Top 100
Global
Innovator
for 10 years

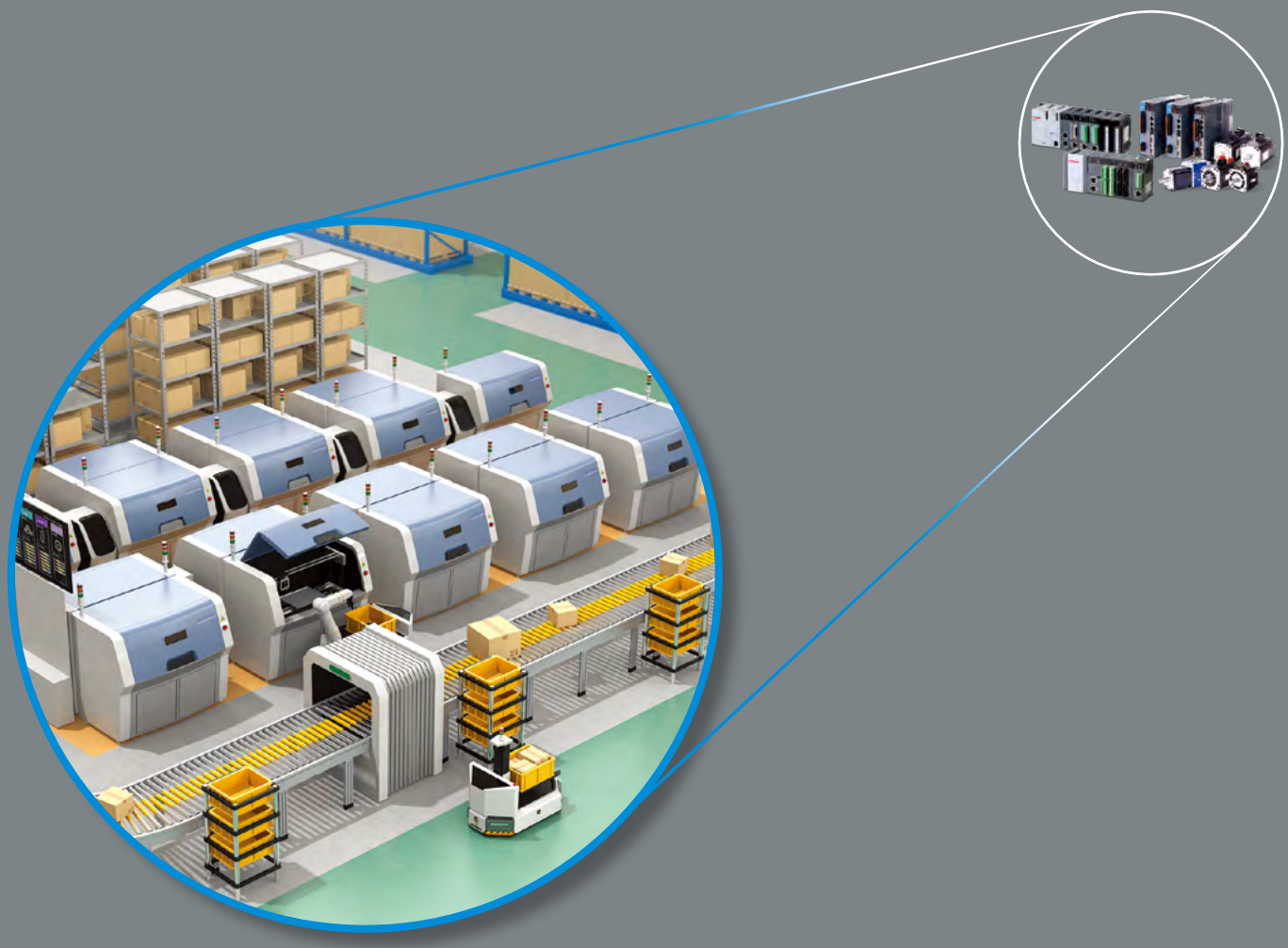
Precision Planetary Gearbox

LS ELECTRIC

Contents

Precision Planetary Gearbox

Full line-up for Factory automation from
PLC to Servo Motors and Gearboxes!
LS ELECTRIC provides them all.



Helical Gear Series

- MSS Series
- MAS Series
- MSR Series
- MAR Series
- MSO Series
- MAO Series
- HSS Series
- HAS Series
- HSR Series
- HAR Series
- HSW Series
- HAW Series
- HSD Series
- HAD Series

LS ELECTRIC Precision Planetary Gearbox That Maximizes Torque Optimized Automation Solution Assurance

LS ELECTRIC planetary gearbox is a device that transfers increased torque to the application by decreasing motor speed. LS ELECTRIC thrives to provide total solution in the industrial automation market by having a wide range of products with high performance and promised quality, including motion controllers to servo drives, motor.

Precision Plan

High Performance by LS ELECTRIC's Strict Quality Process

- Low noise level
- High output torque
- Best-in-class backlash
- High efficiency

Variable Gear Ratios

- Straight type : 3 : 1 ~ 100 : 1
- Angle type : 3 : 1 ~ 200 : 1

Easy installation with various motors and Manufacturing by Korea technology.

- Competitive price
- Short delivery

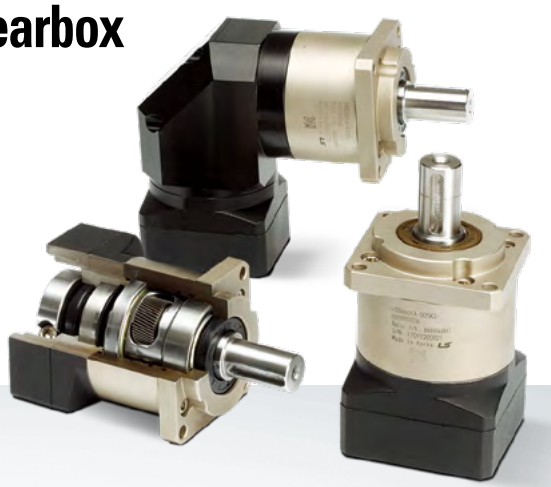
Application

- Packaging machines
- Logistics machines
- Semiconductor machines
- FPD/LCD machines

etary Gearbox

LS ELECTRIC Planetary Gearbox

With superior quality and high precision,
TCO savings we offer optimized motion solutions.



Part Number

A				B				
HSS	045	1A	—	003	K	S	—	MOTOR
(I)	(II)	(III)		(1)	(2)	(3)		

The adapter model can be created by Size manager, selection tool.
www.ls-electric.com/gearbox

A Type : (I), (II), (III)

(I) Series

Gear	Housing	Flange	
S : Spur Gear	S : Straight	S : Standard	W : Weight
H : Helical Gear	A : Angular	O/R : Round	D : Direct

(II) Size

Part	①	②	③	④	⑤	⑥	⑦
MSS/MAS	045	060	090	115	142	180	
MSR/MAR	050	070	090	120	155	205	
MSO/MAO	040	060	080	120	160		
HSS/HAS	045	060	090	115	142	180	220
HSR/HAR	050	070	090	120	155	205	235
HSW/HAW	045	060	075	100	140	180	220
*SD/*AD	047	064	090	110	140	200	

(III) Stage and Input Shaft Hole

1A	Standard single stage
2B	Standard double stage
2A	Optional double stage
1M	Customized single stage (expanded input hole)
2M	Customized single stage (expanded input hole)

For the details, refer to 'Input shaft hole size' table in the right page.

B Character : (1), (2), (3)

(1) Size

Series		Single Stage	Double Stage
MS*/HS*		3, 4, 5, 6, 7, 8, 9, 10	15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
MA*/HA*	①	3, 4, 5, 6, 7, 8, 9, 10	15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 120, 140, 180, 200
	②~⑦	3, 4, 5, 6, 7, 8, 9, 10, 14, 20	25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 120, 140, 180, 200
MSD/HSD		4, 5, 7, 10	20, 25, 35, 40, 50, 70, 100
MAD/HAD		4, 5, 7, 10, 14, 20	25, 35, 40, 50, 70, 100, 140, 200

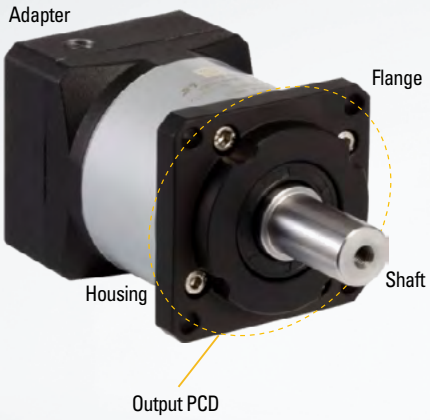
(2) Key Type

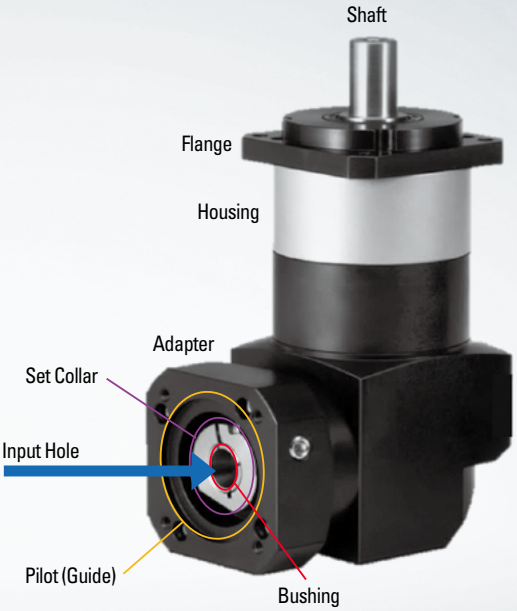
K	Key
N	No Key

(3) Backlash

S	Standard
P	Premium
A	Advanced

Part Name





Input Hole Size

Part	①	②	③	④	⑤	⑥	⑦
B	-	8mm	14mm	19mm	24mm	35mm	42mm
A	8mm	14mm	19mm	24mm	35mm	42mm	55mm
M	14mm	19mm	24mm	35mm	42mm	55mm	-

Stage (e.g.)

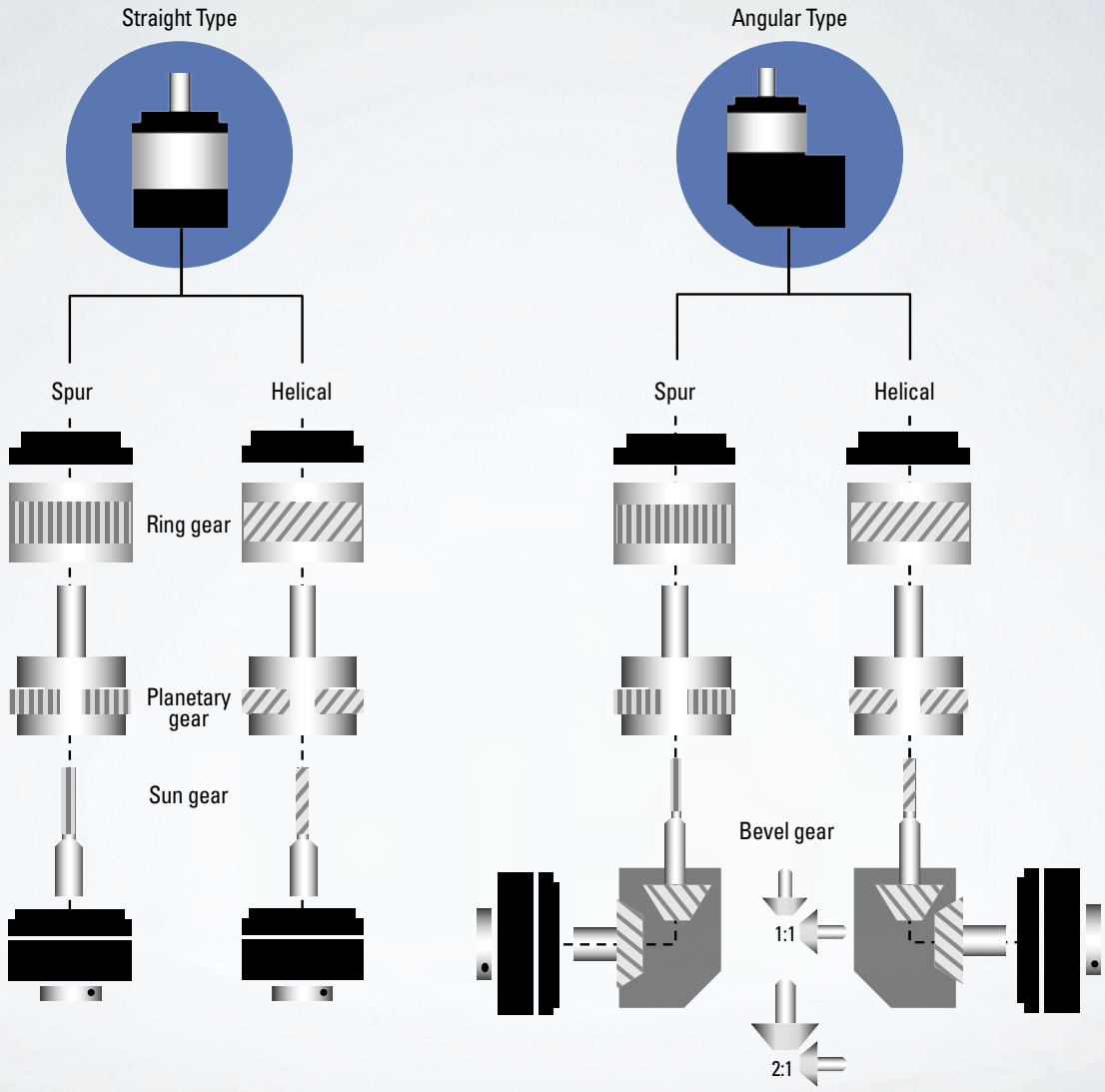
1A

2B

2A

LS ELECTRIC Planetary Gearbox

Structure Diagram



Spur vs Helical Gear Comparison Table

Item	Shape	Driving Method	Allowable Torque	Noise/ Vibaration Stability	Shaft Thrust	Efficiency	Backlash
Spur		 Line contact	Low	Difficult	Inactive	High	Low
Helical		 Point contact	High	Easy	Active	Low	High

Comparison Table

LS Gearbox	A brand	L brand	S Co. (Taiwan)	S Co. (Japen)	S Co. (South Korea)	A Co. (Gemany)	N Co. (Gemany)
MSS	PAII	PGX-H	PGL, PEL	VRB	SPI	-	(PLQE), (PLHE)
MSO	PGII	(KFE)	-	-	-	CP	PLE
MSR	PEII	KSE	PEC, PGC	VRL	-	LP	PLPE
HSS	AB	KSB	PGH, PHL	VRB	SPIH	(SP)	(PLN)
HSR	AE	KSE	-	VRL	-	LP	-
HSW	AF	KSF	-	VRS	-	SP	(PLN)
HSD/MSD	AD	KSD	PHF	VRT	SPIFH	TP	(PSFN), (PLFN)

※ ( ) Additional check is required due to the mounting size difference.

LS ELECTRIC Planetary Gearbox

Mounting Instruction

1 Check the size of gearbox and motor.
Clean the mounting part.

2 Loosen the clamp bolt through the clamp hole of adapter.

3 Mount the gearbox on the motor.

4 Tighten the motor and gearbox with the torque wrench to the recommended torque in page 11.

5 Tighten the clamp with the torque wrench to the recommended torque in page 11.

6 Mount the plug on the gearbox clamp hole.

Tightening torque recommended for motor mounting bolt.

Size	Strength		
	8.8	10.9	12.9
M3 X 0.5P	1.3 N·m	1.8 N·m	2.1 N·m
M4 X 0.7P	2 N·m	4.1 N·m	4.9 N·m
M5 X 0.8P	6.1 N·m	8.2 N·m	9.8 N·m
M6 X 1.0P	11 N·m	14 N·m	17 N·m
M8 X 1.25P	25 N·m	34 N·m	41 N·m
M10 X 1.5P	49 N·m	67 N·m	80 N·m
M12 X 1.75P	85 N·m	116 N·m	139 N·m
M14 X 2P	137 N·m	186 N·m	223 N·m
M16 X 2P	210 N·m	286 N·m	343 N·m

Bolt for clamp mounting

Planetary Gearbox Frame		Servo Motor		Strength
Size	Stage	Shaft Diameter	Bolt Size	
①	1A, 2A	≤ 8mm	M4 x 0.7P	4.9 N·m
	1M, 2M	≤ 14mm	M5 x 0.8P	9.8 N·m
②	1A, 2A	≤ 14mm	M5 x 0.8P	9.8 N·m
	2B	≤ 8mm	M4 x 0.7P	4.9 N·m
	1M, 2M	≤ 19mm	M6 x 1.0P	17 N·m
③	1A, 2A	≤ 19mm	M6 x 1.0P	17 N·m
	2B	≤ 14mm	M5 x 0.8P	9.8 N·m
	1M, 2M	≤ 24mm	M8 x 1.25P	41 N·m
④	1A, 2A	≤ 24mm	M8 x 1.25P	41 N·m
	2B	≤ 19mm	M6 x 1.0P	17 N·m
	1M, 2M	≤ 35mm	M8 x 1.25P	41 N·m
⑤	1A, 2A	≤ 35mm	M8 x 1.25P	41 N·m
	2B	≤ 24mm	M8 x 1.25P	41 N·m
	1M, 2M	≤ 42mm	M8 x 1.25P	41 N·m
⑥	1A, 2A	≤ 42mm	M8 x 1.25P	41 N·m
	2B	≤ 35mm	M8 x 1.25P	41 N·m
	1M, 2M	≤ 55mm	M8 x 1.25P	41 N·m
⑦	1A, 2A	≤ 55mm	M12 x 1.75P	139 N·m
	2B	≤ 42mm	M8 x 1.25P	41 N·m

Selection Guide

Motor capacity and Shaft diameter

Motor Capacity	Shaft Diameter						
	5.65~8	6.35~14	14~19	19~24	24~35	35~42	42~55
100W	①1A ①2A	②2B	②1A ②2A				
200W							
400W			③1A ③2A	④1A ④2A	⑤1A ⑤2A		
750W		③2B					
1kW							
1.5kW			④2B		⑤2B		
2.2kW							
3.75kW							
5.5kW					⑥2B	⑥1A ⑥2A	⑦1A ⑦2A
7.5kW							
11kW						⑦2B	
15kW							
22kW							
30kW							

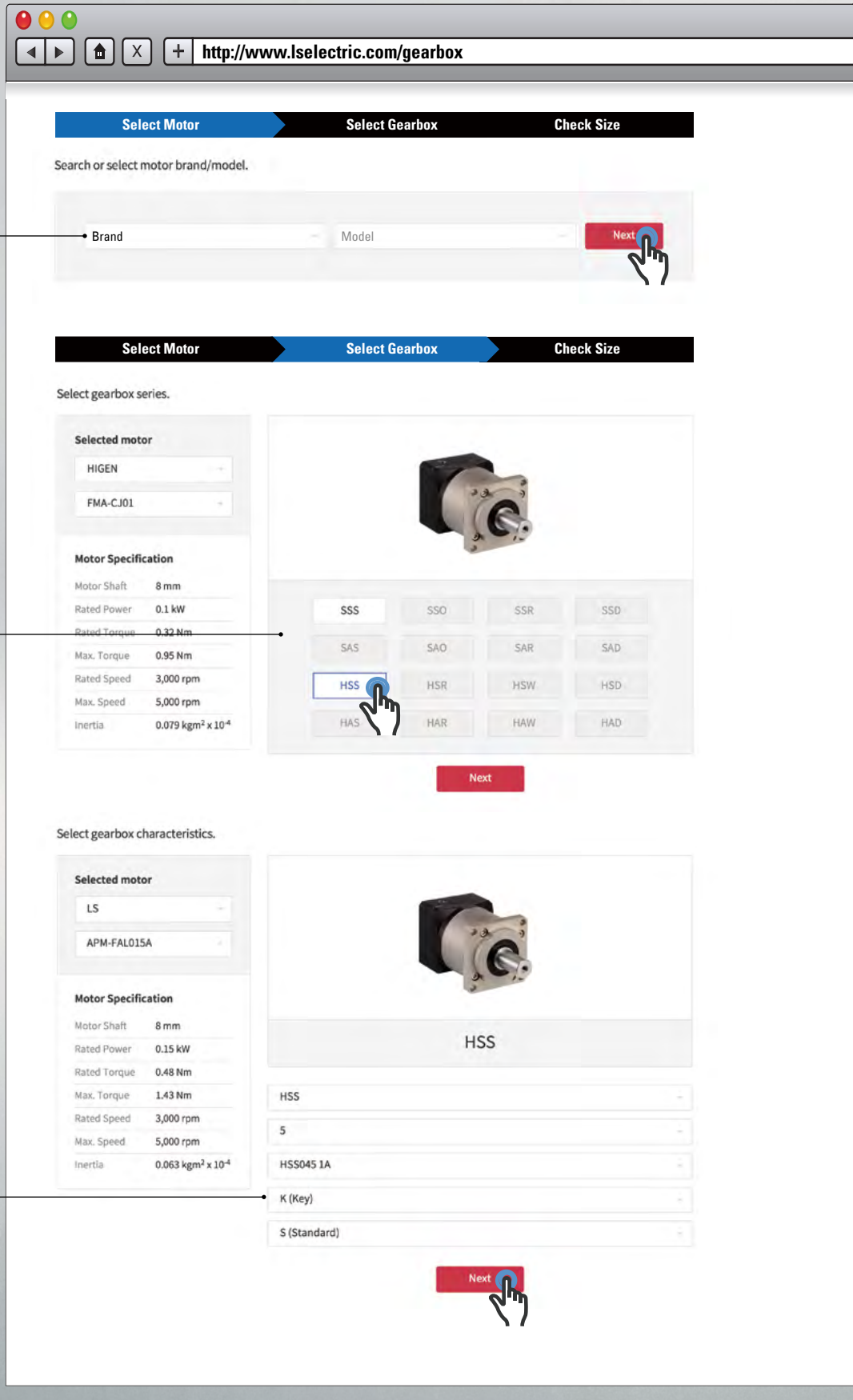
Flange size of gearbox and motor

Gearbox Flange Size	Motor Flange Size					
	38~42	60~62	80~100	110~130	176~200	220~250
①	①1A ②2A					
②	②2B	②1A ②2A				
③		③2B	③1A ③2B			
④			④2B	④1A ④2A		
⑤				⑤2B	⑤1A ⑤2A	
⑥					⑥1A ⑥2A ⑥2B	
⑦					⑦2B	⑦1A ⑦2A

For further information of gearbox flange size (①~⑦), refer to page6.

- This table provides the approximate dimension for motor shaft diameter and flange size.
  Check the detail with Size manager (http://www.lselectric.com/gearbox)

Gearbox Size Manager



Brand

LS
MITSUBISHI
PANASONIC

Tap Brand and scroll down and select the motor.

Model

APM-FAL015A
APM-FAL01A
APM-FALR5A

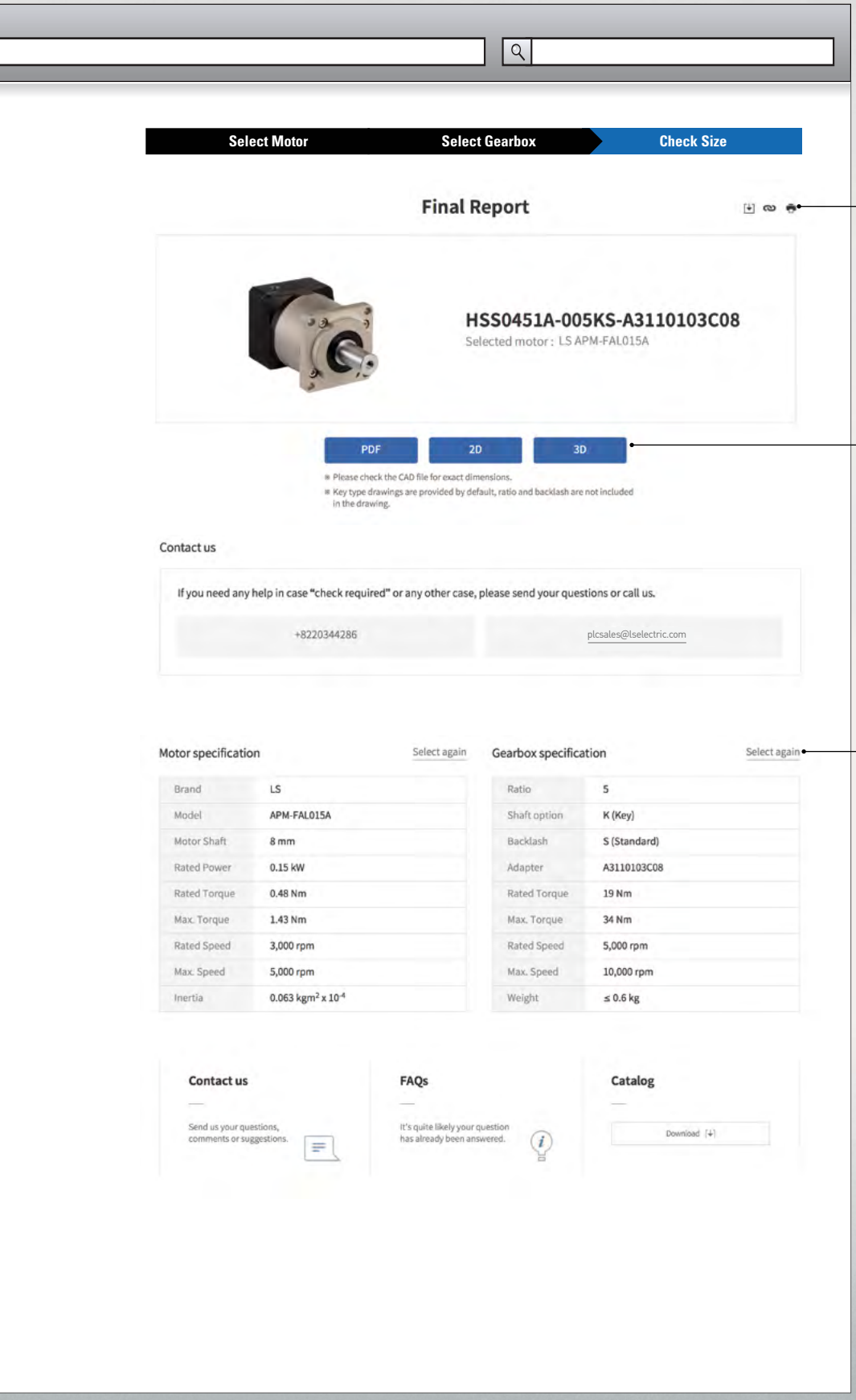
Choose the motor model.

Select the gearbox from the available model.

Torque check required alert means either the rated or maximum torque of the motor and gear ratio exceeds the torque values of the selected gearbox. For better selection guide or accurate calculations, please contact LS ELECTRIC overseas sales.

Size-Stage

HSS045 2A (Torque check required) ⓘ
HSS060 2A (Torque check required) ⓘ



The page can be downloaded or printed or URL link can be saved.

Gray button means that the document is not available for the selected gearbox.
for any support, please contact LS ELECTRIC overseas sales manager.

Click here to choose gearbox again.

Size manager is available in mobile.
visit www.lselectric.com/gearbox or scan QR code.

Basic Line/ Helical Gear

Economic planetary differential reducer with basic line/ helical gear structure

- High torque, high efficiency, and low noise are realized with a round flange type tap fastening structure at the output part
- Maximize space utilization with the Angle Type with MAO Spiral Bevel Gear
- Affordable products with at least a single backlash

MSS Series

Square output flange
Straight type gearbox, Standard

- Best-in-class backlash
- High output torque
- Low noise level
- High efficiency
- Maintenance free
- Balanced motor pinion
- Gear ratios available from 3:1 up to 200:1
- No need to replace lubrication to expand the lifespan

MSS							
Stage	Gear ratio	045	060	090	115	142	180
1A	3~10	○	○	○	○	○	○
2B	15~100	☎	○	○	○	○	○
2A	15~100	○	○	○	○	○	○
1M/2M	3~100	☎	☎	☎	☎	☎	☎

MAS							
Stage	Gear ratio	045	060	090	115	142	180
1A	3~10	○	○	○	○	○	○
	14, 20	☎	○	○	○	○	○
2B	15, 20	☎	☎	☎	☎	-	-
	25~100	☎	○	○	○	○	○
	120~200	☎	☎	○	○	○	○
2A	15, 20	○	☎	☎	☎	-	-
	25~100	○	○	○	○	○	○
	120~200	☎	○	○	○	○	○
1M/2M	3~200	☎	☎	☎	☎	-	-

○ : Standard, △: Custom made, ☎ : Contact sales person.

MAS Series

Square output flange
Right-angle type gearbox, Standard

MSS	060	1A	–	010	K	S	–	MOTOR
①	②	③		④	⑤	⑥		

① Type

MMS	Straight
MAS	Angular

② Size

045	45	115	115
060	60	142	142
090	90	180	180

③ Stage and Input Shaft Hole

1A	Standard single stage
2B	Standard double stage
2A	Optional double stage
1M	Customized single stage (expanded input hole)
2M	Customized double stage (expanded input hole)

④ Gear ratio

Single stage	MSS: 3~10
	MAS: 3~20 (045: 3~10)
Double stage	MSS: 15~100
	MAS: 25~200 (045: 15~100)

⑤ Key Type

K	Key
N	No Key

⑥ Backlash

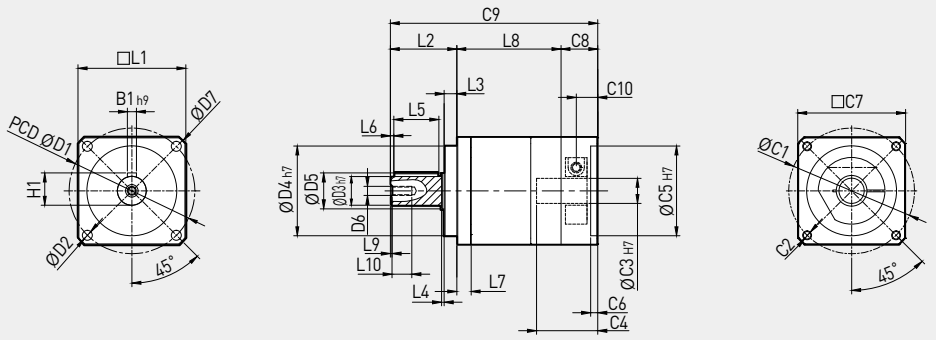
S	Standard

Division	Stage	Gear ratio	045	060	090	115	142	180
Nominal Output Torque (Nm)	1	3	20	57	148	272	484	897
		4	18	51	143	295	549	1,060
		5	19	54	160	332	634	1,195
		6	18	50	151	311	592	1,109
		7	17	48	145	305	562	1,104
		8	16	44	132	279	527	1,035
		9	14	42	123	254	483	947
		10	14	42	121	262	500	980
	2	15	20	57	148	272	484	897
		20	18	51	143	295	549	1,060
		25	19	54	160	332	634	1,195
		30	18	50	151	311	592	1,109
		35	17	48	145	305	562	1,104
		40	16	44	132	279	527	1,035
		45	14	42	123	254	483	947
		50	19	54	160	332	634	1,195
		60	18	50	151	311	592	1,109
		70	17	48	145	305	562	1,104
		80	16	44	132	279	527	1,035
		90	14	42	123	254	483	947
		100	14	42	121	262	500	980
Emergency Stop Torque (Nm)	1,2	3~100	3 times nominal output torque					
Nominal Input Speed (rpm)	1,2	3~100	5,000	5,000	4,000	4,000	3,000	3,000
Max. Input Speed (rpm)	1,2	3~100	10,000	10,000	8,000	8,000	6,000	6,000
Torsional Rigidity (Nm/Arcmin)	1,2	3~100	3	7	14	26	55	143
Max. Radial Load (N)	1,2	3~100	750	1,280	3,200	6,800	9,300	15,100
Max. Axial Load (N)	1,2	3~100	390	690	1,600	3,400	4,500	7,500
Backlash (Arcmin) S	1	3~10	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
	2	15~100	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9
Service Life (Hrs)	1,2	3~100	20,000 (10,000 under continuous operation)					
Efficiency (%)	1	3~10	≥ 97					
	2	15~100	≥ 94					
Weight (kg)	1A	3~10	≤ 0.6	≤ 1.3	≤ 3.8	≤ 7.6	≤ 15.0	≤ 26.0
	2A	15~100	≤ 0.8	≤ 1.8	≤ 5.0	≤ 10.3	≤ 19.6	≤ 30.0
	2B	15~100	-	≤ 1.6	≤ 4.7	≤ 9.6	≤ 18.0	≤ 30.0
Operating Temp (°C)	1,2	3~100	-10 ~ 90					
Lubrication	1,2	3~100	Grease (VIGO Grease RE #0)					
Degree of Gearbox Protection	1,2	3~100	IP65					
Noise (dB)	1,2	3~100	≤ 52	≤ 54	≤ 56	≤ 59	≤ 62	≤ 64
Inertia ($kgcm^2$)	1A	3	0.03	0.17	0.64	3.12	9.23	29.98
		4	0.03	0.15	0.51	2.84	7.66	24.78
		5	0.03	0.13	0.48	2.81	7.52	24.29
		6	0.03	0.13	0.47	2.75	7.34	23.89
		7	0.03	0.13	0.45	2.69	7.16	23.48
		8	0.03	0.13	0.45	2.64	7.11	23.56
		9	0.03	0.13	0.44	2.59	7.05	23.63
		10	0.03	0.13	0.44	2.59	7.05	23.51
	2B	15~45	0.03	0.03	0.13	0.48	2.81	7.52
		50~100	0.03	0.03	0.13	0.44	2.69	7.05
	2A	15~45	-	0.13	0.48	2.81	7.52	24.29
		50~100	-	0.13	0.44	2.69	7.05	23.63

(1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

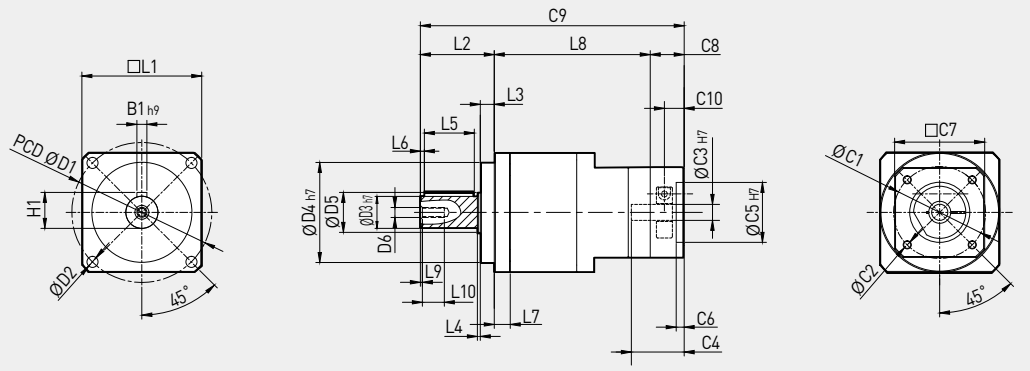
Dimension	MSS0451A	MSS0601A	MSS0901A	MSS1151A	MSS1421A	MSS1801A
D1	50	70	100	130	165	215
D2	3.5	5.5	6.8	8.7	11	13
D3 h7	13	16	22	32	40	55
D4 h7	35	50	80	110	130	160
D5	15	20	30	39.5	60	75
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P
D7	58	80	116	152	185	240
L1	45	60	90	115	142	180
L2	26.5	37	48	64	97	105
L3	5.5	7	10	12	15	20
L4	1	1.5	1.5	2	3	3
L5	15	25	32	40	65	70
L6	2	2	3	5	5	6
L7	6.5	8	11	12	19	18
L8	45.5	58	78.9	96.5	116.5	139
L9	1.5	1.5	1.5	2	2	2
L10	9.5	10.5	13.5	18	34	42
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)	42 (55)
* C4	26.5	34	43.1	62	82	86
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	89	115.5	150.4	202.5	260.5	291
* C10	10	12	13.4	28	29.5	28.5
B1 h9	5	5	6	10	12	16
H1	15	18	24.5	35	43	59

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

MSS Series

Double Stage B Type

Drawing of Planetary Gearbox



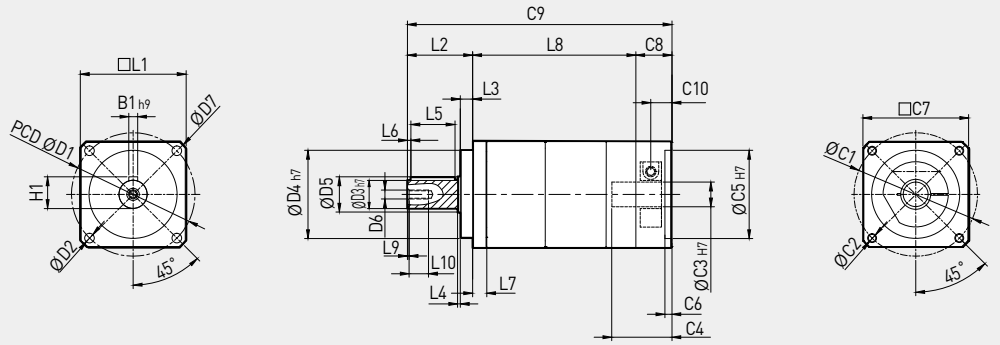
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	MSS0602B	MSS0902B	MSS1152B	MSS1422B	MSS1802B
D1	70	100	130	165	215
D2	5.5	6.8	8.7	11	13
D3 h7	16	22	32	40	55
D4 h7	50	80	110	130	160
D5	20	30	39.5	60	75
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P
D7	80	116	152	185	240
L1	60	90	115	142	180
L2	37	48	64	97	105
L3	7	10	12	15	20
L4	1.5	1.5	2	3	3
L5	25	32	40	65	70
L6	2	3	5	5	6
L7	8	11	12	19	18
L8	78	101.5	135.4	161	198
L9	1.5	1.5	2	2	2
L10	10.5	13.5	18	34	42
* C1	46	70	90	145	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)
* C4	26.5	34	43.1	62	82
* C5 H7	30	50	70	110	114.3
* C6	4	4	6	7	7
* C7	45	60	90	132	180
* C8	17	20.5	23.5	42	47
* C9	132	170	222.9	300	350
* C10	10	12	13.4	28	29.5
B1 h9	5	6	10	12	16
H1	18	24.5	35	43	59

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage A Type

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	MSS0452A	MSS0602A	MSS0902A	MSS1152A	MSS1422A	MSS1802A
D1	50	70	100	130	165	215
D2	3.5	5.5	6.8	8.7	11	13
D3 h7	13	16	22	32	40	55
D4 h7	35	50	80	110	130	160
D5	15	20	30	39.5	60	75
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P
D7	58	80	116	152	185	240
L1	45	60	90	115	142	180
L2	26.5	37	48	64	97	105
L3	5.5	7	10	12	15	20
L4	1	1.5	1.5	2	3	3
L5	15	25	32	40	65	70
L6	2	2	3	5	5	6
L7	6.5	8	11	12	19	18
L8	74.5	92.5	122.9	136.8	174.5	198
L9	1.5	1.5	1.5	2	2	2
L10	9.5	10.5	13.5	18	34	42
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)	42 (55)
* C4	26.5	34	43.1	62	82	82
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	118	150	194.4	242.8	318.5	350
* C10	10	12	13.4	28	29.5	28.5
B1 h9	5	5	6	10	12	16
H1	15	18	24.5	35	43	59

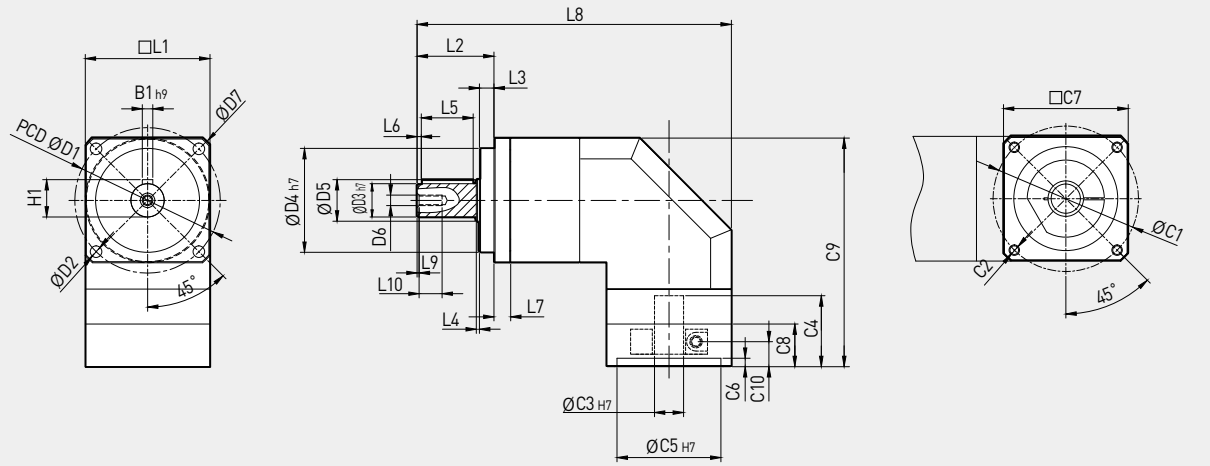
(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Division		Stage	Gear ratio	045	060	090	115	142	180
Nominal Output Torque (Nm)		1	3	20	57	148	272	484	897
			4	18	51	143	295	549	1,060
			5	19	54	160	332	634	1,195
			6	18	50	151	311	592	1,109
			7	17	48	145	305	562	1,104
			8	16	44	132	279	527	1,035
			9	14	42	123	254	483	947
			10	14	42	121	262	500	980
			14	-	44	145	305	562	1,104
			15	14	-	-	-	-	-
			20	14	42	121	262	500	980
		2	25	19	54	160	332	634	1,195
			30	18	50	151	311	592	1,109
			35	17	48	145	305	562	1,104
			40	16	44	132	279	527	1,035
			45	14	42	123	254	483	947
			50	19	54	160	332	634	1,195
			60	18	50	151	311	592	1,109
			70	17	48	145	305	562	1,104
			80	16	44	132	279	527	1,035
			90	14	42	123	254	483	947
			100	14	42	121	262	500	980
			120	-	-	151	311	592	1,109
			140	-	-	145	305	562	1,104
			160	-	-	132	279	527	1,035
			180	-	-	123	254	483	947
			200	-	-	121	262	500	980
Emergency Stop Torque (Nm)		-	-	3 times nominal output torque					
Nominal Input Speed (rpm)		-	-	5,000	5,000	4,000	4,000	3,000	3,000
Max. Input Speed (rpm)		-	-	10,000	10,000	8,000	8,000	6,000	6,000
Torsional Rigidity (Nm/Arcmin)		-	-	3	7	14	26	55	143
Max. Radial Load (N)		-	-	750	1,280	3,200	6,800	9,300	15,100
Max. Axial Load (N)		-	-	390	690	1,600	3,400	4,500	7,500
Backlash (Arcmin)	S	1	-	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8
		2	-	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11
Service Life (Hrs)		-	-	20,000 (10,000 under continuous operation)					
Efficiency (%)		1	-	≥ 95					
		2	-	≥ 92					
Weight (kg)		1A	-	≤ 0.9	≤ 1.5	≤ 6.0	≤ 12.0	≤ 24.0	≤ 51.0
		2A	-	≤ 1.2	≤ 2.0	≤ 7.5	≤ 13.5	≤ 26.0	≤ 54.0
		2B	-	-	≤ 1.9	≤ 7.3	≤ 12.8	≤ 25.0	≤ 53.0
Operating Temp (°C)		1,2	-	-10 ~ 90					
Lubrication		-	-	Grease (VIGO Grease RE #0)					
Degree of Gearbox Protection		-	-	IP65					
Noise (dB)		-	-	≤ 58	≤ 60	≤ 63	≤ 66	≤ 69	≤ 72
Inertia (kgcm²)		1A	3~10	0.09	0.36	2.27	6.88	23.50	69.2
			14, 20	-	0.08	1.89	6.23	21.75	66.3
		2B	15, 20	-	-	-	-	-	-
			25~100	-	0.09	0.36	2.27	6.88	23.5
			120~200	-	-	0.32	1.89	6.23	21.75
		2A	15, 20	0.09	-	-	-	-	-
			25~100	0.09	0.36	2.27	6.88	23.50	69.2
			120~200	-	-	1.89	6.23	21.75	66.3

(1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

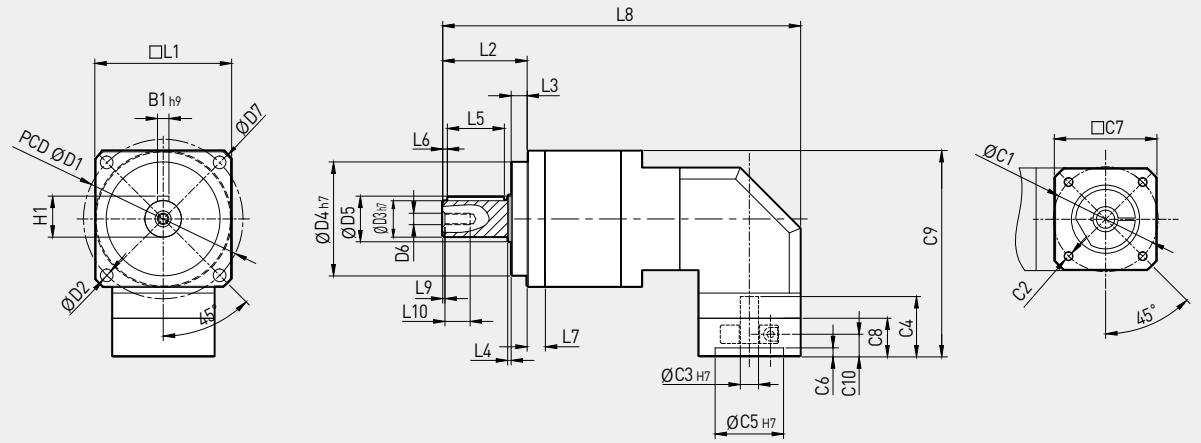
Dimension	MAS0451A	MAS0601A	MAS0901A	MAS1151A	MAS1421A	MAS1801A
D1	50	70	100	130	165	215
D2	3.5	5.5	6.8	8.7	11	13
D3 h7	13	16	22	32	40	55
D4 h7	35	50	80	110	130	160
D5	15	20	30	39.5	60	75
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P
D7	58	80	116	152	185	240
L1	45	60	90	115	142	180
L2	26.5	37	48	64	97	105
L3	5.5	7	10	12	15	20
L4	1	1.5	1.5	2	3	3
L5	15	25	32	40	65	70
L6	2	2	3	5	5	6
L7	6.5	8	11	12	19	18
* L8	114	151.2	203	270	333	375.5
L9	1.5	1.5	1.5	2	2	2
L10	9.5	10.5	13.5	18	34	42
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)	42 (55)
* C4	26.5	34	43.1	62	82	86
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	83	110	152	200	240	288
* C10	10	12	13.4	28	29.5	28.5
B1 h9	5	5	6	10	12	16
H1	15	18	24.5	35	43	59

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

MAS Series

Double Stage B Type

Drawing of Planetary Gearbox



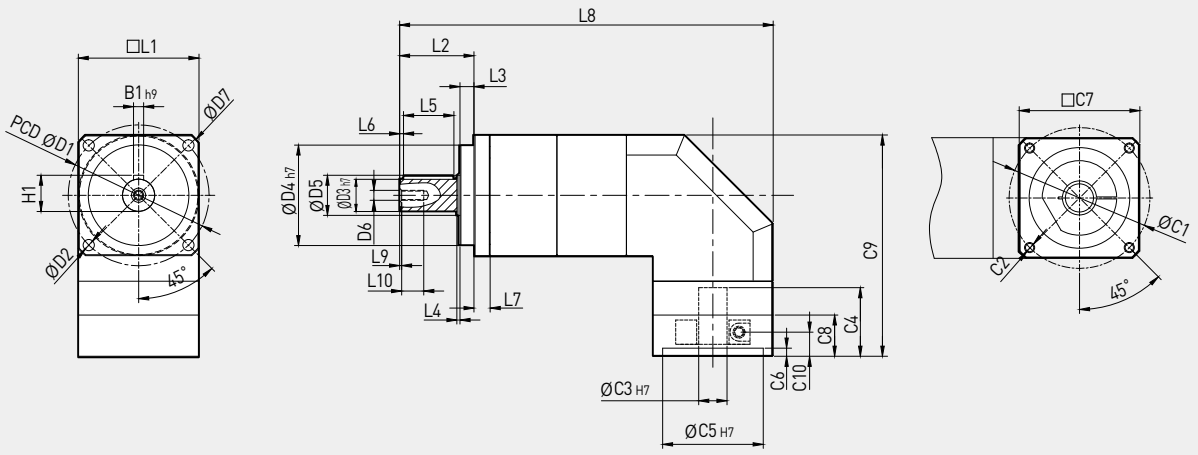
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	MAS0602B	MAS0902B	MAS1152B	MAS1422B	MAS1802B
D1	70	100	130	165	215
D2	5.5	6.8	8.7	11	13
D3 h7	16	22	32	40	55
D4 h7	50	80	110	130	160
D5	20	30	39.5	60	75
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P
D7	80	116	152	185	240
L1	60	90	115	142	180
L2	37	48	64	97	105
L3	7	10	12	15	20
L4	1.5	1.5	2	3	3
L5	25	32	40	65	70
L6	2	3	5	5	6
L7	8	11	12	19	18
* L8	157	205.7	275.5	367.5	441.5
L9	1.5	1.5	2	2	2
L10	10.5	13.5	18	34	42
* C1	46	70	90	145	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)
* C4	26.5	34	43.1	62	82
* C5 H7	30	50	70	110	114.3
* C6	4	4	6	7	7
* C7	45	60	90	132	180
* C8	17	20.5	23.5	42	47
* C9	90.5	125	164.5	213.5	259
* C10	10	12	13.4	28	29.5
B1 h9	5	6	10	12	16
H1	18	24.5	35	43	59

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage A Type

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	MAS0452A	MAS0602A	MAS0902A	MAS1152A	MAS1422A	MAS1802A
D1	50	70	100	130	165	215
D2	3.5	5.5	6.8	8.7	11	13
D3 h7	13	16	22	32	40	55
D4 h7	35	50	80	110	130	160
D5	15	20	30	39.5	60	75
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P
D7	58	80	116	152	185	240
L1	45	60	90	115	142	180
L2	26.5	37	48	64	97	105
L3	5.5	7	10	12	15	20
L4	1	1.5	1.5	2	3	3
L5	15	25	32	40	65	70
L6	2	2	3	5	5	6
L7	6.5	8	11	12	19	18
* L8	143	185.7	247	295.5	392.5	441.5
L9	1.5	1.5	1.5	2	2	2
L10	9.5	10.5	13.5	18	34	42
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)	42 (55)
* C4	26.5	34	43.1	62	82	82
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	83	110	152	184.4	232	259
* C10	10	12	13.4	28	29.5	28.5
B1 h9	5	5	6	10	12	16
H1	15	18	24.5	35	43	59

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Basic Line/ Helical Gear

Economic planetary differential reducer with basic line/ helical gear structure

- High torque, high efficiency, and low noise are realized with a round flange type tap fastening structure at the output part
- Maximize space utilization with ANGLE Type with MAR Spiral Bevel Gear
- Affordable products with at least a single backlash

MSR Series

Circle output flange
Straight type gearbox, Standard

- Best-in-class backlash
- High output torque
- Low noise level
- High efficiency
- Maintenance free
- Balanced motor pinion
- Gear ratios available from 3:1 up to 200:1
- No need to replace lubrication to expand the lifespan

MSR							
Stage	Gear ratio	045	070	090	120	155	205
1A	3~10	○	○	○	○	○	○
2B	15~100	☎	○	○	○	○	○
2A	15~100	○	○	○	○	○	○
1M/2M	3~100	☎	☎	☎	☎	☎	☎

MAR Series

Circle output flange
Right-angle type gearbox, Standard

MAR							
Stage	Gear ratio	050	070	090	120	155	205
1A	3~10	○	○	○	○	○	○
	14, 20	☎	○	○	○	○	○
2B	15, 20	☎	☎	☎	☎	-	-
	25~100	☎	○	○	○	○	○
	120~200	☎	☎	○	○	○	○
2A	15, 20	○	☎	☎	☎	-	-
	25~100	○	○	○	○	○	○
	120~200	☎	○	○	○	○	○
1M/2M	3~200	☎	☎	☎	☎	-	-

○ : Standard, △: Custom made, ☎ : Contact sales person.

MSR	070	1A	–	010	K	S	–	MOTOR
①	②	③		④	⑤	⑥		

① Type

MSR	직선형
MAR	직각형

② Size

050	50	120	120
070	70	155	155
090	90	205	205

③ Stage and Input Shaft Hole

1A	Standard single stage
2B	Standard double stage
2A	Optional double stage
1M	Customized single stage (expanded input hole)
2M	Customized double stage (expanded input hole)

④ Gear ratio

Single stage	MSR: 3~10
	MAR: 3~20 (050: 3~10)
Double stage	MSR: 15~100
	MAR: 25~200 (050: 15~100)

⑤ Key Type

K	Key
N	No Key

⑥ Backlash

S	Standard

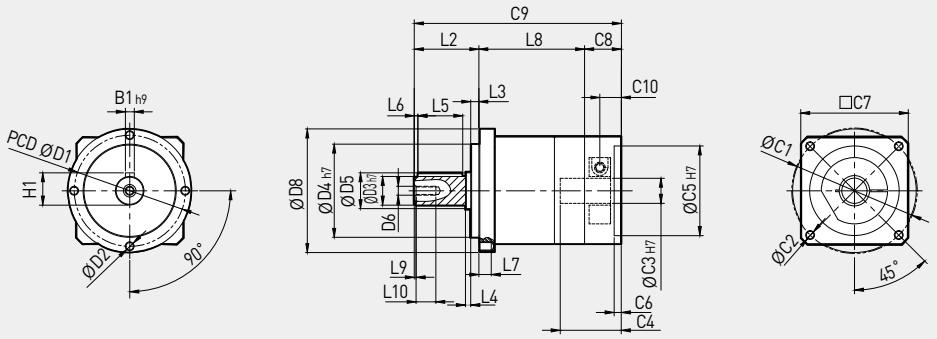
MSR Series

Division		Stage	Gear ratio	050	070	090	120	155	205
Nominal Output Torque (Nm)		1	3	20	57	148	272	484	897
			4	18	51	143	295	549	1,060
			5	19	54	160	332	634	1,195
			6	18	50	151	311	592	1,109
			7	17	48	145	305	562	1,104
			8	16	44	132	279	527	1,035
			9	14	42	123	254	483	947
			10	14	42	121	262	500	980
		2	15	20	57	148	272	484	897
			20	18	51	143	295	549	1,060
			25	19	54	160	332	634	1,195
			30	18	50	151	311	592	1,109
			35	17	48	145	305	562	1,104
			40	16	44	132	279	527	1,035
			45	14	42	123	254	483	947
			50	19	54	160	332	634	1,195
			60	18	50	151	311	592	1,109
			70	17	48	145	305	562	1,104
			80	16	44	132	279	527	1,035
			90	14	42	123	254	483	947
			100	14	42	121	262	500	980
Emergency Stop Torque (Nm)		1,2	3~100	3 times nominal output torque					
Nominal Input Speed (rpm)		1,2	3~100	5,000	5,000	4,000	4,000	3,000	3,000
Max. Input Speed (rpm)		1,2	3~100	10,000	10,000	8,000	8,000	6,000	6,000
Torsional Rigidity (Nm/Arcmin)		1,2	3~100	3	7	14	26	55	143
Max. Radial Load (N)		1,2	3~100	750	1,280	3,200	6,800	9,300	15,100
Max. Axial Load (N)		1,2	3~100	390	690	1,600	3,400	4,500	7,500
Backlash (Arcmin)	S	1	3~10	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
		2	15~100	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9
Service Life (Hrs)		1,2	3~100	20,000 (10,000 under continuous operation)					
Efficiency (%)		1	3~10	≥ 97					
		2	15~100	≥ 94					
Weight (kg)		1A	3~10	≤ 0.6	≤ 1.3	≤ 3.8	≤ 7.6	≤ 15.0	≤ 26.0
		2A	15~100	≤ 0.8	≤ 1.8	≤ 5.0	≤ 10.3	≤ 19.6	≤ 30.0
		2B	15~100	-	≤ 1.6	≤ 4.7	≤ 9.6	≤ 18.0	≤ 30.0
Operating Temp (°C)		1,2	3~100	-10 ~ 90					
Lubrication		1,2	3~100	Grease (VIGO Grease RE #0)					
Degree of Gearbox Protection		1,2	3~100	IP65					
Noise (dB)		1,2	3~100	≤ 52	≤ 54	≤ 56	≤ 59	≤ 62	≤ 64
Inertia ($kgcm^2$)		1A	3	0.03	0.17	0.64	3.12	9.23	29.98
			4	0.03	0.15	0.51	2.84	7.66	24.78
			5	0.03	0.13	0.48	2.81	7.52	24.29
			6	0.03	0.13	0.47	2.75	7.34	23.89
			7	0.03	0.13	0.45	2.69	7.16	23.48
			8	0.03	0.13	0.45	2.64	7.11	23.56
			9	0.03	0.13	0.44	2.59	7.05	23.63
			10	0.03	0.13	0.44	2.59	7.05	23.51
		2B	15~45	0.03	0.03	0.13	0.48	2.81	7.52
			50~100	0.03	0.03	0.13	0.44	2.69	7.05
		2A	15~45	-	0.13	0.48	2.81	7.52	24.29
			50~100	-	0.13	0.44	2.69	7.05	23.63

(1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

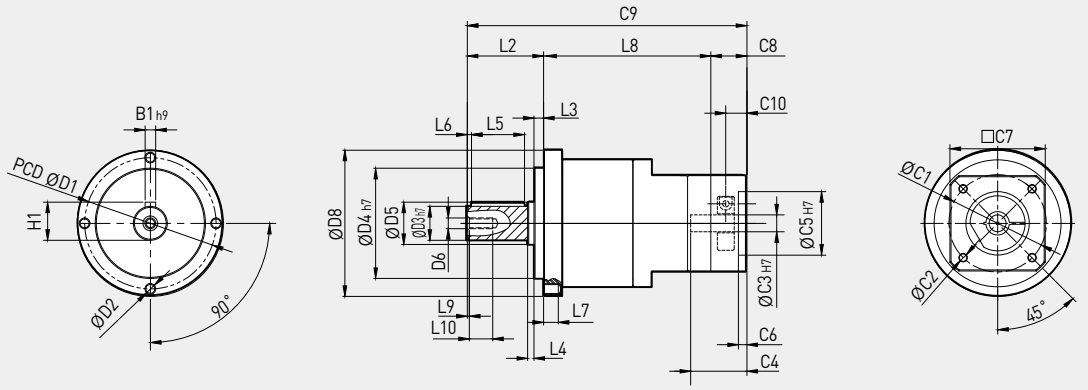
Dimension	MSR0501A	MSR0701A	MSR0901A	MSR1201A	MSR1551A	MSR2051A
D1	44	62	80	108	140	184
D2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M10 X 1.5P	M12 X 1.75P
D3 h7	12	16	22	32	40	55
D4 h7	35	52	68	90	120	160
D5	13	20	30	40	60	75
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P
D7	-	-	-	-	-	-
D8	49	69	94	119	155	205
L1	-	-	-	-	-	-
L2	24.5	36	46	70	97	100
L3	4	4.5	6	7	15	15
L4	2.5	3	3.5	5	3	3
L5	14	25	32	40	65	70
L6	2	2	3	10	5	6
L7	6.5	7.5	10	12	15	20
L8	47.5	59	80.9	101.5	116.5	144
L9	1.5	1.5	1.5	2	2	2
L10	9.5	10.5	13.5	18	34	42
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)	42 (55)
* C4	26.5	34	43.1	62	82	86
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	89	115.5	150.4	213.5	260.5	291
* C10	10	12	13.4	28	29.5	28.5
B1 h9	4	5	6	10	12	16
H1	13.5	18	24.5	35	43	59

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

MSR Series

Double Stage B Type

Drawing of Planetary Gearbox



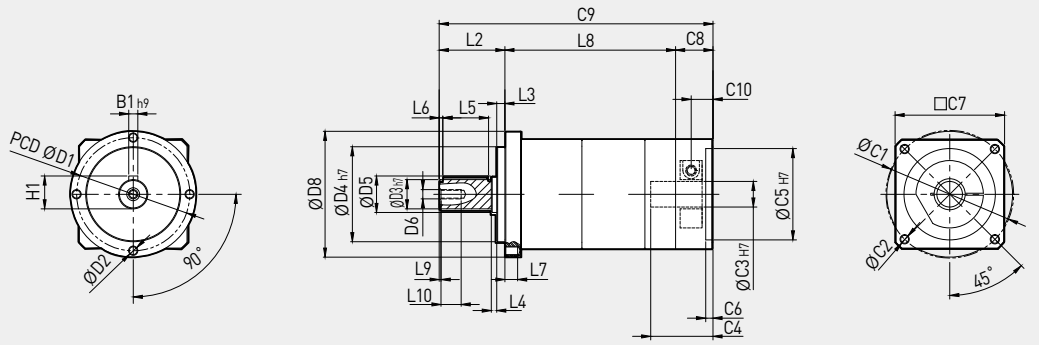
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	MSR0702B	MSR0902B	MSR1202B	MSR1552B	MSR2052B
D1	62	80	108	140	184
D2	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M10 X 1.5P	M12 X 1.75P
D3 h7	16	22	32	40	55
D4 h7	52	68	90	120	160
D5	20	30	40	60	75
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P
D7	-	-	-	-	-
D8	69	94	119	155	205
L1	-	-	-	-	-
L2	36	46	70	97	100
L3	4.5	6	7	15	15
L4	3	3.5	5	3	3
L5	25	32	40	65	70
L6	2	3	10	5	6
L7	7.5	10	12	15	20
L8	79	103.5	140.4	161	203
L9	1.5	1.5	2	2	2
L10	10.5	13.5	18	34	42
* C1	46	70	90	145	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)
* C4	26.5	34	43.1	62	82
* C5 H7	30	50	70	110	114.3
* C6	4	4	6	7	7
* C7	45	60	90	132	180
* C8	17	20.5	23.5	42	47
* C9	132	170	233.9	300	350
* C10	10	12	13.4	28	29.5
B1 h9	5	6	10	12	16
H1	18	24.5	35	43	59

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage A Type

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	MSR0502A	MSR0702A	MSR0902A	MSR1202A	MSR1552A	MSR2052A
D1	44	62	80	108	140	184
D2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M10 X 1.5P	M12 X 1.75P
D3 h7	12	16	22	32	40	55
D4 h7	35	52	68	90	120	160
D5	13	20	30	40	60	75
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P
D7	-	-	-	-	-	-
D8	49	69	94	119	155	205
L1	-	-	-	-	-	-
L2	24.5	36	46	70	97	100
L3	4	4.5	6	7	15	15
L4	2.5	3	3.5	5	3	3
L5	14	25	32	40	65	70
L6	2	2	3	10	5	6
L7	6.5	7.5	10	12	15	20
L8	76.5	93.5	124.9	141.8	174.5	203
L9	1.5	1.5	1.5	2	2	2
L10	9.5	10.5	13.5	18	34	42
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)	42 (55)
* C4	26.5	34	43.1	62	82	82
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	118	150	194.4	253.8	318.5	350
* C10	10	12	13.4	28	29.5	28.5
B1 h9	4	5	6	10	12	16
H1	13.5	18	24.5	35	43	59

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

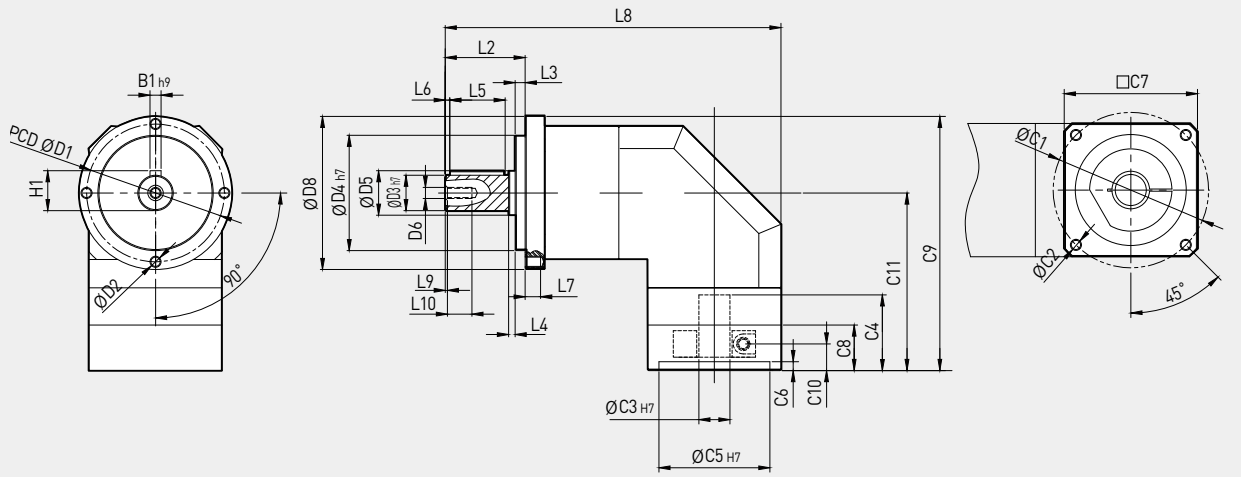
MAR Series

Division		Stage	Gear ratio	050	070	090	120	155	205
Nominal Output Torque (Nm)		1	3	20	57	148	272	484	897
			4	18	51	143	295	549	1,060
			5	19	54	160	332	634	1,195
			6	18	50	151	311	592	1,109
			7	17	48	145	305	562	1,104
			8	16	44	132	279	527	1,035
			9	14	42	123	254	483	947
			10	14	42	121	262	500	980
			14	-	44	145	305	562	1,104
			15	14	-	-	-	-	-
			20	14	42	121	262	500	980
		2	25	19	54	160	332	634	1,195
			30	18	50	151	311	592	1,109
			35	17	48	145	305	562	1,104
			40	16	44	132	279	527	1,035
			45	14	42	123	254	483	947
			50	19	54	160	332	634	1,195
			60	18	50	151	311	592	1,109
			70	17	48	145	305	562	1,104
			80	16	44	132	279	527	1,035
			90	14	42	123	254	483	947
			100	14	42	121	262	500	980
			120	-	-	151	311	592	1,109
			140	-	-	145	305	562	1,104
			160			132	279	527	1,035
			180	-	-	123	254	483	947
			200	-	-	121	262	500	980
Emergency Stop Torque (Nm)		1,2	3~200	3 times nominal output torque					
Nominal Input Speed (rpm)		1,2	3~200	5,000	5,000	4,000	4,000	3,000	3,000
Max. Input Speed (rpm)		1,2	3~200	10,000	10,000	8,000	8,000	6,000	6,000
Torsional Rigidity (Nm/Arcmin)		1,2	3~200	3	7	14	26	55	143
Max. Radial Load (N)		1,2	3~200	750	1,280	3,200	6,800	9,300	15,100
Max. Axial Load (N)		1,2	3~200	390	690	1,600	3,400	4,500	7,500
Backlash (Arcmin)	S	1	3~20	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8
		2	25~200	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11
Service Life (Hrs)		1,2	3~200	20,000 (10,000 under continuous operation)					
Efficiency (%)		1	3~20	≥ 95					
		2	25~100	≥ 92					
Weight (kg)		1A	3~20	≤ 0.9	≤ 1.5	≤ 6.0	≤ 12.0	≤ 24.0	≤ 51.0
		2A	25~200	≤ 1.2	≤ 2.0	≤ 7.5	≤ 13.5	≤ 26.0	≤ 54.0
		2B	25~200	-	≤ 1.9	≤ 7.3	≤ 12.8	≤ 25.0	≤ 53.0
Operating Temp (°C)		1,2	3~200	-10 ~ 90					
Lubrication		1,2	3~200	Grease (VIGO Grease RE #0)					
Degree of Gearbox Protection		1,2	3~200	IP65					
Noise (dB)		1,2	3~200	≤ 58	≤ 60	≤ 63	≤ 66	≤ 69	≤ 72
Inertia (kgcm²)		1A	3~10	0.09	0.36	2.27	6.88	23.50	69.2
			14, 20	-	0.08	1.89	6.23	21.75	66.3
		2B	15, 20	-	-	-	-	-	-
			25~100	-	0.09	0.36	2.27	6.88	23.5
			120~200	-	-	0.32	1.89	6.23	21.75
		2A	15, 20	0.09	-	-	-	-	-
			25~100	0.09	0.36	2.27	6.88	23.50	69.2
			120~200	-	-	1.89	6.23	21.75	66.3

(1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

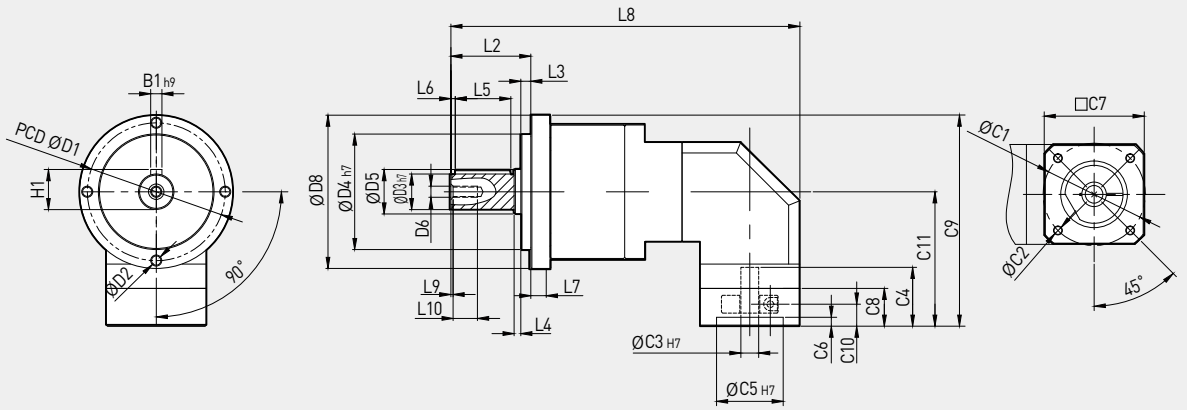
Dimension	MAR0501A	MAR0701A	MAR0901A	MAR1201A	MAR1551A	MAR2051A
D1	50	70	100	130	165	215
D2	3.5	5.5	6.8	8.7	11	13
D3 h7	13	16	22	32	40	55
D4 h7	35	50	80	110	130	160
D5	15	20	30	39.5	60	75
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P
D7	58	80	116	152	185	240
D8	45	60	90	115	142	180
L1	26.5	37	48	64	97	105
L2	5.5	7	10	12	15	20
L3	1	1.5	1.5	2	3	3
L4	15	25	32	40	65	70
L5	2	2	3	5	5	6
L6	6.5	8	11	12	19	18
L7	114	151.2	203	270	333	375.5
* L8	1.5	1.5	1.5	2	2	2
L9	9.5	10.5	13.5	18	34	42
L10	46	70	90	145	200	200
* C1	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C2	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)	42 (55)
* C3 H7	26.5	34	43.1	62	82	86
* C4	30	50	70	110	114.3	114.3
* C5 H7	4	4	6	7	7	7
* C6	45	60	90	132	180	180
* C7	17	20.5	23.5	42	47	47
* C8	83	110	152	200	240	288
* C9						
* C10						
C11	10	12	13.4	28	29.5	28.5
B1 h9	5	5	6	10	12	16
H1	15	18	24.5	35	43	59

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

MAR Series

Double Stage B Type

Drawing of Planetary Gearbox



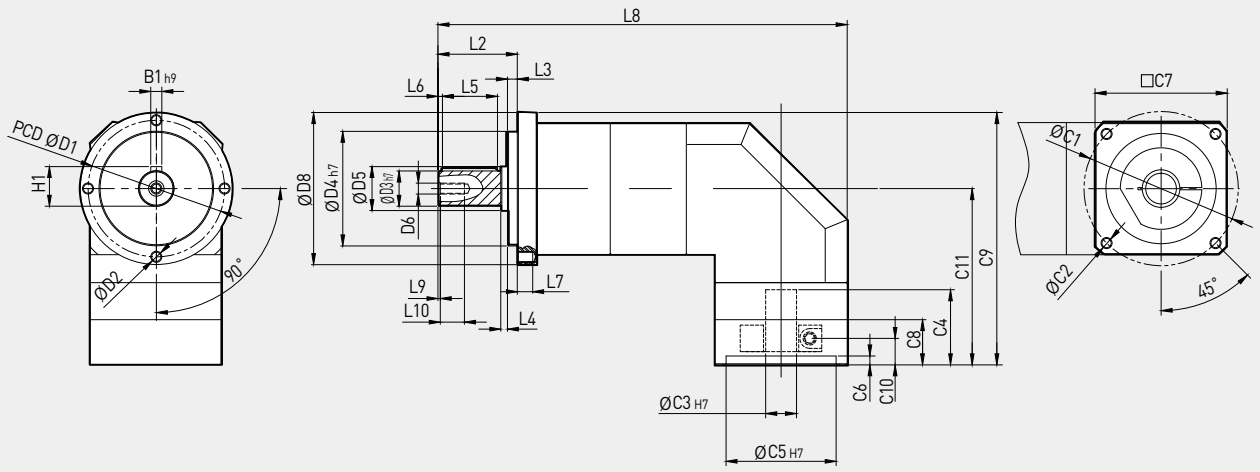
※ Please check the detail with size manager (www.lselectric.com/gearbox).
because the dimensions differ according to the applied motor.

Dimension	MAR0702B	MAR0902B	MAR1202B	MAR1552B	MAR2052B
D1	62	80	108	140	184
D2	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M10 X 1.5P	M12 X 1.75P
D3 h7	16	22	32	40	55
D4 h7	52	68	90	120	160
D5	20	30	40	60	75
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P
D7	-	-	-	-	-
D8	69	94	119	155	205
L1	-	-	-	-	-
L2	36	46	70	97	100
L3	4.5	6	7	15	15
L4	3	3.5	5	3	3
L5	25	32	40	65	70
L6	2	3	10	5	6
L7	7.5	10	12	15	20
* L8	157	205.7	286.5	367.5	441.5
L9	1.5	1.5	2	2	2
L10	10.5	13.5	18	34	42
* C1	46	70	90	145	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)
* C4	26.5	34	43.1	62	82
* C5 H7	30	50	70	110	114.3
* C6	4	4	6	7	7
* C7	45	60	90	132	180
* C8	17	20.5	23.5	42	47
* C9	95	127	166.5	220	271.5
* C10	10	12	13.4	28	29.5
C11	60.5	80	107	142.5	169
B1 h9	5	6	10	12	16
H1	18	24.5	35	43	59

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage A Type

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	MAR0502A	MAR0702A	MAR0902A	MAR1202A	MAR1552A	MAR2052A
D1	44	62	80	108	140	184
D2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M10 X 1.5P	M12 X 1.75P
D3 h7	12	16	22	32	40	55
D4 h7	35	52	68	90	120	160
D5	13	20	30	40	60	75
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P
D7	-	-	-	-	-	-
D8	49	69	94	119	155	205
L1	-	-	-	-	-	-
L2	24.5	36	46	70	97	100
L3	4	4.5	6	7	15	15
L4	2.5	3	3.5	5	3	3
L5	14	25	32	40	65	70
L6	2	2	3	10	5	6
L7	6.5	7.5	10	12	15	20
* L8	143	185.7	247	306.5	392.5	441.5
L9	1.5	1.5	1.5	2	2	2
L10	9.5	10.5	13.5	18	34	42
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)	42 (55)
* C4	26.5	34	43.1	62	82	82
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	85	114.5	154	186.4	238.5	271.5
* C10	10	12	13.4	28	29.5	28.5
C11	60.5	80	107	126.9	161	169
B1 h9	4	5	6	10	12	16
H1	13.5	18	24.5	35	43	59

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Basic Line/ Helical Gear

MSO Series

Circle output flange
Right-angle type gearbox, Standard

MAO Series

Circle output flange
Right-angle type gearbox, Standard

Economic planetary differential reducer with basic line/ helical gear structure

- High torque, high efficiency, and low noise are realized with a round flange type tap fastening structure at the output part
- Maximize space utilization with the Angle Type with MAO Spiral Bevel Gear
- Affordable products with at least a single backlash

- Best-in-class backlash
- High output torque
- Low noise level
- High efficiency
- Maintenance free
- Balanced motor pinion
- Gear ratios available from 3:1 up to 200:1
- No need to replace lubrication to expand the lifespan

MSO						
Stage	Gear ratio	040	060	080	120	160
1A	3~10	○	○	○	○	○
2B	15~100	☎	○	○	○	○
2A	15~100	○	○	○	○	○
1M/2M	3~100	☎	☎	☎	☎	☎

MAO						
Stage	Gear ratio	040	060	080	120	160
1A	3~10	○	○	○	○	○
	14, 20	☎	○	○	○	○
2B	15, 20	☎	☎	☎	☎	☎
	25~100	☎	○	○	○	○
	120~200	☎	☎	○	○	○
2A	15, 20	○	☎	☎	☎	☎
	25~100	○	○	○	○	○
	120~200	☎	○	○	○	○
1M/2M	3~200	☎	☎	☎	☎	☎

○ : Standard, △: Custom made, ☎ : Contact sales person.

MSO	060	1A	–	010	K	S	–	MOTOR
①	②	③		④	⑤	⑥		

① Type

MSO	Straight
MAO	Angular

② Size

040	40	120	120
060	60	160	160
080	80		

③ Stage and Input Shaft Hole

1A	Standard single stage
2B	Standard double stage
2A	Optional double stage
1M	Customized single stage (expanded input hole)
2M	Customized double stage (expanded input hole)

④ Gear ratio

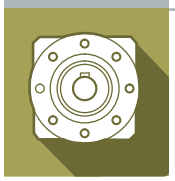
Single stage	MSO: 3~10
	MAO: 3~20 (040: 3~10)
Double stage	MSO: 15~100
	MAO: 25~200 (040: 15~100)

⑤ Key Type

K	Key
N	No Key

⑥ Backlash

S	Standard



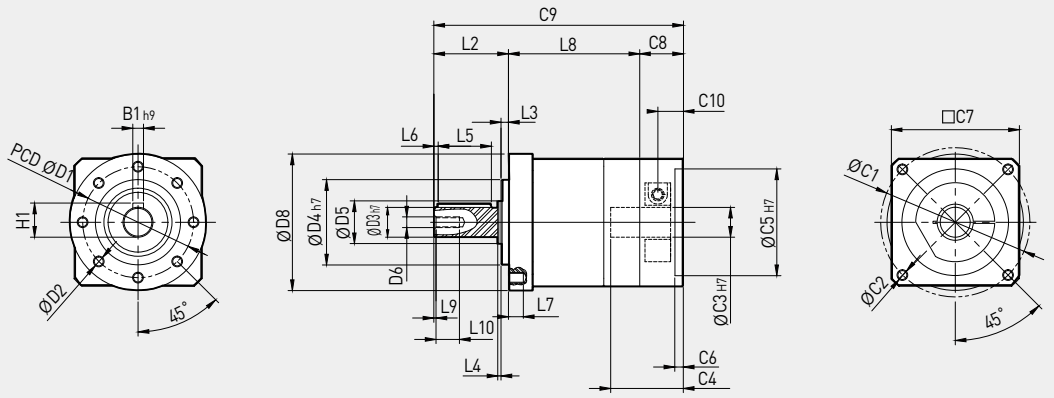
MSO Series

Division		Stage	Gear ratio	040	060	080	120	160
Nominal Output Torque (Nm)		1	3	20	57	148	272	484
			4	18	51	143	295	549
			5	19	54	160	332	634
			6	18	50	151	311	592
			7	17	48	145	305	562
			8	16	44	132	279	527
			9	14	42	123	254	483
			10	14	42	121	262	500
		2	15	20	57	148	272	484
			20	18	51	143	295	549
			25	19	54	160	332	634
			30	18	50	151	311	592
			35	17	48	145	305	562
			40	16	44	132	279	527
			45	14	42	123	254	483
			50	19	54	160	332	634
			60	18	50	151	311	592
			70	17	48	145	305	562
			80	16	44	132	279	527
			90	14	42	123	254	483
			100	14	42	121	262	500
Emergency Stop Torque (Nm)		1,2	3~100	3 times nominal output torque				
Nominal Input Speed (rpm)		1,2	3~100	5,000	5,000	4,000	4,000	3,000
Max. Input Speed (rpm)		1,2	3~100	10,000	10,000	8,000	8,000	6,000
Torsional Rigidity (Nm/Arcmin)		1,2	3~100	3	7	14	26	55
Max. Radial Load (N)		1,2	3~100	750	1,280	3,200	6,800	9,300
Max. Axial Load (N)		1,2	3~100	390	690	1,600	3,400	4,500
Backlash (Arcmin)	S	1	3~10	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
		2	15~100	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9
Service Life (Hrs)		1,2	3~100	20,000 (10,000 under continuous operation)				
Efficiency (%)		1	3~10	≥ 97				
		2	15~100	≥ 94				
Weight (kg)		1A	3~10	≤ 0.6	≤ 1.3	≤ 3.8	≤ 7.6	≤ 15.0
		2A	15~100	≤ 0.8	≤ 1.8	≤ 5.0	≤ 10.3	≤ 19.6
		2B	15~100	-	≤ 1.6	≤ 4.7	≤ 9.6	≤ 18.0
Operating Temp (°C)		1,2	3~100	-10 ~ 90				
Lubrication		1,2	3~100	Grease (VIGO Grease RE #0)				
Degree of Gearbox Protection		1,2	3~100	IP65				
Noise (dB)		1,2	3~100	≤ 52	≤ 54	≤ 56	≤ 59	≤ 62
Inertia ($kgcm^2$)		1A	3	0.03	0.17	0.64	3.12	9.23
			4	0.03	0.15	0.51	2.84	7.66
			5	0.03	0.13	0.48	2.81	7.52
			6	0.03	0.13	0.47	2.75	7.34
			7	0.03	0.13	0.45	2.69	7.16
			8	0.03	0.13	0.45	2.64	7.11
			9	0.03	0.13	0.44	2.59	7.05
			10	0.03	0.13	0.44	2.59	7.05
		2B	15~45	0.03	0.03	0.13	0.48	2.81
			50~100	0.03	0.03	0.13	0.44	2.69
		2A	15~45	-	0.13	0.48	2.81	7.52
			50~100	-	0.13	0.44	2.69	7.05

(1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



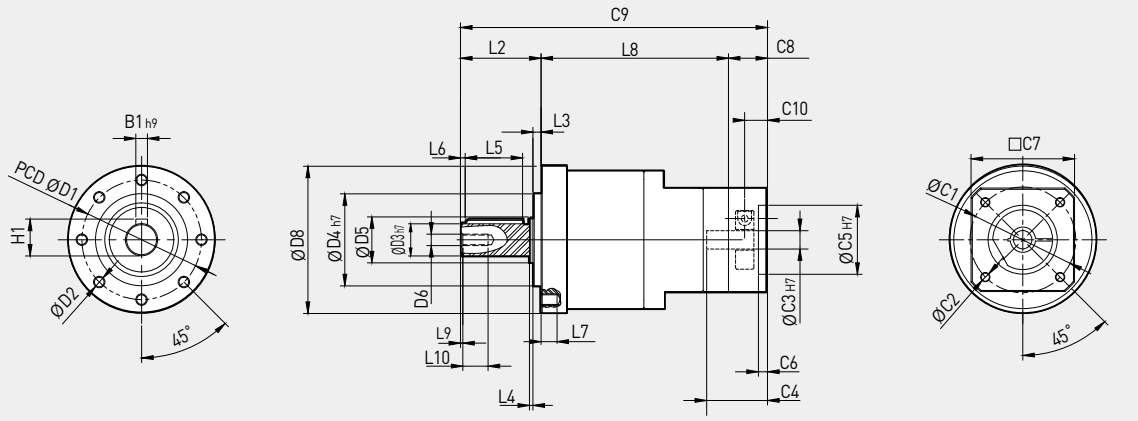
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	MSO0401A	MSO0601A	MSO0801A	MSO1201A	MSO1601A
D1	34	52	70	100	145
D2	M4 X 0.7P , DP:7	M5 X 0.8P , DP:8	M6 X 1.0P , DP:10	M10 X 1.5 , DP:16	M12 X 1.75 , DP:22
D3 h7	10	14	20	25	40
D4 h7	26	40	60	80	130
D5	15	20	30	32	60
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P
D7	-	-	-	-	-
D8	49	64	94	119	159
L1	-	-	-	-	-
L2	26	35	40.5	55	87
L3	2	3.5	2.5	4	5
L4	1	1.5	1.5	5	3
L5	18	25	28	40	65
L6	1	2	3	3	5
L7	7	8	10	16	22
L8	49	61.5	86.4	105.5	126.5
L9	1.5	1.5	1.5	2	2
L10	9.5	12	14.5	18	34
* C1	46	70	90	145	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)
* C4	26.5	34	43.1	62	82
* C5 H7	30	50	70	110	114.3
* C6	4	4	6	7	7
* C7	45	60	90	132	180
* C8	17	20.5	23.5	42	47
* C9	92	117	150.4	202.5	260.5
* C10	10	12	13.4	28	29.5
B1 h9	3	5	6	8	12
H1	11.2	16	22.5	28	43

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage B Type

Drawing of Planetary Gearbox



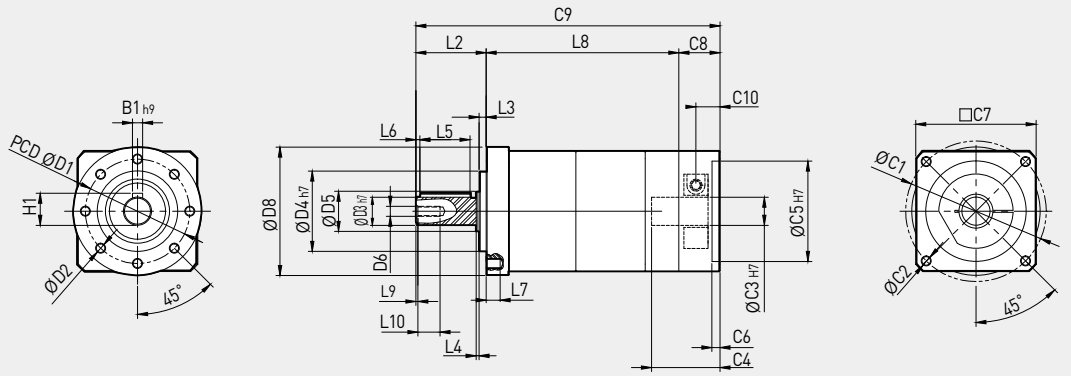
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	MSO0602B	MSO0802B	MSO1202B	MSO1602B
D1	52	70	100	145
D2	M5 X 0.8P , DP:8	M6 X 1.0P , DP:10	M10 X 1.5 , DP:16	M12 X 1.75 , DP:22
D3 h7	14	20	25	40
D4 h7	40	60	80	130
D5	20	30	32	60
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P
D7	-	-	-	-
D8	64	94	119	159
L1	-	-	-	-
L2	35	40.5	55	87
L3	3.5	2.5	4	5
L4	1.5	1.5	5	3
L5	25	28	40	65
L6	2	3	3	5
L7	8	10	16	22
L8	81.5	90.5	144.4	171
L9	1.5	1.5	2	2
L10	12	14.5	18	34
* C1	46	70	90	145
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)
* C4	26.5	34	43.1	62
* C5 H7	30	50	70	110
* C6	4	4	6	7
* C7	45	60	90	132
* C8	17	20.5	23.5	42
* C9	133.5	170	222.9	300
* C10	10	12	13.4	28
B1 h9	5	6	8	12
H1	16	22.5	28	43

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage A Type

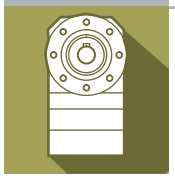
Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	MSO0402A	MSR0602A	MSO0802A	MSO1202A	MSO1602A
D1	34	52	70	100	145
D2	M4 X 0.7P , DP:7	M5 X 0.8P , DP:8	M6 X 1.0P , DP:10	M10 X 1.5 , DP:16	M12 X 1.75 , DP:22
D3 h7	10	14	20	25	40
D4 h7	26	40	60	80	130
D5	15	20	30	32	60
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P
D7	-	-	-	-	-
D8	49	64	94	119	159
L1	-	-	-	-	-
L2	26	35	40.5	55	87
L3	2	3.5	2.5	4	5
L4	1	1.5	1.5	5	3
L5	18	25	28	40	65
L6	1	2	3	3	5
L7	7	8	10	16	22
L8	78	96	130.4	145.8	184.5
L9	1.5	1.5	1.5	2	2
L10	9.5	12	14.5	18	34
* C1	46	70	90	145	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)
* C4	26.5	34	43.1	62	82
* C5 H7	30	50	70	110	114.3
* C6	4	4	6	7	7
* C7	45	60	90	132	180
* C8	17	20.5	23.5	42	47
* C9	121	151.5	194.4	242.8	318.5
* C10	10	12	13.4	28	29.5
B1 h9	3	5	6	8	12
H1	11.2	16	22.5	28	43

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.



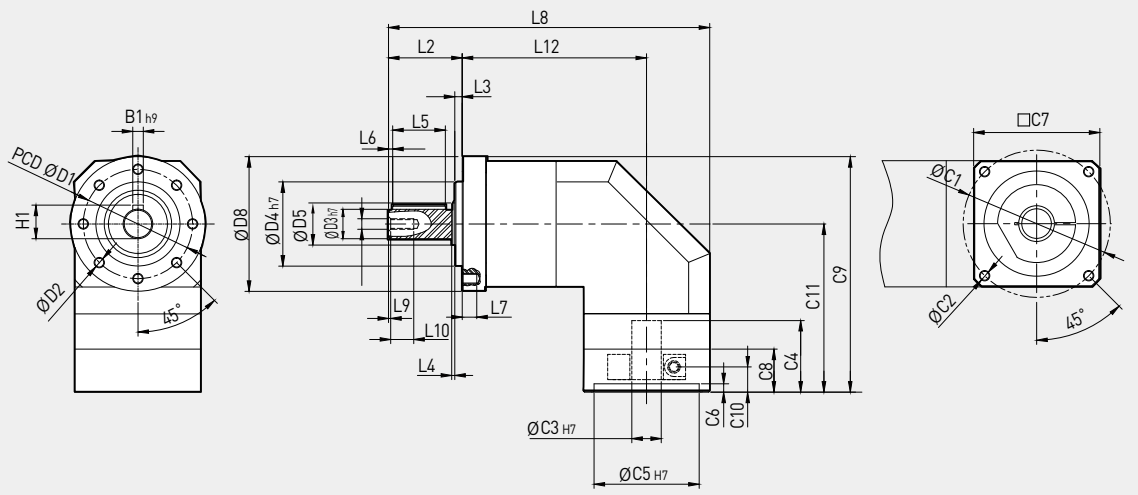
MA0 Series

Division		Stage	Gear ratio	040	060	080	120	160
Nominal Output Torque (Nm)		1	3	20	57	148	272	484
			4	18	51	143	295	549
			5	19	54	160	332	634
			6	18	50	151	311	592
			7	17	48	145	305	562
			8	16	44	132	279	527
			9	14	42	123	254	483
			10	14	42	121	262	500
			14	-	44	145	305	562
			15	14	-	-	-	-
			20	14	42	121	262	500
		2	25	19	54	160	332	634
			30	18	50	151	311	592
			35	17	48	145	305	562
			40	16	44	132	279	527
			45	14	42	123	254	483
			50	19	54	160	332	634
			60	18	50	151	311	592
			70	17	48	145	305	562
			80	16	44	132	279	527
			90	14	42	123	254	483
			100	14	42	121	262	500
			120	-	-	151	311	592
			140	-	-	145	305	562
			160			132	279	527
			180	-	-	123	254	483
			200	-	-	121	262	500
Emergency Stop Torque (Nm)		1,2	3~200	3 times nominal output torque				
Nominal Input Speed (rpm)		1,2	3~200	5,000	5,000	4,000	4,000	3,000
Max. Input Speed (rpm)		1,2	3~200	10,000	10,000	8,000	8,000	6,000
Torsional Rigidity (Nm/Arcmin)		1,2	3~200	3	7	14	26	55
Max. Radial Load (N)		1,2	3~200	750	1,280	3,200	6,800	9,300
Max. Axial Load (N)		1,2	3~200	390	690	1,600	3,400	4,500
Backlash (Arcmin)	S	1	3~20	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8
		2	25~200	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11
Service Life (Hrs)		1,2	3~200	20,000 (10,000 under continuous operation)				
Efficiency (%)		1	3~20	≥ 95				
		2	25~100	≥ 92				
Weight (kg)		1A	3~20	≤ 0.9	≤ 1.5	≤ 6.0	≤ 12.0	≤ 24.0
		2A	25~200	≤ 1.2	≤ 2.0	≤ 7.5	≤ 13.5	≤ 26.0
		2B	25~200	-	≤ 1.9	≤ 7.3	≤ 12.8	≤ 25.0
Operating Temp (°C)		1,2	3~200	-10 ~ 90				
Lubrication		1,2	3~200	Grease (VIGO Grease RE #0)				
Degree of Gearbox Protection		1,2	3~200	IP65				
Noise (dB)		1,2	3~200	≤ 58	≤ 60	≤ 63	≤ 66	≤ 69
Inertia (kgcm²)		1A	3~10	0.09	0.36	2.27	6.88	23.50
			14, 20	-	0.08	1.89	6.23	21.75
		2B	15, 20	-	-	-	-	-
			25~100	-	0.09	0.36	2.27	6.88
			120~200	-	-	0.32	1.89	6.23
		2A	15, 20	0.09	-	-	-	-
			25~100	0.09	0.36	2.27	6.88	23.50
			120~200	-	-	1.89	6.23	21.75

(1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



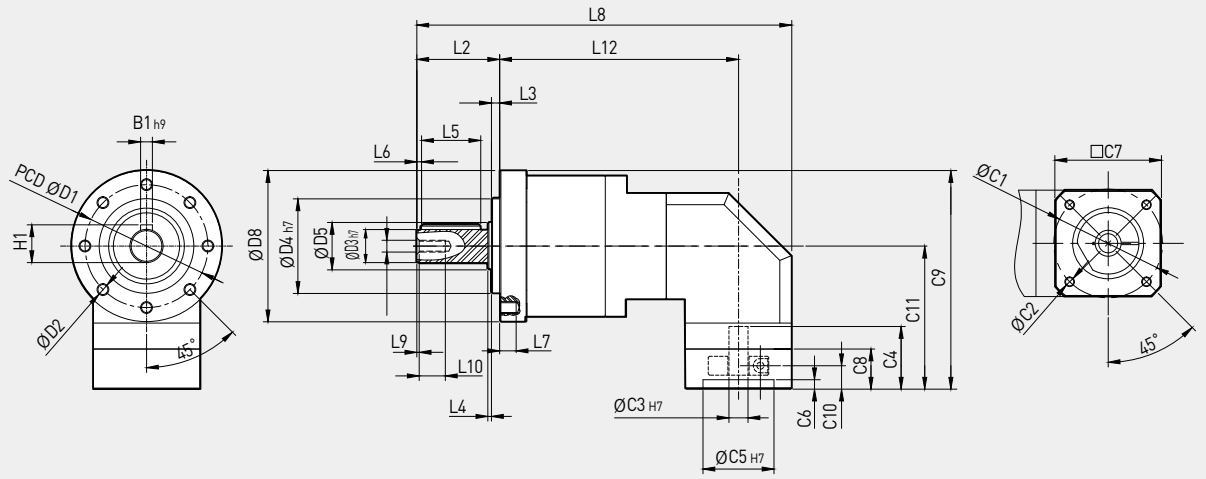
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	MAO0401A	MAO0601A	MAO0801A	MAO1201A	MAO1601A
D1	34	52	70	100	145
D2	M4 X 0.7P , DP:7	M5 X 0.8P , DP:8	M6 X 1.0P , DP:10	M10 X 1.5 , DP:16	M12 X 1.75 , DP:22
D3 h7	10	14	20	25	40
D4 h7	26	40	60	80	130
D5	15	20	30	32	60
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P
D7	-	-	-	-	-
D8	49	64	94	119	159
L1	-	-	-	-	-
L2	26	35	40.5	55	87
L3	2	3.5	2.5	4	5
L4	1	1.5	1.5	5	3
L5	18	25	28	40	65
L6	1	2	3	3	5
L7	7	8	10	16	22
* L8	117	152.7	203	270	352
L9	1.5	1.5	1.5	2	2
L10	9.5	12	14.5	18	34
L11	-	-	-	-	-
L12	68.5	87.7	117.5	150	175
* C1	46	70	90	145	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)
* C4	26.5	34	43.1	62	82
* C5 H7	30	50	70	110	114.3
* C6	4	4	6	7	7
* C7	45	60	90	132	180
* C8	17	20.5	23.5	42	47
* C9	85	112	154	202	248.5
* C10	10	12	13.4	28	29.5
* C11	60.5	80	107	142.5	169
B1 h9	3	5	6	8	12
H1	11.2	16	22.5	28	43

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage B Type

Drawing of Planetary Gearbox



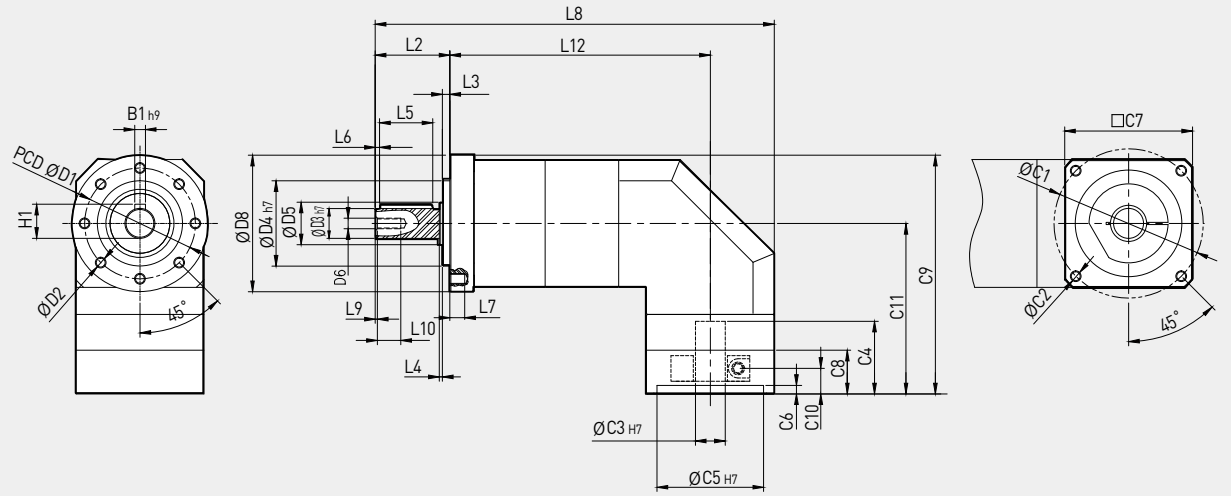
※ Please check the detail with size manager (www.lselectric.com/gearbox).
because the dimensions differ according to the applied motor.

Dimension	MAO0602B	MAO0802B	MAO1202B	MAO1602B
D1	52	70	100	145
D2	M5 X 0.8P , DP:8	M6 X 1.0P , DP:10	M10 X 1.5 , DP:16	M12 X 1.75 , DP:22
D3 h7	14	20	25	40
D4 h7	40	60	80	130
D5	20	30	32	60
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P
D7	-	-	-	-
D8	64	94	119	159
L1	-	-	-	-
L2	35	40.5	55	87
L3	3.5	2.5	4	5
L4	1.5	1.5	5	3
L5	25	28	40	65
L6	2	3	3	5
L7	8	10	16	22
* L8	158.5	205.7	275.5	367.5
L9	1.5	1.5	2	2
L10	12	14.5	18	34
L11	-	-	-	-
L12	123.5	135.2	175.5	215.5
* C1	46	70	90	145
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)
* C4	26.5	34	43.1	62
* C5 H7	30	50	70	110
* C6	4	4	6	7
* C7	45	60	90	132
* C8	17	20.5	23.5	42
* C9	92.5	127	166.5	222
* C10	10	12	13.4	28
* C11	60.5	80	107	142.5
B1 h9	5	6	8	12
H1	16	22.5	28	43

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage A Type

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	MAO0402A	MAO0602A	MAO0802A	MAO1202A	MAO1602A
D1	34	52	70	100	145
D2	M4 X 0.7P , DP:7	M5 X 0.8P , DP:8	M6 X 1.0P , DP:10	M10 X 1.5 , DP:16	M12 X 1.75 , DP:22
D3 h7	10	14	20	25	40
D4 h7	26	40	60	80	130
D5	15	20	30	32	60
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P
D7	-	-	-	-	-
D8	49	64	94	119	159
L1	-	-	-	-	-
L2	26	35	40.5	55	87
L3	2	3.5	2.5	4	5
L4	1	1.5	1.5	5	3
L5	18	25	28	40	65
L6	1	2	3	3	5
L7	7	8	10	16	22
* L8	146	187.2	247	295.5	392.5
L9	1.5	1.5	1.5	2	2
L10	9.5	12	14.5	18	34
L11	-	-	-	-	-
L12	97.5	122.2	161.5	175.5	215.5
* C1	46	70	90	145	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P
* C3 H7	8 (14)	14 (19)	19 (24)	24 (35)	35 (42)
* C4	26.5	34	43.1	62	82
* C5 H7	30	50	70	110	114.3
* C6	4	4	6	7	7
* C7	45	60	90	132	180
* C8	17	20.5	23.5	42	47
* C9	85	112	154	186.4	240.5
* C10	10	12	13.4	28	29.5
* C11	60.5	80	107	126.9	161
B1 h9	3	5	6	8	12
H1	11.2	16	22.5	28	43

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Premium Line/ Helical Gear

Ultra-precise planetary differential reducer with premium line/ helical gear structure

- High-precision, high-torque, high-efficiency, and low noise through structural improvement as a representative model of premium line
- Maximize space utilization with Angle Type with HAS Spiral Bevel Gear
- Standard, precise, and ultra-precise backlash configurations applicable to applications

HSS Series

Square output flange
Straight type gearbox,
Standard / Premium / Advanced

HAS Series

Square output flange
Right-angle type gearbox,
Standard / Premium / Advanced

- Best-in-class backlash
- High output torque
- Low noise level
- High efficiency
- Maintenance free
- Balanced motor pinion
- Gear ratios available from 3:1 up to 200:1
- No need to replace lubrication to expand the lifespan

HSS								
Stage	Gear ratio	045	060	090	115	142	180	220
1A	3~10	○	○	○	○	○	○	○
2B	15~100	☎	○	○	○	○	○	○
2A	15~100	○	○	○	○	○	○	○
1M/2M	3~100	☎	☎	☎	☎	☎	☎	☎

HAS								
Stage	Gear ratio	045	060	090	115	142	180	220
1A	3~10	○	○	○	○	○	○	○
	14, 20	☎	○	○	○	○	○	○
2B	15, 20	☎	☎	☎	☎	☎	☎	☎
	25~100	☎	○	○	○	○	○	○
	120~200	☎	☎	○	○	○	○	○
2A	15, 20	○	☎	☎	☎	☎	☎	☎
	25~100	○	○	○	○	○	○	○
	120~200	☎	○	○	○	○	○	○
1M/2M	3~200	☎	☎	☎	☎	☎	☎	☎

○ : Standard, △: Custom made, ☎ : Contact sales person.

HSS	060	1A	–	010	K	P	–	MOTOR
①	②	③		④	⑤	⑥		

① Type

HSS	Straight
HAS	Angular

② Size

045	45	142	142
060	60	180	180
090	90	220	220
115	115		

③ Stage and Input Shaft Hole

1A	Standard single stage
2B	Standard double stage
2A	Optional double stage
1M	Customized single stage (expanded input hole)
2M	Customized double stage (expanded input hole)

④ Gear ratio

Single stage	HSS: 3~10
	HAS: 3~20 (045: 3~10)
Double stage	HSS: 15~100
	HAS: 25~200 (045: 15~100)

⑤ Key Type

K	Key
N	No Key

⑥ Backlash

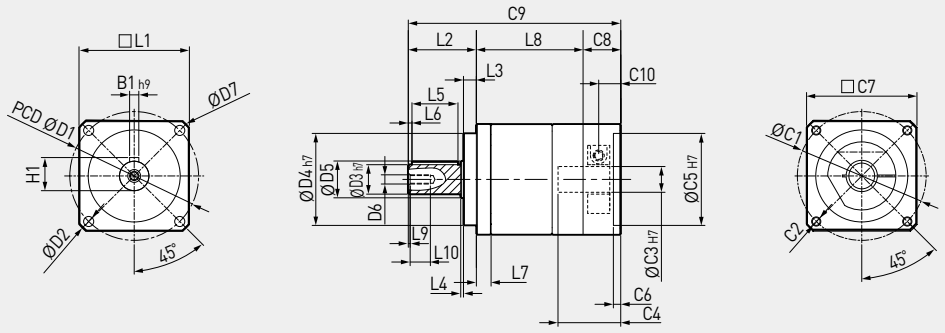
S	Standard
P	Premium
A	Advanced

Division		Stage	Gear ratio	045	060	090	115	142	180	220
Nominal Output Torque (Nm)		1	3	20	57	148	272	484	897	1,585
			4	18	51	143	295	549	1,060	1,752
			5	19	54	160	332	634	1,195	2,005
			6	18	50	151	311	592	1,109	1,906
			7	17	48	145	305	562	1,104	1,835
			8	16	44	132	279	527	1,035	1,712
			9	14	42	123	254	483	947	1,597
			10	14	42	121	262	500	980	1,640
		2	15	20	57	148	272	484	897	1,585
			20	18	51	143	295	549	1,060	1,752
			25	19	54	160	332	634	1,195	2,005
			30	18	50	151	311	592	1,109	1,906
			35	17	48	145	305	562	1,104	1,835
			40	16	44	132	279	527	1,035	1,712
			45	14	42	123	254	483	947	1,597
			50	19	54	160	332	634	1,195	2,005
			60	18	50	151	311	592	1,109	1,906
			70	17	48	145	305	562	1,104	1,835
			80	16	44	132	279	527	1,035	1,712
			90	14	42	123	254	483	947	1,597
			100	14	42	121	262	500	980	1,640
Emergency Stop Torque (Nm)		1,2	3~100	3 times nominal output torque						
Nominal Input Speed (rpm)		1,2	3~100	5,000	5,000	4,000	4,000	3,000	3,000	2,000
Max. Input Speed (rpm)		1,2	3~100	10,000	10,000	8,000	8,000	6,000	6,000	4,000
Torsional Rigidity (Nm/Arcmin)		1,2	3~100	3	7	14	26	55	143	233
Max. Radial Load (N)		1,2	3~100	750	1,280	3,200	6,800	9,300	15,100	50,000
Max. Axial Load (N)		1,2	3~100	390	690	1,600	3,400	4,500	7,500	28,000
Backlash (Arcmin)	S	1	3~10	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
		2	15~100	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9
	P	1	3~10	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
		2	15~100	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
	A	1	3~10	★	≤ 3	≤ 3	≤ 3	≤ 3	≤ 3	≤ 3
		2	15~100	★	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
Service Life (Hrs)		1,2	3~100	20,000 (10,000 under continuous operation)						
Efficiency (%)		1	3~10	≥ 97						
		2	15~100	≥ 94						
Weight (kg)		1A	3~10	≤ 0.6	≤ 1.3	≤ 3.8	≤ 7.6	≤ 15.0	≤ 26.0	≤ 45.0
		2A	15~100	≤ 0.8	≤ 1.8	≤ 5.0	≤ 10.3	≤ 19.6	≤ 30.0	≤ 54.0
		2B	15~100	-	≤ 1.6	≤ 4.7	≤ 9.6	≤ 18.0	≤ 30.0	≤ 54.0
Operating Temp (°C)		1,2	3~100	-10 ~ 90						
Lubrication		1,2	3~100	Grease (VIGO Grease RE #0)						
Degree of Gearbox Protection		1,2	3~100	IP65						
Noise (dB)		1,2	3~100	≤ 52	≤ 54	≤ 56	≤ 59	≤ 62	≤ 64	≤ 66
Inertia (kgcm²)		1A	3	0.03	0.17	0.64	3.12	9.23	29.98	65.72
			4	0.03	0.15	0.51	2.84	7.66	24.78	55.48
			5	0.03	0.13	0.48	2.81	7.52	24.29	54.29
			6	0.03	0.13	0.47	2.75	7.34	23.89	53.63
			7	0.03	0.13	0.45	2.69	7.16	23.48	52.97
			8	0.03	0.13	0.45	2.64	7.11	23.56	52.85
			9	0.03	0.13	0.44	2.59	7.05	23.63	52.73
			10	0.03	0.13	0.44	2.59	7.05	23.51	51.96
		2B	15~45	0.03	0.03	0.13	0.48	2.81	7.52	24.29
			50~100	0.03	0.03	0.13	0.44	2.69	7.05	23.63
		2A	15~45	-	0.13	0.48	2.81	7.52	24.29	54.29
			50~100	-	0.13	0.44	2.69	7.05	23.63	52.73

Please contact LS ELECTRIC sales person for ★ gear ratio. (1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

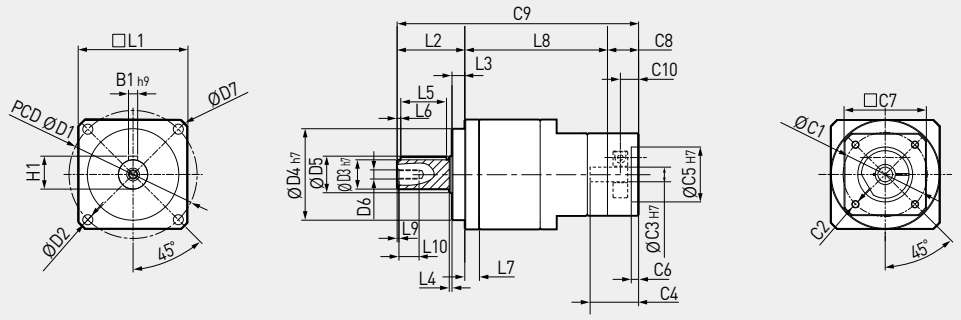
Dimension	HSS0451A	HSS0601A	HSS0901A	HSS1151A	HSS1421A	HSS1801A	HSS2201A
D1	50	70	100	130	165	215	250
D2	3.5	5.5	6.8	8.7	11	13	17
D3 h7	13	16	22	32	40	55	75
D4 h7	35	50	80	110	130	160	180
D5	15	20	30	39.5	60	75	100
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
D7	58	80	116	152	185	240	292
L1	45	60	90	115	142	180	220
L2	26.5	37	48	64	97	105	138
L3	5.5	7	10	12	15	20	30
L4	1	1.5	1.5	2	3	3	3
L5	15	25	32	40	65	70	90
L6	2	2	3	5	5	6	7
L7	6.5	8	11	12	19	18	30
L8	45.5	58	78.9	96.5	116.5	139	143
L9	1.5	1.5	1.5	2	2	2	2
L10	9.5	10.5	13.5	18	34	42	42
* C1	46	70	90	145	200	200	235
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42	55
* C4	26.5	34	43.1	62	82	86	86
* C5 H7	30	50	70	110	114.3	114.3	200
* C6	4	4	6	7	7	7	12
* C7	45	60	90	132	180	180	220
* C8	17	20.5	23.5	42	47	47	52
* C9	89	115.5	150.4	202.5	260.5	291	333
* C10	10	12	13.4	28	29.5	28.5	33.5
B1 h9	5	5	6	10	12	16	20
H1	15	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

HSS Series

Double Stage B Type

Drawing of Planetary Gearbox



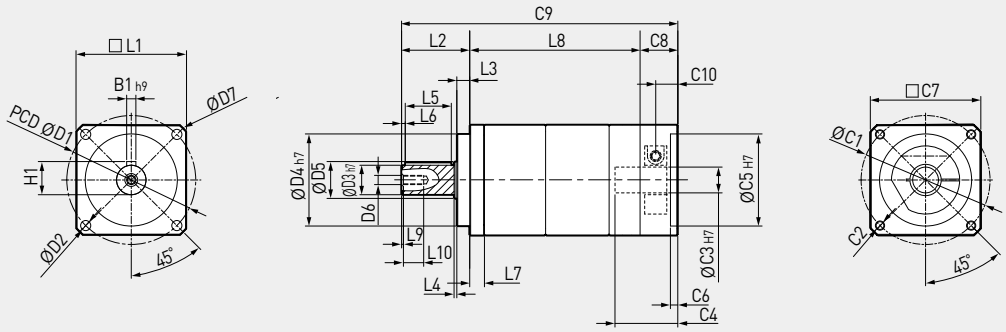
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HSS0602B	HSS0902B	HSS1152B	HSS1422B	HSS1802B	HSS2202B
D1	70	100	130	165	215	250
D2	5.5	6.8	8.7	11	13	17
D3 h7	16	22	32	40	55	75
D4 h7	50	80	110	130	160	180
D5	20	30	39.5	60	75	100
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
D7	80	116	152	185	240	292
L1	60	90	115	142	180	220
L2	37	48	64	97	105	138
L3	7	10	12	15	20	30
L4	1.5	1.5	2	3	3	3
L5	25	32	40	65	70	90
L6	2	3	5	5	6	7
L7	8	11	12	19	18	30
L8	78	101.5	135.4	161	198	230
L9	1.5	1.5	2	2	2	2
L10	10.5	13.5	18	34	42	42
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42
* C4	26.5	34	43.1	62	82	86
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	132	170	222.9	300	350	415
* C10	10	12	13.4	28	29.5	28.5
B1 h9	5	6	10	12	16	20
H1	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage A Type

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HSS0452A	HSS0602A	HSS0902A	HSS1152A	HSS1422A	HSS1802A	HSS2202A
D1	50	70	100	130	165	215	250
D2	3.5	5.5	6.8	8.7	11	13	17
D3 h7	13	16	22	32	40	55	75
D4 h7	35	50	80	110	130	160	180
D5	15	20	30	39.5	60	75	100
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
D7	58	80	116	152	185	240	292
L1	45	60	90	115	142	180	220
L2	26.5	37	48	64	97	105	138
L3	5.5	7	10	12	15	20	30
L4	1	1.5	1.5	2	3	3	3
L5	15	25	32	40	65	70	90
L6	2	2	3	5	5	6	7
L7	6.5	8	11	12	19	18	30
L8	74.5	92.5	122.9	136.8	174.5	198	230
L9	1.5	1.5	1.5	2	2	2	2
L10	9.5	10.5	13.5	18	34	42	42
* C1	46	70	90	145	200	200	235
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42	55
* C4	26.5	34	43.1	62	82	82	86
* C5 H7	30	50	70	110	114.3	114.3	200
* C6	4	4	6	7	7	7	12
* C7	45	60	90	132	180	180	220
* C8	17	20.5	23.5	42	47	47	52
* C9	118	150	194.4	242.8	318.5	350	420
* C10	10	12	13.4	28	29.5	28.5	33.5
B1 h9	5	5	6	10	12	16	20
H1	15	18	24.5	35	43	59	79.5

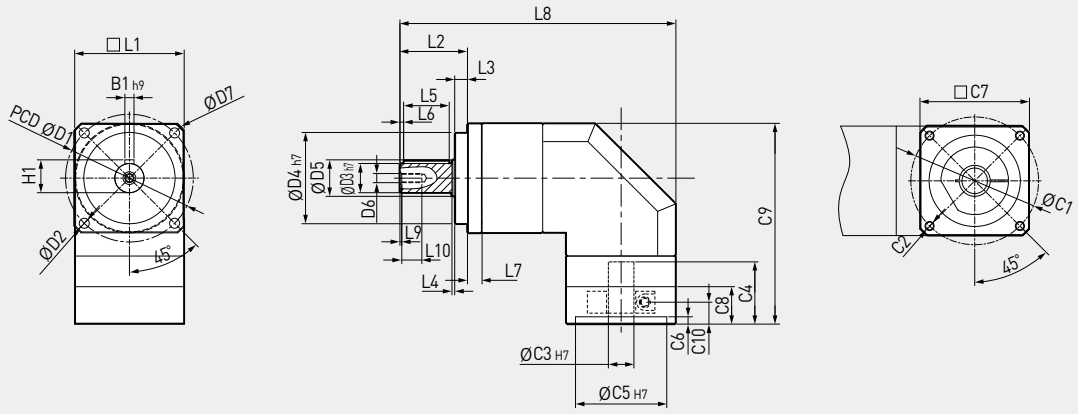
(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Division	Stage	Gear ratio	045	060	090	115	142	180	220
Nominal Output Torque (Nm)	1	3	20	57	148	272	484	897	1,585
		4	18	51	143	295	549	1,060	1,752
		5	19	54	160	332	634	1,195	2,005
		6	18	50	151	311	592	1,109	1,906
		7	17	48	145	305	562	1,104	1,835
		8	16	44	132	279	527	1,035	1,712
		9	14	42	123	254	483	947	1,597
		10	14	42	121	262	500	980	1,640
		14	-	44	145	305	562	1,104	1,835
		15	14	-	-	-	-	-	-
		20	14	42	121	262	500	980	1,640
	2	25	19	54	160	332	634	1,195	2,005
		30	18	50	151	311	592	1,109	1,906
		35	17	48	145	305	562	1,104	1,835
		40	16	44	132	279	527	1,035	1,712
		45	14	42	123	254	483	947	1,597
		50	19	54	160	332	634	1,195	2,005
		60	18	50	151	311	592	1,109	1,906
		70	17	48	145	305	562	1,104	1,835
		80	16	44	132	279	527	1,035	1,712
		90	14	42	123	254	483	947	1,597
		100	14	42	121	262	500	980	1,640
		120	-	-	151	311	592	1,109	1,906
		140	-	-	145	305	562	1,104	1,835
		160	-	-	132	279	527	1,035	1,712
		180	-	-	123	254	483	947	1,597
		200	-	-	121	262	500	980	1,640
Emergency Stop Torque (Nm)	-	-	3 times nominal output torque						
Nominal Input Speed (rpm)	-	-	5,000	5,000	4,000	4,000	3,000	3,000	2,000
Max. Input Speed (rpm)	-	-	10,000	10,000	8,000	8,000	6,000	6,000	4,000
Torsional Rigidity (Nm/Arcmin)	-	-	3	7	14	26	55	143	233
Max. Radial Load (N)	-	-	750	1,280	3,200	6,800	9,300	15,100	50,000
Max. Axial Load (N)	-	-	390	690	1,600	3,400	4,500	7,500	28,000
Backlash (Arcmin) S	1	-	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8
	2	-	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11
Backlash (Arcmin) P	1	-	≤ 6	≤ 6	≤ 6	≤ 6	≤ 6	≤ 6	≤ 6
	2	-	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9
Backlash (Arcmin) A	1	-	★	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4
	2	-	★	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
Service Life (Hrs)	-	-	20,000 (10,000 under continuous operation)						
Efficiency (%)	1	-	≥ 95						
	2	-	≥ 92						
Weight (kg)	1A	-	≤ 0.9	≤ 1.5	≤ 6.0	≤ 12.0	≤ 24.0	≤ 51.0	≤ 84.0
	2A	-	≤ 1.2	≤ 2.0	≤ 7.5	≤ 13.5	≤ 26.0	≤ 54.0	≤ 90.5
	2B	-	-	≤ 1.9	≤ 7.3	≤ 12.8	≤ 25.0	≤ 53.0	≤ 97.0
Operating Temp (°C)	1,2	-	-10 ~ 90						
Lubrication	-	-	Grease (VIGO Grease RE #0)						
Degree of Gearbox Protection	-	-	IP65						
Noise (dB)	-	-	≤ 58	≤ 60	≤ 63	≤ 66	≤ 69	≤ 72	≤ 74
Inertia (kgcm²)	1A	3~10	0.09	0.36	2.27	6.88	23.50	69.20	134.70
		14, 20	-	0.08	1.89	6.23	21.75	66.30	120.50
	2B	15, 20	-	-	-	-	-	-	-
		25~100	-	0.09	0.36	2.27	6.88	23.50	69.20
		120~200	-	-	0.32	1.89	6.23	21.75	66.30
	2A	15, 20	0.09	-	-	-	-	-	-
		25~100	0.09	0.36	2.27	6.88	23.50	69.20	134.70
		120~200	-	-	1.89	6.23	21.75	66.30	120.50

Please contact LS ELECTRIC sales person for ★ gear ratio. (1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

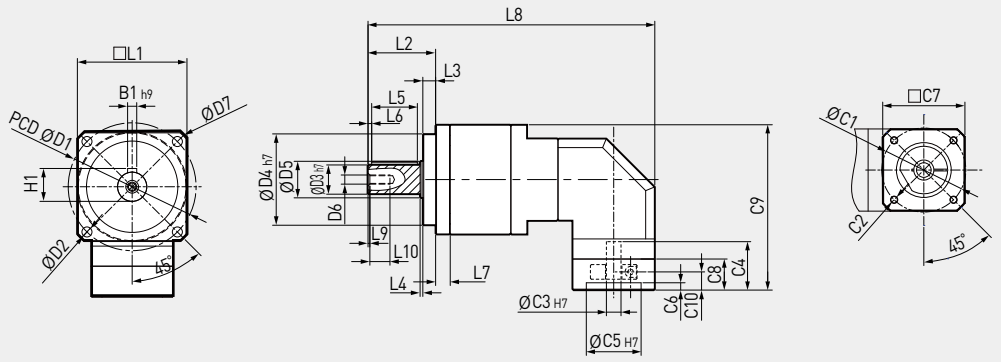
Dimension	HAS0451A	HAS0601A	HAS0901A	HAS1151A	HAS1421A	HAS1801A	HAS2201A
D1	50	70	100	130	165	215	250
D2	3.5	5.5	6.8	8.7	11	13	17
D3 h7	13	16	22	32	40	55	75
D4 h7	35	50	80	110	130	160	180
D5	15	20	30	39.5	60	75	100
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
D7	58	80	116	152	185	240	292
L1	45	60	90	115	142	180	220
L2	26.5	37	48	64	97	105	138
L3	5.5	7	10	12	15	20	30
L4	1	1.5	1.5	2	3	3	3
L5	15	25	32	40	65	70	90
L6	2	2	3	5	5	6	7
L7	6.5	8	11	12	19	18	30
L8	114	151.2	203	270	333	375.5	446.5
L9	1.5	1.5	1.5	2	2	2	2
L10	9.5	10.5	13.5	18	34	42	42
* C1	46	70	90	145	200	200	235
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42	55
* C4	26.5	34	43.1	62	82	86	86
* C5 H7	30	50	70	110	114.3	114.3	200
* C6	4	4	6	7	7	7	12
* C7	45	60	90	132	180	180	220
* C8	17	20.5	23.5	42	47	47	52
* C9	83	110	152	200	240	288	336.5
* C10	10	12	13.4	28	29.5	28.5	33.5
B1 h9	5	5	6	10	12	16	20
H1	15	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

HAS Series

Double Stage B Type

Drawing of Planetary Gearbox



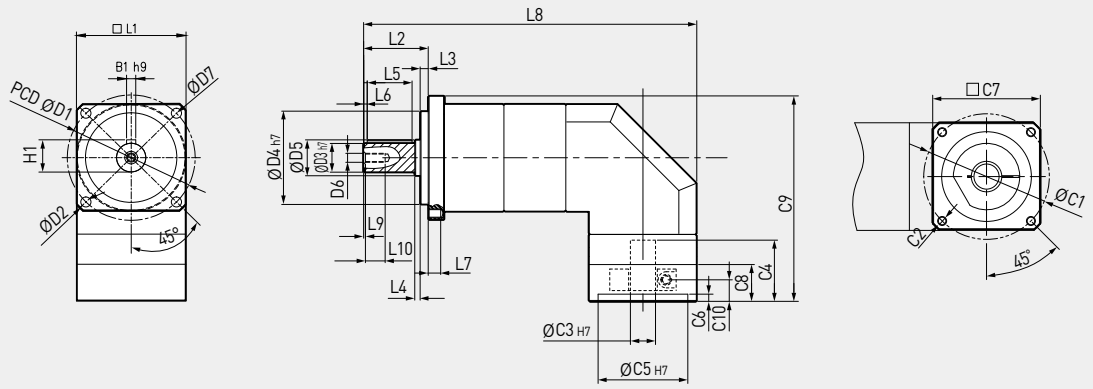
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HAS0602B	HAS0902B	HAS1152B	HAS1422B	HAS1802B	HAS2202B
D1	70	100	130	165	215	250
D2	5.5	6.8	8.7	11	13	17
D3 h7	16	22	32	40	55	75
D4 h7	50	80	110	130	160	180
D5	20	30	39.5	60	75	100
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
D7	80	116	152	185	240	292
L1	60	90	115	142	180	220
L2	37	48	64	97	105	138
L3	7	10	12	15	20	30
L4	1.5	1.5	2	3	3	3
L5	25	32	40	65	70	90
L6	2	3	5	5	6	7
L7	8	11	12	19	18	30
L8	157	205.7	275.5	367.5	441.5	499.5
L9	1.5	1.5	2	2	2	2
L10	10.5	13.5	18	34	42	42
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42
* C4	26.5	34	43.1	62	82	86
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	90.5	125	164.5	213.5	259	308
* C10	10	12	13.4	28	29.5	28.5
B1 h9	5	6	10	12	16	20
H1	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage A Type

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HAS0452A	HAS0602A	HAS0902A	HAS1152A	HAS1422A	HAS1802A	HAS2202A
D1	50	70	100	130	165	215	250
D2	3.5	5.5	6.8	8.7	11	13	17
D3 h7	13	16	22	32	40	55	75
D4 h7	35	50	80	110	130	160	180
D5	15	20	30	39.5	60	75	100
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
D7	58	80	116	152	185	240	292
L1	45	60	90	115	142	180	220
L2	26.5	37	48	64	97	105	138
L3	5.5	7	10	12	15	20	30
L4	1	1.5	1.5	2	3	3	3
L5	15	25	32	40	65	70	90
L6	2	2	3	5	5	6	7
L7	6.5	8	11	12	19	18	30
L8	143	185.7	247	295.5	392.5	441.5	519.5
L9	1.5	1.5	1.5	2	2	2	2
L10	9.5	10.5	13.5	18	34	42	42
* C1	46	70	90	145	200	200	235
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42	55
* C4	26.5	34	43.1	62	82	82	86
* C5 H7	30	50	70	110	114.3	114.3	200
* C6	4	4	6	7	7	7	12
* C7	45	60	90	132	180	180	220
* C8	17	20.5	23.5	42	47	47	52
* C9	83	110	152	184.4	232	259	313
* C10	10	12	13.4	28	29.5	28.5	33.5
B1 h9	5	5	6	10	12	16	20
H1	15	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Premium Line/ Helical Gear

Ultra-precise planetary differential reducer with premium line/ helical gear structure

- High-precision, high-torque, high-efficiency, low noise with circular flange-type tap fastening structure at the output part
- Maximize space utilization with Angle Type with HAR Spiral Bevel Gear
- Standard, precise, and ultra-precise backlash configurations applicable to applications

HSR Series

Circle output flange
Straight type gearbox, Standard / Premium / Advanced

- Best-in-class backlash
- High output torque
- Low noise level
- High efficiency
- Maintenance free

- Balanced motor pinion
- Gear ratios available from 3:1 up to 200:1
- No need to replace lubrication to expand the lifespan

HSR								
Stage	Gear ratio	050	070	090	120	155	205	235
1A	3~10	○	○	○	○	○	○	○
2B	15~100	☎	○	○	○	○	○	○
2A	15~100	○	○	○	○	○	○	○
1M/2M	3~100	☎	☎	☎	☎	☎	☎	☎

HAR								
Stage	Gear ratio	050	070	090	120	155	205	235
1A	3~10	○	○	○	○	○	○	○
	14, 20	☎	○	○	○	○	○	○
2B	15, 20	☎	☎	☎	☎	☎	☎	☎
	25~100	☎	○	○	○	○	○	○
	120~200	☎	☎	○	○	○	○	○
2A	15, 20	○	☎	☎	☎	☎	☎	☎
	25~100	○	○	○	○	○	○	○
	120~200	☎	○	○	○	○	○	○
1M/2M	3~200	☎	☎	☎	☎	☎	☎	☎

○ : Standard, △: Custom made, ☎ : Contact sales person.

HAR Series

Circle output flange
Right-angle type gearbox, Standard / Premium / Advanced

HSR	070	1A	–	010	K	P	–	MOTOR
①	②	③		④	⑤	⑥		

① Type

HSR	Straight
HAR	Angular

② Size

050	50	155	155
070	70	205	205
090	90	235	235
120	120		

③ Stage and Input Shaft Hole

1A	Standard single stage
2B	Standard double stage
2A	Optional double stage
1M	Customized single stage (expanded input hole)
2M	Customized double stage (expanded input hole)

④ Gear ratio

Single stage	HSR: 3~10
	HAR: 3~20 (050: 3~10)
Double stage	HSR: 15~100
	HAR: 25~200 (050: 15~100)

⑤ Key Type

K	Key
N	No Key

⑥ Backlash

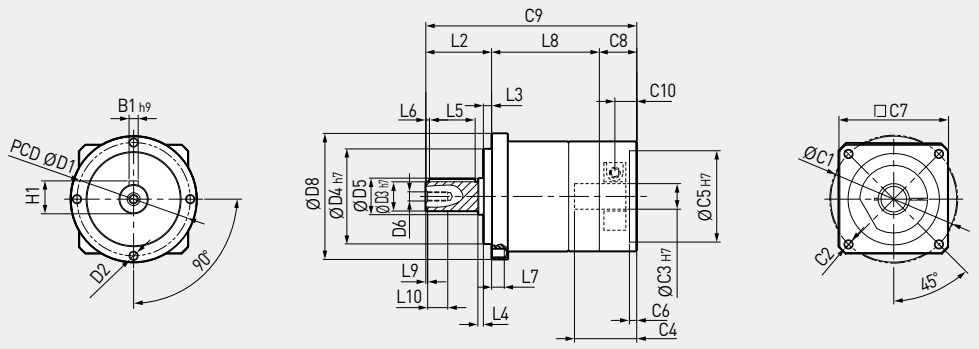
S	Standard
P	Premium
A	Advanced

Division		Stage	Gear ratio	050	070	090	120	155	205	235
Nominal Output Torque (Nm)		1	3	20	57	148	272	484	897	1,585
			4	18	51	143	295	549	1,060	1,752
			5	19	54	160	332	634	1,195	2,005
			6	18	50	151	311	592	1,109	1,906
			7	17	48	145	305	562	1,104	1,835
			8	16	44	132	279	527	1,035	1,712
			9	14	42	123	254	483	947	1,597
			10	14	42	121	262	500	980	1,640
		2	15	20	57	148	272	484	897	1,585
			20	18	51	143	295	549	1,060	1,752
			25	19	54	160	332	634	1,195	2,005
			30	18	50	151	311	592	1,109	1,906
			35	17	48	145	305	562	1,104	1,835
			40	16	44	132	279	527	1,035	1,712
			45	14	42	123	254	483	947	1,597
			50	19	54	160	332	634	1,195	2,005
			60	18	50	151	311	592	1,109	1,906
			70	17	48	145	305	562	1,104	1,835
			80	16	44	132	279	527	1,035	1,712
			90	14	42	123	254	483	947	1,597
			100	14	42	121	262	500	980	1,640
Emergency Stop Torque (Nm)		1,2	3~100	3 times nominal output torque						
Nominal Input Speed (rpm)		1,2	3~100	5,000	5,000	4,000	4,000	3,000	3,000	2,000
Max. Input Speed (rpm)		1,2	3~100	10,000	10,000	8,000	8,000	6,000	6,000	4,000
Torsional Rigidity (Nm/Arcmin)		1,2	3~100	3	7	14	26	55	143	233
Max. Radial Load (N)		1,2	3~100	750	1,280	3,200	6,800	9,300	15,100	50,000
Max. Axial Load (N)		1,2	3~100	390	690	1,600	3,400	4,500	7,500	28,000
Backlash (Arcmin)	S	1	3~10	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
		2	15~100	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9
	P	1	3~10	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
		2	15~100	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
	A	1	3~10	★	≤ 3	≤ 3	≤ 3	≤ 3	≤ 3	≤ 3
		2	15~100	★	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
Service Life (Hrs)		1,2	3~100	20,000 (10,000 under continuous operation)						
Efficiency (%)		1	3~10	≥ 97						
		2	15~100	≥ 94						
Weight (kg)		1A	3~10	≤ 0.6	≤ 1.3	≤ 3.8	≤ 7.6	≤ 15.0	≤ 26.0	≤ 45.0
		2A	15~100	≤ 0.8	≤ 1.8	≤ 5.0	≤ 10.3	≤ 19.6	≤ 30.0	≤ 54.0
		2B	15~100	-	≤ 1.6	≤ 4.7	≤ 9.6	≤ 18.0	≤ 30.0	≤ 54.0
Operating Temp (°C)		1,2	3~100	-10 ~ 90						
Lubrication		1,2	3~100	Grease (VIGO Grease RE #0)						
Degree of Gearbox Protection		1,2	3~100	IP65						
Noise (dB)		1,2	3~100	≤ 52	≤ 54	≤ 56	≤ 59	≤ 62	≤ 64	≤ 66
Inertia (kgcm²)		1A	3	0.03	0.17	0.64	3.12	9.23	29.98	65.72
			4	0.03	0.15	0.51	2.84	7.66	24.78	55.48
			5	0.03	0.13	0.48	2.81	7.52	24.29	54.29
			6	0.03	0.13	0.47	2.75	7.34	23.89	53.63
			7	0.03	0.13	0.45	2.69	7.16	23.48	52.97
			8	0.03	0.13	0.45	2.64	7.11	23.56	52.85
			9	0.03	0.13	0.44	2.59	7.05	23.63	52.73
			10	0.03	0.13	0.44	2.59	7.05	23.51	51.96
		2B	15~45	0.03	0.03	0.13	0.48	2.81	7.52	24.29
			50~100	0.03	0.03	0.13	0.44	2.69	7.05	23.63
		2A	15~45	-	0.13	0.48	2.81	7.52	24.29	54.29
			50~100	-	0.13	0.44	2.69	7.05	23.63	52.73

Please contact LS ELECTRIC sales person for ★ gear ratio. (1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



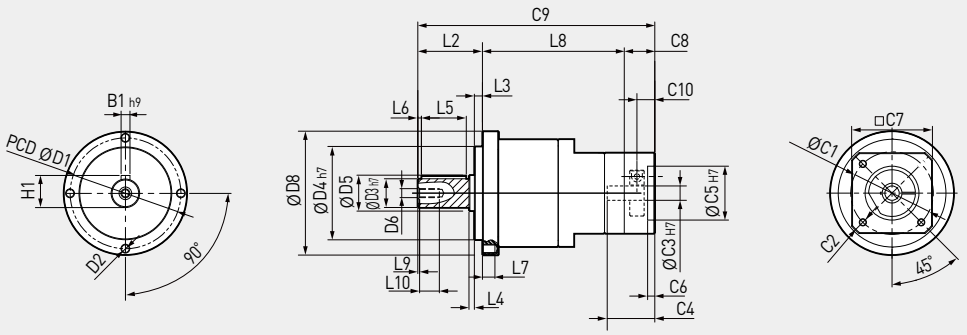
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HSR0501A	HSR0701A	HSR0901A	HSR1201A	HSR1551A	HSR2051A	HSR2351A
D1	44	62	80	108	140	184	210
D2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M10 X 1.5P	M12 X 1.75P	M16 X 2.0P
D3 h7	12	16	22	32	40	55	75
D4 h7	35	52	68	90	120	160	180
D5	13	20	30	40	60	75	100
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
D7	-	-	-	-	-	-	-
D8	49	69	94	119	155	205	235
L1	-	-	-	-	-	-	-
L2	24.5	36	46	70	97	100	126
L3	4	4.5	6	7	15	15	18
L4	2.5	3	3.5	5	3	3	3
L5	14	25	32	40	65	70	90
L6	2	2	3	10	5	6	7
L7	6.5	7.5	10	12	15	20	28
L8	47.5	59	80.9	101.5	116.5	144	155
L9	1.5	1.5	1.5	2	2	2	2
L10	9.5	10.5	13.5	18	34	42	42
* C1	46	70	90	145	200	200	235
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42	55
* C4	26.5	34	43.1	62	82	86	86
* C5 H7	30	50	70	110	114.3	114.3	200
* C6	4	4	6	7	7	7	12
* C7	45	60	90	132	180	180	220
* C8	17	20.5	23.5	42	47	47	52
* C9	89	115.5	150.4	213.5	260.5	291	333
* C10	10	12	13.4	28	29.5	28.5	33.5
B1 h9	4	5	6	10	12	16	20
H1	13.5	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage B Type

Drawing of Planetary Gearbox



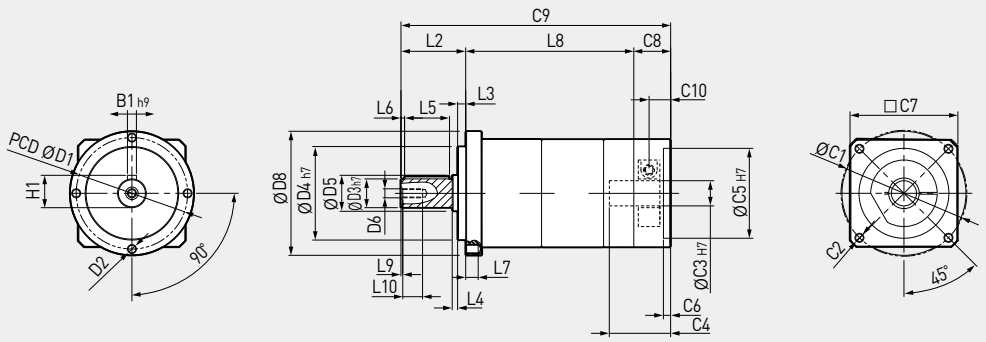
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HSR0702B	HSR0902B	HSR1202B	HSR1552B	HSR2052B	HSR2352B
D1	62	80	108	140	184	210
D2	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M10 X 1.5P	M12 X 1.75P	M16 X 2.0P
D3 h7	16	22	32	40	55	75
D4 h7	52	68	90	120	160	180
D5	20	30	40	60	75	100
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
D7	-	-	-	-	-	-
D8	69	94	119	155	205	235
L1	-	-	-	-	-	-
L2	36	46	70	97	100	126
L3	4.5	6	7	15	15	18
L4	3	3.5	5	3	3	3
L5	25	32	40	65	70	90
L6	2	3	10	5	6	7
L7	7.5	10	12	15	20	28
L8	79	103.5	140.4	161	203	242
L9	1.5	1.5	2	2	2	2
L10	10.5	13.5	18	34	42	42
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42
* C4	26.5	34	43.1	62	82	86
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	132	170	233.9	300	350	415
* C10	10	12	13.4	28	29.5	28.5
B1 h9	5	6	10	12	16	20
H1	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage A Type

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HSR0502A	HSR0702A	HSR0902A	HSR1202A	HSR1552A	HSR2052A	HSR2352A
D1	44	62	80	108	140	184	210
D2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M10 X 1.5P	M12 X 1.75P	M16 X 2.0P
D3 h7	12	16	22	32	40	55	75
D4 h7	35	52	68	90	120	160	180
D5	13	20	30	40	60	75	100
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
D7	-	-	-	-	-	-	-
D8	49	69	94	119	155	205	235
L1	-	-	-	-	-	-	-
L2	24.5	36	46	70	97	100	126
L3	4	4.5	6	7	15	15	18
L4	2.5	3	3.5	5	3	3	3
L5	14	25	32	40	65	70	90
L6	2	2	3	10	5	6	7
L7	6.5	7.5	10	12	15	20	28
L8	76.5	93.5	124.9	141.8	174.5	203	242
L9	1.5	1.5	1.5	2	2	2	2
L10	9.5	10.5	13.5	18	34	42	42
* C1	46	70	90	145	200	200	235
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42	55
* C4	26.5	34	43.1	62	82	82	86
* C5 H7	30	50	70	110	114.3	114.3	200
* C6	4	4	6	7	7	7	12
* C7	45	60	90	132	180	180	220
* C8	17	20.5	23.5	42	47	47	52
* C9	118	150	194.4	253.8	318.5	350	420
* C10	10	12	13.4	28	29.5	28.5	33.5
B1 h9	4	5	6	10	12	16	20
H1	13.5	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

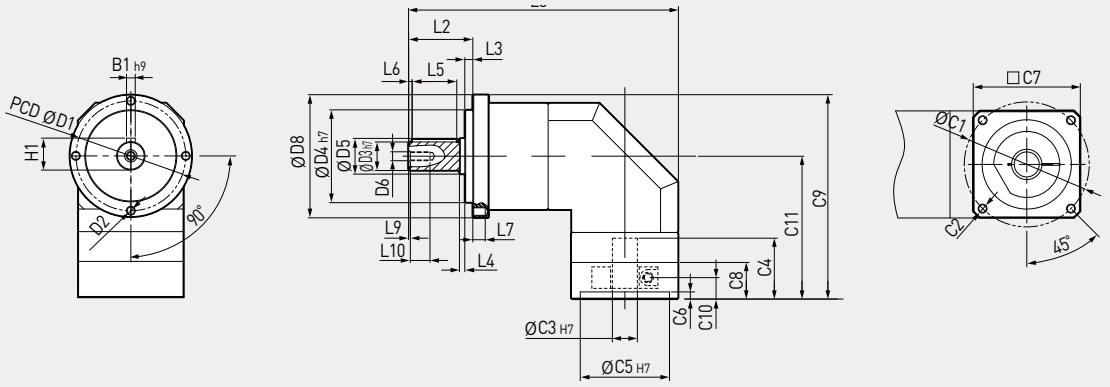
HAR Series

Division		Stage	Gear ratio	050	070	090	120	155	205	235
Nominal Output Torque (Nm)		1	3	20	57	148	272	484	897	1,585
			4	18	51	143	295	549	1,060	1,752
			5	19	54	160	332	634	1,195	2,005
			6	18	50	151	311	592	1,109	1,906
			7	17	48	145	305	562	1,104	1,835
			8	16	44	132	279	527	1,035	1,712
			9	14	42	123	254	483	947	1,597
			10	14	42	121	262	500	980	1,640
			14	-	44	145	305	562	1,104	1,835
			15	14	-	-	-	-	-	-
			20	14	42	121	262	500	980	1,640
		2	25	19	54	160	332	634	1,195	2,005
			30	18	50	151	311	592	1,109	1,906
			35	17	48	145	305	562	1,104	1,835
			40	16	44	132	279	527	1,035	1,712
			45	14	42	123	254	483	947	1,597
			50	19	54	160	332	634	1,195	2,005
			60	18	50	151	311	592	1,109	1,906
			70	17	48	145	305	562	1,104	1,835
			80	16	44	132	279	527	1,035	1,712
			90	14	42	123	254	483	947	1,597
			100	14	42	121	262	500	980	1,640
			120	-	-	151	311	592	1,109	1,906
			140	-	-	145	305	562	1,104	1,835
			160			132	279	527	1,035	1,712
			180	-	-	123	254	483	947	1,597
			200	-	-	121	262	500	980	1,640
Emergency Stop Torque (Nm)		1,2	3~200	3 times nominal output torque						
Nominal Input Speed (rpm)		1,2	3~200	5,000	5,000	4,000	4,000	3,000	3,000	2,000
Max. Input Speed (rpm)		1,2	3~200	10,000	10,000	8,000	8,000	6,000	6,000	4,000
Torsional Rigidity (Nm/Arcmin)		1,2	3~200	3	7	14	26	55	143	233
Max. Radial Load (N)		1,2	3~200	750	1,280	3,200	6,800	9,300	15,100	50,000
Max. Axial Load (N)		1,2	3~200	390	690	1,600	3,400	4,500	7,500	28,000
Backlash (Arcmin)	S	1	3~20	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8
		2	25~200	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11
	P	1	3~20	≤ 6	≤ 6	≤ 6	≤ 6	≤ 6	≤ 6	≤ 6
		2	25~200	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9
	A	1	3~20	★	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4
		2	25~200	★	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
Service Life (Hrs)		1,2	3~200	20,000 (10,000 under continuous operation)						
Efficiency (%)		1	3~20	≥ 95						
		2	25~100	≥ 92						
Weight (kg)		1A	3~20	≤ 0.9	≤ 1.5	≤ 6.0	≤ 12.0	≤ 24.0	≤ 51.0	≤ 84.0
		2A	25~200	≤ 1.2	≤ 2.0	≤ 7.5	≤ 13.5	≤ 26.0	≤ 54.0	≤ 90.5
		2B	25~200	-	≤ 1.9	≤ 7.3	≤ 12.8	≤ 25.0	≤ 53.0	≤ 97.0
Operating Temp (°C)		1,2	3~200	-10 ~ 90						
Lubrication		1,2	3~200	Grease (VIGO Grease RE #0)						
Degree of Gearbox Protection		1,2	3~200	IP65						
Noise (dB)		1,2	3~200	≤ 58	≤ 60	≤ 63	≤ 66	≤ 69	≤ 72	≤ 74
Inertia (kgcm²)		1A	3~10	0.09	0.36	2.27	6.88	23.50	≤ 69.2	≤ 134.7
			14, 20	-	0.08	1.89	6.23	21.75	≤ 66.3	≤ 120.5
		2B	15, 20	-	-	-	-	-	-	-
			25~100	-	0.09	0.36	2.27	6.88	≤ 23.5	≤ 69.2
			120~200	-	-	0.32	1.89	6.23	≤ 21.8	≤ 66.3
		2A	15, 20	0.09	-	-	-	-	-	-
			25~100	0.09	0.36	2.27	6.88	23.50	≤ 69.2	≤ 134.7
			120~200	-	-	1.89	6.23	21.75	≤ 66.3	≤ 120.5

Please contact LS ELECTRIC sales person for ★ gear ratio. (1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

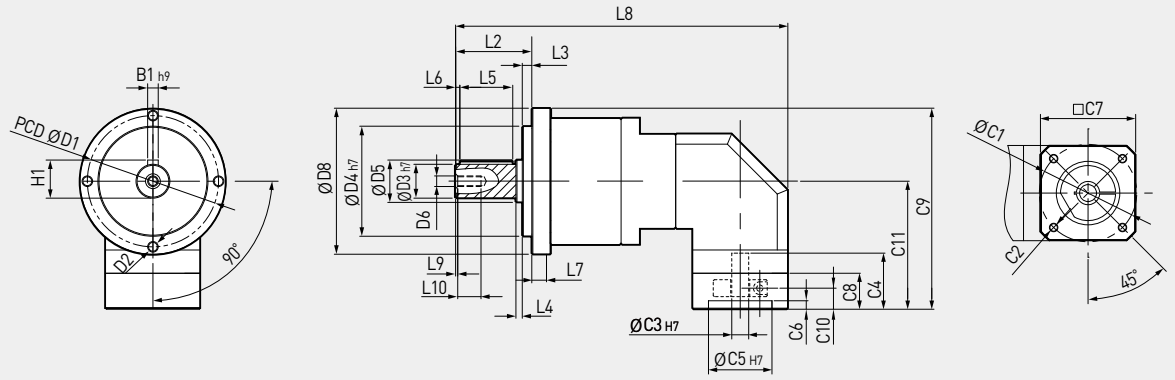
Dimension	HAR0501A	HAR0701A	HAR0901A	HAR1201A	HAR1551A	HAR2051A	HAR2351A
D1	44	62	80	108	140	184	210
D2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M10 X 1.5P	M12 X 1.75P	M16 X 2.0P
D3 h7	12	16	22	32	40	55	75
D4 h7	35	52	68	90	120	160	180
D5	13	20	30	40	60	75	100
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
D7	-	-	-	-	-	-	-
D8	49	69	94	119	155	205	235
L1	-	-	-	-	-	-	-
L2	24.5	36	46	70	97	100	126
L3	4	4.5	6	7	15	15	18
L4	2.5	3	3.5	5	3	3	3
L5	14	25	32	40	65	70	90
L6	2	2	3	10	5	6	7
L7	6.5	7.5	10	12	15	20	28
* L8	114	151.2	203	281	352	375.5	446.5
L9	1.5	1.5	1.5	2	2	2	2
L10	9.5	10.5	13.5	18	34	42	42
* C1	46	70	90	145	200	200	235
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42	55
* C4	26.5	34	43.1	62	82	86	86
* C5 H7	30	50	70	110	114.3	114.3	200
* C6	4	4	6	7	7	7	12
* C7	45	60	90	132	180	180	220
* C8	17	20.5	23.5	42	47	47	52
* C9	85	114.5	154	202	248.5	300.5	344
* C10	10	12	13.4	28	29.5	28.5	33.5
C11	60.5	80	107	142.5	169	198	226.5
B1 h9	4	5	6	10	12	16	20
H1	13.5	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

HAR Series

Double Stage B Type

Drawing of Planetary Gearbox



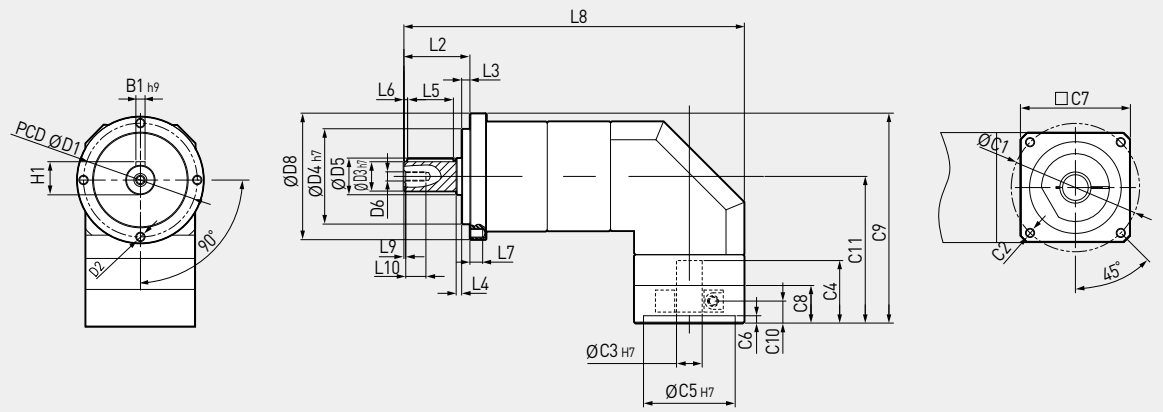
※ Please check the detail with size manager (www.lselectric.com/gearbox).
because the dimensions differ according to the applied motor.

Dimension	HAR0702B	HAR0902B	HAR1202B	HAR1552B	HAR2052B	HAR2352B
D1	62	80	108	140	184	210
D2	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M10 X 1.5P	M12 X 1.75P	M16 X 2.0P
D3 h7	16	22	32	40	55	75
D4 h7	52	68	90	120	160	180
D5	20	30	40	60	75	100
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
D7	-	-	-	-	-	-
D8	69	94	119	155	205	235
L1	-	-	-	-	-	-
L2	36	46	70	97	100	126
L3	4.5	6	7	15	15	18
L4	3	3.5	5	3	3	3
L5	25	32	40	65	70	90
L6	2	3	10	5	6	7
L7	7.5	10	12	15	20	28
* L8	157	205.7	286.5	367.5	441.5	499.5
L9	1.5	1.5	2	2	2	2
L10	10.5	13.5	18	34	42	42
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42
* C4	26.5	34	43.1	62	82	86
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	95	127	166.5	220	271.5	315.5
* C10	10	12	13.4	28	29.5	28.5
C11	60.5	80	107	142.5	169	198
B1 h9	5	6	10	12	16	20
H1	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage A Type

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HAR0502A	HAR0702A	HAR0902A	HAR1202A	HAR1552A	HAR2052A	HAR2352A
D1	44	62	80	108	140	184	210
D2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M10 X 1.5P	M12 X 1.75P	M16 X 2.0P
D3 h7	12	16	22	32	40	55	75
D4 h7	35	52	68	90	120	160	180
D5	13	20	30	40	60	75	100
D6	M4 X 0.7P	M5 X 0.8P	M8 X 1.25P	M12 X 1.75P	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
D7	-	-	-	-	-	-	-
D8	49	69	94	119	155	205	235
L1	-	-	-	-	-	-	-
L2	24.5	36	46	70	97	100	126
L3	4	4.5	6	7	15	15	18
L4	2.5	3	3.5	5	3	3	3
L5	14	25	32	40	65	70	90
L6	2	2	3	10	5	6	7
L7	6.5	7.5	10	12	15	20	28
* L8	143	185.7	247	306.5	392.5	441.5	519.5
L9	1.5	1.5	1.5	2	2	2	2
L10	9.5	10.5	13.5	18	34	42	42
* C1	46	70	90	145	200	200	235
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42	55
* C4	26.5	34	43.1	62	82	82	86
* C5 H7	30	50	70	110	114.3	114.3	200
* C6	4	4	6	7	7	7	12
* C7	45	60	90	132	180	180	220
* C8	17	20.5	23.5	42	47	47	52
* C9	85	114.5	154	186.4	238.5	271.5	320.5
* C10	10	12	13.4	28	29.5	28.5	33.5
C11	60.5	80	107	126.9	161	169	203
B1 h9	4	5	6	10	12	16	20
H1	13.5	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Premium Line/ Helical Gear

Ultra-precise planetary differential reducer with premium line/helical gear structure

- High Load Representative Model of Premium Line with Output Taper Roller Bearing
- Maximize space utilization with ANGLE Type with HAW Spiral Bevel Gear
- Standard, precise, and ultra-precise backlash configurations applicable to applications

HSW Series

Square output flange
Straight type gearbox,
Standard / Premium / Advanced

HAW Series

Square output flange
Right-angle type gearbox,
Standard / Premium / Advanced

- Best-in-class backlash
- High output torque
- Low noise level
- High efficiency
- Maintenance free
- Balanced motor pinion
- Gear ratios available from 3:1 up to 200:1
- No need to replace lubrication to expand the lifespan
- Tapered roller bearing

HSW							
Stage	Gear ratio	060	075	100	140	180	220
1A	3~10	○	○	○	○	○	○
2B	15~100	○	○	○	○	○	○
2A	15~100	○	○	○	○	○	○
1M/2M	3~100	☎	☎	☎	☎	☎	☎

HAW							
Stage	Gear ratio	060	075	100	140	180	220
1A	3~10	○	○	○	○	○	○
	14, 20	○	○	○	○	○	○
2B	15, 20	☎	☎	☎	☎	☎	☎
	25~100	○	○	○	○	○	○
	120~200	☎	○	○	○	○	○
2A	15, 20	☎	☎	☎	☎	☎	☎
	25~100	○	○	○	○	○	○
	120~200	○	○	○	○	○	○
1M/2M	3~200	☎	☎	☎	☎	☎	☎

○ : Standard, △: Custom made, ☎ : Contact sales person.

HSW	060	1A	–	010	K	P	–	MOTOR
①	②	③		④	⑤	⑥		

① Type

HSW	Straight
HAW	Angular

② Size

060	60	140	140
075	75	180	180
100	100	220	220

③ Stage and Input Shaft Hole

1A	Standard single stage
2B	Standard double stage
2A	Optional double stage
1M	Customized single stage (expanded input hole)
2M	Customized double stage (expanded input hole)

④ Gear ratio

Single stage	HSW: 3~10
	HAW: 3~20
Double stage	HSW: 15~100
	HAW: 25~200 (060: 25~100)

⑤ Key Type

K	Key
N	No Key

⑥ Backlash

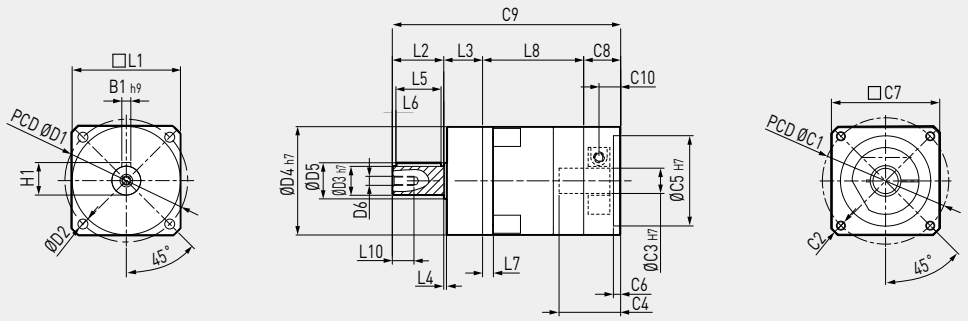
S	Standard
P	Premium
A	Advanced

Division		Stage	Gear ratio	060	075	100	140	180	220
Nominal Output Torque (Nm)		1	3	57	148	272	484	897	1,585
			4	51	143	295	549	1,060	1,752
			5	54	160	332	634	1,195	2,005
			6	50	151	311	592	1,109	1,906
			7	48	145	305	562	1,104	1,835
			8	44	132	279	527	1,035	1,712
			9	42	123	254	483	947	1,597
			10	42	121	262	500	980	1,640
		2	15	57	148	272	484	897	1,585
			20	51	143	295	549	1,060	1,752
			25	54	160	332	634	1,195	2,005
			30	50	151	311	592	1,109	1,906
			35	48	145	305	562	1,104	1,835
			40	44	132	279	527	1,035	1,712
			45	42	123	254	483	947	1,597
			50	54	160	332	634	1,195	2,005
			60	50	151	311	592	1,109	1,906
			70	48	145	305	562	1,104	1,835
			80	44	132	279	527	1,035	1,712
			90	42	123	254	483	947	1,597
			100	42	121	262	500	980	1,640
Emergency Stop Torque (Nm)		1,2	3~100	3 times nominal output torque					
Nominal Input Speed (rpm)		1,2	3~100	5,000	4,000	4,000	3,000	3,000	2,000
Max. Input Speed (rpm)		1,2	3~100	10,000	8,000	8,000	6,000	6,000	4,000
Torsional Rigidity (Nm/Arcmin)		1,2	3~100	7	14	26	55	143	233
Max. Radial Load (N)		1,2	3~100	1,536	3,840	8,160	11,160	18,120	60,000
Max. Axial Load (N)		1,2	3~100	828	1,920	4,080	5,400	9,000	33,600
Backlash (Arcmin)	S	1	3~10	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
		2	15~100	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9
	P	1	3~10	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
		2	15~100	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
	A	1	3~10	≤ 3	≤ 3	≤ 3	≤ 3	≤ 3	≤ 3
		2	15~100	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
Service Life (Hrs)		1,2	3~100	20,000 (10,000 under continuous operation)					
Efficiency (%)		1	3~10	≥ 97					
		2	15~100	≥ 94					
Weight (kg)		1A	3~10	≤ 1.5	≤ 4.0	≤ 8.0	≤ 17.0	≤ 29.0	≤ 48.0
		2A	15~100	≤ 2.0	≤ 5.2	≤ 10.7	≤ 21.6	≤ 33.0	≤ 57.0
		2B	15~100	≤ 1.8	≤ 5.0	≤ 9.5	≤ 20.8	≤ 33.0	≤ 55.0
Operating Temp (°C)		1,2	3~100	-10 ~ 90					
Lubrication		1,2	3~100	Grease (VIGO Grease RE #0)					
Degree of Gearbox Protection		1,2	3~100	IP65					
Noise (dB)		1.2	3~100	≤ 54	≤ 56	≤ 59	≤ 62	≤ 64	≤ 66
Inertia (kgcm²)		1A	3	0.17	0.64	3.12	9.23	29.98	65.72
			4	0.15	0.51	2.84	7.66	24.78	55.48
			5	0.13	0.48	2.81	7.52	24.29	54.29
			6	0.13	0.47	2.75	7.34	23.89	53.63
			7	0.13	0.45	2.69	7.16	23.48	52.97
			8	0.13	0.45	2.64	7.11	23.56	52.85
			9	0.13	0.44	2.59	7.05	23.63	52.73
			10	0.13	0.44	2.59	7.05	23.51	51.96
		2B	15~45	0.03	0.13	0.48	2.81	7.52	24.29
			50~100	0.03	0.13	0.44	2.69	7.05	23.63
		2A	15~45	0.13	0.48	2.81	7.52	24.29	54.29
			50~100	0.13	0.44	2.69	7.05	23.63	52.73

(1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

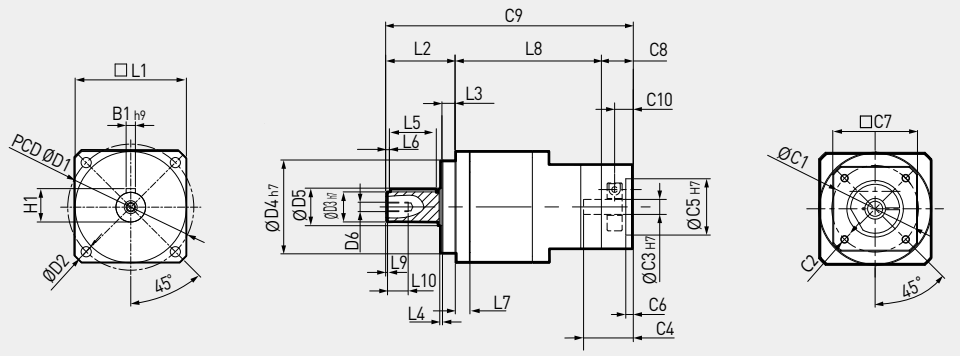
Dimension	HSW0601A	HSW0751A	HSW1001A	HSW1401A	HSW1801A	HSW2201A
D1	68	85	120	165	215	250
D2	5.5	6.8	9	11	13	17
D3 h7	16	22	32	40	55	75
D4 h7	60	70	90	130	160	180
D5	20	30	40	75	75	100
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
L1	60	90	115	142	180	220
L2	28.5	36.5	58	79	82	105
L3	21.5	19.5	30	33	30	33
L4	1.5	1.5	2	1	3	3
L5	25	32	40	65	70	90
L6	2	3	5	5	6	7
L7	6	11	12	19	18	15
L8	56	78.9	96.5	116.5	139	143
L9	-	-	-	-	-	-
L10	12	15	20	36	42	42
* C1	70	90	145	200	200	235
* C2	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P	M12 X 1.75P
* C3 H7	14	19	24	35	42	55
* C4	34	43.1	62	82	86	86
* C5 H7	50	70	110	114.3	114.3	200
* C6	4	6	7	7	7	12
* C7	60	90	132	180	180	220
* C8	20.5	23.5	42	47	47	52
* C9	126.5	158.4	226.5	275.5	298	333
* C10	12	13.4	28	29.5	28.5	33.5
B1 h9	5	6	10	12	16	20
H1	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

HSW Series

Double Stage B Type

Drawing of Planetary Gearbox



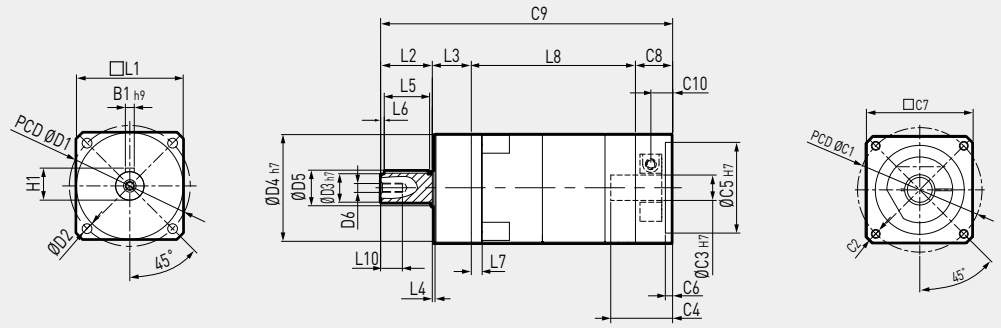
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HSW0602B	HSW0752B	HSW1002B	HSW1402B	HSW1802B	HSW2202B
D1	68	85	120	165	215	250
D2	5.5	6.8	9	11	13	17
D3 h7	16	22	32	40	55	75
D4 h7	60	70	90	130	160	180
D5	20	30	40	75	75	100
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
L1	60	90	115	142	180	220
L2	28.5	36.5	58	79	82	105
L3	21.5	19.5	30	33	30	33
L4	1.5	1.5	2	1	3	3
L5	25	32	40	65	70	90
L6	2	3	5	5	6	7
L7	6	11	12	19	18	15
L8	76	101.5	135.4	161	198	230
L9	-	-	-	-	-	-
L10	12	15	20	36	42	42
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42
* C4	26.5	34	43.1	62	82	86
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	143	178	246.9	315	357	415
* C10	10	12	13.4	28	29.5	28.5
B1 h9	5	6	10	12	16	20
H1	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage A Type

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HSW0602A	HSW0752A	HSW1002A	HSW1402A	HSW1802A	HSW2202A
D1	68	85	120	165	215	250
D2	5.5	6.8	9	11	13	17
D3 h7	16	22	32	40	55	75
D4 h7	60	70	90	130	160	180
D5	20	30	40	75	75	100
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
L1	60	90	115	142	180	220
L2	28.5	36.5	58	79	82	105
L3	21.5	19.5	30	33	30	33
L4	1.5	1.5	2	1	3	3
L5	25	32	40	65	70	90
L6	2	3	5	5	6	7
L7	6	11	12	19	18	15
L8	90.5	122.9	136.8	174.5	198	230
L9	-	-	-	-	-	-
L10	12	15	20	36	42	42
* C1	70	90	145	200	200	235
* C2	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P	M12 X 1.75P
* C3 H7	14	19	24	35	42	55
* C4	34	43.1	62	82	82	86
* C5 H7	50	70	110	114.3	114.3	200
* C6	4	6	7	7	7	12
* C7	60	90	132	180	180	220
* C8	20.5	23.5	42	47	47	52
* C9	161	202.4	266.8	333.5	357	420
* C10	12	13.4	28	29.5	28.5	33.5
B1 h9	5	6	10	12	16	20
H1	18	24.5	35	43	59	79.5

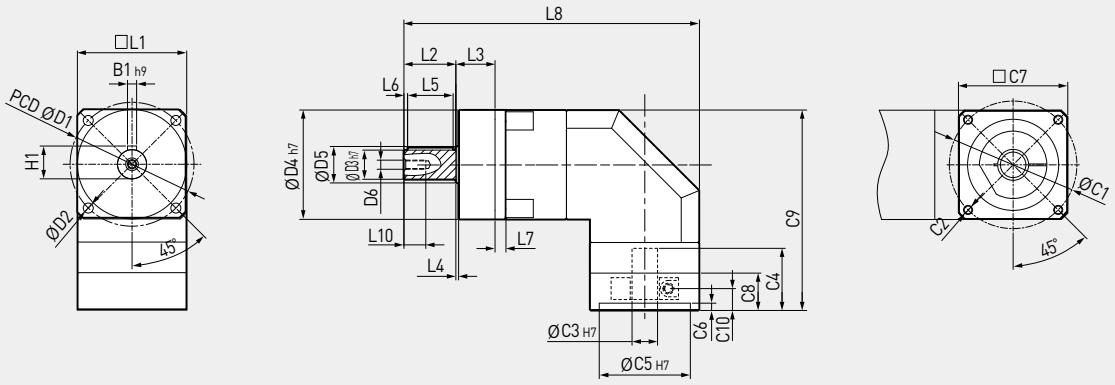
(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Division		Stage	Gear ratio	060	075	100	140	180	220
Nominal Output Torque (Nm)		1	3	57	148	272	484	897	1,585
			4	51	143	295	549	1,060	1,752
			5	54	160	332	634	1,195	2,005
			6	50	151	311	592	1,109	1,906
			7	48	145	305	562	1,104	1,835
			8	44	132	279	527	1,035	1,712
			9	42	123	254	483	947	1,597
			10	42	121	262	500	980	1,640
			14	44	145	305	562	1,104	1,835
			15	-	-	-	-	-	-
			20	22	71	147	275	980	1,640
		2	25	54	160	332	634	1,195	2,005
			30	50	151	311	592	1,109	1,906
			35	48	145	305	562	1,104	1,835
			40	44	132	279	527	1,035	1,712
			45	42	123	254	483	947	1,597
			50	54	160	332	634	1,195	2,005
			60	50	151	311	592	1,109	1,906
			70	48	145	305	562	1,104	1,835
			80	44	132	279	527	1,035	1,712
			90	42	123	254	483	947	1,597
			100	42	121	262	500	980	1,640
			120	-	151	311	592	1,109	1,906
			140	-	145	305	562	1,104	1,835
			160	-	132	279	527	1,035	1,712
			180	-	123	254	483	947	1,597
			200	-	121	262	500	980	1,640
Emergency Stop Torque (Nm)		1,2	3~200	3 times nominal output torque					
Nominal Input Speed (rpm)		1,2	3~200	5,000	4,000	4,000	3,000	3,000	2,000
Max. Input Speed (rpm)		1,2	3~200	10,000	8,000	8,000	6,000	6,000	4,000
Torsional Rigidity (Nm/Arcmin)		1,2	3~200	7	14	26	55	143	233
Max. Radial Load (N)		1,2	3~200	1,536	3,840	8,160	11,160	18,120	60,000
Max. Axial Load (N)		1,2	3~200	828	1,920	4,080	5,400	9,000	33,600
Backlash (Arcmin)	S	1	3~20	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8
		2	25~200	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11
	P	1	3~20	≤ 6	≤ 6	≤ 6	≤ 6	≤ 6	≤ 6
		2	25~200	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9
	A	1	3~20	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4
		2	25~200	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
Service Life (Hrs)		1,2	3~200	20,000 (10,000 under continuous operation)					
Efficiency (%)		1	3~20	≥ 97					
		2	25~100	≥ 94					
Weight (kg)		1A	3~20	≤ 1.7	≤ 6.2	≤ 12.4	≤ 26.0	≤ 52.5	≤ 86.0
		2A	25~200	≤ 2.2	≤ 7.7	≤ 13.9	≤ 28.0	≤ 56.0	≤ 93.0
		2B	25~200	≤ 2.1	≤ 7.5	≤ 13.2	≤ 27.0	≤ 54.5	≤ 98.0
Operating Temp (°C)		1,2	3~200	-10 ~ 90					
Lubrication		1,2	3~200	Grease (VIGO Grease RE #0)					
Degree of Gearbox Protection		1,2	3~200	IP65					
Noise (dB)		1,2	3~200	≤ 60	≤ 63	≤ 66	≤ 69	≤ 72	≤ 74
Inertia ($kgcm^2$)		1A	3~10	0.36	2.27	6.88	23.50	69.20	134.70
			14, 20	0.08	1.89	6.23	21.75	66.30	120.50
		2B	15, 20	-	-	-	-	-	-
			25~100	0.09	0.36	2.27	6.88	23.50	69.20
			120~200	-	0.32	1.89	6.23	21.75	66.30
		2A	15, 20	-	-	-	-	-	-
			25~100	0.36	2.27	6.88	23.50	69.20	134.70
			120~200	-	1.89	6.23	21.75	66.30	120.50

(1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

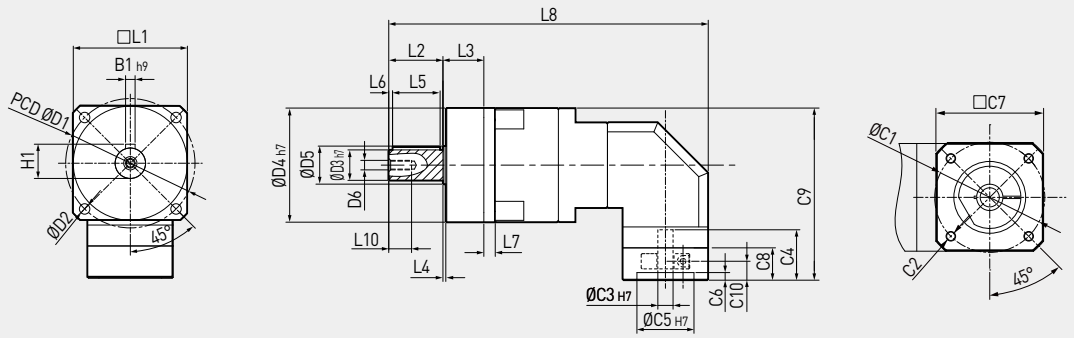
Dimension	HAW0601A	HAW0751A	HAW1001A	HAW1401A	HAW1801A	HAW2201A
D1	68	85	120	165	215	250
D2	5.5	6.8	9	11	13	17
D3 h7	16	22	32	40	55	75
D4 h7	60	70	90	130	160	180
D5	20	30	40	75	75	100
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
L1	60	90	115	142	180	220
L2	28.5	36.5	58	79	82	105
L3	21.5	19.5	30	33	30	33
L4	1.5	1.5	2	1	3	3
L5	25	32	40	65	70	90
L6	2	3	5	5	6	7
L7	6	11	12	19	18	15
* L8	162.2	211	294	367	382.5	446.5
L9	-	-	-	-	-	-
L10	12	15	20	36	42	42
* C1	70	90	145	200	200	235
* C2	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P	M12 X 1.75P
* C3 H7	14	19	24	35	42	55
* C4	34	43.1	62	82	86	86
* C5 H7	50	70	110	114.3	114.3	200
* C6	4	6	7	7	7	12
* C7	60	90	132	180	180	220
* C8	20.5	23.5	42	47	47	52
* C9	110	152	200	240	288	336.5
* C10	12	13.4	28	29.5	28.5	33.5
B1 h9	5	6	10	12	16	20
H1	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YYmeans fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

HAW Series

Double Stage B Type

Drawing of Planetary Gearbox



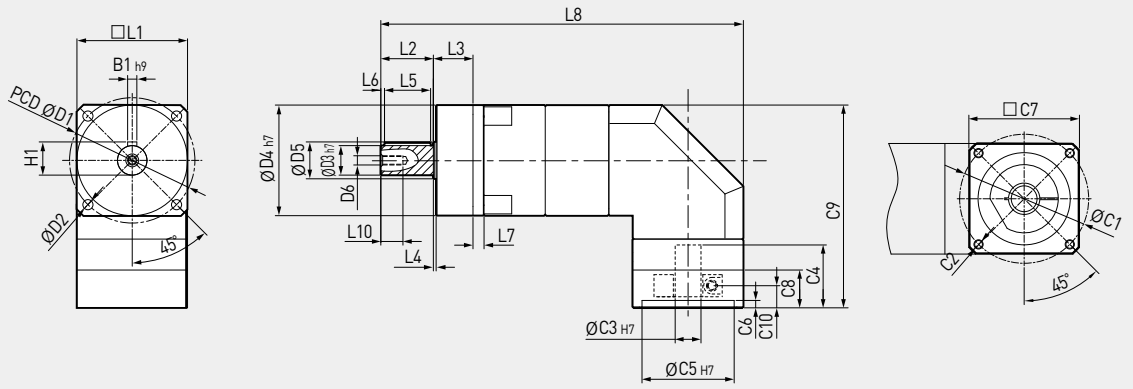
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HAW0602B	HAW0752B	HAW1002B	HAW1402B	HAW1802B	HAW2202B
D1	68	85	120	165	215	250
D2	5.5	6.8	9	11	13	17
D3 h7	16	22	32	40	55	75
D4 h7	60	70	90	130	160	180
D5	20	30	40	75	75	100
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
L1	60	90	115	142	180	220
L2	28.5	36.5	58	79	82	105
L3	21.5	19.5	30	33	30	33
L4	1.5	1.5	2	1	3	3
L5	25	32	40	65	70	90
L6	2	3	5	5	6	7
L7	6	11	12	19	18	15
* L8	168	213.7	299.5	382.5	448.5	499.5
L9	-	-	-	-	-	-
L10	12	15	20	36	42	42
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42
* C4	26.5	34	43.1	62	82	86
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	90.5	125	164.5	213.5	259	308
* C10	10	12	13.4	28	29.5	28.5
B1 h9	5	6	10	12	16	20
H1	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YYmeans fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Double Stage A Type

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HAW0602A	HAW0752A	HAW1002A	HAW1402A	HAW1802A	HAW2202A
D1	68	85	120	165	215	250
D2	5.5	6.8	9	11	13	17
D3 h7	16	22	32	40	55	75
D4 h7	60	70	90	130	160	180
D5	20	30	40	75	75	100
D6	M5 X 0.8P	M8 X 1.25P	M12 X 1.75	M16 X 2.0P	M20 X 2.5P	M20 X 2.5P
L1	60	90	115	142	180	220
L2	28.5	36.5	58	79	82	105
L3	21.5	19.5	30	33	30	33
L4	1.5	1.5	2	1	3	3
L5	25	32	40	65	70	90
L6	2	3	5	5	6	7
L7	6	11	12	19	18	15
* L8	196.7	255	319.5	407.5	448.5	519.5
L9	-	-	-	-	-	-
L10	12	15	20	36	42	42
* C1	70	90	145	200	200	235
* C2	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P	M12 X 1.75P
* C3 H7	14	19	24	35	42	55
* C4	34	43.1	62	82	82	86
* C5 H7	50	70	110	114.3	114.3	200
* C6	4	6	7	7	7	12
* C7	60	90	132	180	180	220
* C8	20.5	23.5	42	47	47	52
* C9	110	152	184.4	232	259	313
* C10	12	13.4	28	29.5	28.5	33.5
B1 h9	5	6	10	12	16	20
H1	18	24.5	35	43	59	79.5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YYmeans fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.

Premium Line/ Helical Gear

Ultra-precise planetary differential reducer with premium line/helical gear structure

- High load planetary differential reducer suitable for index and tilting structure with flange type
- Maximum radial load by applying output tapered roller bearing Delivering high performance
- Standard, precise, and ultra-precise backlash configurations applicable to applications

HSD Series

Flat output flange / High inertia Straight type gearbox, Standard / Premium / Advanced

HAD Series

Flat output flange / High loads Right-angle type gearbox, Standard / Premium / Advanced

- Best-in-class backlash
- High output torque
- Low noise level
- High efficiency
- Maintenance free
- Balanced motor pinion
- Gear ratios available from 3:1 up to 200:1
- No need to replace lubrication to expand the lifespan
- Tapered roller bearing

HSD							
Stage	Gear ratio	047	064	090	110	140	200
1A	3~10	○	○	○	○	○	○
2B	15~100	☎	○	○	○	○	○
2A	15~100	○	○	○	○	○	○
1M/2M	3~100	☎	☎	☎	☎	☎	☎

HAD							
Stage	Gear ratio	047	064	090	110	140	200
1A	3~10	○	○	○	○	○	○
	14, 20	☎	○	○	○	○	○
2B	15, 20	☎	☎	☎	☎	☎	☎
	25~100	☎	○	○	○	○	○
	120~200	☎	☎	○	○	○	○
2A	15, 20	○	☎	☎	☎	☎	☎
	25~100	○	○	○	○	○	○
	120~200	☎	○	○	○	○	○
1M/2M	3~200	☎	☎	☎	☎	☎	☎

○ : Standard, △: Custom made, ☎ : Contact sales person.

HSD	060	1A	–	010	K	P	–	MOTOR
①	②	③		④	⑤	⑥		

① Type

HSD	Straight
HAD	Angular

② Size

047	47	110	110
064	64	140	140
090	90	200	200

③ Stage and Input Shaft Hole

1A	Standard single stage
2B	Standard double stage
2A	Optional double stage
1M	Customized single stage (expanded input hole)
2M	Customized double stage (expanded input hole)

④ Gear ratio

Single stage	HSD: 4~10
	HAD: 4~20 (047: 4~10)
Double stage	HSD: 20~100
	HAD: 25~200 (047: 20~100)

⑤ Key Type

K	Key
N	No Key

⑥ Backlash

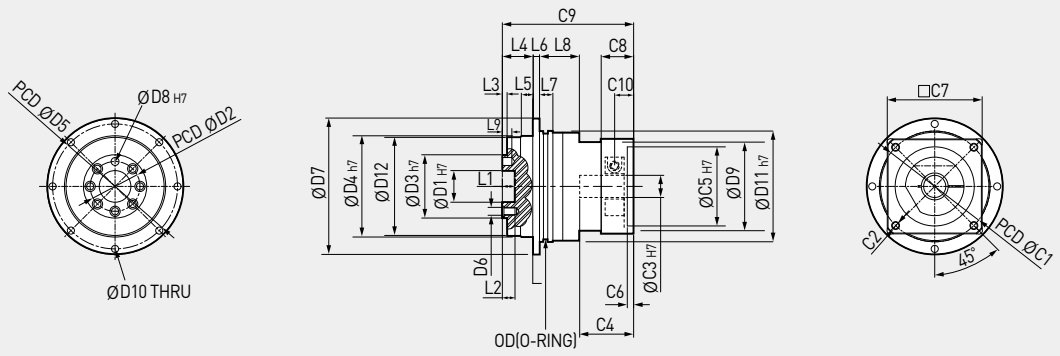
S	Standard
P	Premium
A	Advanced

Division		Stage	Gear ratio	047	064	090	110	140	200
Nominal Output Torque (Nm)		1	4	21	54	145	303	605	1,150
			5	21	55	158	332	634	1,195
			7	19	49	141	305	562	1,104
			10	15	42	118	262	500	980
		2	20	21	54	145	303	605	1,150
			25	21	55	158	332	634	1,195
			35	19	49	141	305	562	1,104
			40	21	54	145	303	605	1,150
			50	21	55	158	332	584	1,195
			70	19	49	141	305	562	1,104
			100	15	42	118	262	500	980
Emergency Stop Torque (Nm)		1,2	3~100	3 times nominal output torque					
Nominal Input Speed (rpm)		1,2	3~100	5,000	5,000	4,000	4,000	3,000	3,000
Max. Input Speed (rpm)		1,2	3~100	10,000	10,000	8,000	8,000	6,000	6,000
Torsional Rigidity (Nm/Arcmin)		1,2	3~100	7	14	31	84	153	445
Max. Axial Load (N)		1,2	3~100	1,005	1,155	3,540	4,675	8,813	17,130
Max. Axial Load (N)		1,2	3~100	45	135	242	445	1,300	3,050
Backlash (Arcmin)	S	1	3~10	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
		2	15~100	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9
	P	1	3~10	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
		2	15~100	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
	A	1	3~10	★	≤ 3	≤ 3	≤ 3	≤ 3	≤ 3
		2	15~100	★	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
Service Life (Hrs)		1,2	3~100	20,000 (10,000 under continuous operation)					
Efficiency (%)		1	3~10	≥ 97					
		2	15~100	≥ 94					
Weight (kg)		1A	3~10	≤ 0.7	≤ 1.2	≤ 3.0	≤ 5.6	≤ 11.9	≤ 31.6
		2A	15~100	≤ 1.0	≤ 1.6	≤ 3.7	≤ 7.3	≤ 15.9	≤ 36.9
		2B	15~100	-	≤ 1.4	≤ 3.5	≤ 6.5	≤ 15.5	≤ 34.2
Operating Temp (°C)		1,2	3~100	-10 ~ 90					
Lubrication		1,2	3~100	Grease (VIGO Grease RE #0)					
Degree of Gearbox Protection		1,2	3~100	IP65					
Noise (dB)		1,2	3~100	≤ 52	≤ 54	≤ 56	≤ 59	≤ 62	≤ 64
Inertia ($kgcm^2$)		1A	4	0.03	0.14	0.49	2.81	7.50	24.52
			5	0.03	0.13	0.46	2.71	7.42	23.26
			7	0.03	0.13	0.45	2.63	7.13	22.30
			10	0.03	0.13	0.44	2.57	7.05	22.36
			20~40	-	0.03	0.14	0.46	2.71	7.32
			50~100	-	0.03	0.14	0.43	2.59	7.05
		2B	20~40	0.03	0.14	0.46	2.71	7.32	23.89
			50~100	0.03	0.14	0.43	2.59	7.05	22.33
		2A	15~45	0.03	0.14	0.46	2.71	7.32	23.89
			50~100	0.03	0.14	0.43	2.59	7.05	22.33

Please contact LS ELECTRIC sales person for ★ gear ratio. (1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



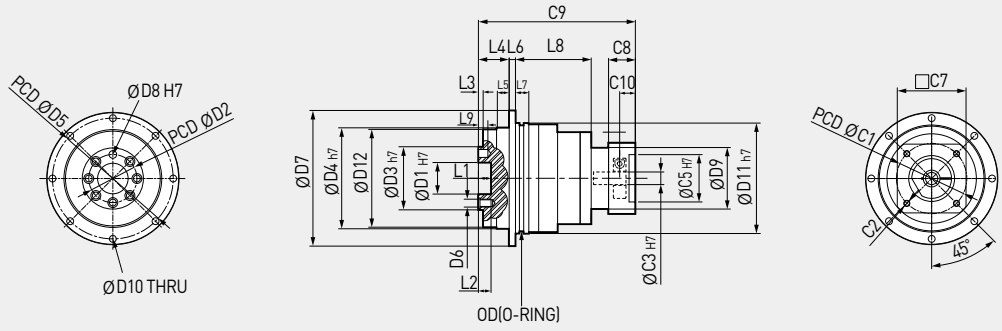
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HSD0471A	HSD0641A	HSD0901A	HSD1101A	HSD1401A	HSD2001A
D1 H7	12	20	31.5	40	50	80
D2	20	31.5	50	63	80	125
D3 h7	28	40	63	80	100	160
D4 h7	47	64	90	110	140	200
D5	67	79	109	135	168	233
D6	4 - M3 X 0.5P	7 - M5 X 0.8P	7 - M6 X 1.0P	11 - M6 X 1.0P	11 - M8 X 1.25P	11 - M10 X 1.5P
D7	72	86	118	145	179	247
D8 H7	3	5	6	6	8	10
D9	-	-	-	-	-	-
D10	8 - 3.5	8 - 4.5	8 - 5.5	8 - 5.5	12 - 6.8	12 - 8.6
D11 h7	60	70	95	120	152	212
D12	45	62	88	108	138	198
L1	4	8	15	12	12	16
L2	6	8	12	12	16	20
L3	3	3	6	6	6	8
L4	19.5	19.5	30	29	38	50
L5	7	8	11	11	15.6	16
L6	4	4	7	8	10	12
L7	5.75	8.45	8.75	11	13	16
L8	18.5	25.2	29	47	31.7	71.5
L9	4	6	6	6	8	9
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42
* C4	26.5	34	43.1	62	82	86
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	70	93	125.5	155	176	203
* C10	10	12	13.4	28	29.5	28.5
OD	56 X 2	66 X 2	90 X 3	110 X 3	145 X 3	200 X 5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.
(4) Check the detailed drawing of Size Manager for the number and shape of the left side drawing tab hole.(www.lselectric.com/gearbox))

Double Stage B Type

Drawing of Planetary Gearbox



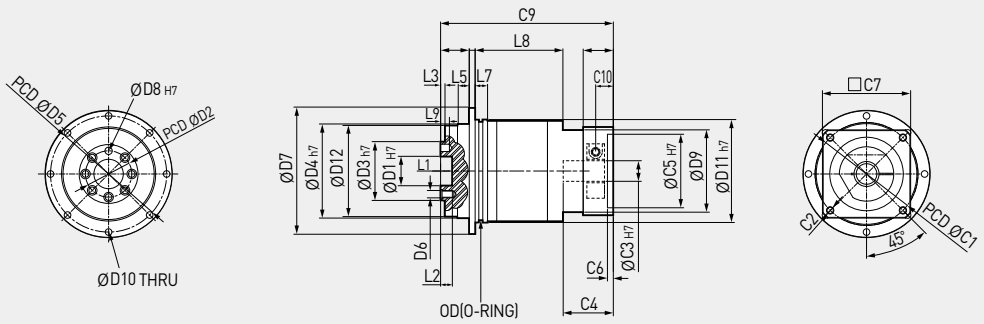
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HSD0642B	HSD0902B	HSD1102B	HSD1402B	HSD2002B
D1 H7	20	31.5	40	50	80
D2	31.5	50	63	80	125
D3 h7	40	63	80	100	160
D4 h7	64	90	110	140	200
D5	79	109	135	168	233
D6	7 - M5 X 0.8P	7 - M6 X 1.0P	11 - M6 X 1.0P	11 - M8 X 1.25P	11 - M10 X 1.5P
D7	86	118	145	179	247
D8 H7	5	6	6	8	10
D9	-	-	-	-	-
D10	8 - 4.5	8 - 5.5	8 - 5.5	12 - 6.8	12 - 8.6
D11 h7	70	95	120	152	212
D12	62	88	108	138	198
L1	8	15	12	12	16
L2	8	12	12	16	20
L3	3	6	6	6	8
L4	19.5	30	29	38	50
L5	8	11	11	15.6	16
L6	4	7	8	10	12
L7	8.45	8.75	11	13	16
L8	26.7	29	47	66	71.5
L9	6	6	6	8	9
* C1	46	70	90	145	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P
* C3 H7	8	14	19	24	35
* C4	26.5	34.1	43	62	82
* C5 H7	30	50	70	110	114.3
* C6	4	4	6	7	7
* C7	45	60	90	132	180
* C8	17	20.5	23.5	42	47
* C9	109.5	145	175.4	215.5	262
* C10	10	12	13.4	28	29.5
OD	66 X 2	90 X 3	110 X 3	145 X 3	200 X 5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.
(4) Check the detailed drawing of Size Manager for the number and shape of the left side drawing tab hole.(www.lselectric.com/gearbox))

Double Stage A Type

Drawing of Planetary Gearbox



※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HSD0472A	HSD0642A	HSD0902A	HSD1102A	HSD1402A	HSD2002A
D1 H7	12	20	31.5	40	50	80
D2	20	31.5	50	63	80	125
D3 h7	28	40	63	80	100	160
D4 h7	47	64	90	110	140	200
D5	67	79	109	135	168	233
D6	4 - M3 X 0.5P	7 - M5 X 0.8P	7 - M6 X 1.0P	11 - M6 X 1.0P	11 - M8 X 1.25P	11 - M10 X 1.5P
D7	72	86	118	145	179	247
D8 H7	3	5	6	6	8	10
D9	-	-	-	-	-	-
D10	8 - 3.5	8 - 4.5	8 - 5.5	8 - 5.5	12 - 6.8	12 - 8.6
D11 h7	60	70	95	120	152	212
D12	45	62	88	108	138	198
L1	4	8	15	12	12	16
L2	6	8	12	12	16	20
L3	3	3	6	6	6	8
L4	19.5	19.5	30	29	38	50
L5	7	8	11	11	15.6	16
L6	4	4	7	8	10	12
L7	5.75	8.45	8.75	11	13	16
L8	47.5	59.7	72.8	47	66	71.5
L9	4	6	6	6	8	9
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42
* C4	26.5	34	43.1	62	82	82
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	99	127.5	169.3	195.3	234	262
* C10	10	12	13.4	28	29.5	28.5
OD	56 X 2	66 X 2	90 X 3	110 X 3	145 X 3	200 X 5

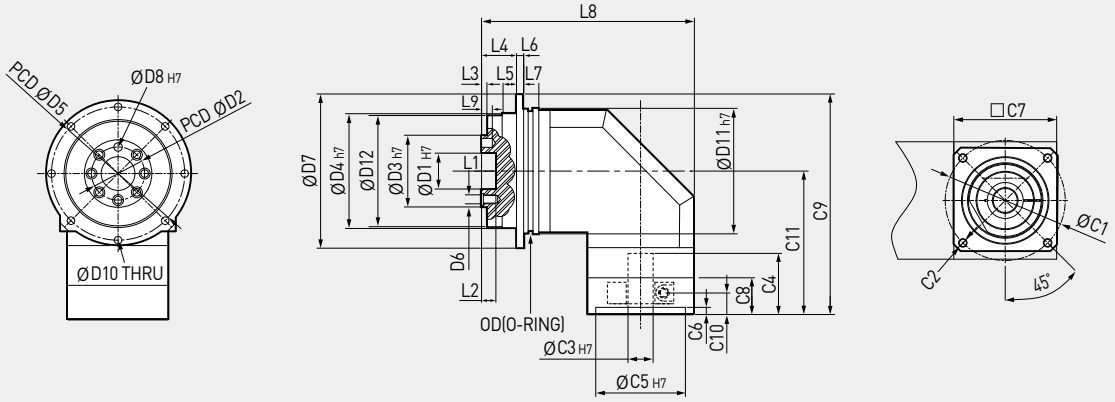
(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.
(4) Check the detailed drawing of Size Manager for the number and shape of the left side drawing tab hole.(www.lselectric.com/gearbox))

Division		Stage	Gear ratio	047	064	090	110	140	200
Nominal Output Torque (Nm)		1	4	21	54	145	303	605	1,150
			5	21	55	158	332	634	1,195
			7	19	49	141	305	562	1,104
			10	15	42	118	262	500	980
			14	-	45	141	305	562	1,104
			20	21	42	118	262	500	980
		2	25	21	55	158	332	634	1,195
			35	19	49	141	305	562	1,104
			40	21	54	145	303	605	1,150
			50	21	55	158	332	634	1,195
			70	19	49	141	305	562	1,104
			100	15	42	118	262	500	980
			140	-	-	141	305	562	1,104
			200	-	-	118	262	500	980
Emergency Stop Torque (Nm)		1,2	3~200	3 times nominal output torque					
Nominal Input Speed (rpm)		1,2	3~200	5,000	5,000	4,000	4,000	3,000	3,000
Max. Input Speed (rpm)		1,2	3~200	10,000	10,000	8,000	8,000	6,000	6,000
Torsional Rigidity (Nm/Arcmin)		1,2	3~200	7	14	31	84	153	445
Max. Axial Load (N)		1,2	3~200	1,005	1,155	3,540	4,675	8,813	17,130
Max. Bending Moment (Nm)		1,2	3~100	45	135	242	445	1,300	3,050
Backlash (Arcmin)	S	1	3~20	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8
		2	25~200	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11
	P	1	3~20	≤ 6	≤ 6	≤ 6	≤ 6	≤ 6	≤ 6
		2	25~200	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9	≤ 9
	A	1	3~20	★	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4
		2	25~200	★	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
Service Life (Hrs)		1,2	3~200	20,000 (10,000 under continuous operation)					
Efficiency (%)		1	3~20	≥ 94					
		2	25~100	≥ 91					
Weight (kg)		1A	3~20	≤ 1.2	≤ 2.3	≤ 6.0	≤ 10.8	≤ 22.0	≤ 52.0
		2A	25~200	≤ 1.4	≤ 2.6	≤ 6.5	≤ 12.0	≤ 25.0	≤ 56.5
		2B	25~200	-	≤ 2.0	≤ 5.0	≤ 10.0	≤ 20.5	≤ 46.0
Operating Temp (°C)		1,2	3~200	-10 ~ 90					
Lubrication		1,2	3~200	Grease (VIGO Grease RE #0)					
Degree of Gearbox Protection		1,2	3~200	IP65					
Noise (dB)		1,2	3~200	≤ 58	≤ 60	≤ 63	≤ 66	≤ 69	≤ 72
Inertia (kgcm²)		1A	3~10	0.18	0.42	2.69	7.15	23.40	69.50
			14,20	-	0.42	2.69	7.15	21.80	66.70
		2B	15, 20	-	-	-	-	-	-
			25~100	-	0.18	0.42	2.69	7.15	23.40
			120~200	-	-	0.42	2.69	7.15	21.80
		2A	15, 20	0.18	-	-	-	-	-
			25~100	0.18	0.42	2.69	7.15	23.40	69.50
			120~200	-	-	2.69	7.15	21.80	66.70

Please contact LS ELECTRIC sales person for ★ gear ratio. (1) Considering safety factors, nominal output torque is calculated. (2) Max. output torque is equivalent to 60% of the emergency stop torque.

Single Stage

Drawing of Planetary Gearbox



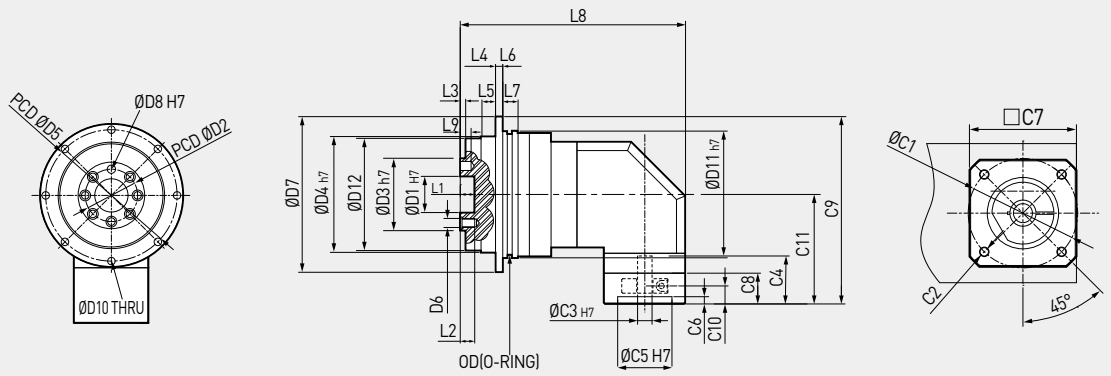
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HAD0471A	HAD0641A	HAD0901A	HAD1101A	HAD1401A	HAD2001A
D1 H7	12	20	31.5	40	50	80
D2	20	31.5	50	63	80	125
D3 h7	28	40	63	80	100	160
D4 h7	47	64	90	110	140	200
D5	67	79	109	135	168	233
D6	4 - M3 X 0.5P	7 - M5 X 0.8P	7 - M6 X 1.0P	11 - M6 X 1.0P	11 - M8 X 1.25P	11 - M10 X 1.5P
D7	72	86	118	145	179	247
D8 H7	3	5	6	6	8	10
D9	-	-	-	-	-	-
D10	8 - 3.5	8 - 4.5	8 - 5.5	8 - 5.5	12 - 6.8	12 - 8.6
D11 h7	60	70	95	120	152	212
D12	45	62	88	108	138	198
L1	4	8	15	12	12	16
L2	6	8	12	12	16	20
L3	3	3	6	6	6	8
L4	19.5	19.5	30	29	38	50
L5	7	8	11	11	15.6	16
L6	4	4	7	8	10	12
L7	5.75	8.45	8.75	11	13	16
* L8	95	128.7	178.1	222.5	267.5	299.5
L9	4	6	6	6	8	9
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42
* C4	26.5	34	43.1	62	82	86
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	96.5	123	166	215	258.5	302
* C10	10	12	13.4	28	29.5	28.5
* C11	60.5	80	107	142.5	169	198
OD	56 X 2	66 X 2	90 X 3	110 X 3	145 X 3	200 X 5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order.
(4) Check the detailed drawing of Size Manager for the number and shape of the left side drawing tab hole.(www.lselectric.com/gearbox))

Double Stage B Type

Drawing of Planetary Gearbox



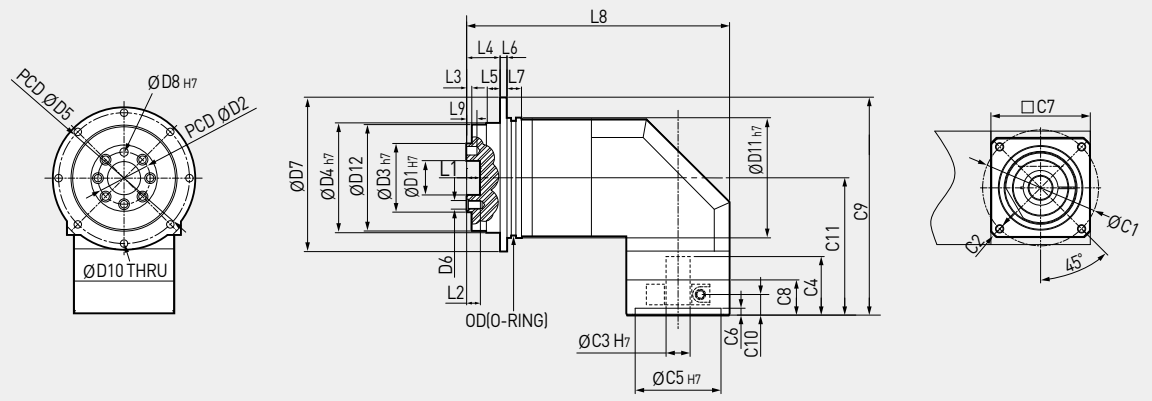
※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

Dimension	HAD0642B	HAD0902B	HAD1102B	HAD1402B	HAD2002B
D1 H7	20	31.5	40	50	80
D2	31.5	50	63	80	125
D3 h7	40	63	80	100	160
D4 h7	64	90	110	140	200
D5	79	109	135	168	233
D6	7 - M5 X 0.8P	7 - M6 X 1.0P	11 - M6 X 1.0P	11 - M8 X 1.25P	11 - M10 X 1.5P
D7	86	118	145	179	247
D8 H7	5	6	6	8	10
D9	-	-	-	-	-
D10	8 - 4.5	8 - 5.5	8 - 5.5	12 - 6.8	12 - 8.6
D11 h7	70	95	120	152	212
D12	62	88	108	138	198
L1	8	15	12	12	16
L2	8	12	12	16	20
L3	3	6	6	6	8
L4	19.5	30	29	38	50
L5	8	11	11	15.6	16
L6	4	7	8	10	12
L7	8.45	8.75	11	13	16
* L8	134.5	180.7	228	283	353.5
L9	6	6	6	8	9
* C1	46	70	90	145	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P
* C3 H7	8	14	19	24	35
* C4	26.5	34	43.1	62	82
* C5 H7	30	50	70	110	114.3
* C6	4	4	6	7	7
* C7	45	60	90	132	180
* C8	17	20.5	23.5	42	47
* C9	103.5	139	179.5	232	292.5
* C10	10	12	13.4	28	29.5
* C11	60.5	80	107	142.5	169
OD	66 X 2	90 X 3	110 X 3	145 X 3	200 X 5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order. (4) Check the detailed drawing of Size Manager for the number and shape of the left side drawing tab hole.(www.lselectric.com/gearbox))

Double Stage A Type

Drawing of Planetary Gearbox

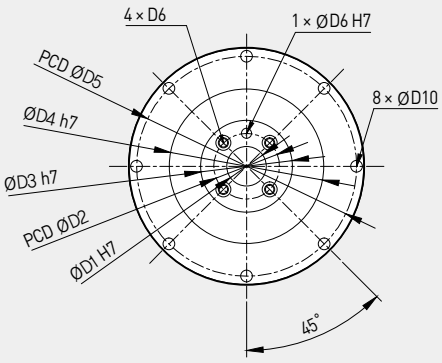


※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

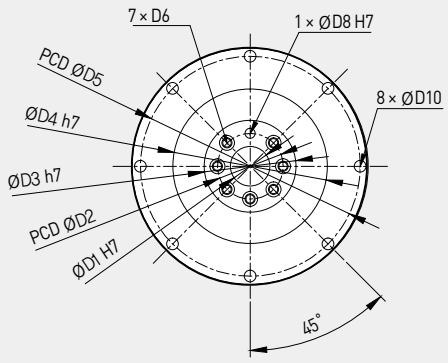
Dimension	HAD0472A	HAD0642A	HAD0902A	HAD1102A	HAD1402A	HAD2002A
D1 H7	12	20	31.5	40	50	80
D2	20	31.5	50	63	80	125
D3 h7	28	40	63	80	100	160
D4 h7	47	64	90	110	140	200
D5	67	79	109	135	168	233
D6	4 - M3 X 0.5P	7 - M5 X 0.8P	7 - M6 X 1.0P	11 - M6 X 1.0P	11 - M8 X 1.25P	11 - M10 X 1.5P
D7	72	86	118	145	179	247
D8 H7	3	5	6	6	8	10
D9	-	-	-	-	-	-
D10	8 - 3.5	8 - 4.5	8 - 5.5	8 - 5.5	12 - 6.8	12 - 8.6
D11 h7	60	70	95	120	152	212
D12	45	62	88	108	138	198
L1	4	8	15	12	12	16
L2	6	8	12	12	16	20
L3	3	3	6	6	6	8
L4	19.5	19.5	30	29	38	50
L5	7	8	11	11	15.6	16
L6	4	4	7	8	10	12
L7	5.75	8.45	8.75	11	13	16
* L8	124	163.2	221.9	248	308	353.5
L9	4	6	6	6	8	9
* C1	46	70	90	145	200	200
* C2	M4 X 0.7P	M5 X 0.8P	M6 X 1.0P	M8 X 1.25P	M12 X 1.75P	M12 X 1.75P
* C3 H7	8	14	19	24	35	42
* C4	26.5	34	43.1	62	82	82
* C5 H7	30	50	70	110	114.3	114.3
* C6	4	4	6	7	7	7
* C7	45	60	90	132	180	180
* C8	17	20.5	23.5	42	47	47
* C9	96.5	123	166	199.4	250.5	292.5
* C10	10	12	13.4	28	29.5	28.5
* C11	60.5	80	107	142.5	169	169
OD	56 X 2	66 X 2	90 X 3	110 X 3	145 X 3	200 X 5

(1) C(C1~C10)is dimension for input shaft parts. Dimensions differ by motor types and makers. Find CAD file for exact dimensions of gearbox in www.lselectric.com/gearbox.
(2) In XXYY, YY means fit tolerance (KS B 0401) .
(3) ( )is M Type-made to order. (4) Check the detailed drawing of Size Manager for the number and shape of the left side drawing tab hole.(www.lselectric.com/gearbox)

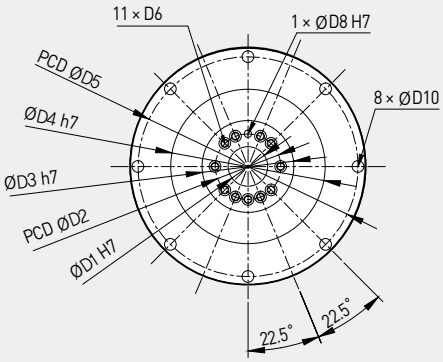
HSD, HAD Shaft Shape



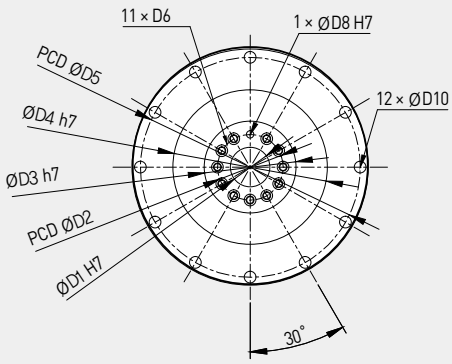
HSD 047, HAD 047



HSD 064, HAD 064
HSD 090, HAD 090



HSD 110, HAD 110



HSD 140, HAD 140

※ Please check the detail with size manager (www.lselectric.com/gearbox). because the dimensions differ according to the applied motor.

HSD, HAD Dimension

Dimension	HSD047 / HAD047	HSD064 / HAD064	HSD090 / HAD090	HSD110 / HAD110	HSD140 / HAD140	HSD200 / HAD200
D1 H7	12	20	31.5	40	50	80
D2	20	31.5	50	63	80	125
D3 h7	28	40	63	80	100	160
D4 h7	47	64	90	110	140	200
D5	67	79	109	135	168	233
D6	M3 X 0.5P	M5 X 0.8P	M6 X 1.0P	M6 X 1.0P	M8 X 1.25P	M10 X 1.5P
D8 H7	3	5	6	6	8	10
D10	3.5	4.5	5.5	5.5	6.8	8.6

Memo

Adapter Selection By Gearbox Frame Size (New Part Number)

LS ELECTRIC

SERIES	MODEL	①	②	③	④	⑤	⑥	⑦
APM(C)-F	FALR5A, FAL01A, FAL015A	A3110103C08	B2110103C08					
	FBL01A, FBL02A, FBL04A		B3110103C14	C2110103C14				
	FCL04A, FCL03D		B4110103C14	C3110103C14	D2110103C14			
	FCL06A, FCL05D, FCL08A, FCL06D, FCL10A, FCL07D			C3110103C19	D2110103C19			
	FB01A, FB02A, FB04A		B3110103C14	C2110103C14				
	FC04A, FC03D		B4110103C14	C3110103C14	D2110103C14			
	FC06A, FC05D, FC08A, FC06D, FC10A, FC07D			C3110103C19	D2110103C19			
	FE09A, FE06D, FE05G, FE03M, FE15A, FE11D, FE09G, FE06M, FEP09A, FEP06D, FEP05G, FEP03M, FEP15A, FEP11D, FEP09G, FEP06M			C4120103C19	D3110103C19	E2110103C19		
	FE22A, FE16D, FE13G, FE09M, FEP22A, FEP16D, FEP13G, FEP09M				D3110103C22	E2110103C22	F2110103C22	
	FE30A, FE22D, FE17G, FE12M, FEP30A, FEP22D, FEP17G, FEP12M				D3110103C24	E2110103C24	F2110103C24	
	FF30A, FF22D, FF20G, FF12M, FF50A, FF35D, FF30G, FF20M, FF55D, FF44G, FF30M, FFP30A, FFP22D, FFP20G, FFP12M, FFP50A, FFP35D, FFP30G, FFP20M, FFP55D, FFP44G, FFP30M					E3110103C35	F3110103C35	G2110103C35
	FF75D, FF60G, FF44M, FFP75D, FFP60G, FFP44M						F3110103C42	G2110103C42
	FF75G, FFP75G						F3120103C42	G2120103C42
	FG22D, FG20G, FG12M, FG35D, FG30G, FG20M, FG55D, FG44G, FG30M, FGP20M, FGP22D, FGP20G, FGP12M, FGP35D, FGP30G, FGP55D, FGP44G, FGP30M					E4110103C35	F4110103C35	G3110103C35
	FG75D, FG60G, FG44M, FGP75D, FGP60G, FGP44M						F4110103C42	G3110103C42
APM(C)-S	SAR3A, SAR5A, SA01A, SA015A	A3110103C08	B2110103C08					
	SB01A, SB02A, SB04A		B3110103C14	C2110103C14				
	SC04A, SC03D		B4110103C14	C3110103C14	D2110103C14			
	SC06A, SC05D, SC08A, SC06D, SC10A, SC07D			C3110103C16	D2110103C16			
	SE09A, SE06D, SE05G, SE03M, SE15A, SE11D, SE09G, SE06M, SEP15A			C4120103C19	D3110103C19	E2110103C19		
	SE22A, SE16D, SE13G, SE09M, SE30A, SE22D, SE17G, SE12M				D3110103C22	E2110103C22	F2110103C22	
	SF30A, SF22D, SF20G, SF12M, SF50A, SF20M, SF55D, SF44G, SF75D, SF60G, SF44M, LF35D, LF30G, LF30M					E3110103C35	F3110103C35	G2110103C35
	SF75G						F3120103C42	G2120103C42
	SG22D, SG20G, SG12M, SG20M, SG55D, SG44G, SG75D, SG60G, SG44M					E4110103C35	F4110103C35	G3110103C35
	SG110D, SG85G, SG60M							G3110103C45
	SG110G						F4120103C42	G3120103C42
	SG150G							G3120103C55
	LG35D, LG30G, LG30M					E4110103C35	F4110103C35	G3110103C35

• Displayed as ①~⑦due to different sizes, refer to the page 6 (Ⅲ) Size table for detailed sizes.

HIGEN

SERIES	MODEL	①	②	③	④	⑤	⑥	⑦
FMA-CJ	CJZ5, CJ01	A3110103C08	B2110103C08					
	CJ02, CJ04		B3110103C14	C2110103C14				
FMA-CN	CN01, CN02, CN03, CN04, CN05		B3110103C14	C2110103C14				
	CN04A		B4110103C14	C3110103C14	D2110103C14			
	CN06, CN08, CN10			C3110103C16	D2110103C16			
	CN09, CN15			C4120103C19	D3110103C19	E2110103C19		
	CN22, CN30				D3110103C22	E2110103C22	F2110103C22	
	CN30A, CN50A					E3110103C35	F3110103C35	G2110103C35
FMA-KN	KN03		B4110103C14	C3110103C14	D2110103C14			
	KN05, KN06, KN07			C3110103C16	D2110103C16			
	KN06A, KN11			C4120103C19	D3110103C19	E2110103C19		
	KN16, KN22				D3110103C22	E2110103C22	F2110103C22	
	KN22A, KN35, KN55, KN70					E3110103C35	F3110103C35	G2110103C35
FMA-TN	TN05, TN09			C4120103C19	D3110103C19	E2110103C19		
	TN13, TN17				D3110103C22	E2110103C22	F2110103C22	
	TN20, TN30, TN44, TN55, TN75N					E3110103C35	F3110103C35	G2110103C35
	TN110						F4210103C42	G3120103C42
	TN150(Standard)							G3120103C55
	TN150(Brake)							G3120103C48
	TN220, TN300, TN370							
FMA-LN	LN03, LN06			C4120103C19	D3110103C19	E2110103C19		
	LN09, LN12				D3110103C22	E2110103C22	F2110103C22	
	LN12A, LN20, LN30, LN40, LN55					E3110103C35	F3110103C35	G2110103C35
FMA-KF	KF08, KF10			C4120103C19	D3110103C19	E2110103C19		
	KF15				D3110103C22	E2110103C22	F2110103C22	
	KF22, KF35, KF50					E3110103C35	F3110103C35	G2110103C35
FMA-TF	TF05, TF09			C4120103C19	D3110103C19	E2110103C19		
	TF13				D3110103C22	E2110103C22	F2110103C22	
	TF20, TF30, TF44					E3110103C35	F3110103C35	G2110103C35
FAM-LF	LF03, LF06			C4120103C19	D3110103C19	E2110103C19		
	LF09				D3110103C22	E2110103C22	F2110103C22	
	LF12, LF20, LF30					E3110103C35	F3110103C35	G2110103C35

• Displayed as ①~⑦due to different sizes, refer to the page 6 (Ⅲ) Size table for detailed sizes.

Adapter Selection By Gearbox Frame Size (New Part Number)

MITSUBISHI

SERIES	MODEL	❶	❷	❸	❹	❺	❻	❼
HF-KP/MP	KP053, KP13, MP053, MP13	A3110103C08	B2110103C08					
	KP23, KP43, MP23, MP43		B3110103C14	C2110103C14				
	KP73, MP73			C3110103C19	D2110103C19			
HF-SP	SP51, SP81, SP52(4), SP102(4), SP152(4)				D3110103C24	E2110103C24	F2110103C24	
	SP121, SP201, SP301, SP421, SP202(4), SP352(4), SP502(4), SP702(4)					E3110103C35	F3110103C35	G2110103C35
HF-JP	JP53(4), JP73(4), JP103(4), JP153(4), JP203(4)			C3221103C16	D2211103C16			
	JP353(4), JP503(4)					E2110103C28	F2110103C28	
	JP703(4), JP903(4					E3110103C35	F3110103C35	G2110103C35
	JP11K1M(4), JP15K1M(4)							G3120103C55
HC-LP	LP52, LP102, LP152				D3110103C24	E2110103C24	F2110103C24	
	LP202, LP302					E3110103C35	F3110103C35	G2110103C35
HC-RP	RP103, RP153, RP203				D3211103C24	E2211103C24	F2211103C24	
	RP353, RP503					E2110103C28	F2110103C28	
HC-UP	UP72				D4110103C22	E3110103C22	F3110103C22	
	UP152					E3110103C28	F3110103C28	G2110103C28
	UP202, UP352, UP502					E4110103C35	F4110103C35	G3110103C35
HA-LP	LP15K1, LP20K1, LP15K14, LP20K14, LP22K1M, LP22K1M4, LP30K1M4, LP30K24, LP37K24, LP30K1M, LP30K2, LP37K2						F4211103C42	G3211103C42
	LP502, LP702, LP601(4), LP701M(4), LP11K2(4)							G4110103C55
	LP801(4), LP12K1(4), LP11K1M(4), LP15K1M(4), LP15K2(4), LP22K2(4)							
	LP15K1, LP20K1, LP15K14, LP20K14, LP22K1M, LP22K1M4, LP30K1M4, LP30K24, LP37K24, LP30K1M, LP30K2, LP37K2							
	LP25K1, LP30K1, LP25K14, LP30K14, LP37K1M, LP37K1M4, LP45K1M4, LP45K24, LP55K24,							
	LP37K1, LP37K14, LP50K1M4							
HG-KR/MR	KR053, KR13, MR053, MR13	A3110103C08	B2110103C08					
	KR23, KR43, MR23, MR43		B3110103C14	C2110103C14				
	KR73, MR73			C3110103C19	D2110103C19			

SERIES	MODEL	①	②	③	④	⑤	⑥	⑦
HG-SR	SR51, SR81, SR52(4), SR102(4), SR152(4)				D3110103C24	E2110103C24	F2110103C24	
	SR121, SR201, SR301, SR421, SR202(4), SR352(4), SR502(4), SR702(4)					E3110103C35	F3110103C35	G2110103C35
	JR53(4), JR73(4), JR103(4), JR153(4), JR203(4)			C3210103C16	D2210103C16			
HG-JR	JR353(4), JR503(4)							
	JR703(4), JR903(4)							G3110103C45
	JR601(4), JR701M(4)						F4120103C42	G3120103C42
	JR801(4), JR12K1(4), JR11K1M(4), JR15K1M(4)							G3120103C55
	JR15K1, JR20K1, JR25K1, JR15K14, JR20K14, JR25K14, JR22K1M, JR30K1M, JR37K1M, JR22K1M4, JR30K1M4, JR37K1M4			C3210103C16		E4110103C35	F4110103C35	G3110103C35
	JR30K1, JR37K1, JR30K14, JR37K14, JR45K1M4, JR55K1M4							
HG-RR	RR103, RR153, RR203				D3210103C24	E2210103C24	F2211103C24	
	RR353, RR503					E2110103C28	F2110103C28	
HG-UR	UR72				D4110103C22	E3110103C22	F3110103C22	
	UR152					E3110103C28	F3110103C28	G2110103C28
	UR202, UR352, UR502					E4110103C35	F4110103C35	G3110103C35
HG-AK	AK0136, AK0236, AK0336	A2110103C05						
HG-KN	KN13	A3110103C08	B2110103C08					
	KN23, KN43		B3110103C14	C2110103C14				
	KN73			C3110103C19	D2110103C19			
	SN52, SN102, SN152				D3110103C24	E2110103C24	F2110103C24	
	SN202, SN302					E3110103C35	F3110103C35	G2110103C35

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Adapter Selection By Gearbox Frame Size (New Part Number)

PANASONIC

SERIES	MODEL	❶	❷	❸	❹	❺	❻	❼
MSMD	5AZ, 011, 012	A3210102C08	B2210102C08					
	021, 022		B3110102C11	C2110102C11				
	041, 042		B3110102C14	C2110102C14				
	082			C3110102C19	D2110102C19			
MHMD	021, 022		B3110102C11	C2110102C11				
	041, 042		B3110102C14	C2110102C14				
	082			C3110102C19	D2110102C19			
MSME	5AZ, 011, 012	A3210102C08	B2210102C08					
	021, 022		B3110102C11	C2110102C11				
	041, 042		B3110102C14	C2110102C14				
	082			C3110102C19	D2110102C19			
	102, 152, 202			C4221103C19	D3211103C19	E2211103C19		
	302, 304				D3110103C22	E2110103C22	F2110103C22	
	402, 502, 404, 504				D3120103C24	E2110103C24	F2110103C24	
MDME	044, 064			C4221103C19	D3210103C19	E2210103C19		
	102, 152, 202, 104, 154, 204				D3110103C22	E2110103C22	F2110103C22	
	302, 304				D3120103C24	E2110103C24	F2110103C24	
	402, 502, 404, 504					E3110103C35	F3110103C35	G2110103C35
	752, 754						F3120103C42	G2120103C42
	C12, C52, C14, C54							G3120103C55
MFME	152, 154					E3110103C35	F3110103C35	G2110103C35
	252, 254, 452, 454					E4110103C35	F4110103C35	G3110103C35
MGME	092, 094				D3120103C22	E2110103C22	F2110103C22	
	202, 302, 204, 304					E3110103C35	F3110103C35	G2110103C35
	452, 602, 454, 604						F3120103C42	G2120103C42
MHME	102, 152, 104, 154				D3120103C22	E2110103C22	F2110103C22	
	202, 302, 402, 502, 204, 304, 404, 504					E3110103C35	F3110103C35	G2110103C35
	752, 754						F3120103C42	G2120103C42
MSMJ	022		B3110102C11	C2110102C11				
	042		B3110102C14	C2110102C14				
	082			C3110102C19	D2110102C19			
MUMA	5A, 01	A3310102C08	B2310102C08					
	02		B2311102C11					
	022		B3110102C11	C2110102C11				
	04, 042		B3110102C14	C2110102C14				
	082			C3110102C19	D2110102C19			

SERIES	MODEL	①	②	③	④	⑤	⑥	⑦
MSMF	5AZ, 011, 012	A3210102C08	B2210102C08					
	021, 022		B3110102C11	C2110102C11				
	041, 042		B3110102C14	C2110102C14				
	082, 092			C3110102C19	D2110102C19			
	102, 152, 202			C4221103C19	D3211103C19	E2211103C19		
	302				D3110103C22	E2110103C22	F2110103C22	
	402, 502				D3120103C24	E2110103C24	F2110103C24	
MQMF	011, 012	A4110102C08	B3110102C08					
	011, 012(Protective Lip)	A4110202C08	B3120202C08					
	021, 022		B4110102C11	C3110102C11				
	021, 022(Protective Lip)		B4110202C11	C3120202C11				
	041, 042		B4110102C14	C3110102C14	D2110102C14			
	041, 042(Protective Lip)		B4110202C14	C3120202C14	D2120202C14			
MHMF	5AZ, 011, 012	A3110103C08	B2110103C08					
	5AZ, 011, 012(Protective Lip)	A3120203C08	B2120203C08					
	021, 022		B3110102C11	C2110102C11				
	021, 022(Protective Lip)		B3120202C11	C2120202C11				
	041, 042		B3110102C14	C2110102C14				
	041. 042(Protective Lip)		B3120202C14	C2120202C14				
	082, 092			C3110102C19	D2110102C19			
	082, 092(Protective Lip)			C3120202C19	D2120202C19			
	102, 152				D3120103C22	E2110103C22	F2110103C22	
	202, 302, 402, 502					E3110103C35	F3110103C35	G2110103C35
MDMF	102, 152, 202				D3110103C22	E2110103C22	F2110103C22	
	302				D3120103C24	E2110103C24	F2110103C24	
	402, 502					E3110103C35	F3110103C35	G2110103C35
MGMF	092, 132, 182				D3110103C22	E2110103C22	F2110103C22	
	292, 442					E3110103C35	F3110103C35	G2110103C35

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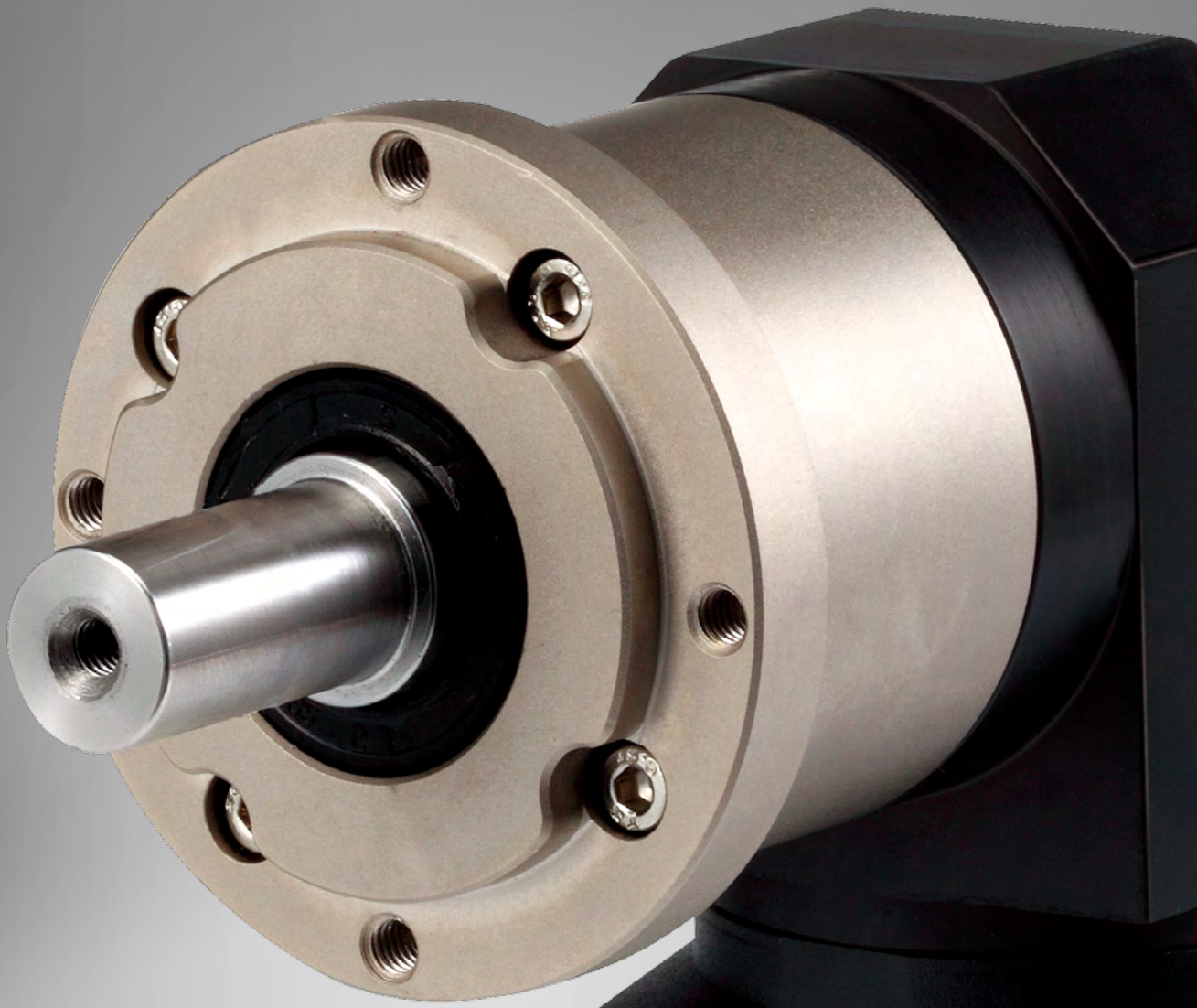
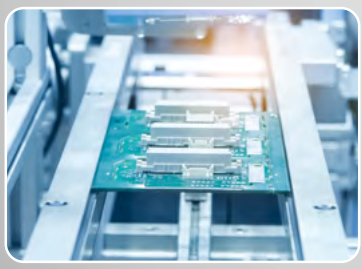
Adapter Selection By Gearbox Frame Size (New Part Number)

YASKAWA

SERIES	MODEL	❶	❷	❸	❹	❺	❻	❼
SGM7J	A5A, 01A, C2A	A3110103C08	B2110103C08					
	02A, 04A, 06A		B3110103C14	C2110103C14				
	08A			C3110103C19	D2110103C19			
SGM7A	A5A, 01A, C2A	A3110103C08	B2110103C08					
	02A, 04A, 06A		B3110103C14	C2110103C14				
	08A, 10A			C3110103C19	D2110103C19			
SGM7P	01A	A4110103C08	B3110103C08					
	02A, 04A		B4110103C14	C3110103C14	D2110103C14			
	08A, 15A			C4110103C19	D3110103C19	E2110103C19		
SGM7G	03A, 05A			C3221103C16	D2210103C16			
	09A, 13A, 20A				D3110103C24	E2110103C24	F2110103C24	
	30A, 44A					E3110103C35	F3110103C35	G2110103C35
	55A, 75A						F3120103C42	G2120103C42
	1AA						F4120103C42	G3120103C42
	1EA							G3120103C55
SGMMV	B3E2A, B5E2A, B9E2A							
	A1, A2, A3	A2110102C05						
SGMJV	A5A, 01A, C2A	A3110103C08	B2110103C08					
	02A, 04A, 06A		B3110103C14	C2110103C14				
	08A			C3110103C19	D2110103C19			
SGMAV	A5A, 01A, C2A	A3110103C08	B2110103C08					
	02A, 04A, 06A		B3110103C14	C2110103C14				
	08A, 10A			C3110103C19	D2110103C19			
SGMPS	01A	A4110103C08	B3110103C08					
	02A, 04A		B4110103C14	C3110103C14	D2110103C14			
	08A			C4110103C16	D3110103C16	E2110103C16		
	15A			C4110103C19	D3110103C19	E2110103C19		
SGMGV	03		B4211103C14	C3221103C14	D2221103C14			
	05			C3221103C16	D2211103C16			
	09			C4120103C19	D3110103C19	E2110103C19		
	13				D3110103C22	E2110103C22	F2110103C22	
	20				D3110103C24	E2110103C24	F2110103C24	
	30, 44					E3110103C35	F3110103C35	G2110103C35
	55, 75						F3120103C42	G2120103C42
	1A						F4120103C42	G3120103C42
	1E							G3120103C55
	10, 15, 20, 25				D3211102C24	E2211102C24	F2211102C24	
	30, 40, 50					E2110103C28	F2110103C28	





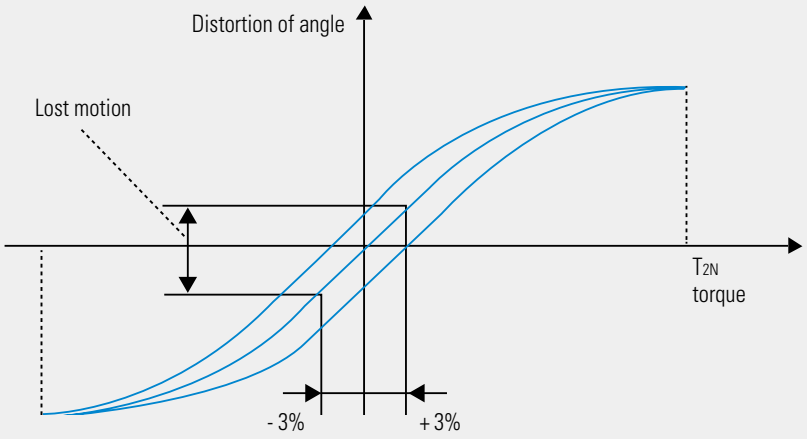
Technical Notes

Backlash

Backlash is the degree of precision of a gearbox. The value is generally measured by first fixing the input and applying torque on the output, in both directions. Backlash is the angle when the applied torque is ±3% of its rated torque (± is for directions).

❶ Forward rotaion (Rated output torque TCW) ▶ ❷ Zero ▶ ❸ Reverse roation (Rated output torque TCCW) ▶ ❹ Zero ▶ ❺ Forward rotaion (Rated output torque TCW)

The relationship between Torque and Distortion angle follows the Hysteresis model, LS ELECTRIC gearboxes can withstand high torque in the market, so the backlash is measured at higher torque standards, leading to higher performance.



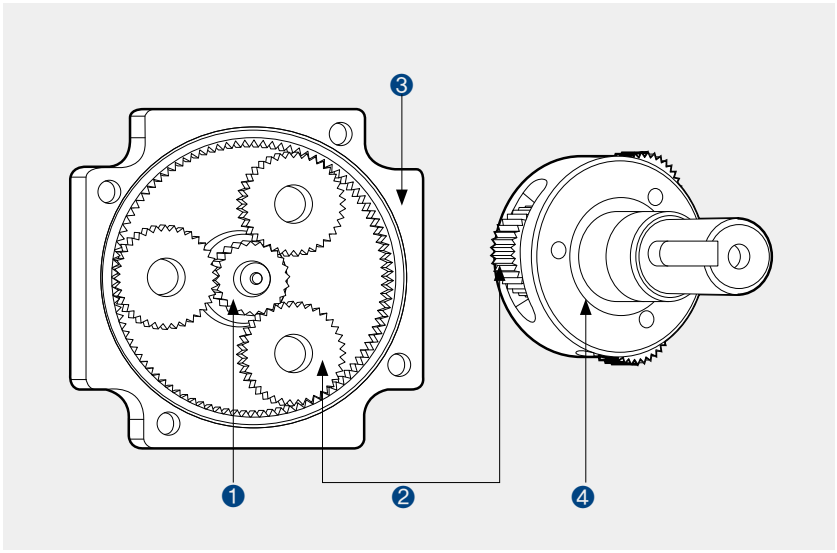
LS ELECTRIC gearboxes can withstand high torque in the market, so the backlash is measured at higher torque standards, leading to higher performance.

Backlash Level

Level	Backlash (Arcmin)	Applications	Control Type
Advznced Level	Less than 3'	Robot peripherals (Positioner, Slider, Etc.), Inspection machine, Precision FA machine, Medical machine, Index machine, Packaging machine, Textile machine, Machine tool	Position control
Premium Level	Less than 5'	Precision conveyor (Moving, Inspecting, loading), Transportation logistics system (AGV, Automation factory), Injection machine, Extraction machine	Speed control
Standard Level	10'~30'	Conveyor, Bending machine, Pallet stacker, Printing machine, Food machine, Film winder, Inspection machines.	Torque control

Technical Notes

Gear Ratios Formula



The main components of a planetary gearbox is as following:

❶ Sun gear
❷ Planetary gear
❸ Internal gear
❹ Consis of a carrier base Unit.

This compact structure is applicable for accurate controls due to high efficiency and wide range of gear ratios.

Type	Fixed Part	Input	Output	*Gear Ratios Formula	Gear Ratios Range	**Planetary Gear
Planetary Gear	Internal gear	Sun gear	Carrier	$\frac{1}{\frac{Za}{Zc}+1}$	1/3 ~ 1/12	Simultaneous rotation and revolution
Star	Carrier	Sun gear	Internal gear	$-\frac{1}{\frac{Za}{Zc}}$	1/2 ~ 1/11	Rotation only
Solar	Sun gear	Internal gear	Carrier	$\frac{1}{\frac{Za}{Zc}+1}$	1/1.2 ~ 1/1.7	Simultaneous rotation and revolution

* Z is the number of teeth for each component, and - means the output is rotating the opposite direction of the input.
** Operating status between gears.

Gearbox Lifetime (hr)

Total lifetime have many factors which differs for all applications. to calculate the lifetime, use the equation below.

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

L_h : Calculated lifetime (hr)

L_m : Average output ratation number (rpm)❶

N_o : Rated output rated number(rpm)

T_m : Average load torque (kg·m)❷

T_o : Rated output torque (Kg·m)
*For continous operation : 10,000 hrs

❶ N_m : Average Output Ratation Number (rpm)

$$N_m = \frac{1\,|N_1|^3 + \cdots + t_n\,|N_n|^3}{t_1 + \cdots + t_n}$$

❷ T_m : Average Load Torque (kg·m)

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

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

Technical Notes

Torsional Rigidity

Torsional Rigidity (Nm / Arcmin)

Torsional rigidity is the distortion (angle) of the output, when applied 50% and 100% of its rated torque at fixed input axis.
It is the slope from the hysteresis graph.

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

Tr : Torsional rigidity (Spring integer)
a : Torsional rigidity is the distortion (angle) of the output, when applied 50% and 100% of its rated torque
b : Allowed output torque

Wind Up Torsional Rigidity (Arcmin)

The equation below calculates the total torsional amount(average) in one direction when load is applied at no-load conditions.

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

Θ : Total torsional amount (Arcmin)
d : Allowed output torque (Nm) X 0.55 One direction torsional amount at the torque section
T_L : Load torque (Nm) X 0.5 (= Tr X 0.5)
T_R : Torsional rigidity (Nm / arcmin)

Output Shaft Maximum Load Moment

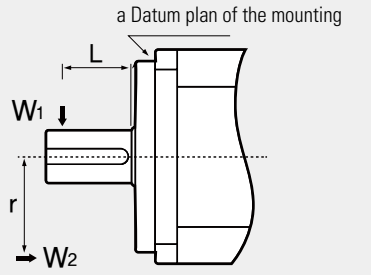
Output Shaft Maximum Load Moment (N-mm)

The equation below calculates the maximum moment load of the output shaft. Note Mmax ≤ Mc.

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

W_1 : Radial Load (N, kgf)
W_2 : Thrust Load (N, kgf)
L_r : Length (mm)
M_c : Load moment (N-mm, kgf-mm)

[External Load Diagram]



Memo

FUTURING SMART ENERGY

We open up a brighter future through
efficient and convenient energy solutions.

Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.
  Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

- According to The WEEE Directive, please do not discard the device with your household waste.

LS ELECTRIC

www.ls-electric.com

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Specifications in this catalog are subject to change without notice due to continuous product development and improvement.