		7	8	10	14	12	15	20
L9		13	13	19	28	36	42	42
L10	A, B	92	121	147	206	272	331.5	361.5
	C	95.5	125.5	152	–	–	–	–
L11	A, B	27	32.5	42.5	67	84.1	109	88.5
	C	30.5	37	47.5	–	–	–	–
L12		3.5	4	4	7	7	7	6
L13		42	60	90	130	180	180	220
L14	A, B	8.3	11.5	11.5	27.5	33.6	47	20
	C	11.8	16	16.5	–	–	–	–
B h9		5	5	6	10	12	16	20
H		15	18	24.5	35	43	59	79.5

Note) 1. Specifications are subject to change without notice to improve product performances.
2. The values of D7 through D11 and L10 through L14 on the above table may vary by servo motor.
3. CAD files are available to download from website(www.spg.co.kr).

■ Dimensions (2 Stage, Ratio(i) = 1/15 ~ 1/100)



(Unit : mm)

Dimension \ Model		SPIH 042	SPIH 060	SPIH 060D	SPIH 090	SPIH 090D	SPIH 115	SPIH 115D	SPIH 142D	SPIH 180D	SPIH 220D
D1		42	60	60	90	90	115	115	142	180	220
D2		50	70	70	100	100	130	130	165	215	250
D3		3.4	5.5	5.5	6.5	6.5	9	9	11	13	17
D4 h7		35	50	50	80	80	110	110	130	160	180
D5 h6		13	16	16	22	22	32	32	40	55	75
D6		M4xP0.7	M5xP0.8	M5xP0.8	M8xP1.25	M8xP1.25	M12xP1.75	M12xP1.75	M16xP2.0	M20xP2.5	M20xP2.5
D7	A	M4 DP 8	M5 DP 12	M4 DP 8	M6 DP 12	M5 DP 12	M8 DP 20	M6 DP 12	M8 DP 20	M12 DP 21	M12 DP 21
	B	M3 DP 6	M4 DP 12	M3 DP 6	M5 DP 12	M4 DP 12	–	M5 DP 12	–	–	–
	C	M4 DP 8	M5 DP 12	M4 DP 8	M6 DP 12	M5 DP 12	–	M6 DP 12	–	–	–
D8	A	46	70	46	90	70	145	90	145	200	200
	B	45	70	45	90	70	–	90	–	–	–
	C	46	70	46	90	70	–	90	–	–	–
D9 H7		≤8	≤14	≤8	≤19	≤14	≤32	≤19	≤32	≤38	≤48
D10 H7		30	50	30	70	50	110	70	110	114.3	114.3
D11		M3	M5	M3	M5	M5	M8	M5	M8	M8	M10
L1		24.5	37	37	46	46	65	65	97	105	138
L2		28.5	36	46.7	49	65	59	80	103	119	145
L3		50.5	56	44	72	51.5	90	65.7	72	100.9	134.5
L4	A, B	13.5	18	13.5	18	18	42	18	42	42.5	57
	C	17	22.5	17	23	22.5	–	23	–	–	–
L5		19.5	29	29	36.5	36.5	51	51	80	83	105
L6		16	25	25	32	32	45	45	68	76	97
L7		4	7	7	8	8	12	12	15	20	30
L8		7	8	8	10	10	14	14	12	15	20
L9		13	13	13	19	19	28	28	36	42	42
L10	A, B	117	147	141.2	185	180.5	256	228.7	314	367.4	474.5
	C	120.5	151.5	144.7	190	185	–	233.7	–	–	–
L11	A, B	27	32.5	27	42.5	32.5	67	42.5	67	84.1	109
	C	30.5	37	30.5	47.5	37	–	47.5	–	–	–
L12		3.5	4	3.5	4	4	7	4	7	7	7
L13		42	60	42	90	60	130	90	130	180	180
L14	A, B	8.3	11.5	8.3	11.5	11.5	27.5	11.5	27.5	33.6	47
	C	11.8	16	11.8	16.5	16	–	16	–	–	–
B h9		5	5	5	6	6	10	10	12	16	20
H		15	18	18	24.5	24.5	35	35	43	59	79.5

Note) 1. Specifications are subject to change without notice to improve product performances.
2. The values of D7 through D11 and L10 through L14 on the above table may vary by servo motor.
3. CAD files are available to download from website(www.spg.co.kr).

HIGH PRECISION PLANETARY GEARHEADS FOR SERVO MOTORS SPIFH Series

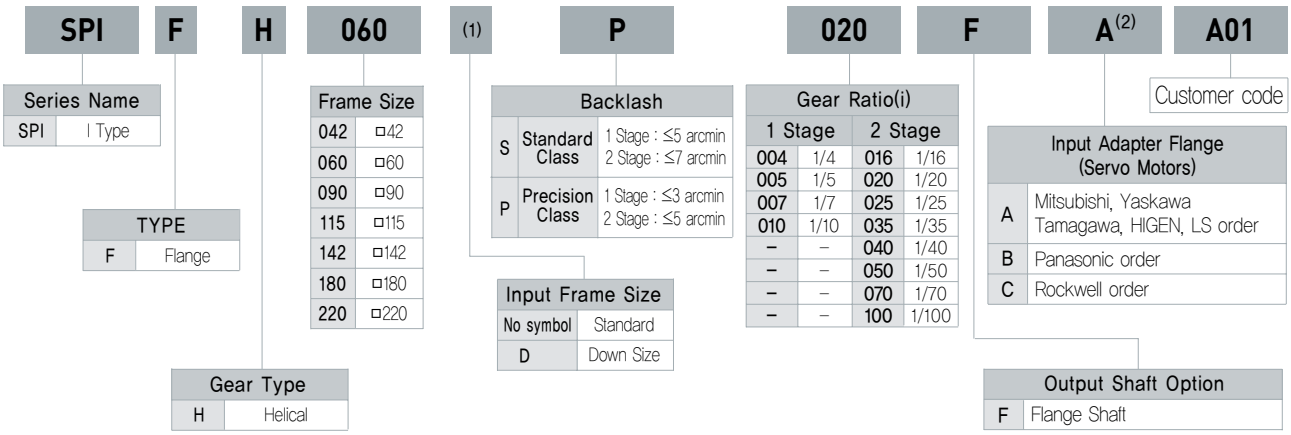
- ▶ Helical Gear
- ▶ Compact size
- ▶ High Precision, High Durability
- ▶ High Efficiency
- ▶ Easy Mount
- ▶ Protection grade IP65

■ Specifications

Description	Unit	Stage	Ratio (1)	Model No.												
				SPIFH 042	SPIFH 060	SPIFH 060D	SPIFH 090	SPIFH 090D	SPIFH 115	SPIFH 115D	SPIFH 142	SPIFH 142D	SPIFH 180	SPIFH 180D	SPIFH 220	SPIFH 220D
Nominal Output torque T_{2N} (2)	Nm	1	4	16	36	–	107	–	215	–	540	–	950	–	1,600	–
			5	19	43	–	120	–	250	–	590	–	1,200	–	2,080	–
			7	15	40	–	100	–	213	–	530	–	980	–	1,960	–
			10	11	30	–	94	–	215	–	420	–	790	–	1,395	–
		2	16	16	36	36	107	107	215	215	–	540	–	950	–	1,600
			20	16	36	36	107	107	215	215	–	540	–	950	–	1,600
			25	19	43	43	120	120	250	250	–	590	–	1,200	–	2,080
			35	19	43	43	120	120	250	250	–	590	–	1,200	–	2,080
			40	19	43	43	120	120	250	250	–	590	–	950	–	2,080
			50	19	43	43	120	120	250	250	–	590	–	1,200	–	2,080
			70	15	40	40	100	100	213	213	–	530	–	980	–	1,960
			100	11	30	30	94	94	215	215	–	420	–	790	–	1,395
Max Acceleration torque T_{2B}	Nm	1,2	4~100	3 times of Nominal Output torque												
Nominal Input speed n_1	rpm	1,2	4~100	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Max. Input speed N_1	rpm	1,2	4~100	6,000	6,000	6,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Backlash (Standard class)	arcmin	1	4~10	≤ 5	≤ 5	–	≤ 5	–	≤ 5	–	≤ 5	–	≤ 5	–	≤ 5	–
		2	16~100	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	–	≤ 7	–	≤ 7	–	≤ 7
Backlash (Precision Class)	arcmin	1	4~10	≤ 3	≤ 3	–	≤ 3	–	≤ 3	–	≤ 3	–	≤ 3	–	≤ 3	–
		2	16~100	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	–	≤ 5	–	≤ 5	–	≤ 5
Torsional Rigidity	Nm/arcmin	1,2	4~100	2	3	3	12	12	23	23	38	38	110	110	210	210
Max. Bending moment Mmax (2)	N	1,2	4~100	41	123	123	241	241	417	417	247	247	719	719	1,188	1,188
Max. Axial load Fa max (2)	N	1,2	4~100	1,050	2,140	2,140	2,750	2,750	5,230	5,230	6,370	6,370	9,880	9,880	12,830	12,830
Service life (2)	hr	1,2	4~100	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Noise level (3)	dB(A)	1,2	4~100	≤ 56	≤ 58	≤ 58	≤ 60	≤ 60	≤ 63	≤ 63	≤ 65	≤ 65	≤ 67	≤ 67	≤ 70	≤ 70
Weight	kg	1	4~10	0.7	1.4	–	4.0	–	8.5	–	18.1	–	48.1	–	85.4	–
		2	16~100	0.9	1.9	1.5	5.5	4.4	12.3	9.6	–	24.2	–	56.2	–	107.2
Mass Moments of Inertia (4)	kg ㎠	1	4~10	0.04	0.15	–	0.8	–	2.8	–	11.9	–	23.5	–	54	–
		2	16~100	0.03	0.07	0.07	0.5	0.5	1.5	1.5	–	5.1	–	8.03	–	23.5
Operating Temp. (5)	℃	1,2	4~100	–10 ~ +90												
Lubrication	–	1,2	4~100	High temperature & Extreme pressure Lubricant												
Mounting position	–	1,2	4~100	All directions												
Efficiency η	%	1	4~10	≥ 97												
		2	16~100	≥ 94												
Degree of protection	–	1,2	4~100	IP 65												

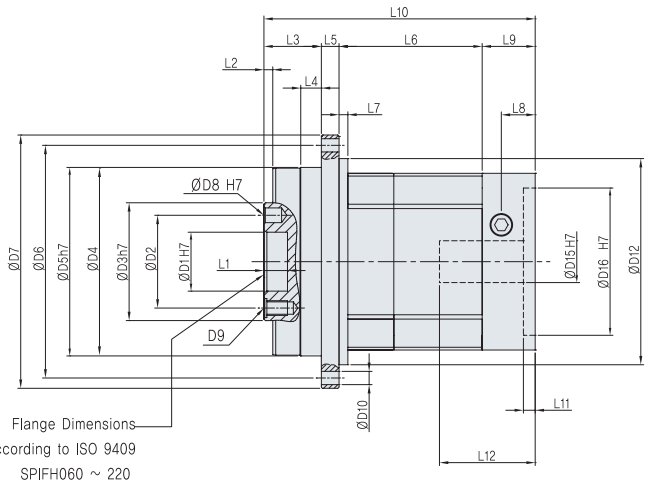
(1) Ratio = N_{in} / N_{out} (2) Values were measured at the following conditions : 100 rpm at the output, Load applied to the middle of the output shaft, Load coefficient(Ka) = 1, Continuous operation(S1≒15,000hrs). (3) Noise level : A measurement 1m away from the gear head, 3000 input rpm and at no load condition. (Background noise 21dB(A)) (4) Moment of inertia : A measurement at the input shaft and representatives from each ratio.(i=1/5)
(5) Operating temperature : Surface temperature of gear case in –10°C~40°C of ambient temperature.
※ The data in the above table are representative values. Specifications are subject to change without notice to improve product performances.

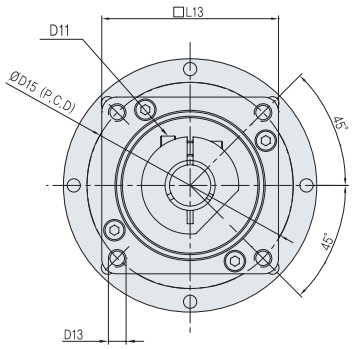
■ Coding System



(1) The input flame of down size depends on customer's request.
(2) It is important for customers to verify mounting dimensions of a servo motor along with dimensions of gear head prior to placing purchase order.

■ Dimensions (1 Stage, Ratio(i) = 1/4 ~ 1/10)



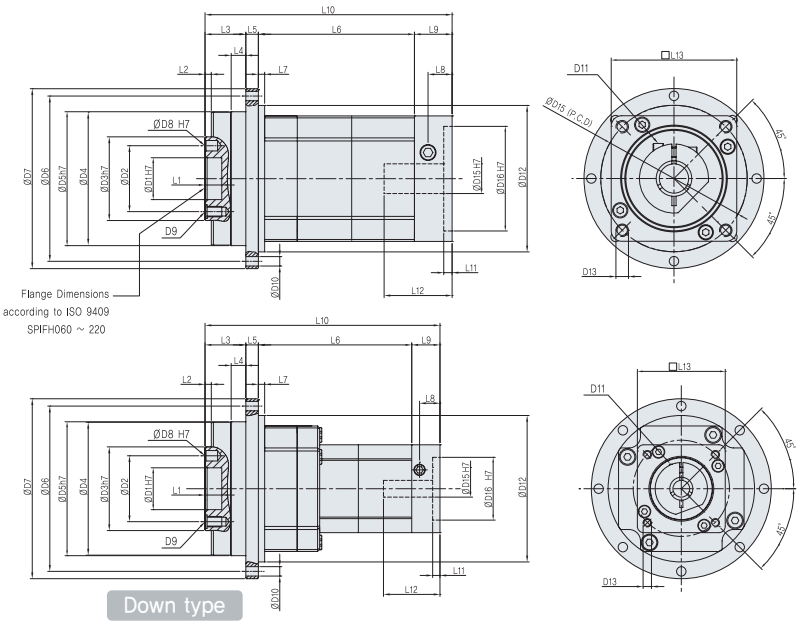


(Unit : mm)

Dimension \ Model		SPIFH 042	SPIFH 060	SPIFH 090	SPIFH 115	SPIFH 142	SPIFH 180	SPIFH 220
D1 H7		12	20	31.5	40	50	80	100
D2		20	31.5	50	63	80	125	140
D3 h7		28	40	63	80	100	160	180
D4		46.5	63.5	89.4	109.4	138	198	253
D5 h7		47	64	90	110	140	200	255
D6		67	79	109	135	168	233	280
D7		72	86	118	145	179	247	300
D8 H7		3 DP4	5 DP6	6 DP7	6 DP7	8 DP7	10 DP10	12 DP10
D9		4 – M3 DP6.5	7 – M5 DP8	7 – M6 DP13.5	11 – M6 DP13.5	11 – M8 DP17	11 – M10 DP22.5	12 – M16 DP30.5
D10		8 – 3.4	8 – 4.5	8 – 5.5	8 – 5.5	12 – 6.6	12 – 9	16 – 13.5
D11		M3	M5	M5	M8	M8	M10	M12
D12		50	70	105	135	165	212	255
D13	A	M4 DP8	M5 DP12	M6 DP12	M8 DP20	M12 DP21	M12 DP21	M12 DP21
	B	M3 DP6	M4 DP12	M5 DP12	–	–	–	–
	C	M4 DP8	M5 DP12	M6 DP12	–	–	–	–
D14	A	46	70	90	145	200	200	235
	B	45	70	90	–	–	–	–
	C	46	70	90	–	–	–	–
D15 H7		≤8	≤14	≤19	≤32	≤38	≤48	≤55
D16 H7		30	50	70	110	114.3	114.3	200
L1		4	8	12	12	12	16	20
L2		3	3	6	6	6	8	12
L3		19.5	19.5	30	29	38	50	66
L4		7	7	15	15	14.6	15	20
L5		4	6	7	8	9	12	18
L6		38.9	48.6	65.7	82.2	112.4	153.3	117
L7		1	3	3	3	–	–	–
L8	A, B	8.3	11.5	11.5	27.5	33.6	47	20
	C	11.8	16	16.5	–	–	–	–
L9	A, B	13.5	18	18	42	42.5	57	82.5
	C	17	22.5	23	–	–	–	–
L10	A, B	75.9	92.1	120.7	161.2	201.9	272.3	283.5
	C	79.4	96.6	125.7	–	–	–	–
L11		3.5	4	4	7	7	7	6
L12	A, B	27	32.5	42.5	67	84.1	109	88.5
	C	30.5	37	47.5	–	–	–	–
L13		42	60	90	130	180	180	220

Note) 1. Specifications are subject to change without notice to improve product performances.
2. The values of D13 through D16 and L8 through L13 on the above table may vary by servo motor.
3. CAD files are available to download from website(www.spg.co.kr).

■ Dimensions (2 Stage, Ratio(i) = 1/16 ~ 1/100)



(Unit : mm)

Dimension \ Model		SPIFH 042	SPIFH 060	SPIFH 060D	SPIFH 090	SPIFH 090D	SPIFH 115	SPIFH 115D	SPIFH 142D	SPIFH 180D	SPIFH 220D
D1 H7		12	20	20	31.5	31.5	40	40	50	80	100
D2		20	31.5	31.5	50	50	63	63	80	125	140
D3 h7		28	40	40	63	63	80	80	100	160	180
D4		46.5	63.5	63.5	89.4	89.4	109.4	109.4	138	198	253
D5 h7		47	64	64	90	90	110	110	140	200	255
D6		67	79	79	109	109	135	135	168	233	280
D7		72	86	86	118	118	145	145	179	247	300
D8 H7		3 DP 4	5 DP 6	5 DP 6	6 DP 7	6 DP 7	6 DP 7	6 DP 7	8 DP 7	10 DP 10	12 DP 10
D9		4-M3 DP 6.5	7- M5 DP 8	7- M5 DP 8	7- M6 DP 13.5	7- M6 DP 13.5	11- M6 DP 13.5	11- M6 DP 13.5	11- M8 DP 17	11- M10 DP 22.5	12- M16 DP 30.5
D10		8 – 3.4	8 – 4.5	8 – 4.5	8 – 5.5	8 – 5.5	8 – 5.5	8 – 5.5	12 – 6.6	12 – 9	16 – 13.5
D11		M3	M5	M3	M5	M5	M8	M5	M8	M10	M12
D12		50	70	70	105	105	135	135	165	212	255
D13	A	M4 DP 8	M5 DP 12	M4 DP 8	M6 DP 12	M5 DP 12	M8 DP 20	M6 DP 12	M8 DP 20	M12 DP 21	M12 DP 21
	B	M3 DP 6	M4 DP 12	M3 DP 6	M5 DP 12	M4 DP 12	–	M5 DP 12	–	–	–
	C	M4 DP 8	M5 DP 12	M4 DP 8	M6 DP 12	M5 DP 12	–	M6 DP 12	–	–	–
D14	A	46	70	46	90	70	145	90	145	200	200
	B	45	70	45	90	70	–	90	–	–	–
	C	46	70	46	90	70	–	90	–	–	–
D15 H7		≤8	≤14	≤8	≤19	≤14	≤32	≤19	≤32	≤38	≤48
D16 H7		30	50	30	70	50	110	70	110	114.3	114.3
L1		4	8	8	12	12	12	12	12	16	20
L2		3	3	3	6	6	6	6	6	8	12
L3		19.5	19.5	19.5	30	30	29	29	38	50	66
L4		7	7	7	15	15	15	15	15	16	20
L5		4	6	6	7	7	8	8	9	12	18
L6		63.9	74.6	73.3	103.7	99.2	132.2	128.9	154.9	203.7	256
L7		1	3	3	3	3	3	3	–	–	–
L8	A, B	8.3	11.5	8.3	11.5	11.5	27.5	11.5	27.5	33.6	47
	C	11.8	16	11.8	16.5	16	–	16.5	–	–	–
L9	A, B	13.5	18	13.5	18	18	42	18	42	42.5	57
	C	17	22.5	17	23	22.5	–	23	–	–	–
L10	A, B	100.9	118.1	112.3	158.7	154.2	211.2	183.9	243.9	308.2	396.5
	C	104.4	122.6	115.8	163.7	158.7	–	188.9	–	–	–
L11		3.5	4	3.5	4	4	7	4	7	7	7
L12	A, B	27	32.5	27	42.5	32.5	67	42.5	67	84.1	109
	C	30.5	37	30.5	47.5	37	–	47.5	–	–	–
L13		42	60	42	90	60	130	90	130	180	180

Note) 1. Specifications are subject to change without notice to improve product performances.
2. The values of D13 through D16 and L8 through L13 on the above table may vary by servo motor.
3. CAD files are available to download from website(www.spg.co.kr).

SPG MOTOR

HIGH PRECISION PLANETARY GEARHEADS FOR SERVO MOTORS SPLH Series

- ▶ Helical Gear
- ▶ Compact size
- ▶ High Precision, High Durability
- ▶ High Efficiency
- ▶ Easy Mount
- ▶ Protection grade IP65

■ Specifications

Description	Unit	Stage	Ratio (1)	Model No.												
				SPLH 042	SPLH 060	SPLH 060D	SPLH 090	SPLH 090D	SPLH 115	SPLH 115D	SPLH 142	SPLH 142D	SPLH 180	SPLH 180D	SPLH 220	SPLH 220D
Nominal Output torque T_{2N} (2)	Nm	1	3	7.5	13.5	–	78	–	171	–	333	–	540	–	810	–
			4	10	18	–	107	–	215	–	489	–	720	–	1,080	–
			5	12.5	22.5	–	120	–	250	–	580	–	900	–	1,350	–
			6	15	27	–	107	–	215	–	530	–	1,100	–	1,630	–
			7	15	31.5	–	100	–	213	–	495	–	980	–	1,960	–
			8	10	36	–	106	–	220	–	420	–	870	–	1,700	–
			9	14	35	–	93	–	160	–	390	–	710	–	1,560	–
			10	11	30	–	94	–	215	–	370	–	790	–	1,395	–
			14	–	31.5	–	100	–	213	–	495	–	980	–	1,960	–
			20	–	30	–	94	–	215	–	370	–	790	–	1,395	–
		2	15	16	–	–	–	–	–	–	–	–	–	–	–	–
			20	16	–	–	–	–	–	–	–	–	–	–	–	–
			25	19	43	43	120	120	250	250	–	580	–	1,200	–	2,080
			30	19	43	43	120	120	250	250	–	580	–	1,200	–	2,080
			35	19	43	43	120	120	250	250	–	580	–	1,200	–	2,080
			40	19	43	43	120	120	250	250	–	580	–	1,200	–	2,080
			45	19	43	43	120	120	250	250	–	580	–	1,200	–	2,080
			50	19	43	43	120	120	250	250	–	580	–	1,200	–	2,080
			60	15	43	43	107	107	215	215	–	530	–	1,100	–	1,630
			70	15	40	40	100	100	213	213	–	495	–	980	–	1,960
			80	10	43	43	106	106	220	220	–	420	–	870	–	1,700
			90	14	35	35	93	93	160	160	–	390	–	710	–	1,560
			100	11	30	30	94	94	215	215	–	370	–	790	–	1,395
Max Acceleration torque T_{2B}	Nm	1,2	3~100	3 times of Nominal Output torque												
Nominal Input speed n_1	rpm	1,2	3~100	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Max. Input speed N_1	rpm	1,2	3~100	6,000	6,000	6,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Backlash (Standard class)	arcmin	1	3~20	≤ 7	≤ 7	–	≤ 7	–	≤ 7	–	≤7	–	≤7	–	≤7	–
		2	25~100	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	–	≤10	–	≤10	–	≤10
Backlash (Precision Class)	arcmin	1	3~20	≤ 5	≤ 5	–	≤ 5	–	≤ 5	–	≤ 5	–	≤ 5	–	≤5	–
		2	25~100	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	–	≤ 8	–	≤ 8	–	≤8
Torsional Rigidity	Nm/arcmin	1,2	3~100	2	3	3	12	12	23	23	38	38	110	110	210	210
Max. Radial load Fr max (2)	N	1,2	3~100	400	1,100	1,100	2,400	2,400	4,000	4,000	8,000	8,000	13,000	13,000	18,600	18,600
Max. Axial load Fa max (2)	N	1,2	3~100	300	600	600	1,800	1,800	2,500	2,500	3,000	3,000	6,000	6,000	11,300	11,300
Service life (2)	hr	1,2	3~100	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Noise level (3)	dB(A)	1,2	3~100	≤ 61	≤ 63	≤ 63	≤ 65	≤ 65	≤ 68	≤ 68	≤ 70	≤ 70	≤ 72	≤ 72	≤ 74	≤74
Weight	kg	1	3~20	0.9	2	–	5.7	–	12.9	–	22	–	46.4	–	77	–
		2	25~100	1.1	2.4	2	7	5.9	16.7	14.1	–	24.8	–	50	–	88.2
Mass Moments of Inertia (4)	kg ㎠	1	3~20	0.04	0.15	–	0.8	–	2.8	–	11.9	–	23.5	–	54	–
		2	25~100	0.03	0.07	0.07	0.5	0.5	1.5	1.5	–	5.1	–	8.03	–	23.5
Operating Temp. (5)	℃	1,2	3~100	–10 ~ +90												
Lubrication	–	1,2	3~100	High temperature & Extreme pressure Lubricant												
Mounting position	–	1,2	3~100	All directions												
Efficiency η	%	1	3~20	≥ 95												
		2	15~100	≥ 92												
Degree of protection	–	1,2	3~100	IP 65												

(1) Ratio = N_{in} / N_{out} (2) Values were measured at the following conditions : 100 rpm at the output. Load applied to the middle of the output shaft. Load coefficient(Ka) = 1. Continuous operation(S1≒10,000hrs). (3) Noise level : A measurement 1m away from the gear head, 3000 input rpm and at no load condition. (Background noise 21dB(A)) (4) Moment of inertia : A measurement at the input shaft and representatives from each ratio.(i=1/5)
(5) Operating temperature : Surface temperature of gear case in –10°C~40°C of ambient temperature.
※ The data in the above table are representative values. Specifications are subject to change without notice to improve product performances.

■ Coding System

SPL | **H** | **060** | **(1)** | **P** | **020**(2) | **S[K]** | **A**(3) | **A01**

Series Name	
SPL	L Type

Gear Type	
H	Helical

Frame Size	
042	□42
060	□60
090	□90
115	□115
142	□142
180	□180
220	□220

Input Frame Size	
No symbol	Standard
D	Down Size

Backlash		
S	Standard Class	1 Stage : ≤7 arcmin 2 Stage : ≤10 arcmin
P	Precision Class	1 Stage : ≤5 arcmin 2 Stage : ≤8 arcmin

Gear Ratio(i)			
1단		2단	
003	1/3	(015)	(1/15)
004	1/4	(020)	(1/20)
005	1/5	025	1/25
006	1/6	030	1/30
007	1/7	035	1/35
008	1/8	040	1/40
009	1/9	045	1/45
010	1/10	050	1/50
014	1/14	060	1/60
020	1/20	070	1/70
–	–	080	1/80
–	–	090	1/90
–	–	100	1/100

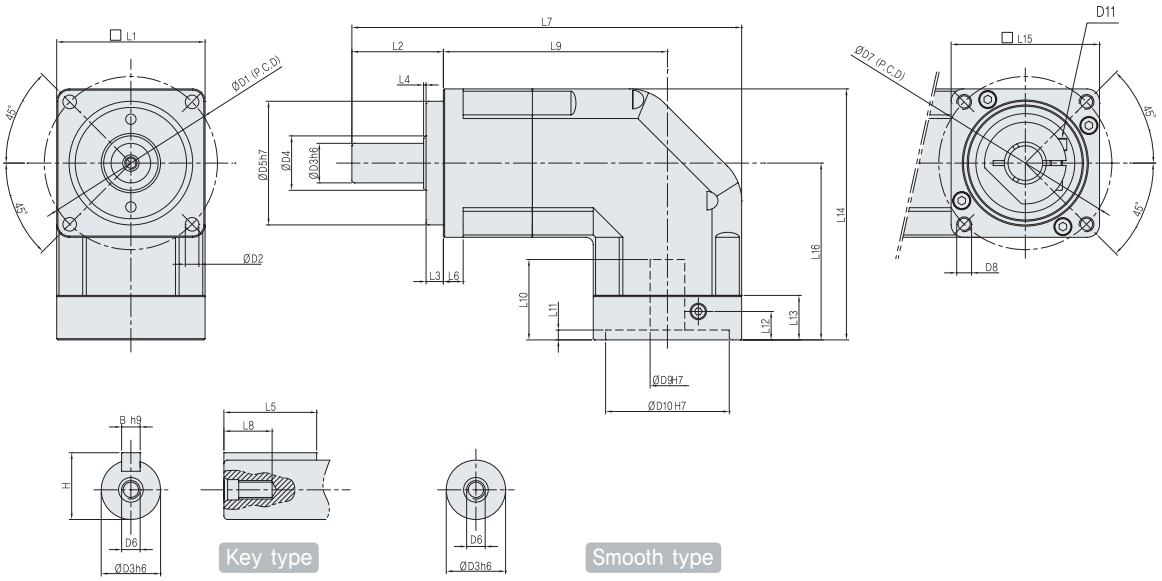
Input Adapter Flange (Servo Motors)	
A	Mitsubishi, Yaskawa Tamagawa, HIGEN, LS order
B	Panasonic order
C	Rockwell order

Output Shaft Option	
S	Smooth Output Shaft
K	Output Shaft with Key

Customer code

(1) The input flame of down size depends on customer's request.
(2) Ratio 1/14 and 1/20 of 1 stage are custom-made specification.
(3) It is important for customers to verify mounting dimensions of a servo motor along with dimensions of gear head prior to placing purchase order.

■ Dimensions (1 Stage, Ratio(i) = 1/3 ~ 1/20)

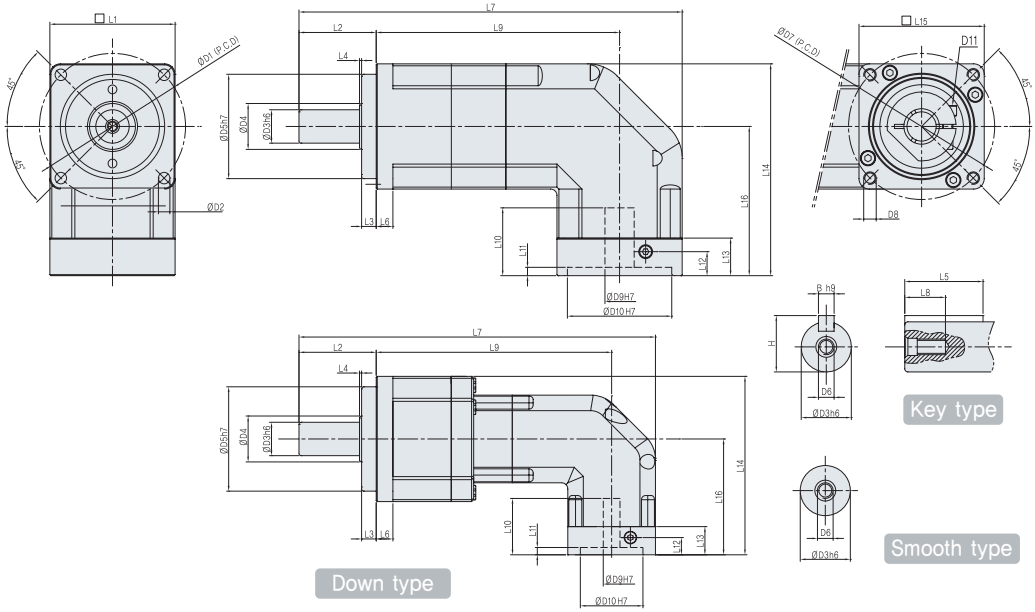


(Unit : mm)

Dimension \ Model		SPLH 042	SPLH 060	SPLH 090	SPLH 115	SPLH 142	SPLH 180	SPLH 220
D1		50	70	100	130	165	215	250
D2		3.4	5.5	6.5	9	11	13	17
D3 h6		13	16	22	32	40	55	75
D4		14.5	19.7	24.8	39.8	49.8	64.8	79.8
D5 h7		35	50	80	110	130	160	180
D6		M4xP0.7	M5xP0.8	M8xP1.25	M12xP1.75	M16xP2.0	M20xP2.5	M20xP2.5
D7	A	46	70	90	145	200	200	235
	B	45	70	90	–	–	–	–
	C	46	70	90	–	–	–	–
D8	A	M4 DP 8	M5 DP 12	M6 DP 12	M8 DP 20	M12 DP21	M12 DP21	M12 DP21
	B	M3 DP 6	M4 DP 12	M5 DP 12	–	–	–	–
	C	M4 DP 8	M5 DP 12	M6 DP 12	–	–	–	–
D9 H7		≤ 8	≤ 14	≤ 19	≤ 32	≤ 38	≤ 48	≤ 55
D10 H7		30	50	70	110	114.3	114.3	200
D11		M3	M5	M5	M8	M8	M10	M12
L1		42	60	90	115	142	180	220
L2		24.5	37	46	65	97	105	138
L3		4	7	8	12	15	20	30
L4		1	1	1.5	2	2	2	3
L5		16	25	32	45	68	76	97
L6		7	8	10	14	12	15	20
L7		121.6	157.6	216.2	283.8	383	426	530
L8		13	13	19	28	36	42	42
L9		76.1	90.6	125.2	153.8	196	231	282
L10	A, B	27	35.5	42.5	73	84	109	116
	C	30.5	40	47.5	–	–	–	–
L11		3.5	4	4	7	7	7	7
L12	A, B	8.3	11.5	11.5	27.5	33.5	47	41
	C	11.8	16	16	–	–	–	–
L13	A, B	13.5	18	18	42	46	68.5	64.5
	C	17	22.5	23	–	–	–	–
L14	A, B	76.5	101.5	133.1	188.8	227	286	326.5
	C	80	106	138.1	–	–	–	–
L15		42	60	90	130	180	180	220
L16	A, B	55.5	71.5	88.1	131.3	156	196	216.5
	C	59	76	93.1	–	–	–	–
B h9		5	5	6	10	12	16	20
H		15	18	24.5	35	43	59	79.5

Note) 1. Specifications are subject to change without notice to improve product performances.
2. The values of D7 through D11 and L10 through L16 on the above table may vary by servo motor.
3. CAD files are available to download from website(www.spg.co.kr).

■ Dimensions (2 Stage, Ratio(i) = 1/25 ~ 1/100)



(Unit : mm)

Dimension \ Model		SPLH 042	SPLH 060	SPLH 060D	SPLH 090	SPLH 090D	SPLH 115	SPLH 115D	SPLH 142D	SPLH 180D	SPLH 220D
D1		50	70	70	100	100	130	130	165	215	250
D2		3.4	5.5	5.5	6.5	6.5	9	9	11	13	17
D3 h6		13	16	16	22	22	32	32	40	55	75
D4		14.5	19.7	19.7	24.8	24.8	39.8	39.8	49.8	64.8	79.8
D5 h7		35	50	50	80	80	110	110	130	160	180
D6		M4xP0.7	M5xP0.8	M5xP0.8	M8xP1.25	M8xP1.25	M12xP1.75	M12xP1.75	M16xP2.0	M20xP2.5	M20xP2.5
D7	A	46	70	46	90	70	145	90	145	200	200
	B	45	70	45	90	70	–	90	–	–	–
	C	46	70	46	90	70	–	90	–	–	–
D8	A	M4 DP 8	M5 DP 12	M4 DP 8	M6 DP 12	M5 DP 12	M8 DP 20	M6 DP 12	M8 DP20	M12 DP21	M12 DP21
	B	M3 DP 6	M4 DP 12	M3 DP 6	M5 DP 12	M4 DP 12	–	M5 DP 12	–	–	–
	C	M4 DP 8	M5 DP 12	M4 DP 8	M6 DP 12	M5 DP 12	–	M5 DP 12	–	–	–
D9 H7		≤ 8	≤ 14	≤ 8	≤ 19	≤ 14	≤ 32	≤ 19	≤ 32	≤ 38	≤ 48
D10 H7		30	50	30	70	50	110	70	110	114.3	114.3
D11		M3	M5	M3	M5	M5	M8	M5	M8	M8	M10
L1		42	60	60	90	90	115	115	142	180	220
L2		24.5	37	37	46	46	65	65	97	105	138
L3		4	7	7	8	8	12	12	15	20	30
L4		1	1	1	1.5	1.5	2	2	2	2	3
L5		16	25	25	32	32	45	45	68	76	97
L6		7	8	8	10	10	14	14	12	15	20
L7		146.6	183.6	170.8	254.2	217.1	333.8	297.9	391.8	478.4	569
L8		13	13	13	19	19	28	28	36	42	42
L9		101.1	116.6	112.8	163.2	141.1	203.8	187.9	229.8	283.4	341
L10	A, B	27	35.5	27	42.5	35.5	73	42.5	73	84	109
	C	30.5	40	30.5	47.5	40	–	47.5	–	–	–
L11		3.5	4	3.5	4	4	7	4	7	7	7
L12	A, B	8.3	11.5	8.3	11.5	11.5	27.5	11.5	27.5	33.5	47
	C	11.8	16	11.8	16	16	–	16.5	–	–	–
L13	A, B	13.5	18	13.5	18	18	42	18	42	46	68.5
	C	17	22.5	17	23	22.5	–	23	–	–	–
L14	A, B	76.5	101.5	85.5	133.1	116.5	188.8	145.6	202.3	246	306
	C	80	106	89	138.1	121	–	150.6	–	–	–
L15		42	60	42	90	60	130	90	130	180	180
L16	A, B	55.5	71.5	55.5	88.1	71.5	131.3	88.1	131.3	156	196
	C	59	76	59	93.1	76	–	93.1	–	–	–
B h9		5	5	5	6	6	10	10	12	16	20
H		15	18	18	24.5	24.5	35	35	43	59	79.5

Note) 1. Specifications are subject to change without notice to improve product performances.
2. The values of D7 through D11 and L10 through L16 on the above table may vary by servo motor.
3. CAD files are available to download from website(www.spg.co.kr).

HIGH PRECISION PLANETARY GEARHEADS FOR SERVO MOTORS SPLFH Series

- ▶ Helical Gear
- ▶ Compact size
- ▶ High Precision, High Durability
- ▶ High Efficiency
- ▶ Easy Mount
- ▶ Protection grade IP65

■ Specifications

Description	Unit	Stage	Ratio (1)	Model No.												
				SPLFH 042	SPLFH 060	SPLFH 060D	SPLFH 090	SPLFH 090D	SPLFH 115	SPLFH 115D	SPLFH 142	SPLFH 142D	SPLFH 180	SPLFH 180D	SPLFH 220	SPLFH 220D
Nominal Output torque T_{2N} (2)	Nm	1	4	10	18	–	76	–	205	–	489	–	720	–	1,080	–
			5	12.5	22.5	–	95	–	235	–	580	–	900	–	1,350	–
			7	14	31.5	–	100	–	210	–	495	–	900	–	1,872	–
			10	11	30	–	94	–	215	–	420	–	790	–	1,395	–
			14	–	31.5	–	100	–	210	–	505	–	980		1,872	
			20	–	30	–	94	–	215	–	370	–	790		1,395	
		2	20	16	–	–	–	–	–	–	–	–	–	–	–	–
			25	19	43	43	112	112	250	250	–	590	–	1,200	–	2,080
			35	19	43	43	112	112	250	250	–	590	–	1,200	–	2,080
			40	19	43	43	112	112	250	250	–	590	–	1,200	–	2,080
			50	19	43	43	112	112	250	250	–	590	–	1,200	–	2,080
			70	15	40	40	100	100	210	210	–	530	–	980	–	1,960
			100	11	30	30	94	94	215	215	–	420	–	790	–	1,395
Max Acceleration torque T_{2B}	Nm	1,2	4~100	3 times of Nominal Output torque												
Nominal Input speed n_1	rpm	1,2	4~100	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Max. Input speed N_1	rpm	1,2	4~100	6,000	6,000	6,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Backlash (Standard class)	arcmin	1	4~20	≤ 7	≤ 7	–	≤ 7	–	≤ 7	–	≤ 7	–	≤ 7	–	≤ 7	–
		2	25~100	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	–	≤ 10	–	≤ 10	–	≤ 10
Backlash (Precision Class)	arcmin	1	4~20	≤ 5	≤ 5	–	≤ 5	–	≤ 5	–	≤ 5	–	≤ 5	–	≤ 5	–
		2	25~100	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤8	≤ 8	–	≤ 8	–	≤ 8	–	≤ 5
Torsional Rigidity	Nm/arcmin	1,2	4~100	2	3	3	12	12	23	23	38	38	110	110	210	210
Max. Bending moment Mmax (2)	Nm	1,2	4~100	41	123	123	241	241	417	417	247	247	719	719	1,188	1,188
Max. Axial load Fa max (2)	N	1,2	4~100	1,050	2,140	2,140	2,750	2,750	5,230	5,230	6,370	6,370	9,880	9,880	12,830	12,830
Service life (2)	hr	1,2	4~100	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Noise level (3)	dB(A)	1,2	4~100	≤ 61	≤ 63	≤ 63	≤ 65	≤ 65	≤ 68	≤ 68	≤ 70	≤ 70	≤ 72	≤ 72	≤ 74	≤ 74
Weight	kg	1	4~20	1.0	2.3	–	6.5	–	13.9	–	29	–	67.4	–	113	–
		2	25~100	1.2	2.8	2.4	8.0	6.9	17.7	15.1	–	26.6	–	61.2	–	113.5
Mass Moments of Inertia (4)	kg ㎠	1	4~20	0.04	0.15	–	0.8	–	2.8	–	11.9	–	23.5	–	54	–
		2	25~100	0.03	0.07	0.07	0.5	0.5	1.5	1.5	–	5.1	–	8.03	–	23.5
Operating Temp. (5)	℃	1,2	4~100	−10 ~ +90												
Lubrication	–	1,2	4~100	High temperature & Extreme pressure Lubricant												
Mounting position	–	1,2	4~100	All directions												
Efficiency η	%	1	4~20	≥ 95												
		2	25~100	≥ 92												
Degree of protection	–	1,2	4~100	IP 65												

(1) Ratio = N_{in} / N_{out} (2) Values were measured at the following conditions : 100 rpm at the output, Load coefficient(Ka) = 1. Continuous operation(S1≒15,000hrs). (3) Noise level : A measurement 1m away from the gear head, 3000 input rpm and at no load condition. (Background noise 21dB(A)) (4) Moment of inertia : A measurement at the input shaft and representatives from each ratio.(i=1/5)
(5) Operating temperature : Surface temperature of gear case in −10°C~40°C of ambient temperature.
※ The data in the above table are representative values. Specifications are subject to change without notice to improve product performances.

■ Coding System

SPL	F	H	060	(1)	P	020	F	A (2)	A01

Series Name

SPL	L Type

TYPE

F	Flange

Gear Type

H	Helical

Frame Size

042	□42
060	□60
090	□90
115	□115
142	□142
180	□180
220	□220

Input Frame Size

No symbol	Standard
D	Down Size

Backlash

S	Standard Class	1 Stage : ≤7 arcmin 2 Stage : ≤10 arcmin
P	Precision Class	1 Stage : ≤5 arcmin 2 Stage : ≤8 arcmin

Gear Ratio(i)

1 Stage		2 Stage	
004	1/4	(020)	(1/20)
005	1/5	025	1/25
007	1/7	035	1/35
010	1/10	040	1/40
014	1/14	050	1/50
020	1/20	070	1/70
–	–	100	1/100

Output Shaft Option

F	Flange Shaft

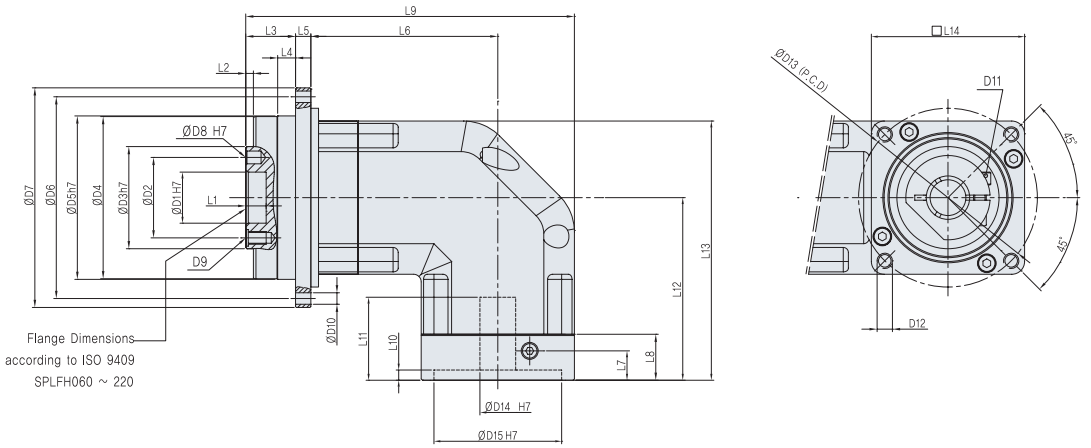
Input Adapter Flange (Servo Motors)

A	Mitsubishi, Yaskawa Tamagawa, HIGEN, LS order
B	Panasonic order
C	Rockwell order

Customer code

(1) The input flame of down size depends on customer's request.
(2) Ratio 1/14 and 1/20 of 1 stage are custom-made specification.
(3) It is important for customers to verify mounting dimensions of a servo motor along with dimensions of gear head prior to placing purchase order.

■ Dimensions (1 Stage, Ratio(i) = 1/4 ~ 1/20)

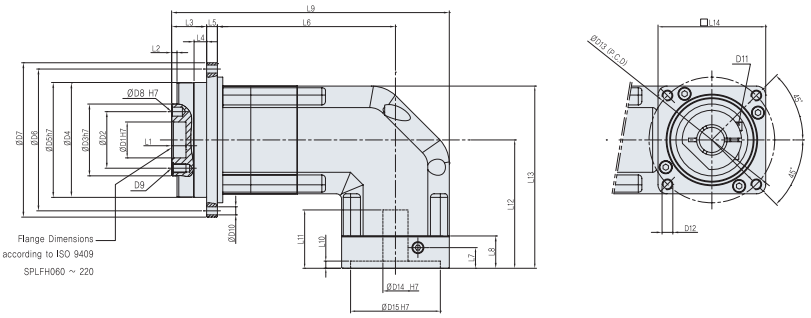


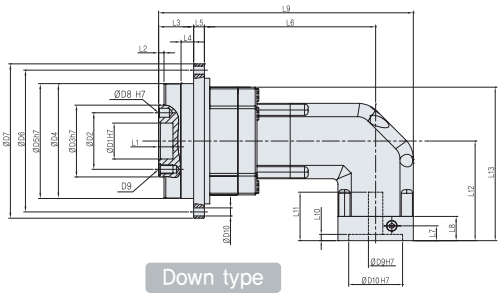
(Unit : mm)

Dimension \ Model		SPLFH 042	SPLFH 060	SPLFH 090	SPLFH 115	SPLFH 142	SPLFH 180	SPLFH 220
D1 H7		12	20	31.5	40	50	80	100
D2		20	31.5	50	63	80	125	140
D3 h7		28	40	63	80	100	160	180
D4		46.5	63.5	89.4	109.4	138	198	253
D5 h7		47	64	90	110	140	200	255
D6		67	79	109	135	168	233	280
D7		72	86	118	145	179	247	300
D8 H7		3 DP 4	5 DP 6	6 DP 7	6 DP 7	8 DP 7	10 DP 10	12 DP 10
D9		4-M3 DP 6.5	7-M5 DP 8	7-M6 DP 13.5	11-M6 DP 13.5	11-M8 DP 17	11-M10 DP 22.5	12-M16 DP 30.5
D10		8 – 3.4	8 – 4.5	8 – 5.5	8 – 5.5	12 – 6.6	12 – 9	16 – 13.5
D11		M3	M5	M5	M8	M8	M10	M12
D12	A	M4 DP 8	M5 DP 12	M6 DP 12	M8 DP 20	M12 DP 21	M12 DP 21	M12 DP 21
	B	M3 DP 6	M4 DP 12	M5 DP 12	–	–	–	–
	C	M4 DP 8	M5 DP 12	M6 DP 12	–	–	–	–
D13 H7	A	46	70	90	145	200	200	235
	B	45	70	90	–	–	–	–
	C	46	70	90	–		–	–
D14 H7		≤ 8	≤ 14	≤ 19	≤ 32	≤ 38	≤ 48	≤ 55
D15 H7		30	50	70	110	114.3	114.3	200
L1		4	8	12	12	12	16	20
L2		3	3	6	6	6	8	12
L3		19.5	19.5	30	29	38	50	66
L4		7	7	15	15	15	16	20
L5		4	6	7	8	9	12	18
L6		61	73.2	107.9	137	178	237	285
L7	A, B	8.3	11.5	11.5	27.5	33.5	47	41
	C	11.8	16	16.5	–	–	–	–
L8	A, B	13.5	18	18	42	46	68.5	64.5
	C	17	22.5	23	–	–	–	–
L9	A, B, C	105.5	128.7	189.9	231.5	315	389	479
L10		3.5	4	4	7	7	7	7
L11	A, B	27	35.5	42.5	73	84	109	116
	C	30.5	40	47.5	–	–	–	–
L12	A, B	55.5	71.5	88.1	131.3	156	196	216.5
	C	59	76	93.1	–	–	–	–
L13	A, B	76.5	101.5	113.1	188.8	227	286	326.5
	C	80	106	118.1	–	–	–	–
L14		42	60	90	130	180	180	220

Note) 1. Specifications are subject to change without notice to improve product performances.
2. The values of D12 through D15 and L7 through L14 on the above table may vary by servo motor.
3. CAD files are available to download from website(www.spg.co.kr).

■ Dimensions (2 Stage, Ratio(i) = 1/25 ~ 1/100)





Down type

(Unit : mm)

Dimension \ Model		SPLFH 042	SPLFH 060	SPLFH 060D	SPLFH 090	SPLFH 090D	SPLFH 115	SPLFH 115D	SPLFH 142D	SPLFH 180D	SPLFH 220D
D1 H7		12	20	20	31.5	31.5	40	40	50	80	100
D2		20	31.5	31.5	50	50	63	63	80	125	140
D3 h7		28	40	40	63	63	80	80	100	160	180
D4		46.5	63.5	63.5	89.4	89.4	109.4	109.4	138	198	253
D5 h7		47	64	64	90	90	110	110	140	200	255
D6		67	79	79	109	109	135	135	168	233	280
D7		72	86	86	118	118	145	145	179	247	300
D8 H7		3 DP 4	5 DP 6	5 DP 6	6 DP 7	6 DP 7	6 DP 7	6 DP 7	8 DP 7	10 DP 10	12 DP 10
D9		4-M3 DP 6.5	7-M5 DP 8	7-M5 DP 8	7-M6 DP 13.5	7-M6 DP 13.5	11-M6 DP 13.5	11-M6 DP 13.5	11-M8 DP 17	11-M10 DP 22.5	12-M16 DP 30.5
D10		8 – 3.4	8 – 4.5	8 – 4.5	8 – 5.5	8 – 5.5	8 – 5.5	8 – 5.5	12 – 6.6	12 – 9	16 – 13.5
D11		M3	M5	M3	M5	M5	M8	M5	M8	M8	M10
D12	A	M4 DP 8	M5 DP 12	M4 DP 8	M6 DP 12	M5 DP 12	M8 DP 20	M6 DP 12	M8 DP 20	M12 DP 21	M12 DP 21
	B	M3 DP 6	M4 DP 12	M3 DP 6	M5 DP 12	M4 DP 12	–	M5 DP 12	–	–	–
	C	M4 DP 8	M5 DP 12	M4 DP 8	M6 DP 12	M5 DP 12	–	M6 DP 12	–	–	–
D13 H7	A	46	70	46	90	70	145	90	145	200	200
	B	45	70	45	90	70	–	90	–	–	–
	C	46	70	46	90	70	–	90	–	–	–
D14 H7		≤ 8	≤ 14	≤ 8	≤ 19	≤ 14	≤ 32	≤ 19	≤ 32	≤ 38	≤ 48
D15 H7		30	50	30	70	50	110	70	110	114.3	114.3
L1		4	8	8	12	12	12	12	12	16	20
L2		3	3	3	6	6	6	6	6	8	12
L3		19.5	19.5	19.5	30	30	29	29	38	50	66
L4		7	7	7	15	15	15	15	15	16	20
L5		4	6	6	7	7	8	8	9	12	18
L6		86	99.2	95.4	145.9	123.8	187	171.1	209.7	269.3	339.3
L7	A, B	8.3	11.5	8.3	11.5	11.5	27.5	11.5	27.5	33.5	47
	C	11.8	16	11.8	16.5	16	–	16.5	–	–	–
L8	A, B	13.5	18	13.5	18	18	42	18	42	46	68.5
	C	17	22.5	17	23	22.5	–	23	–	–	–
L9	A, B, C	130.5	154.7	141.9	227.9	190.8	281.5	253.1	321.7	421.3	513.3
L10		3.5	4	3.5	4	4	7	4	7	7	7
L11	A, B	27	35.5	27	42.5	35.5	73	42.5	73	84	109
	C	30.5	40	30.5	47.5	40	–	47.5	–	–	–
L12	A, B	55.5	71.5	55.5	88.1	71.5	131.3	88.1	131.3	156	196
	C	59	76	59	93.1	76	–	93.1	–	–	–
L13	A, B	76.5	101.5	85.5	113.1	116.5	188.8	145.6	202.3	231	301
	C	80	106	89	118.1	121	–	150.6	–	–	–
L14		42	60	42	90	60	130	90	130	180	180

Note) 1. Specifications are subject to change without notice to improve product performances.
2. The values of D12 through D15 and L7 through L14 on the above table may vary by servo motor.
3. CAD files are available to download from website(www.spg.co.kr).

HIGH PRECISION PLANETARY GEARHEADS FOR SERVO MOTORS SPI Series

- ▶ Spur Gear
- ▶ Compact size
- ▶ High Precision, High Durability
- ▶ High Efficiency
- ▶ Easy Mount
- ▶ Protection grade IP65

■ Specifications

Description	Unit	Stage	Ratio (1)	Model No.						
				SPI 042	SPI 060	SPI 060D	SPI 090	SPI 090D	SPI 115	SPI 115D
Nominal Output torque T_{2N} (2)	Nm	1	3	15	46	–	110	–	190	–
			4	14	35	–	102	–	205	–
			5	19	42	–	112	–	235	–
			6	–	46	–	103	–	–	–
			7	14	38	–	100	–	210	–
			8	–	46	–	102	–	–	–
			9	14	34	–	96	–	160	–
			10	10	29	–	80	–	191	–
		2	15	15	46	46	110	110	190	190
			20	14	35	35	102	102	205	205
			25	19	42	42	112	112	235	235
			30	15	46	46	110	112	190	235
			35	19	42	42	112	112	235	235
			40	14	35	35	102	112	205	235
			45	19	42	42	112	112	235	235
			50	19	42	42	112	112	235	235
			63	14	38	38	100	100	210	210
			70	14	38	38	100	100	210	210
			81	14	34	34	96	96	160	160
			90	14	34	34	96	96	160	160
			100	10	29	29	80	80	191	191
Max Acceleration torque T_{2B}	Nm	1,2	3~100	3 times of Nominal Output torque						
Nominal Input speed n_1	rpm	1,2	3~100	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Max. Input speed N_1	rpm	1,2	3~100	6,000	6,000	6,000	5,000	5,000	5,000	5,000
Backlash (Standard class)	arcmin	1	3~10	≤ 10	≤ 10	–	≤ 10	–	≤ 10	–
		2	15~100	≤ 13	≤ 13	≤ 13	≤ 13	≤ 13	≤ 13	≤ 13
Torsional Rigidity	Nm/arcmin	1,2	3~100	2	3	3	12	12	23	23
Max. Radial load Fr max (2)	N	1,2	3~100	400	1,100	1,100	2,400	2,400	4,000	4,000
Max. Axial load Fa max (2)	N	1,2	3~100	300	600	600	1,800	1,800	2,500	2,500
Service life (2)	hr	1,2	3~100	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Noise level (3)	dB(A)	1,2	3~100	≤ 56	≤ 58	≤ 58	≤ 60	≤ 60	≤ 63	≤ 63
Weight	kg	1	3~10	0.5	1.2	–	3.2	–	7.2	–
		2	15~100	0.7	1.7	1.3	4.7	3.6	11.0	8.4
Mass Moment of Inertia (4)	kg ㎠	1	3~10	0.04	0.15	–	0.8	–	2.8	–
		2	15~100	0.03	0.07	0.07	0.5	0.5	1.5	1.5
Operating Temp. (5)	℃	1,2	3~100	−10 ~ +90						
Lubrication		1,2	3~100	High temperature & Extreme pressure Lubricant						
Mounting position		1,2	3~100	All directions						
Efficiency η	%	1	3~10	≥ 97						
		2	15~100	≥ 94						
Degree of protection		1,2	3~100	IP 65						

(1) Ratio = N_{in} / N_{out} (2) Values were measured at the following conditions : 100 rpm at the output. Load applied to the middle of the output shaft. Load coefficient(Ka) = 1. Continuous operation(S1≒10,000hrs). (3) Noise level : A measurement 1m away from the gear head, 3000 input rpm and at no load condition. (Background noise 21dB(A)) (4) Moment of inertia : A measurement at the input shaft and representatives from each ratio.(i=1/5)
(5) Operating temperature : Surface temperature of gear case in −10°C~40°C of ambient temperature.
※ The data in the above table are representative values. Specifications are subject to change without notice to improve product performances.

■ Coding System

SPI		060	(1)	S	020	S[K]	A(2)	A01

Series Name

SPI	I Type

Gear Type

No symbol	Spur

Frame Size

042	□42
060	□60
090	□90
115	□115

Input Frame Size

No symbol	Standard
D	Down Size

Backlash

S	Standard Class	1 Stage : ≤10 arcmin 2 Stage : ≤13 arcmin

Gear Ratio(i)

1 Stage		2 Stage	
003	1/3	015	1/15
004	1/4	020	1/20
005	1/5	025	1/25
006	1/6	030	1/30
007	1/7	035	1/35
008	1/8	040	1/40
009	1/9	045	1/45
010	1/10	050	1/50
–	–	063	1/63
–	–	070	1/70
–	–	081	1/81
–	–	090	1/90
–	–	100	1/100

Output Shaft Option

S	Smooth Output Shaft
K	Output Shaft with Key

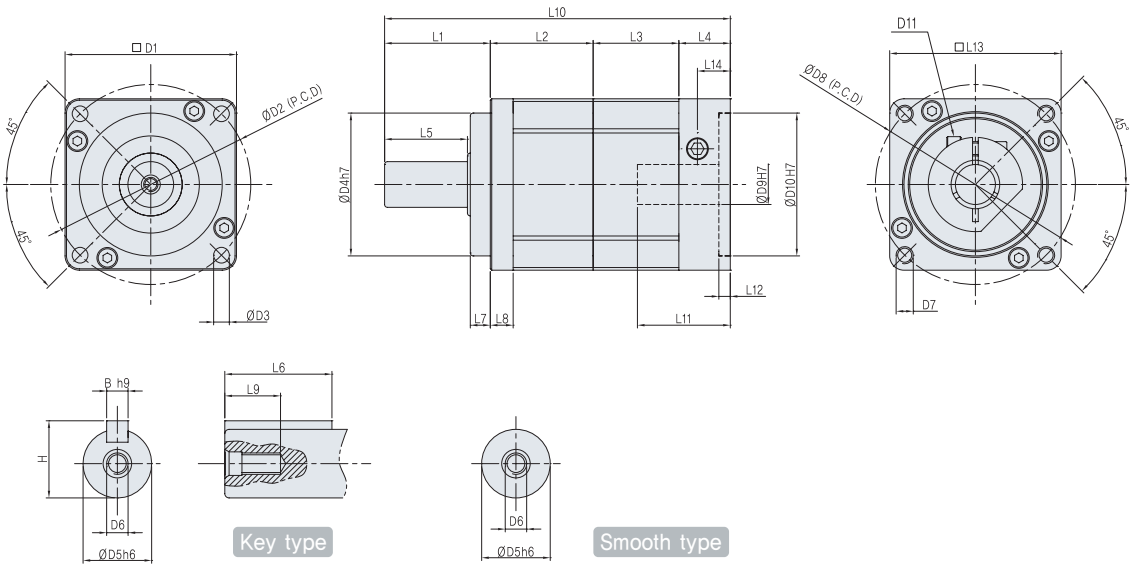
Input Adapter Flange (Servo Motors)

A	Mitsubishi, Yaskawa Tamagawa, HIGEN, LS order
B	Panasonic order
C	Rockwell order

Customer code

(1) The input flame of down size depends on customer's request.
(2) It is important for customers to verify mounting dimensions of a servo motor along with dimensions of gear head prior to placing purchase order.

■ Dimensions (1 Stage, Ratio(i) = 1/3 ~ 1/10)

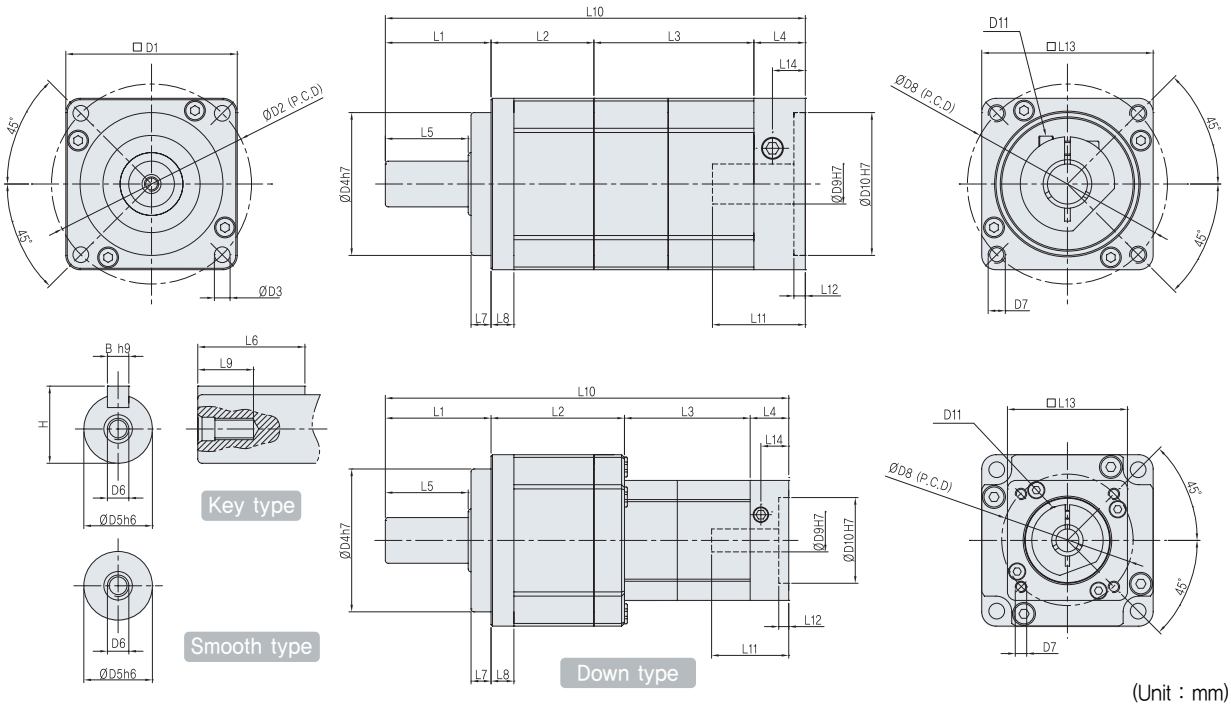


(Unit : mm)

Dimension \ Model		SPI 042	SPI 060	SPI 090	SPI 115
D1		42	60	90	115
D2		50	70	100	130
D3		3.4	5.5	6.5	9
D4 h7		35	50	80	110
D5 h6		13	16	22	32
D6		M4xP0.7	M5xP0.8	M8xP1.25	M12xP1.75
D7	A	M4 DP 8	M5 DP 12	M6 DP 12	M8 DP 20
	B	M3 DP 6	M4 DP 12	M5 DP 12	–
	C	M4 DP 8	M5 DP 12	M6 DP 12	–
D8	A	46	70	90	145
	B	45	70	90	–
	C	46	70	90	–
D9 H7		≤8	≤14	≤19	≤32
D10 H7		30	50	70	110
D11		M3	M5	M5	M8
L1		24.5	37	46	65
L2		28.5	36	49	59
L3		25.5	30	34	40
L4	A, B	13.5	18	18	42
	C	17	22.5	23	–
L5		19.5	29	36.5	51
L6		16	25	32	45
L7		4	7	8	12
L8		7	8	10	14
L9		13	13	19	28
L10	A, B	92	121	147	206
	C	95.5	125.5	152	–
L11	A, B	27	32.5	42.5	67
	C	30.5	37	47.5	–
L12		3.5	4	4	7
L13		42	60	90	130
L14	A, B	8.3	11.5	11.5	27.5
	C	11.8	16	16.5	–
B h9		5	5	6	10
H		15	18	24.5	35

Note) 1. Specifications are subject to change without notice to improve product performances.
2. The values of D7 through D11 and L10 through L14 on the above table may vary by servo motor.
3. CAD files are available to download from website(www.spg.co.kr).

■ Dimensions (2 Stage, Ratio(i) = 1/15 ~ 1/100)



(Unit : mm)

Dimension \ Model		SPI 042	SPI 060	SPI 060D	SPI 090	SPI 090D	SPI 115	SPI 115D
D1		42	60	60	90	90	115	115
D2		50	70	70	100	100	130	130
D3		3.4	5.5	5.5	6.5	6.5	9	9
D4 h7		35	50	50	80	80	110	110
D5 h6		13	16	16	22	22	32	32
D6		M4xP0.7	M5xP0.8	M5xP0.8	M8xP1.25	M8xP1.25	M12xP1.75	M12xP1.75
D7	A	M4 DP 8	M5 DP 12	M4 DP 8	M6 DP 12	M5 DP 12	M8 DP 20	M6 DP 12
	B	M3 DP 6	M4 DP 12	M3 DP 6	M5 DP 12	M4 DP 12	–	M5 DP 12
	C	M4 DP 8	M5 DP 12	M4 DP 8	M6 DP 12	M5 DP 12	–	M6 DP 12
D8	A	46	70	46	90	70	145	90
	B	45	70	45	90	70	–	90
	C	46	70	46	90	70	–	90
D9 H7		≤8	≤14	≤8	≤19	≤14	≤32	≤19
D10 H7		30	50	30	70	50	110	70
D11		M3	M5	M3	M5	M5	M8	M5
L1		24.5	37	37	46	46	65	65
L2		28.5	36	46.7	49	65	59	80
L3		50.5	56	44	72	51.5	90	65.7
L4	A, B	13.5	18	13.5	18	18	42	18
	C	17	22.5	17	23	22.5	–	23
L5		19.5	29	29	36.5	36.5	51	51
L6		16	25	25	32	32	45	45
L7		4	7	7	8	8	12	12
L8		7	8	8	10	10	14	14
L9		13	13	13	19	19	28	28
L10	A, B	117	147	141.2	185	180.5	256	228.7
	C	120.5	151.5	144.7	190	185	–	233.7
L11	A, B	27	32.5	27	42.5	32.5	67	42.5
	C	30.5	37	30.5	47.5	37	–	47.5
L12		3.5	4	3.5	4	4	7	4
L13		42	60	42	90	60	130	90
L14	A, B	8.3	11.5	8.3	11.5	11.5	27.5	11.5
	C	11.8	16	11.8	16.5	16	–	16
B h9		5	5	5	6	6	10	10
H		15	18	18	24.5	24.5	35	35

Note) 1. Specifications are subject to change without notice to improve product performances.
2. The values of D7 through D11 and L10 through L14 on the above table may vary by servo motor.
3. CAD files are available to download from website(www.spg.co.kr).

SPG MOTOR

HIGH PRECISION PLANETARY GEARHEADS FOR SERVO MOTORS SPL Series

- ▶ Spur Gear
- ▶ Compact size
- ▶ High Precision, High Durability
- ▶ High Efficiency
- ▶ Easy Mount
- ▶ Protection grade IP65

■ Specifications

Description	Unit	Stage	Ratio (1)	Model No.						
				SPL 042	SPL 060	SPL 060D	SPL 090	SPL 090D	SPL 115	SPL 115D
Nominal Output torque T_{2N} (2)	Nm	1	3	7.5	13.5	–	78	–	171	–
			4	10	18	–	102	–	205	–
			5	12.5	22.5	–	112	–	235	–
			6	–	27	–	103	–	–	–
			7	14	31.5	–	100	–	210	–
			8	–	36	–	102	–	–	–
			9	14	34	–	96	–	160	–
			10	10	29	–	80	–	191	–
			14	–	31.5	–	100	–	210	–
			20	–	29	–	80	–	191	–
		2	15	15	–	–	–	–	–	–
			20	14	–	–	–	–	–	–
			25	19	42	42	112	112	235	235
			30	15	46	46	110	112	190	235
			35	19	42	42	112	112	235	235
			40	14	35	35	102	112	205	235
			45	19	42	42	112	112	235	235
			50	19	42	42	112	112	235	235
			63	14	38	38	100	100	210	210
			70	14	38	38	100	100	210	210
			81	14	34	34	96	96	160	160
			90	14	34	34	96	96	160	160
			100	10	29	29	80	80	191	191
Max Acceleration torque T_{2B}	Nm	1,2	3~100	3 times of Nominal Output torque						
Nominal Input speed n_1	rpm	1,2	3~100	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Max. Input speed N_1	rpm	1,2	3~100	6,000	6,000	6,000	5,000	5,000	5,000	5,000
Backlash (Standard class)	arcmin	1	3~20	≤ 13	≤ 13	–	≤ 13	–	≤ 13	–
		2	15~100	≤ 16	≤ 16	≤ 16	≤ 16	≤ 16	≤ 16	≤ 16
Torsional Rigidity	Nm/arcmin	1,2	3~100	2	3	3	12	12	23	23
Max. Radial load Fr max (2)	N	1,2	3~100	400	1,100	1,100	2,400	2,400	4,000	4,000
Max. Axial load Fa max (2)	N	1,2	3~100	300	600	600	1,800	1,800	2,500	2,500
Service life (2)	hr	1,2	3~100	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Noise level (3)	dB(A)	1,2	3~100	≤ 61	≤ 63	≤ 63	≤ 65	≤ 65	≤ 68	≤ 68
Weight	kg	1	3~20	0.9	2.0	–	5.7	–	12.9	–
		2	15~100	1.1	2.4	2	7.0	5.9	16.7	14.1
Mass Moment of Inertia (4)	kg ㎠	1	3~20	0.04	0.15	–	0.8	–	2.8	–
		2	15~100	0.03	0.07	0.07	0.5	0.5	1.5	1.5
Operating Temp. (5)	℃	1,2	3~100	−10 ~ +90						
Lubrication		1,2	3~100	High temperature & Extreme pressure Lubricant						
Mounting position		1,2	3~100	All directions						
Efficiency η	%	1	3~20	≥ 95						
		2	15~100	≥ 92						
Degree of protection		1,2	3~100	IP 65						

(1) Ratio = N_{in} / N_{out} (2) Values were measured at the following conditions : 100 rpm at the output. Load applied to the middle of the output shaft. Load coefficient(Ka) = 1. Continuous operation(S1≒10,000hrs). (3) Noise level : A measurement 1m away from the gear head, 3000 input rpm and at no load condition. (Background noise 21dB(A)) (4) Moment of inertia : A measurement at the input shaft and representatives from each ratio.(i=1/5)
(5) Operating temperature : Surface temperature of gear case in −10°C~40°C of ambient temperature.
※ The data in the above table are representative values. Specifications are subject to change without notice to improve product performances.

■ Coding System

SPL		060	(1)	S	020 (2)	S[K]	A (3)	A01

Series Name

SPL	L Type

Gear Type

No symbol	Spur

Frame Size

042	□42
060	□60
090	□90
115	□115

Input Frame Size

No symbol	Standard

Backlash

S	Standard Class	1 Stage : ≤10 arcmin 2 Stage : ≤13 arcmin

Gear Ratio(i)

1 Stage		2 Stage	
003	1/3	(015)	(1/15)
004	1/4	(020)	(1/20)
005	1/5	025	1/25
006	1/6	030	1/30
007	1/7	035	1/35
008	1/8	040	1/40
009	1/9	045	1/45
010	1/10	050	1/50
014	1/14	063	1/63
020	1/20	070	1/70
–	–	081	1/81
–	–	090	1/90
–	–	100	1/100

Input Adapter Flange (Servo Motors)

A	Mitsubishi, Yaskawa Tamagawa, HIGEN, LS order
B	Panasonic order
C	Rockwell order

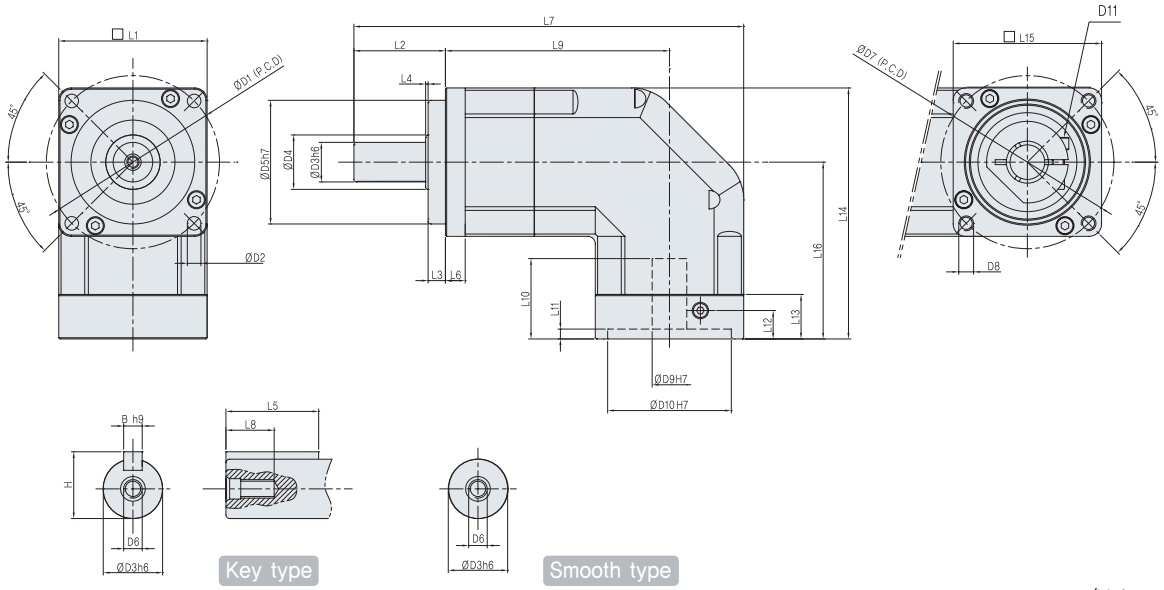
Output Shaft Option

S	Smooth Output Shaft
K	Output Shaft with Key

Customer code

(1) The input flame of down size depends on customer's request.
(2) Ratio 1/14 and 1/20 of 1 stage are custom-made specification.
(3) It is important for customers to verify mounting dimensions of a servo motor along with dimensions of gear head prior to placing purchase order.

■ Dimensions (1 Stage, Ratio(i) = 1/3 ~ 1/20)

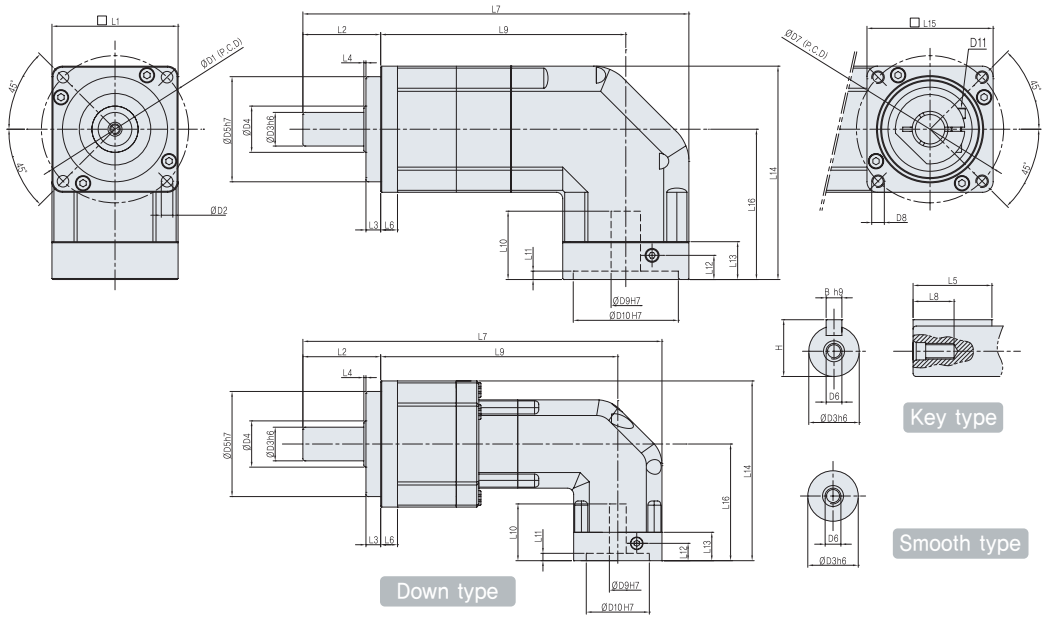


(Unit : mm)

Dimension \ Model		SPL 042	SPL 060	SPL 090	SPL 115
D1		50	70	100	130
D2		3.4	5.5	6.5	9
D3 h6		13	16	22	32
D4		14.5	19.7	24.8	39.8
D5 h7		35	50	80	110
D6		M4xP0.7	M5xP0.8	M8xP1.25	M12xP1.75
D7	A	46	70	90	145
	B	45	70	90	–
	C	46	70	90	–
D8	A	M4 DP 8	M5 DP 12	M6 DP 12	M8 DP 20
	B	M3 DP 6	M4 DP 12	M5 DP 12	–
	C	M4 DP 8	M5 DP 12	M6 DP 12	–
D9 H7		≤ 8	≤ 14	≤ 19	≤ 32
D10 H7		30	50	70	110
D11		M3	M5	M5	M8
L1		42	60	90	115
L2		24.5	37	46	65
L3		4	7	8	12
L4		1	1	1.5	2
L5		16	25	32	45
L6		7	8	10	14
L7		121.6	157.6	216.2	283.8
L8		13	13	19	28
L9		76.1	90.6	125.2	153.8
L10	A, B	27	35.5	42.5	73
	C	30.5	40	47.5	–
L11		3.5	4	4	7
L12	A, B	8.3	11.5	11.5	27.5
	C	11.8	16	16	–
L13	A, B	13.5	18	18	42
	C	17	22.5	22.5	–
L14	A, B	76.5	101.5	133.1	188.8
	C	80	106	138.1	–
L15		42	60	90	130
L16	A, B	55.5	71.5	88.1	131.3
	C	59	76	93.1	–
B h9		5	5	6	10
H		15	18	24.5	35

Note) 1. Specifications are subject to change without notice to improve product performances.
2. The values of D7 through D11 and L10 through L16 on the above table may vary by servo motor.
3. CAD files are available to download from website(www.spg.co.kr).

■ Dimensions (2 Stage, Ratio(i) = 1/25 ~ 1/100)

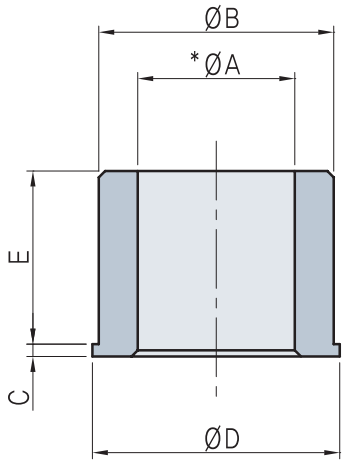


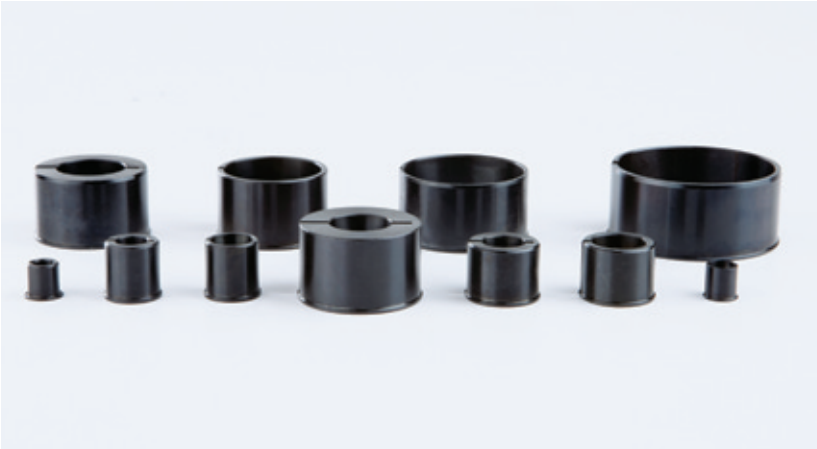
(Unit : mm)

Dimension \ Model		SPL 042	SPL 060	SPL 060D	SPL 090	SPL 090D	SPL 115	SPL 115D
D1		50	70	70	100	100	130	130
D2		3.4	5.5	5.5	6.5	6.5	9	9
D3 h6		13	16	16	22	22	32	32
D4		14.5	19.7	19.7	24.8	24.8	39.8	39.8
D5 h7		35	50	50	80	80	110	110
D6		M4xP0.7	M5xP0.8	M5xP0.8	M8xP1.25	M8xP1.25	M12xP1.75	M12xP1.75
D7	A	46	70	46	90	70	145	90
	B	45	70	45	90	70	–	90
	C	46	70	46	90	70	–	90
D8	A	M4 DP 8	M5 DP 12	M4 DP 8	M6 DP 12	M5 DP 12	M8 DP 20	M6 DP 12
	B	M3 DP 6	M4 DP 12	M3 DP 6	M5 DP 12	M4 DP 12	–	M5 DP 12
	C	M4 DP 8	M5 DP 12	M4 DP 8	M6 DP 12	M5 DP 12	–	M5 DP 12
D9 H7		≤ 8	≤ 14	≤ 8	≤ 19	≤ 14	≤ 32	≤ 19
D10 H7		30	50	30	70	50	110	70
D11		M3	M5	M3	M5	M5	M8	M5
L1		42	60	60	90	90	115	115
L2		24.5	37	37	46	46	65	65
L3		4	7	7	8	8	12	12
L4		1	1	1	1.5	1.5	2	2
L5		16	25	25	32	32	45	45
L6		7	8	8	10	10	14	14
L7		146.6	183.6	170.8	254.2	217.1	333.8	297.9
L8		13	13	13	19	19	28	28
L9		101.1	116.6	112.8	163.2	141.1	203.8	187.9
L10	A, B	27	35.5	27	42.5	35.5	73	42.5
	C	30.5	40	30.5	47.5	40	–	47.5
L11		3.5	4	3.5	4	4	7	4
L12	A, B	8.3	11.5	8.3	11.5	11.5	27.5	11.5
	C	11.8	16	11.8	16	16	–	16.5
L13	A, B	13.5	18	13.5	18	18	42	18
	C	17	22.5	17	23	22.5	–	23
L14	A, B	76.5	101.5	85.5	133.1	116.5	188.8	145.6
	C	80	106	89	138.1	121	–	150.6
L15		42	60	42	90	60	130	90
L16	A, B	55.5	71.5	55.5	88.1	71.5	131.3	88.1
	C	59	76	59	93.1	76	–	93.1
B h9		5	5	5	6	6	10	10
H		15	18	18	24.5	24.5	35	35

Note) 1. Specifications are subject to change without notice to improve product performances.
2. The values of D7 through D11 and L10 through L16 on the above table may vary by servo motor.
3. CAD files are available to download from website(www.spg.co.kr).

■ Adapter Bush (for Motor Shaft)





Dimension \ Model	42	60	90	115	142	180	220
*ØA	5, 6, 6.35, 7	6.35, 8, 11, 12	8, 11, 12, 12.7, 14, 16	16, 19, 22, 24, 28	19, 22, 24, 28, 35	35, 42, 44, 45	35, 42, 45
ØB	8	14	19	32	38	48	55
C	0.5	1	1	1	1	1	1
ØD	9	15	20	33	39	49	56
E	8.5	14	14	19	19	21	27

ØA : Optional dimension depending on type of motor shaft.
Shall verify prior to order placing.

■ Check points for gearhead selection

Select Servo Motor

① Select motor manufacturer.
② Select the model.

Select Gearhead

① Select frame size.
② Select gear ratio.
③ Select backlash.

Check Specification of Servo Motor and Gearhead

① Check dimension
(CAD file can be downloaded from www.spg.co.kr)
② Check specification of gear ratio.
▶ External load condition on the output shaft (radial load(or O.H.L), thrust load)
▶ Rated torque, stall torque
▶ Rated rpm, max rpm
▶ Inertia moment, Maximum load moment of output shaft
▶ Weight
③ Check Specification of Servo Motor.
▶ Rated output
▶ Rated torque
▶ Stall torque
▶ Rated rpm
▶ Max rpm
▶ Rotor inertia···etc.

Other Check Points

① Check output torque on gearhead with the servo motor.
② Check if radial and/or thrust load of the assembling device is within the gearhead's tolerance range.
③ Check on backlash of the gearhead .
④ Check on operating condition (temperature, humidity, cleanness, etc..)

※ A planetary gearhead is designed under an assumption that its working load is run on an ideal and constant load condition. Therefore, select an appropriate product in consideration of a load factor if a working load is in change.

Gearhead Selection

■ Selecting a gearhead 〈1-a〉

Simple selection by servo motor capacity and gear ratio (based on Rated input speed 3,000rpm motor)

Motor Capa. \ Ratio	3	5	10	20	30	40	50	81	100
50W	SPI□/SPL□ 042								
100W									
200W	SPI□/SPL□ 060								
400W									
750W	SPI□/SPL□ 090								
1,000W									
1,500W									
2,000W									
3,000W	SPI□/SPL□ 115								
4,000W									
5,000W									
6,000W	SPIH/SPLH 142								
7,000W									
8,000W									
11,000W	SPIH/SPLH 180								
12,000W									
15,000W	SPIH/SPLH 220								
22,000W									

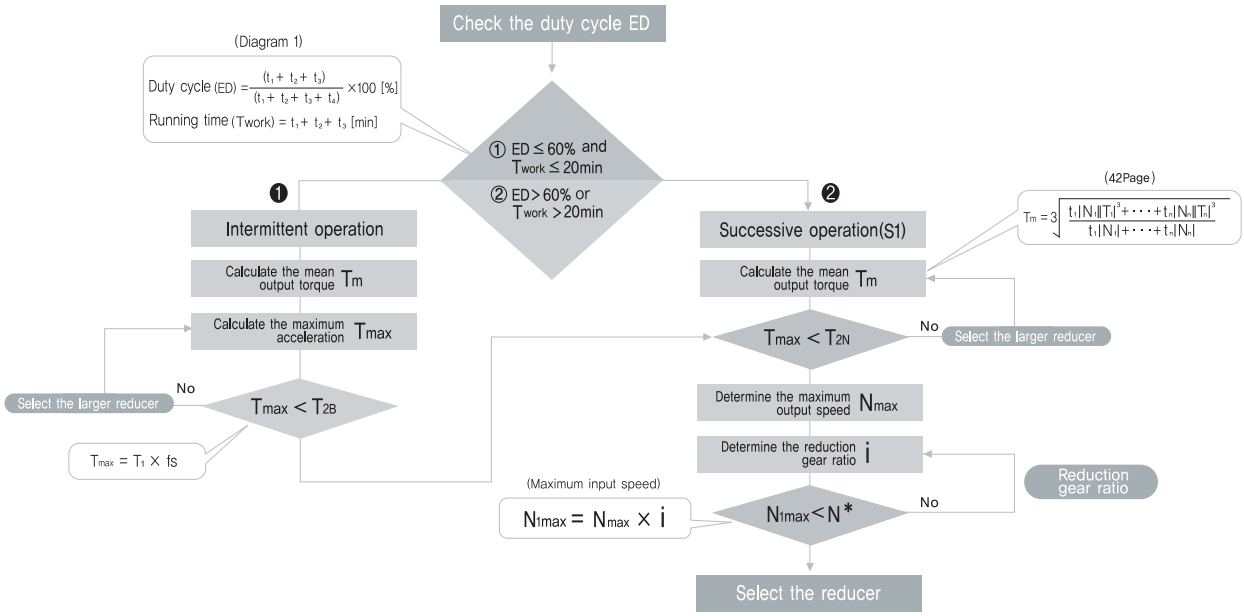
■ Selecting a gearhead 〈1-b〉

Simple selection by servo motor capacity and gear ratio (based on Rated input speed 2,000rpm motor)

Motor Capa. \ Ratio	3	5	10	20	30	40	50	81	100
50W	SPI□/SPL□ 042								
100W									
200W	SPI□/SPL□ 060								
400W									
750W	SPI□/SPL□ 090								
1,000W									
1,500W									
2,000W									
3,000W	SPI□/SPL□ 115								
4,000W									
5,000W	SPIH/SPLH 142								
6,000W									
7,000W									
8,000W	SPIH/SPLH 180								
11,000W									
12,000W									
15,000W	SPIH/SPLH 220								
22,000W									

Note) 1. 「Selecting a gearhead 〈1-a〉 & 〈1-b〉」 are the reference for simple selection of a gearhead. See 「Selecting a gearhead 〈2〉」 for more accurate selection.
2. Select a gearhead within the range **(rated torque X gear ratio X efficiency of servo motor 〈 rated torque of gearhead)**
3. Above selection tables refer till 1/50 gear ratio. If in need of the gear ratio above 1/50, contact us for further information and if possible, raise frame size of gearhead by upper one size.

■ How to select a gearhead 〈2〉 For selection considering operation conditions



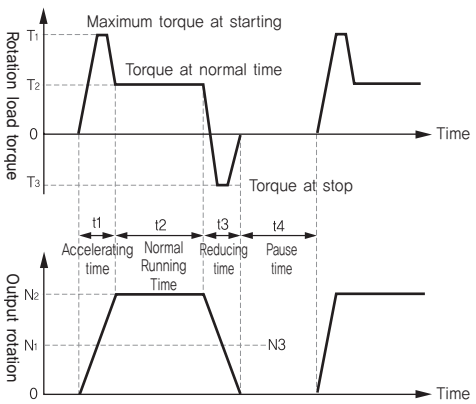
Note) For data of T_{2B}, T_{2N}, and N, see 「Specifications」of the catalogue.

■ Table 1 fs Table of factors

Number of Cycles/hr	fs*
0~1,000	1
1,000~1,500	1.1
1,500~2,000	1.25
2,000~3,000	1.55
3,000~5,000	1.83

Note) fs (shock factor) : Shock factor

■ Diagram 1 Load Cycle's line graph



A list of applicable servo motors by gearhead specification

■ A list of applicable servo motors by specification

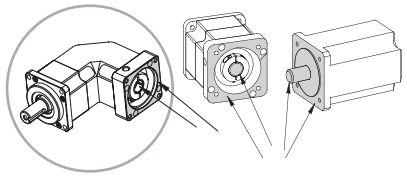
Servo Motor Brand / Frame Size of Gearheads	Higens	LS Mecapion	Mitsubishi	Panasonic
SPI(H) 042 SPIFH 042 SPL(H) 042 SPLFH 042	FMA-CKZ5	APM-SAR3A	HC-KFS053(B)	MSMD5AZP1□
	FMA-CK01	APM-SAR5A	HC-KFS13(B)	MSMD5AZS1□
		APM-SA01A	HC-MFS053(B)	MSMD01□P1□
			HC-MFS13(B)	MSMD01□S1□
SPI(H) 060 SPIFH 060 SPL(H) 060 SPLFH 060	FMA-CK02	APM-SB01A	HC-KFS23(B)	MAMA022P1□, S1□
	FMA-CK04	APM-SB02A	HC-KFS43(B)	MAMA042P1□, S1□
	FMA-CN01	APM-SB04A	HC-KFS-46	MSMD02□P1□, S1□
	FMA-CN02		HC-KFS-410	MSMD04□P1□, S1□
	FMA-CN03, 04, 05		HC-MFS23(B)	MQMA01□P1□, S1□
			HC-MFS43(B)	
SPI(H) 090 SPIFH 090 SPL(H) 090 SPLFH 090	FMA-CN04A	APM-SC04A	HC-KFS73(B)	MAMA082P1□, S1□
	FMA-CN06	APM-SC06A	HC-MFS73(B)	MSMD08□P1□, S1□
	FMA-CN08	APM-SC08A	HC-UFS-23(B)	MQMA02□P1□, S1□
	FMA-CN10	APM-SC10A	HC-UFS-43(B)	MQMA04□P1□, S1□
	FMA-KN03, 05, 06, 07	APM-SC03, 05, 06, 07D		
SPI(H) 115 SPIFH 115 SPL(H) 115 SPLFH 115	FMA-CN09, 15, 22, 30	APM-SE09A, 15A	HC-LFS-52(B)	MSMA302P1□, S1□
	FMA-KN06A, 11, 16, 22	APM-SE22A, 30A	HC-LFS-102, 152(B)	MSMA402P1□, S1□
	FMA-TN05, 09, 13, 17	APM-SE06D, 11D	HC-SFS-81, 52(B)	MSMA502P1□, S1□
	FMA-LN03, 06, 09, 12	APM-SE16D, 22D	HC-SFS-102, 152(B)	MDMA102P1□, S1□
	FMA-KF08, 10, 15	APM-SE05G, 09G	HC-SFS-53, 103(B)	MDMA152P1□, S1□
	FMA-TF05, 09, 13	APM-SE13G, 17G	HC-SFS-153(B)	MDMA202P1□, S1□
	FMA-LF03, 06, 09	APM-SE03M, 06M	HC-SFS-524(B)	MDMA302P1□, S1□
		APM-SE09M, 12M	HC-SFS-1024(B)	MGMA092P1□, S1□
			HC-SFS-1524(B)	MFMA042P1□, S1□
			HC-RFS-353(B)	MHMA052P1□, S1□
			HC-RFS-503(B)	MHMA102P1□, S1□
			HC-UFS-73(B)	MHMA152P1□, S1□
SPIH 142 SPIFH 142 SPLH 142 SPLFH 142 (1 Stage)	FMA-CN30A, 50A	APM-SF30A, 50A	HC-LFS-202, 302(B)	MGMA202P1, S1□
	FMA-KN22A, 35	APM-SF22D, 35D	HC-SFS-121(B)	MGMA302P1, S1□
	FMA-TN20, 30	APM-SF20G, 30G	HC-SFS-201, 202(B)	MFMA152P1, S1□
	FMA-LN12A, 20, 30	APM-SF12M, 20M	HC-SFS-203(B)	MHMA202P1, S1□
	FMA-KF22, 35		HC-SFS-301, 352, 353(B)	MHMA402P1, S1□
	FMA-TF20, 30		HC-SFS-2024(B)	
	FMA-LF12, 20, 30		HC-SFS-3524(B)	
			HC-UFS-72, 152(B)	
SPIH 180 SPIFH 180 SPLH 180 SPLFH 180 (1단)	FMA-KN55	APM-SF55, 75D	HC-SFS-502(B)	MDMA502P1, S1□
	FMA-TN44, 55	APM-SF44, 60G	HC-SFS-702(B)	MDMA752P1, S1□
	FMA-LN40	APM-SF40M	HC-SFS-5024(B)	MHMA502P1, S1□
	FMA-KF50		HC-SFS-7024(B)	MHMA752P1, S1□
	FMA-TF44			MGMA451P1, S1□
				MGMA452P1, S1□
				MGMA602P1, S1□
SPIH 220 SPIFH 220 SPLH 220 SPLFH 220 (1단)		APM-SG22, 35, 55, 75, 110D	HC-UFS-202(B)	MFMA252P1, S1□
		APM-SG20, 30, 44, 60G	HC-UFS-352(B)	MFMA452P1, S1□
		APM-SG85, 110, 150G	HC-UFS-502(B)	
		APM-SG12, 20, 60M		

Note) 1. See also「How to select a gearhead 1」(32 Page) by servo motor capacity.
2. Check again specifications and dimensions of the servo motor of the maker after selecting the servo motor.
3. The model names of the above servo motors are arranged by reference to catalogues of each manufacturer, and for more details, contact the manufacturer.

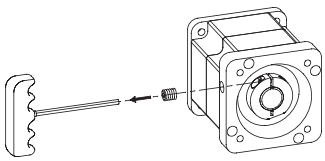
Rockwell	Sanyo	Yaskawa	Fuji
CSMT-A3□□,A5□□,01□□	Q1AA04003D,005D	SGMAH-A3, A5, 01A	GYS500DC1-S8B (B)
SMZ-A3□□,A5□□,01□□	Q1AA04010D	SGMAH-A3, A5, 01B	GYS101DC1-SB (B)
RSMZ-A3□□,A5□□,01□□	Q1EA04003D,005D	SGMAS-A5, 01, C2A	
RSMZ-A8□□	Q1EA04010D	SGMAV-01A, C2A	
	R2AA04003F,05F	SGMJV-A5, 01A	
	R2AA04010F	SJME-01A	
CSMT-02□□,04□□	Q1AA06020D	SGMAH-02A, 02B, 03D, 04A	GYS101DC1-SA (B)
CSMR-01□□	Q2AA06040D	SGMAS-02, 04, 06A	GYS201DC1-SA (B)
CSMZ-02□□,04□□	Q1EA06020D	SGMAV-02, 04, 06A	GYS401DC1-SA (B)
CSMQ-01□□	R2AA06010F	SGMJV-02, 04A	
RSMZ-02□□,04□□	R2AA06020F	SGMPH-01A, 01B	
RSMZ-06□□,08□□,10□□	R2AA06040F	SGMPS-01A	
RSMQ-01□□		SJME-02, 04A	
CSMT-06□□,08□□	Q1AA07075D	SGMAH-07D, 08A	GYC201DC1-SA (B)
CSMR-02□□,04□□	Q2AA07020D	SGMAV-08, 12A	GYC401DC1-SA (B)
CSMZ-07□□	Q2AA07030D	SGMAV-08, 10A	GYS751DC1-SA (B)
CSMQ-02, 04□□	Q2AA07040D	SGMGV-03A, 03D, 05A, 05D	
RSMQ-02, 04□□	Q2AA07050D	SGMJV-08A	
	Q2EA07020D	SGMPS-02, 04A	
	R2AA08020F,40F,75F	SGMSH-10, 15, 20A(D)	
CSMD-07,10,15,20,25,30□□	Q1AA13300D	SGMGH-03, 05, 06, 09, 13A(D)	GYC102DC1-SA (B)
CSMS-30,35,40,45,50□□	Q1AA13400D	SGMGV-09, 13, 20A(D)	GYC152DC1-SA (B)
CSMH-05,10,15□□	Q1AA13500D	SGMPH-08, 15A(D)	GYC202DC1-SA (B)
CSMF-04□□	Q2AA13050H	SGMPS-08, 15A	GYA501BC1-SA (B)
CSMK-03,06,09□□	Q2AA13100H	SGMSH-30, 40, 50A(D)	GYA152BC1-SA (B)
RSMD-08,10,15,20,25,30□□	Q2AA13150H	SGMSS-30, 40, 50, 70A	GYA252BC1-SA (B)
RSMH-05,10,15□□	Q2AA13200H	SGMSV-30, 40, 50A(D)	GYS302DC1-SA (B)
RSMS-30,35,40,45,50□□	Q2CA13200H		GYS402DC1-SA (B)
RSMF-04□□			GYS502DC1-SA (B)
RSMK-03,06,09□□			
RSML-03,06,09□□			
CSMH-20, 30, 40□□	Q2AA18200H	SGMGH-12, 20, 30A(D)	
CSMF-08, 15□□	Q2CA18350H	SGMGV-30A, D	
CSMK-12, 20, 30□□	Q2AA18350H		
RSMD-35, 40□□			
RSMH-20, 30, 40□□			
RSMF-08, 15□□			
RSMK-12, 20, 30□□			
RSML-12, 30□□			
CSMD-45, 50□□	Q1AA18450M	SGMGH-40, 44, 55, 75A	
CSMH-50□□	Q1AA18350H	SGMGH-44, 55, 75D	
CSMK-45, 60□□	Q2AA18450H	SGMGV-44, 55, 75A	
RSMD-45, 50□□	Q2AA18550R	SGMGV-44D	
RSMH-50□□	Q2AA18550H		
RSMK-45, 60□□	Q2AA18450L		
RSML-45, 60□□	Q2CA18450H		
CSMF-25,35,45□□	Q2AA22250H,Q22AA22350H	SGMDH-22, 32, 40A	
RSMF-25,35,45□□	Q2AA22450R	SGMDH-1AA, 1AD, 1EA, 1ED	
	Q2AA22550B	SGMGV-1AA, 1EA	
	Q2AA22700S		
	Q2AA2211KV,Q2AA2215KV		
	Q2CA22550H, Q2CA22700H		

How to mount the servo motor

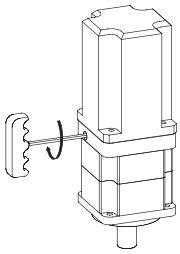
■ Servo motor mounting To mount with the servo motor, keep the following sequence



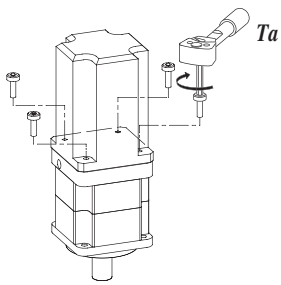
1 Clean the mounting phase after checking the motor and gearhead sizes.
(Check the shaft diameter. use appropriate bush if necessary)



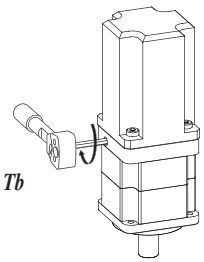
2 Loosen the screw plug from the adapter flange and adjust the position so that the clamp bolt can be seen. (For proper servo motor shaft fixation method, see「Appendix 1」.)



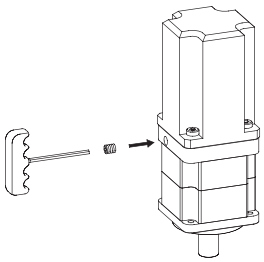
3 When mounting onto the motor, closely adhere the adapter flange of the reducer and the motor mounting side and slightly tighten the clamping bolt so that the clamp ring not idle.



4 Tighten diagonally to the specified tightening torque with a torque wrench.
(For tightening torque, see「Appendix 2」.)



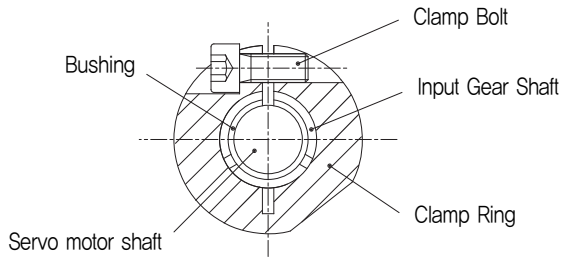
5 Tighten the clamp bolt to the specified tightening torque with a torque wrench. (For tightening torque, see「Appendix 2」.)



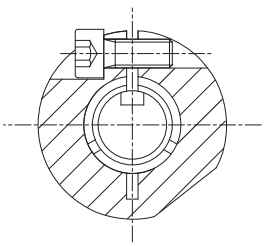
6 Tighten again the screw plug

■ Appendix 1 Proper servo motor shaft fixation method

If the servo motor shaft does not have a circular but key way, remove the key and make sure that the key way of the servo motor shaft and the clamp bolt of the gearhead input shaft can be perpendicular as shown in「Fig. B」at mounting. Also, arrange each slot position of the Clamp Ring, the Gear Shaft, and the Bushing in a line to get higher tightening power.



(Figure A) Annular shaft



(Figure B) Key way

■ Appendix 2 Wrench Bolt tightening torque

Wrench Bolt Size	Motor mounting(8.8T) Ta		Clamp ring(12.9T)Tb	
	N · m	kgf · cm	N · m	kgf · cm
M3	1.28	13	2.15	22
M4	2.9	30	4.95	50
M5	5.75	59	9.7	99
M6	9.9	101	16.5	168
M8	24	245	40	408
M10	48	489	81	826
M12	83	846	140	1,428
M14	132	1,346	220	2,243
M16	200	2,039	340	3,467

■ Appendix 3 Conversion Table (Torque)

Units to be Converted	1 N · m	1 N · cm	1 kgf · m	1 kgf · cm	1 lbf · ft	1 lbf · in
1 N · m	1	10^{2}	0.10197	10.197	0.7376	8.8509
1 N · cm	10^{-2}	1	1.0197×10^{-3}	0.10197	7.376×10^{-3}	8.8509×10^{-2}
1 kgf · m	9.8066	980.665	1	10^{2}	7.233	86.79
1 kgf · cm	9.8066×10^{-2}	9.8066	10^{-2}	1	7.233×10^{-2}	0.8680
1 lbf · ft	1.356	1.356×10^{2}	0.1383	13.83	1	12
1 lbf · in	0.113	11.3	1.152×10^{-2}	1.152	8.333×10^{-2}	1

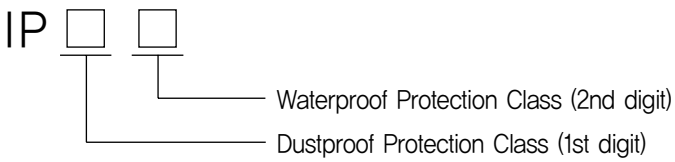
■ Appendix 4 Angular Unit Indication method

Angular Unit	Value	Symbol	약어
degree	1/360 circle	°	Deg
arcminute	1/60 degree	′ (prime)	arcmin, amin, MOA
arcsecond	1/60 arcminute	″ (double prime)	arcsec
miliarcsecond	1/1,000 arcsecond		mas

■ Appendix 5 Equipment Protection Grade (IP)

IP(Ingress Protection) is IEC529 standards specify the class of dustproof and waterproof in terms of the equipment protection structure.

The class indications of dustproof and waterproof are as follows.



1 The classification of dustproof (1st digit)

IP Indication	Level of Protection
IP0□	None
IP1□	Protected from the access of a hand
IP2□	Protected from the access of a finger
IP3□	Protected against the tool's edge
IP4□	Protected against the wire
IP5□	Protected against the dust
IP6□	Perfect dust-proof structure

2 The classification of waterproof (2nd digit)

IP Indication	Level of Protection
IP □0	None
IP □1	Protected from the water-drop dropping vertically
IP □2	Protected from the water-drop dropping within a range of 15° from the vertical direction
IP □3	Protected from the water spraying within a range of 60° from the vertical direction
IP□ 4	Protected from the water splattering from all directions
IP □5	Protected from the water pouring from all directions
IP □6	Protected from the water pouring strongly like a sea wave
IP □7	Possible to use while immersed in the water under certain conditions
IP□ 8	Possible to use under the water

SPG MOTOR

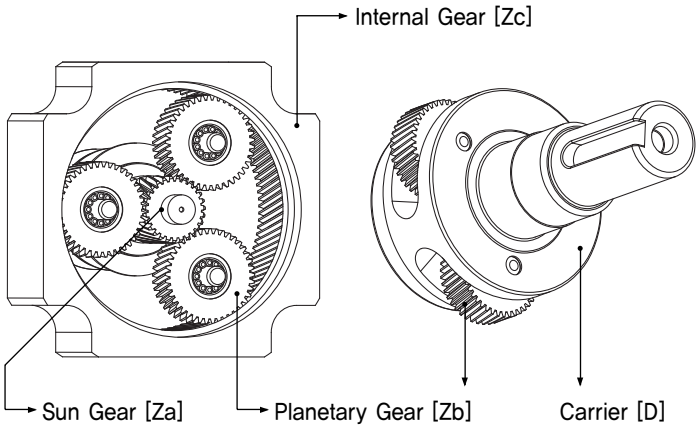
TECHNICAL MATERIAL

▶Classification of planetary gear appliance structure/use

▶Reliability assessment terms [I ~ V]

▶Gearhead selection examples

■ Planetary gear structure



The major components of Planetary gear heads are
① Sun Gear
② Planetary Gear
③ Internal Gear
and composes of **carriers** as a basic unit.

It is gear equipment with such advantageous features that it cannot only obtain a large reduction ratio but also high efficiency and precise control of power transfer while it is in a compact style.

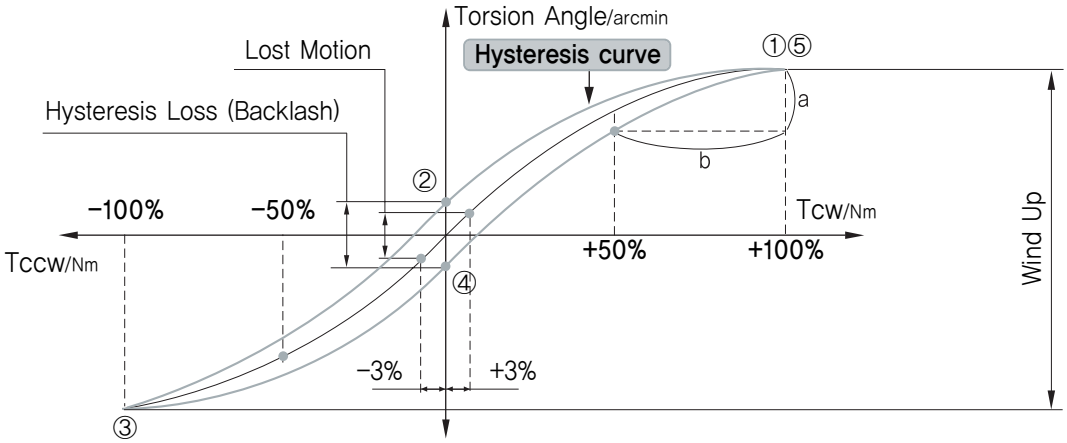
Type	Fixed component	Input	Output	* Calculation formula of reduction ratio	Reduction ratio range	** Planetary Gear
Planetary Gear	Internal Gear	Sun Gear	Carrier	$\frac{1}{\frac{Zc}{Za}+1}$	1/3 ~ 1/12	Performance of simultaneous rotation and revolution
Star	Carrier	Sun Gear	Internal Gear	$-\frac{1}{\frac{Zc}{Za}}$	1/2 ~ 1/11	Performance of revolution only
Solar	Sun Gear	Internal Gear	Carrier	$\frac{1}{\frac{Za}{Zc}+1}$	1/1.2~1/1.7	Performance of simultaneous rotation and revolution

* Z in a calculation formula indicates the number of teeth in each component gear, and the sign (–) means the output direction opposite to that of input.
** It means an operation condition of planetary gears only.

■ Classification of general uses of a planetary reducer (by Backlash grade)

Division	Backlash (arcmin)	Applications	Control method
High precision class	3' or less	• robot peripheral equipment (Positioner, Slider etc.) • inspection equipment, precision FA machinery, medical equipment, Index equipment • packing machinery, textile machinery, machine tool	Position control
Precision class	5' or less	• precision Conveyor (transfer, division, loading) • logistics conveyance system (AGV, automated warehouse) • injection machinery extracting equipment	Speed control
General class (standard class)	10'~30'	• Conveyor, Bending Machine, Pallet Stacker • printing machinery, food processing machinery, film winding machine • various kinds of testing instruments	Torque control

■ Hysteresis curve Torque – torsion angle diagram



■ Backlash Hysteresis Loss (arcmin)

In general, whenever measuring backlash, which indicates the level of a reducer, the value measured by giving 3% of rated output torque of the reducer toward both directions(±3%) should be read. That is, if the input shaft of the reducer is fixed and torque is given to the output part, torsion responding to torque is incurred in the output part. In other words, In general, the torsional angle cannot return to a complete zero, leaving some value with it if a torque is fully applied until it reaches a rated value and then released to a zero, as shown in the line drawing. This is called Hysteresis Loss.

① Normal rotation(rated output torque Tcw) ▶ ② Zero ▶ ③ Inverse rotation(rated output torque Tccw) ▶ ④ Zero ▶ ⑤ If torque values are gradually changed in the same sequence as normal rotation(rated output torque Tcw), the curve is drawn as shown in the figure [Hysteresis Curve].

As shown in the figure, ②④ value for the zero torque part of the hysteresis curve is called Hysteresis Loss, and for the SPG's planetary reducer(SPI□/SPL□ series), the amount of Hysteresis Loss is measured, and it is set as product backlash specification.

■ Lost Motion Rotational accuracy (arcmin)

Lost Motion indicates angle of torsion in the middle of hysteresis up/down curve width within ±3% of rated output torque for backlash measurement. In general cases, Lost Motion including elastic deformation of power transmission system except Hysteresis Loss is indicated in a higher value.

■ Torsional Rigidity (Nm/arcmin)

Difference in angle of torsion, which is measured while the input shaft is fixed and each 50% and 100% of load torque are given to the output shaft, is expressed in a proportional slope, and torsional rigidity in Fig. [Hysteresis Curve] can be indicated in the following equation.

$$T_r = \frac{b}{a}$$

T_r : Torsional rigidity
a : Difference in angle of torsion when each 50% and 100% of rated output torque are given to the output shaft
b : 50% of rated output torque

■ Wind Up (arcmin)

It indicates a method of finding unidirectional total torsional value (average value) when a load is applied to reducer in no load condition.

$$\Theta = d + \frac{T - T_L}{T_r}$$

Θ : total torsional value (arcmin)
d : permissible output torque (Nm) × 0.5 unidirectional torsional value in the torque section
T : load torque (Nm)
T_L : permissible output torque (Nm) × 0.5 (= T_r × 0.5)
T_r : torsional torque stiffness (Nm / arcmin)

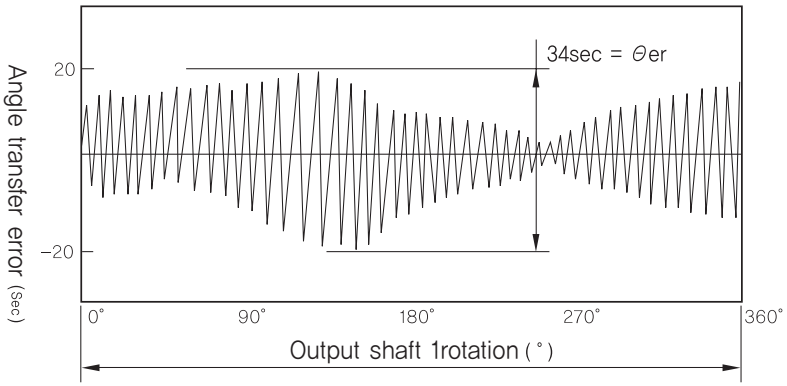
■ Angle transfer degree (arcmin)

angle transfer degree (or transfer error) indicates the difference between the theoretical output rotation angle and the actual output rotation angle (Θout) when an arbitrary rotation angle(Θin) is instructed to enter.

$$\Theta_{er} = \frac{\Theta_{in}}{R} - \Theta_{out}$$

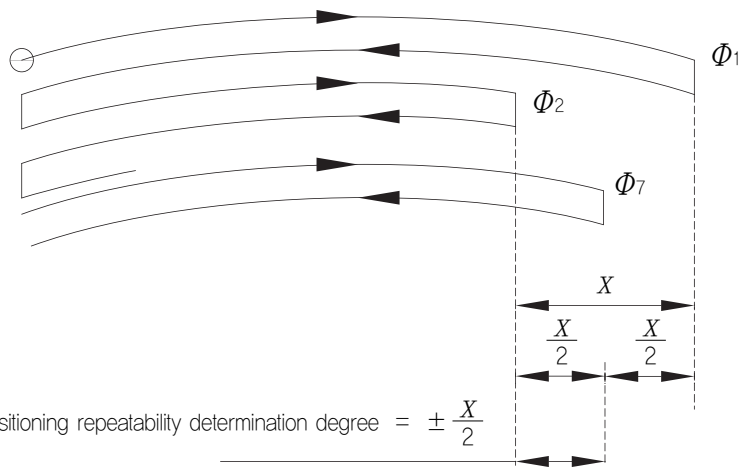
Θ_{er} : angle transfer degree (or transfer error)
Θ_{in} : input rotation angle
Θ_{out} : actual output rotation angle
R : planetary gearbox's reduction gear ratio

Example of actual measurement



■ Positioning repeatability determination degree (arcmin)

A positioning repeatability determination degree (or determination error) finds the maximum difference by measuring the stop position of output shaft after it repeats the position determination seven times in the same direction at an arbitrary position. The measurement is shown in a angle and indicated in a way the ± sign is assigned to the half value of the maximum difference.



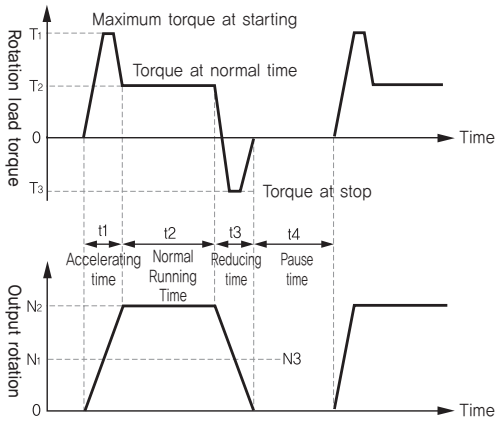
■ The Life of Gearheads (hr)

In case of actual operation by assembling a reducer to the equipment, the service life hours shall be obtained through the following calculation formula as each load condition differs from case to case.

$$L_h = {}^{*}20{,}000 \times \frac{N_o}{N_m} \times \left(\frac{T_o}{T_m}\right)^3$$

L_h : The life of gearheads (hr)
N_m : Mean value output speed (rpm)①
N_o : Rated output speed (rpm)
T_m : Mean value load torque (kg · m)②
T_o : Rated output torque (kg · m)
∗ **In case of continuous operation (S1)** : 10,000hrs

Load Cycle line graph



① N_m : Mean value output speed (rpm)

$$N_m = \frac{t_1 | N_1 | + \cdots + t_n | N_n |}{t_1 + \cdots + t_n}$$

② T_m : Mean value load torque (kg · m)

$$T_m = \sqrt[3]{\frac{t_1 | N_1 | T_1 |^3 + \cdots + t_n | N_n | T_n |^3}{t_1 | N_1 | + \cdots + t_n | N_n |}}$$

(In case of Ball Bearing)

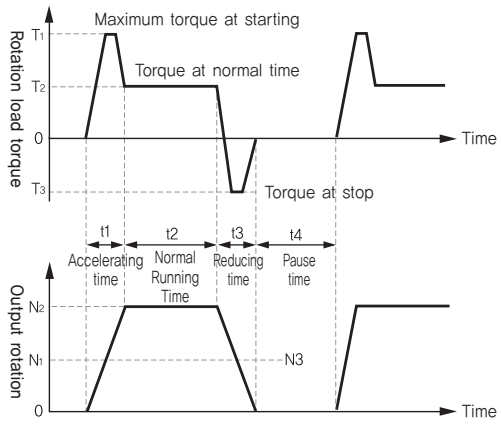
$$T_m = \sqrt[10/3]{\frac{t_1 | N_1 | T_1 |^{10/3} + \cdots + t_n | N_n | T_n |^{10/3}}{t_1 | N_1 | + \cdots + t_n | N_n |}}$$

(In case of Roller Bearing)

■ Cycle load factor (ED)

In case of actually running a reducer after assembling it to the equipment, please refer to the reducer selection method (24 page) and the following calculation formula at time of selecting a reducer based on the load pattern, as each load condition differs from case to case.

Load Cycle line graph



① ED : Cycle load factor (Duty Cycle)

$$ED\ (\%) = \frac{(t_1 + t_2 + t_3)}{(t_1 + t_2 + t_3 + t_4)} \times 100$$

Operation hours $(T_{work}) = t_1 + t_2 + t_3$ [sec]

② Zh : Number of Cycle / hr

$$Zh = \frac{3{,}600\ [s]}{(t_1 + t_2 + t_3 + t_4)}$$

③ i : Reduction of Gear ratio

$$i = \frac{\text{Maximum input speed (rpm)}}{\text{Maximum output speed (rpm)}}$$

④ Operating Condition

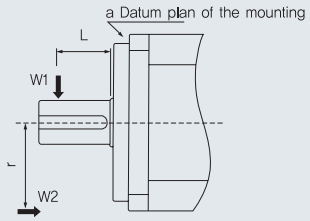
- intermittent operation(S_4/S_5) : ED ≤ 60% and T_{work} ≤ 20min
- continuous operation : ED > 60% or T_{work} > 20min

■ Output shaft maximum load moment (N-mm)

The following calculation formula shows the method seeking the maximum load moment load (Mmax). Make sure that Mmax≤Mc.

$$Mmax = W_{1max} \times L + W_{2max} \times r$$

W_1 : Radial Load (N, kgf)
W_2 : Thrust Load (N, kgf)
L, r : length (mm)
M_c : load moment (N-mm, kgf-mm)



■ Overhang Load (O.H.L) calculation

Overhang Load (O.H.L) is referred to as the suspension load applying to a shaft. It would be the best if a planetary reducer is directly connected with a concerned machine, but if it is linked through a chain, belt or gear, the O.H.L applying to the output shaft of a planetary reducer shall be less than an permissible O.H.L of the planetary reducer to be used.

$$O.H.L(N) = \frac{T_e \times K \times L}{R}$$

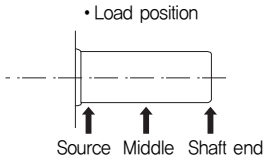
T_e : correction load torque applying to an output shaft of a planetary reducer (Nm)
[Correction load torque= load torque applying to a planetary reducer(Tf)×Service Factor (Sf)]
R : radius of a pitch circle in a component such as sprocket, pulley, and gear (m)
K : co-efficient followed by a connection method (refer to table 1)
L : co-efficient followed by the position of a load applied (refer to table 2)

(table 1)

Connection method	K
Chain, Timming Belt	1.00
Gear	1.25
V-Belt	1.5
Flat-Belt	2.5

(table 2)

Load position	L
Shaft source	0.75
Shaft middle	1
Shaft end	1.5



(table 3) Service Factor by the load condition

Load condition	Service Factor (Sf)		
	Operation of less than 3 hrs/day	operation of 3~10hr/day	operation of more than 10 hrs /day
Uniform load (In case of unidirectional and continuous operation)	1 (1)	1 (1.25)	1.25 (1.50)
Light impact load (In case of frequent reverse operation)	1 (1.25)	1.25 (1.50)	1.50 (1.75)
Severe impact load (In case of instantaneous reversing and instantaneous stop)	1.25 (1.50)	1.50 (1.75)	1.75 (2.00)

(Note) in the case of more than 10 times of running and stopping in an hour, the co-efficient in ( ) shall be used.

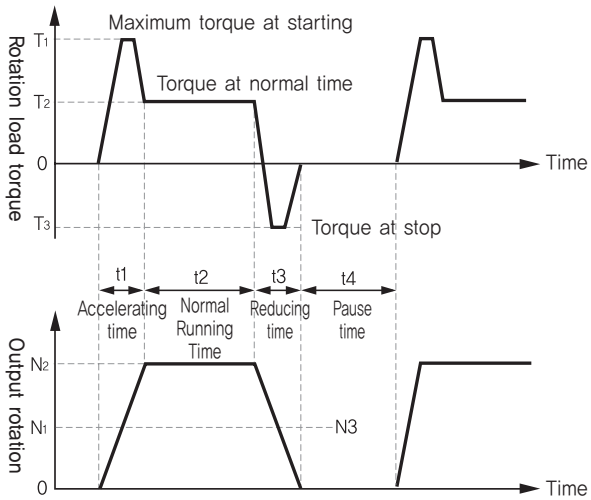
In general, there is almost no condition of continuously uniformed load in servo system. A load torque changes according to the fluctuation in an input rpm, but when it starts or stops, not only a relatively large torque is applied to, but also unexpected shock torque is placed on.

Therefore, first check the「load torque pattern」below considering the service condition like this, and then select an appropriate reducer model, according to 「Model selection order」.

In addition, if any of the specifications concerning a model exceeds the rated torque values, it would be better if you could examine a model higher a stage than a target model, or consider a lower load torque.

■ Conditions of servo system load to be used (example)

Load Cycle line graph



(table1) Condition of servo motor operation patterns (example)

T_1	Maximum torque at starting time	Nm	100
T_2	Torque at normal time	Nm	30
T_3	Maximum torque at stopping time	Nm	80
N_1	Mean output rpm at accelerating time	rpm	300
N_2	Output rpm at normal operation time	rpm	600
N_3	Mean output rpm at reduction time	rpm	300
t_1	Acceleration hours	sec	0.2
t_2	Normal operation hours	sec	5
t_3	Reduction hours	sec	0.2
t_4	Stopping hours	sec	3

■ reducer model selection (reference: 33 page 「reducer selection method 2」)

First, as the service condition in an example, check on the condition of servo motor operation patterns set out in the 35 page (table1), and then select a model following the order described below.

1 Duty cycle ED / calculation of operation conditions

$$ED\ (\%) = \frac{(t_1 + t_2 + t_3)}{(t_1 + t_2 + t_3 + t_4)} \times 100 = \frac{(0.2 + 5 + 0.2)}{(0.2 + 5 + 0.2 + 3)} \times 100 = 64.3\%\ (\ )60\%)$$

Running hours (T_{work}) = $t_1 + t_2 + t_3$ [min] = (0.2 + 5 + 0.2)/60 [min] = 0.09 [min] (〈20[min])

∴ Continuous operation S_1

2 Calculation of mean output torque (T_m)

$$T_m = \sqrt[3]{\frac{t_1 N_1 T_1^3 + \cdots + t_n N_n T_n^3}{t_1 N_1 + \cdots + t_n N_n}}$$

$$= \sqrt[3]{\frac{0.2 \times 300 \times 100^3 + 5 \times 600 \times 30^3 + 0.2 \times 300 \times 80^3}{0.2 \times 300 + 5 \times 600 + 0.2 \times 300}}$$

∴ T_m = 38.03 [N · m]

3 Calculation of maximum acceleration torque [T_{max}]

$T_{max} = T_1 \times f_s$

Z_h [Number of cycles / hr]

$$Z_h = \frac{3{,}600\ [s]}{(t_1 + t_2 + t_3 + t_4)} = \frac{3{,}600}{8.4} = 428.6\ [\text{cycle}]$$ Therefore, f_s = 1 (refer to table 1 on page 33)

∴ T_{max} = 100× 1 = 100 [N · m]

4 Determination of maximum output speed & reduction ratio

In case the maximum output speed (N_{max})) of a reducer is set to 600rpm,

$$\text{Reducer ratio(i)} = \frac{\text{Servo motor's maximum output speed } (N_2\ [rpm])}{\text{Reducer's maximum output speed } (N_{max}\ [rpm])} = \frac{3{,}000}{600} = 5$$

∴ Reducer ratio(i) = 1 : 5

5 Reducer selection

Compare T_{2N} and T_{2B} Data on the Catalog 「Specifications」for the reduction ratio determined, and then the result values of T_m and T_{max} obtained from the calculation of **2**, **3** above, when compared with SPI060S005 (refer to Catalog page 23)

①mean torque [T_m 〈 T_{2N}) : 38.03 [N · m] 〈 42 [N · m] ②acceleration torque [T_{max} 〈 T_{2B}] : 100 [N · m] 〈 126 [N · m]

∴ It is judged to be rational that SPI060S005 shall be selected.

6 Verification

The order of the calculations introduced above can be changed depending on a condition, but mean torque [T_m] and maximum acceleration torque [T_{max}] shall be checked without fail to set the equipment and secure the safety of the system. In addition, T_m and T_{max} in the calculation above is nothing but a selection method following the operation pattern of servo motor when the values are needed to set application equipment, so a separate calculation through a structural analysis of equipment setting is required for the selection of more accurate reducer.

Cautions at use and warranty

■ Caution

Be careful of product handling.
· Be careful not to give an impact to the product with a hammer and not to cause damage from a drop at handling.

In case of directly connecting the product to the load side, pay attention to assembling.
· Be careful of direct connection such as concentricity, parallel level, tension, etc. whenever connecting the product to the load side such as a belt, a chain, etc.
· Be careful of handling the edge of the product and the key way of the output shaft. It may cause an injury.
· Do not put a hand or other foreign substance in a rotating shaft while the product drives. It may cause an injury.

Do not give an impact to the product.
· Be careful not to give an excessive impact whenever assembling a pulley, a coupling, a key, etc. to the product.

Do not exceed permissible torque at use.
· Do not give more than the instantaneous permissible maximum torque. It may cause troubles by bolts loosened on the tightening part, shaking, damage, etc.

Do not disassemble the product.
· Do neither disassemble nor reassemble the product. Otherwise the original performance may not be guaranteed.

If any abnormal condition is sensed, stop the system.
· If abnormal sound, vibration, abnormal heat, etc. occur, immediately stop the system. Otherwise it may adversely influence the system.

■ Warranty

A WARRANTY PERIOD AND A WARRANTY LIMIT OF THE PRODUCT IS AS FOLLOWS.

1 Warranty Period

Either 2,000hour working time or 12 months after the delivery for the product, which reaches earlier, should be applied on condition of use with operation, assembling, and lubrication specified by SPG.

2 Warranty Limit

For a fault by a defect in SPG manufacturing during the above warranty period, repair or exchange of the product should be conducted under SPG responsibilities. However, the following cases are excluded from the Warranty Limit.

① Unsuitable handling or use by customers

② Remodeling or repair not by SPG without permission

③ A fault resulting from other reasons except the product

④ Such fault as attributable to natural disaster etc., which is not SPG responsibility

Warranty herein means warranty for the product.
Other losses (chance loss by loss of the machine & assembly man-hour, assembly & disassembly, and mounting costs) arising out of a failure of the product are beyond the range of SPG burdens.

Request Information

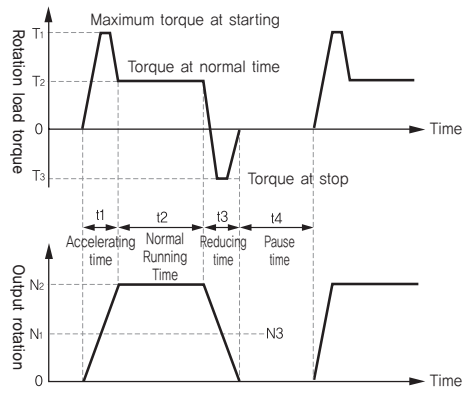
■ To submit SPI/SPL product questions, simply fill out the following form

Customer	Company :	Zip/Postal Codes :	Name :	Job Title :
	TEL :	FAX :	E-mail :	
Address			Country :	

Operating Conditions	
Machine Name	
Application	

Spec. of the Gearheads	SPI□ / SPL□ –	Reduction Ratio i =	Backlash : arcmin

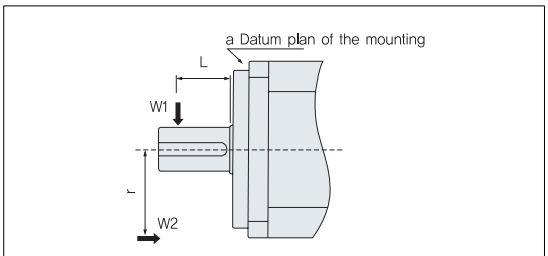
1. The Conditions of Load



	starting (Max.)	Normal	Stop(Max.)	Pause time
N · m	T1	T2	T3	–
rpm	N1	N2	N3	–
sec	t1	t2	t3	t4

Running Time	Cycle/day	Day/year	year

2. The Load Conditions of Output Shaft



W1 :	kg	L :	mm
W1 :	kg	r :	mm

3. The Mounting Direction

☐ Horizontality ☐ Verticality ☐

The Outline figure of Mounting

4. The Specifications of Input Side

☐ Servo motor ☐ other ( )

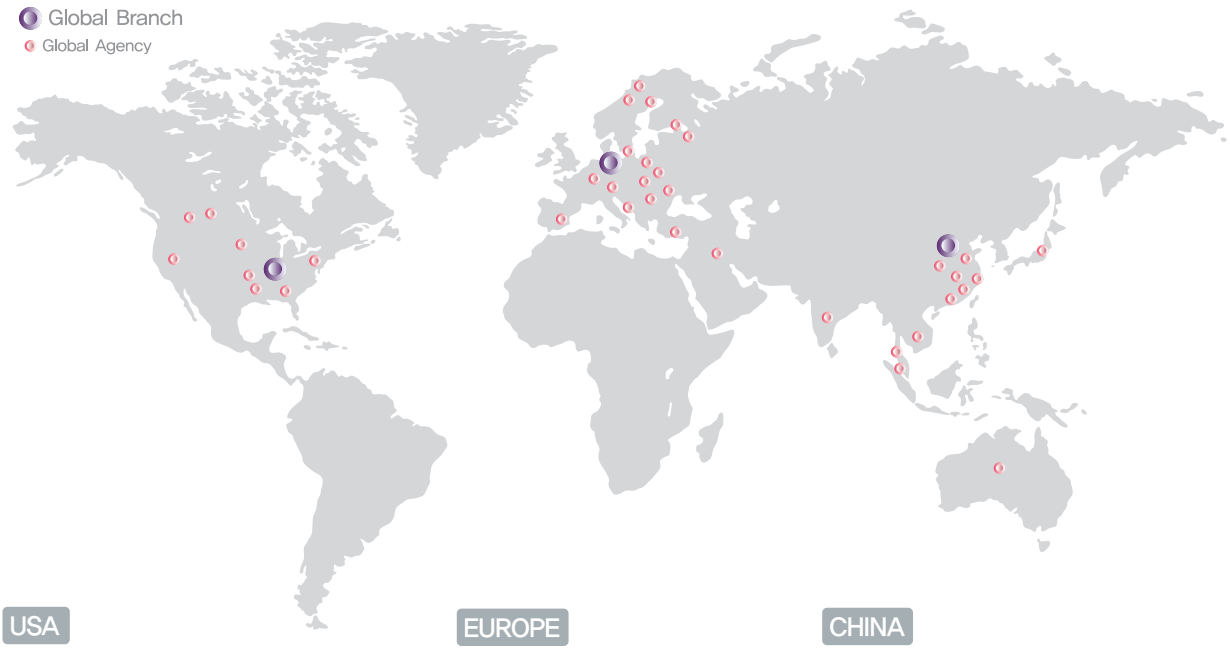
Capacity	W
Nominal Torque	N · m
Input Speed	rpm
Output Shaft Dimensions	Ø = , ℓ mm

5. Others

Sales Network

Domestic

Worldwide



USA

SPG USA, INC
1910 E.Devon Avenue Elk Grove Village, IL 60007 USA
Tel. 1-847-439-4949 Fax. 1-847-439-4940

EUROPE

SPG Europe B.V.
Tupolevlaan 46, 1119NZ, Schiphol-Rijk,
The Netherlands
Tel. +31(20)6553 773 Fax. +31(20)6538 040

CHINA

SPG MOTOR(SUZHOU) COMMERCE AND TRADE CO.,LTD
NO.10 FACTORY INTERNATIONAL INDUSTRIAL ZONE,
LOUFENG BLOCK SUZHOU INDUSTRIAL PARK
Tel. 86-512-6593-2868 Fax. 86-512-6260-3225

MEMO

MEMO

MEMO

MEMO

Passion for only one, SPG Planetary Gearheads

SPG Co., Ltd.

http://www.spg.co.kr

■ SPG 67B/L 12LOT, 628-11, GOJAN-DONG, NAMDONG-KU, INCHON, KOREA TEL : (032) 820-8200 FAX : (032) 821-0383

■ SALES DIVISION TEL : (032) 821-7090 FAX : (032) 821-0383

Revision 6 (2012. 4. 25)
Printed in Korea 2012. 5. 31