HarmonicDrive®

SHG/SHF-LW-Lightweight Hollow Shaft Gear Unit

Now offering a NEW lightweight version of our SHG and SHF-2UH Hollow Shaft Gear Units!

20%lighter than our standard SHG and SHF-2UH gears!

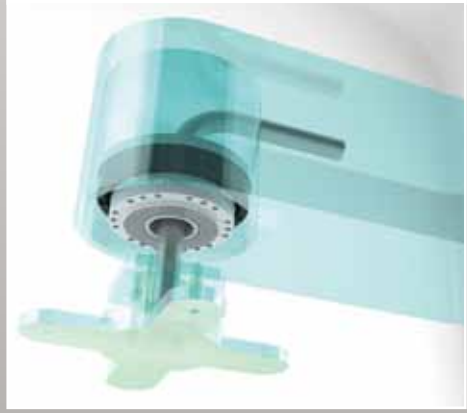
Using new lightweight materials and an optimized design, a 20% reduction in weight has been achieved without reducing the torque rating of the gear unit or any changes to the interface dimensions. This weight reduction, combined with their high torque ratings, results in an exceptional "Torque Density" making it ideally suited for many applications including…
Industrial Robots – *allowing operation with higher acceleration rates and payload capacity*
Mobile Robots – *allowing lower weight designs which improves battery life without sacrificing performance*

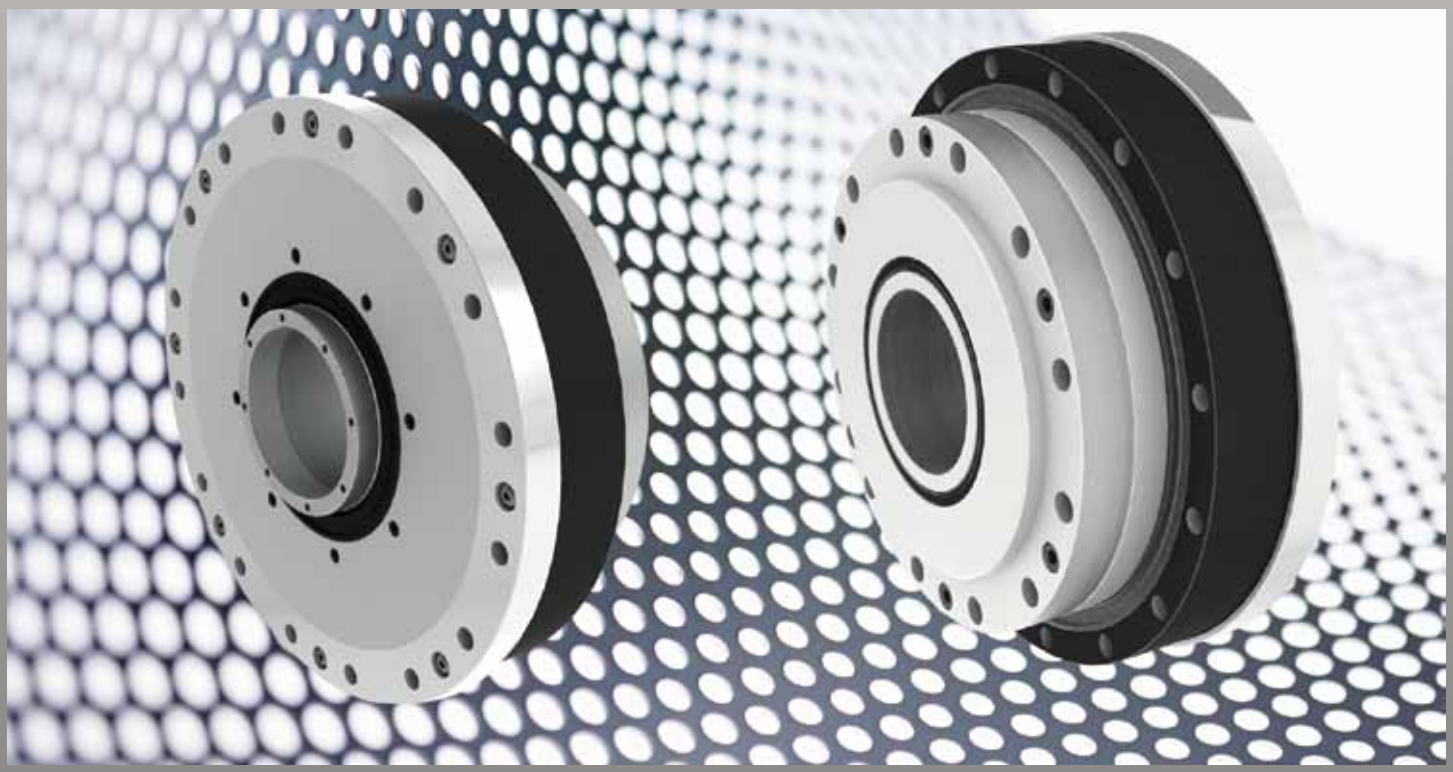
Application Examples

Robot End Effector

Robot Joints

Wafer Transfer Robot





Ordering Code

SHG - 25 - 100 - 2UH - LW - SP

Model	Size	Gear Ratio	Type		Special
SHG Series SHF Series	14~65 14~58	1:50~1:160 1:30~1:160	2UH (Unit Type)	Lightweight	(Custom Specification) leave blank for standard product

Rating Table

SHG Series

Table 2-1

Size	Ratio	Rated Torque at 2000r/min		Limit for Repeated Peak Torque		Limit for Average Torque		Limit for MomentoryTorque		Maximum Input Speed r/min		Max. Average Input Speed r/min	
		Nm	kgfm	Nm	kgfm	Nm	kgfm	Nm	kgfm	Oil	Grease	Oil	Grease
14	50	7.0	0.7	23	2.3	9	0.9	46	4.7	14000	8500	6500	3500
	80	10	1.0	30	3.1	14	1.4	61	6.2				
	100	10	1.0	36	3.7	14	1.4	70	7.2				
17	50	21	2.1	44	4.5	34	3.4	91	9	10000	7300	6500	3500
	80	29	2.9	56	5.7	35	3.6	113	12				
	100	31	3.2	70	7.2	51	5.2	143	15				
	120	31	3.2	70	7.2	51	5.2	112	11				
20	50	33	3.3	73	7.4	44	4.5	127	13	10000	6500	6500	3500
	80	44	4.5	96	9.8	61	6.2	165	17				
	100	52	5.3	107	10.9	64	6.5	191	20				
	120	52	5.3	113	11.5	64	6.5	191	20				
	160	52	5.3	120	12.2	64	6.5	191	20				
25	50	51	5.2	127	13	72	7.3	242	25	7500	5600	5600	3500
	80	82	8.4	178	18	113	12	332	34				
	100	87	8.9	204	21	140	14	369	38				
	120	87	8.9	217	22	140	14	395	40				
	160	87	8.9	229	23	140	14	408	42				
32	50	99	10	281	29	140	14	497	51	7000	4800	4600	3500
	80	153	16	395	40	217	22	738	75				
	100	178	18	433	44	281	29	841	86				
	120	178	18	459	47	281	29	892	91				
	160	178	18	484	49	281	29	892	91				
40	50	178	18	523	53	255	26	892	91	5600	4000	3600	3000
	80	268	27	675	69	369	38	1270	130				
	100	345	35	738	75	484	49	1400	143				
	120	382	39	802	82	586	60	1530	156				
	160	382	39	841	86	586	60	1530	156				
45	50	229	23	650	66	345	35	1235	126	5000	3800	3300	3000
	80	407	41	918	94	507	52	1651	168				
	100	459	47	982	100	650	66	2041	208				
	120	523	53	1070	109	806	82	2288	233				
	160	523	53	1147	117	819	84	2483	253				
50	80	484	49	1223	125	675	69	2418	247	4500	3500	3000	2500
	100	611	62	1274	130	866	88	2678	273				
	120	688	70	1404	143	1057	108	2678	273				
	160	688	70	1534	156	1096	112	3185	325				
58	80	714	73	1924	196	1001	102	3185	325	4000	3000	2700	2200
	100	905	92	2067	211	1378	141	4134	422				
	120	969	99	2236	228	1547	158	4329	441				
	160	969	99	2392	244	1573	160	4459	455				
65	80	969	99	2743	280	1352	138	4836	493	3500	2800	2400	1900
	100	1236	126	2990	305	1976	202	6175	630				
	120	1236	126	3263	333	2041	208	6175	630				
	160	1236	126	3419	349	2041	208	6175	630				

Rating Table

SHF Series

Table 3-1

Size	Ratio	Rated Torque at 2000r/min		Limit for Repeated Peak Torque		Limit for AverageTorque		Limit for Momentory Peak Torque		Maximum Input Speed r/min		Limit for Average Input Speed r/min	
		Nm	kgfm	Nm	kgfm	Nm	kgfm	Nm	kgfm	Oil	Grease	Oil	Grease
14	30	4.0	0.41	9.0	0.92	6.8	0.69	17	1.7	14000	8500	6500	3500
	50	5.4	0.55	18	1.8	6.9	0.70	35	3.6				
	80	7.8	0.80	23	2.4	11	1.1	47	4.8				
	100	7.8	0.80	28	2.9	11	1.1	54	5.5				
17	30	8.8	0.90	16	1.6	12	1.2	30	3.1	10000	7300	6500	3500
	50	16	1.6	34	3.5	26	2.6	70	7.1				
	80	22	2.2	43	4.4	27	2.7	87	8.9				
	100	24	2.4	54	5.5	39	4.0	110	11				
	120	24	2.4	54	5.5	39	4.0	86	8.8				
20	30	15	1.5	27	2.8	20	2.0	50	5.1	10000	6500	6500	3500
	50	25	2.5	56	5.7	34	3.5	98	10				
	80	34	3.5	74	7.5	47	4.8	127	13				
	100	40	4.1	82	8.4	49	5.0	147	15				
	120	40	4.1	87	8.9	49	5.0	147	15				
	160	40	4.1	92	9.4	49	5.0	147	15				
25	30	27	2.8	50	5.1	38	3.9	95	9.7	7500	5600	5600	3500
	50	39	4.0	98	10	55	5.6	186	19				
	80	63	6.4	137	14	87	8.9	255	26				
	100	67	6.8	157	16	108	11	284	29				
	120	67	6.8	167	17	108	11	304	31				
	160	67	6.8	176	18	108	11	314	32				
32	30	54	5.5	100	10	75	7.7	200	20	7000	4800	4600	3500
	50	76	7.8	216	22	108	11	382	39				
	80	118	12	304	31	167	17	568	58				
	100	137	14	333	34	216	22	647	66				
	120	137	14	353	36	216	22	686	70				
	160	137	14	372	38	216	22	686	70				
40	50	137	14	402	41	196	20	686	70	5600	4000	3600	3000
	80	206	21	519	53	284	29	980	100				
	100	265	27	568	58	372	38	1080	110				
	120	294	30	617	63	451	46	1180	120				
	160	294	30	647	66	451	46	1180	120				
45	50	176	18	500	51	265	27	950	97	5000	3800	3300	3000
	80	313	32	706	72	390	40	1270	130				
	100	353	36	755	77	500	51	1570	160				
	120	402	41	823	84	620	63	1760	180				
	160	402	41	882	90	630	64	1910	195				
50	50	245	25	715	73	350	36	1430	146	4500	3500	3000	2500
	80	372	38	941	96	519	53	1860	190				
	100	470	48	980	100	666	68	2060	210				
	120	529	54	1080	110	813	83	2060	210				
	160	529	54	1180	120	843	86	2450	250				
58	50	353	36	1020	104	520	53	1960	200	4000	3000	2700	2200
	80	549	56	1480	151	770	79	2450	250				
	100	696	71	1590	162	1060	108	3180	325				
	120	745	76	1720	176	1190	121	3330	340				
	160	745	76	1840	188	1210	123	3430	350				

1. * The rated torque for gear units size 50 and larger with a gear ratio of 50:1 can be doubled if oil lubrication is used instead of standard grease lubrication. Contact a sales engineer to discuss this special modification.

2. Please refer to the SHG/SHF Series catalog for an explanation of terms and technical information not included in this brochure.

No Load Running Torque

No-load running torque is the input torque (high speed shaft) which is required to rotate the Harmonic Drive® gear with no load applied to the output.

Compensation Value for Each Ratio

The no load running torque of Harmonic Drive® gears varies with the gear ratio. The graphs indicate a value for ratio 100. For other gear ratios, add the compensation value from table 4-2.

Measurement condition

Table 4-1

Ratio: 100			
Lubricant	Grease	Name	Harmonic grease SK-1A
			Harmonic grease SK-2
		Grease quantity	Recommended quantity
Torque value is measured after 2 hour run-in at 2000 rpm input.			

Unit Type No Load Running Torque Compensation Value

Table 4-2

Unit : cNm

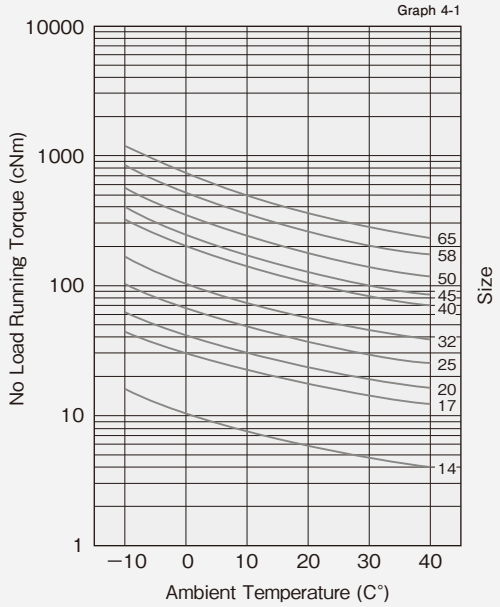
Size \ Ratio	30	50	80	120	160
14	+2.6	+1.1	+0.2	—	—
17	+4.1	+1.8	+0.4	-0.2	—
20	+5.9	+2.6	+0.5	-0.4	-0.8
25	+9.6	+4.2	+0.8	-0.6	-1.3
32	+18.3	+8.0	+1.5	-1.1	-2.5
40	—	+13.3	+2.4	-1.7	-4.0
45	—	+18.2	+3.3	-2.4	-5.5
50	—	+23.9	+4.3	-3.1	-7.2
58	—	+34.6	+6.2	-4.4	-10.3
65	—	—	+8.1	-5.8	-13.7

No Load Running Torque

SHG/SHF-14~65 Ratio 100

Input Speed 500r/min

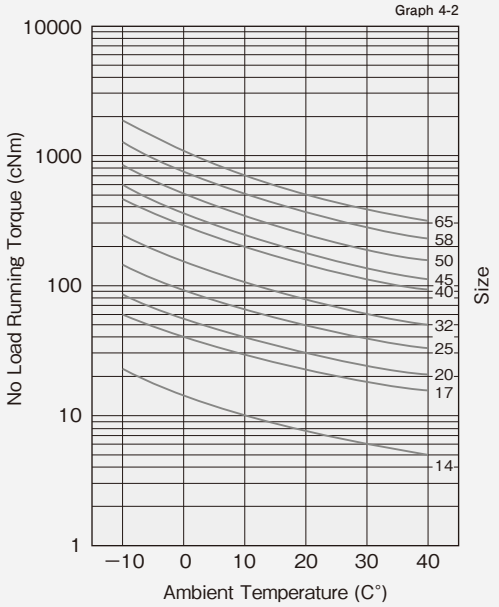
Graph 4-1



SHG/SHF-14~65 Ratio 100

Input Speed 1000r/min

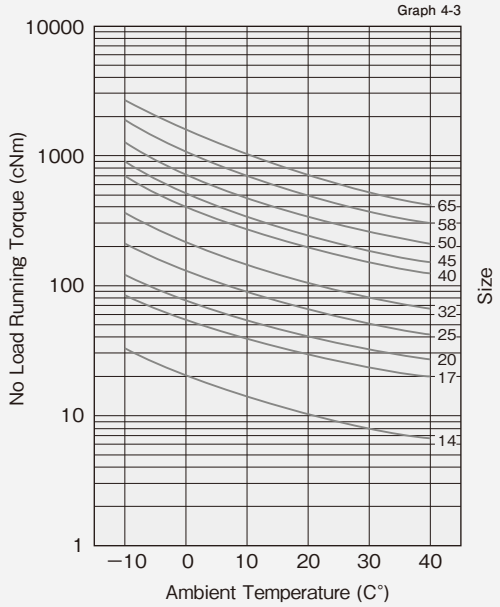
Graph 4-2



SHG/SHF-14~65 Ratio 100

Input Speed 2000r/min

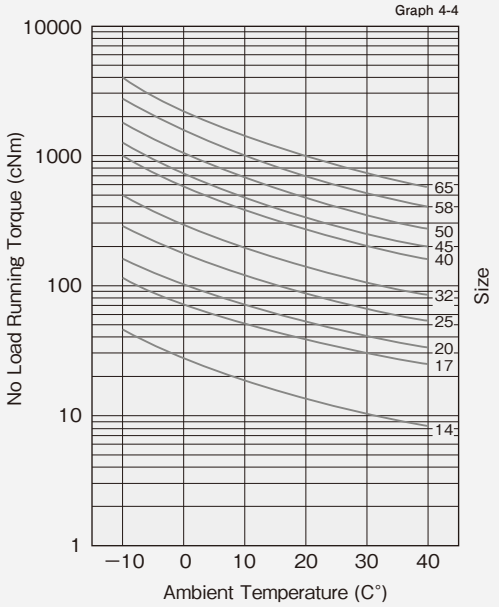
Graph 4-3



SHG/SHF-14~65 Ratio 100

Input Speed 3500r/min

Graph 4-4



※The values in this graph are mean values($\bar{X}$). $\sigma \fallingdotseq \bar{X} \times 0.2$

Efficiency

The gear efficiency is affected by many factors. Efficiency depends on the gear ratio, input speed, load torque, temperature, quantity of lubricant and type of lubricant. Efficiency values shown in the tables shown below are for rated torque. If the actual load torque is below rated torque, a compensation factor must be used.

Load Torque ≥ Rated Torque : Efficiency = Efficiency from Graph
Load Torque < Rated Torque : Efficiency = Efficiency from Graph x Compensation Coefficient from Graph 5-1

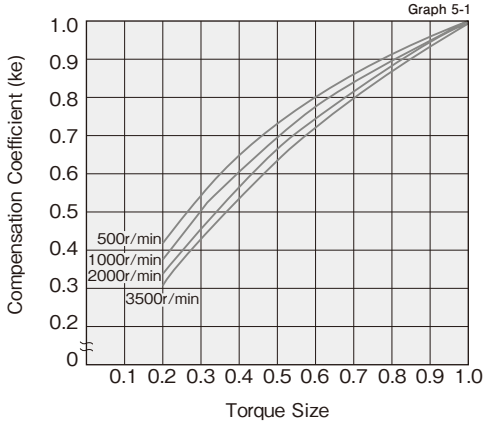
Measurement condition

Table 5-1

Installation	Based on recommended tolerance		
Load torque	Rated torque		
Lubricant	Grease	Name	Harmonic grease SK-1A
			Harmonic grease SK-2
		Grease quantity	Recommended quantity

Efficiency Compensation Coefficient

Graph 5-1

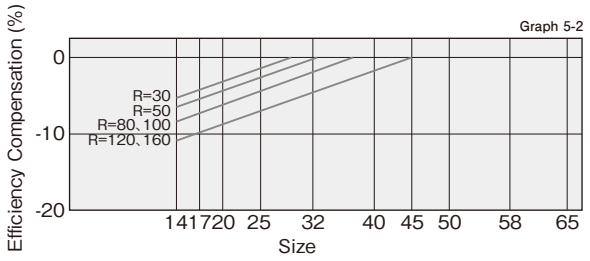


Input Efficiency Compensation by Size

Hollow shaft gear units use support bearings and oil seals on the input side. A compensation factor must be applied to the efficiency calculation based on the size and gear ratio. Find the Efficiency Compensation value (ηe) on the Graph 5-2.

Efficiency Compensation of 2UH (Hollow type)

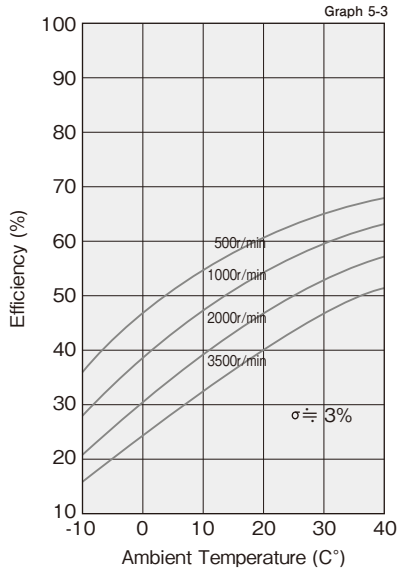
Graph 5-2



Efficiency at Rated Torque (Sizes 14-65)

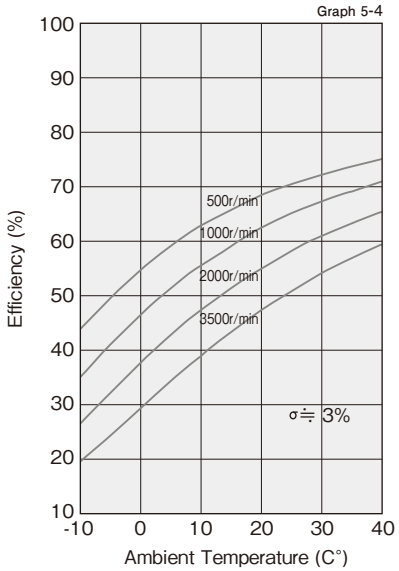
Ratio 30 Ratio

Graph 5-3



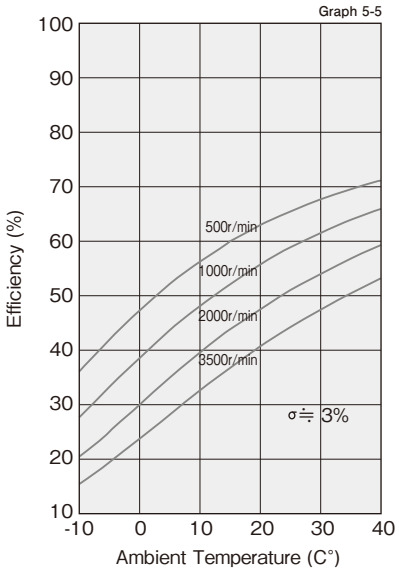
Ratio 50, 80, 100, 120

Graph 5-4



Ratio 30 Ratio 160

Graph 5-5



Efficiency Compensation Equation

Calculating Formula

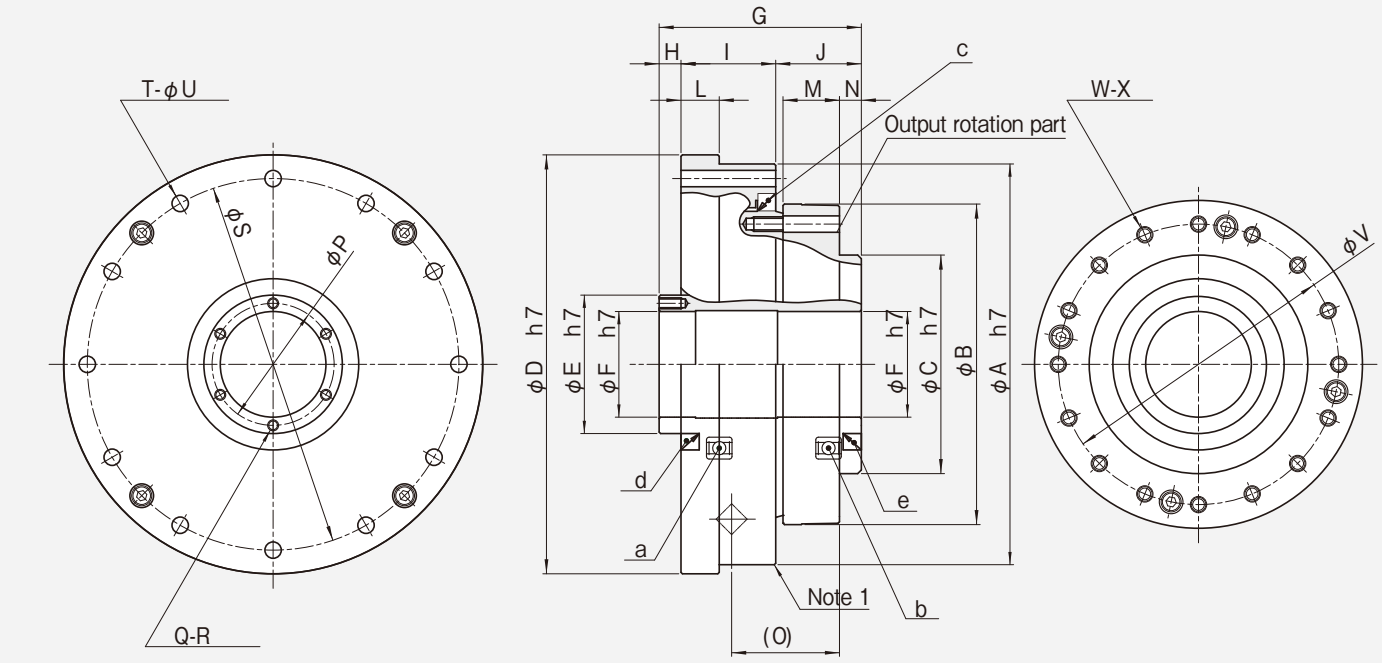
Formula 5-1

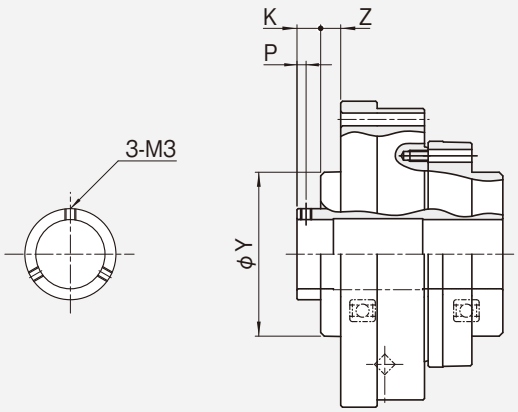
Efficiency (η) = Ke x (ηR) + ηe

Table 5-2

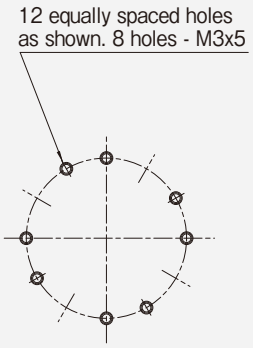
η	Efficiency	————
Ke	Efficiency Compensation Coefficient	Graph 5-1
ηR	Efficiency at rated Torque	Graph 5-3–5-5
ηe	Efficiency Compensation Quantity	Graph 5-2

External Dimensions

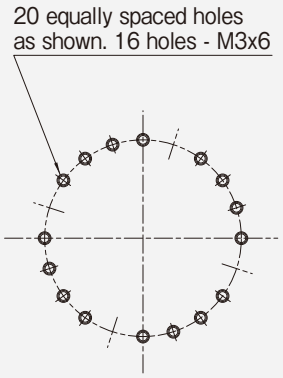




Size 14, 17 Input Configuration



Size 14



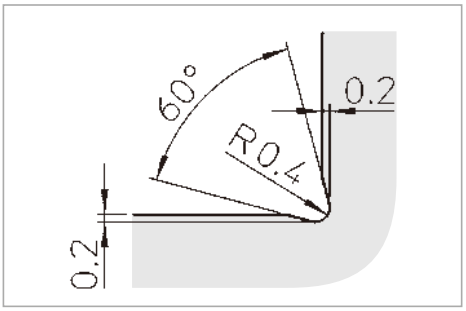
Size 17

Note 1: To prevent interference between the cross roller bearing corner (Note 1 shown in the drawing) and the customer's housing, an undercut in the housing is recommended per drawing 6-2 below.
* Detailed drawing are available upon request.

Recommended Housing Undercut

Customer Housing

Drawing 6-2
Unit: mm



Dimension Table

Table 7-1
Unit: mm

Symbol \ Size	14	17	20	25	32	40	45	50	58	65
ϕA h7	70	80	90	110	142	170	190	214	240	276
ϕB	52	62	73	88	115	140	160	168	195	213
ϕC h7	36	45	50	60	85	100	120	130	150	160
ϕD h7	74	84	95	115	147	175	195	220	246	284
ϕE h7	20	25	30	38	45	59	64	74	84	96
ϕF H7	14	19	21	29	36	46	52	60	70	80
G	52.5	56.5	51.5	55.5	65.5	79	85	93	106	128
H	12	12	5	6	7	8	8	9	10	14
I	20.5	23	25	26	32	38	42	45	52	56.5
J	20	21.5	21.5	23.5	26.5	33	35	39	44	57.5
K	6.5	6.5	-	-	-	-	-	-	-	-
L	9	10	10.5	10.5	12	14	15	16	17	18
M	11.5	12	13.5	15.5	20.5	25	27	30	35	42.5
N	7.5	8.5	7	6	5	7	7	7	7	12
O	21.7	23.9	25.5	29.6	36.4	44	47.5	52.5	62.2	72
ϕP(P)	(2.5)	(2.5)	25.5	33.5	40.5	52	58	67	77	88
Q	3	3	6	6	6	6	6	6	8	6
R	M3	M3	M3×6	M3×6	M3×6	M4×8	M4×8	M4×8	M4×8	M5×10
ϕS	64	74	84	102	132	158	180	200	226	258
T	8	12	12	12	12	12	18	12	16	16
ϕU	3.5	3.5	3.5	4.5	5.5	6.6	6.6	9	9	11
ϕV	44	54	62	77	100	122	140	154	178	195
W	12等配中8	20等配中16	16	16	16	16	12	16	12	16
X	M3×5	M3×6	M3×6	M4×7	M5×8	M6×10	M8×10	M8×11	M10×15	M10×15
	ϕ3.5×11.5	ϕ3.5×12	ϕ3.5×13.5	ϕ5×15.5	ϕ6×20.5	ϕ7×25	ϕ9×27	ϕ9×30	ϕ11×35	ϕ11×42.5
ϕY	36	45	-	-	-	-	-	-	-	-
Z	5.5	5.5	-	-	-	-	-	-	-	-
a	6804ZZ	6805ZZ	6806ZZ	6808ZZ	6909ZZ	6912ZZ	6913ZZ	6915ZZ	6917ZZ	6920ZZ
b	6804ZZ	6805ZZ	6806ZZ	6808ZZ	6809ZZ	6812ZZ	6812ZZ	6815ZZ	6817ZZ	6820ZZ
c	D49585	D59685	D69785	D84945	D1101226	D1321467	D1521707	D1681868	D1932129	D21623811
d	S20304.5	S25356	S30405	S38475	S45607	S60789	S657810	S759510	S8511012	S10012513
e	S20304.5	S25356	S30405	S38475	S45555	S59685	S59685	S69785	S84945	S961128
Weight(kg)	0.55	0.8	1.1	1.6	3.6	6.2	8	11.8	16.4	23.3

Weight Comparison

Table 7-2
Unit: kg

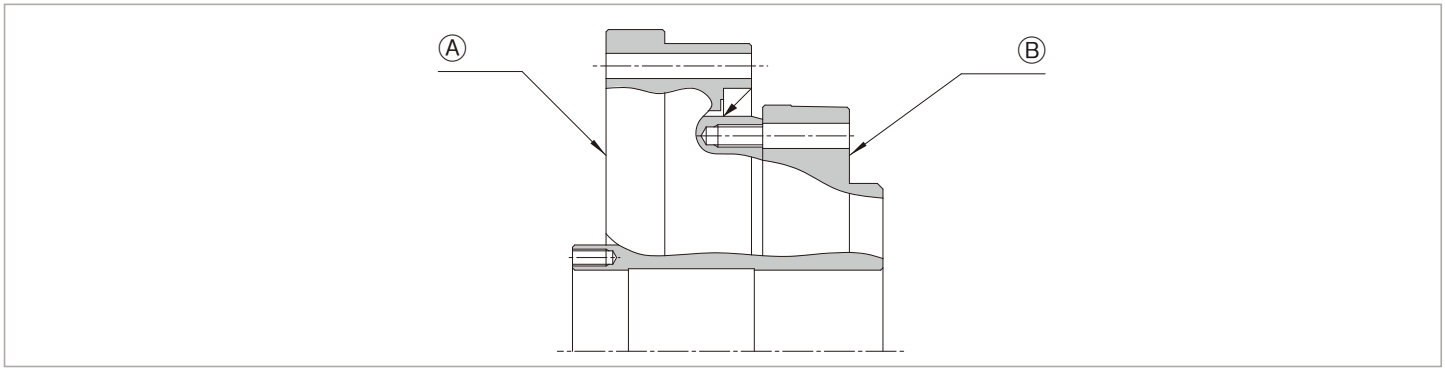
Size	14	17	20	25	32	40	45	50	58	65
SHG/SHF Series standard unit type	0.71	1	1.38	2.1	4.5	7.7	10	14.5	20	28.5
SHG/SHF Series LW unit type	0.55	0.8	1.1	1.6	3.6	6.2	8	11.8	16.4	23.3
Weight Ratio	77%	80%	80%	76%	80%	81%	80%	82%	82%	82%

Specification for cross roller bearing

Table 7-3

Size	Pitch Circle	Offset	Basic Dynamic Rated Load		Basic Static Rated Load		Allowable Moment Load		Moment Stiffness Km	
	dp	R	C		Co		Mc		×10⁴ Nm/rad	kgfm/arc min
	m	m	×10²N	kgf	×10²N	kgf	Nm	kgfm		
14	0.050	0.0217	58	590	86	880	※ 74	7.6	8.5	2.5
17	0.060	0.0239	104	1060	163	1670	※ 124	12.6	15.4	4.6
20	0.070	0.0255	146	1490	220	2250	※ 187	19.1	25.2	7.5
25	0.085	0.0296	218	2230	358	3660	258	26.3	39.2	11.6
32	0.111	0.0364	382	3900	654	6680	580	59.1	100	29.6
40	0.133	0.0440	433	4410	816	8330	849	86.6	179	53.2
45	0.154	0.0475	776	7920	1350	13800	1127	115	257	76.3
50	0.170	0.0525	816	8330	1490	15300	1487	152	351	104
58	0.195	0.0622	874	8920	1710	17500	2180	222	531	158
65	0.218	0.0720	1300	13300	2230	22700	2740	280	741	220

* The basic dynamic rated load means a certain static radial load so that the basic dynamic rated life of the roller bearing is a million rotations.
The basic static rated load means a static load that gives a certain level of contact stress (4kN/mm2)
in the center of the contact area between the rolling element receiving the maximum load and the orbit.
* The moment stiffnesses are mean values.



■ Installation and Transmission Torque

Bolt connection to housing and resulting transmission torque (A)

Size		14	17	20	25	32	40	45	50	58	65
Number of screws		8 (8)	12 (12)	12 (12)	12 (12)	12 (12)	12 (12)	18 (18)	12 (12)	16 (16)	16
Size of screws		M3 (M3)	M3 (M3)	M3 (M3)	M4 (M4)	M5 (M5)	M6 (M6)	M6 (M6)	M8 (M8)	M8 (M8)	M10
Pitch Circle Diameter	mm	64 (64)	74 (74)	84 (84)	102 (102)	132 (132)	158 (158)	180 (180)	200 (200)	226 (226)	258
Screw Tightening Torque	Nm	2.4 (2.0)	2.4 (2.0)	2.4 (2.0)	5.4 (4.5)	10.8 (9.0)	18.4 (15.3)	18.4 (15.3)	44 (37)	44 (37)	74
	kgfm	0.24 (0.20)	0.24 (0.20)	0.24 (0.20)	0.55 (0.46)	1.10 (0.92)	1.87 (1.56)	1.87 (1.56)	4.5 (3.8)	4.5 (3.8)	7.6
Torque Transmitting Capacity	Nm	128 (108)	222 (186)	252 (206)	516 (431)	1069 (892)	1813 (1509)	3098 (2578)	4163 (3489)	6272 (5263)	9546
	kgfm	13 (11)	23 (19)	26 (21)	53 (44)	109 (91)	185 (154)	316 (263)	425 (356)	640 (974)	974

Bolt connection to output flange and resulting transmission torque (B)

Size		14	17	20	25	32	40	45	50	58	65
Number of screws		8 (8)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	12 (12)	16 (16)	12 (12)	16
Size of screws		M3 (M3)	M3 (M3)	M3 (M3)	M4 (M4)	M5 (M5)	M6 (M6)	M8 (M8)	M8 (M8)	M10 (M10)	M10
Pitch Circle Diameter	mm	44 (44)	54 (54)	62 (62)	77 (77)	100 (100)	122 (122)	140 (140)	154 (154)	178 (178)	195
Screw Tightening Torque	Nm	2.4 (2.0)	2.4 (2.0)	2.4 (2.0)	5.4 (4.5)	10.8 (9.0)	18.36 (15.3)	44 (37)	44 (37)	89 (74)	89
	kgfm	0.24 (0.20)	0.24 (0.20)	0.24 (0.20)	0.55 (0.46)	1.10 (0.92)	1.87 (1.56)	4.5 (3.8)	4.5 (3.8)	9.1 (7.5)	9.1
Torque Transmitting Capacity	Nm	88 (72)	216 (176)	248 (206)	520 (431)	1080 (902)	1867 (1558)	2914 (2440)	4274 (3587)	5927 (4910)	8658
	kgfm	9.0 (7.3)	22 (18)	25.3 (21)	53 (44)	110 (92)	191 (159)	297 (249)	436 (366)	605 (501)	883

1. Value not in parentheses is for SHG-LW. Value in parentheses is for SHF-LW Series.
2. Under the premise that materials of the internal thread endure the bolt tightening torque.
3. Recommended bolt : JIS B 1176 hexagon socket head cap screw strength range : JIS B 1051 over 12.9
4. Torque coefficient : K=0.2
5. Clamp coefficient A=1.4
6. Coefficient of friction : μ=0.15

※ Strict compliance to the recommended screw tightening torques is especially important for the lightweight aluminum housing flange. Exceeding the recommended values (over tightening) can cause deformation of the housing flange under the bolt heads. This will result in the housing slipping under full torque loads. Flat washers should be used for all screws in direct contact with the aluminum housing.

* Please contact the sales office of Harmonic Drive Systems Inc. for more information. **http://www.hds.co.jp/**

Harmonic Drive Systems Inc.

Head Office: Believe Omori 7F, 6-25-3 Minami-Oi, Shinagawa-ku, Tokyo 140-0013 JAPAN
Phone: +81-3-5471-7800 / FAX: +81-3-5471-7811

Overseas Division: 1856-1 Hotakamaki, Azumino-shi, Nagano 399-8305 JAPAN
Phone: +81-263-83- 6935 / FAX: +81-263-83-6901

Tokyo Office: Believe Omori 7F, 6-25-3 Minami-Oi, Shinagawa-ku, Tokyo 140-0013 JAPAN
Phone: +81-3-5471-7830 / FAX: +81-3-5471-7836

Kitakanto Office: Y.S.T. Building 3F, 4-263 Sakuragi-cho, Omiya-ku, Saitama-shi,Saitama 330-0854 JAPAN
Phone: +81-48-647-8891 / FAX: +81-48-647-8893

Koshin Office: 1856-1 Hotakamaki, Azumino-shi, Nagano 399-8305 JAPAN
Phone: +81-263-83-6910 / FAX: +81-263-83-6911

Chubu Office : Nagoya Inter Building 6F, 2-173-4 Hongo, Meito-ku, Nagoya-shi, Aichi 465-0024 JAPAN
Phone: +81-52-773-7451 / FAX: +81-52-773-7462

Kansai Office : Shin-Osaka Ueno Toyo Building 3F, 7-4-17 Nishi-nakajima, Yodogawa-ku, Osaka-shi, Osaka 532-0011 JAPAN Phone: +81-6-6885-5720 / FAX: +81-6-6885-5725

Kyushu Office : NOF Hakata-ekimae Building 7F, 1-15-20 Hakata-ekimae,Hakata-ku, Fukuoka-shi, Fukuoka 812-0011 JAPAN Phone: +81-92-451-7208 / FAX: +81-92-481-2493

Hotaka Plant : 1856-1 Hotakamaki, Azumino-shi, Nagano 399-8305 JAPAN
Phone: +81-263-83-6800 / FAX: +81-263-83-6901

Harmonic Drive AG : Hoenbergstrasse 14 D-65555 Limburg a.d. Lahn GERMANY
Phone: +49-6431-5008-0 / FAX: +49-6431-5008-119

Harmonic Drive L.L.C. : 247 Lynnfield Street, Peabody, MA 01960 U.S.A.
Phone: +1-978-532-1800 / FAX: +1-978-532-9406

Harmonic Drive Systems (Shanghai) Co.,Ltd. : Rm206,1#,No.641,Tianshan Rd,Changning District,Shanghai, 200336, CHINA
Phone: +86-21-6237-5656 / FAX: +86-21-3250-7268