



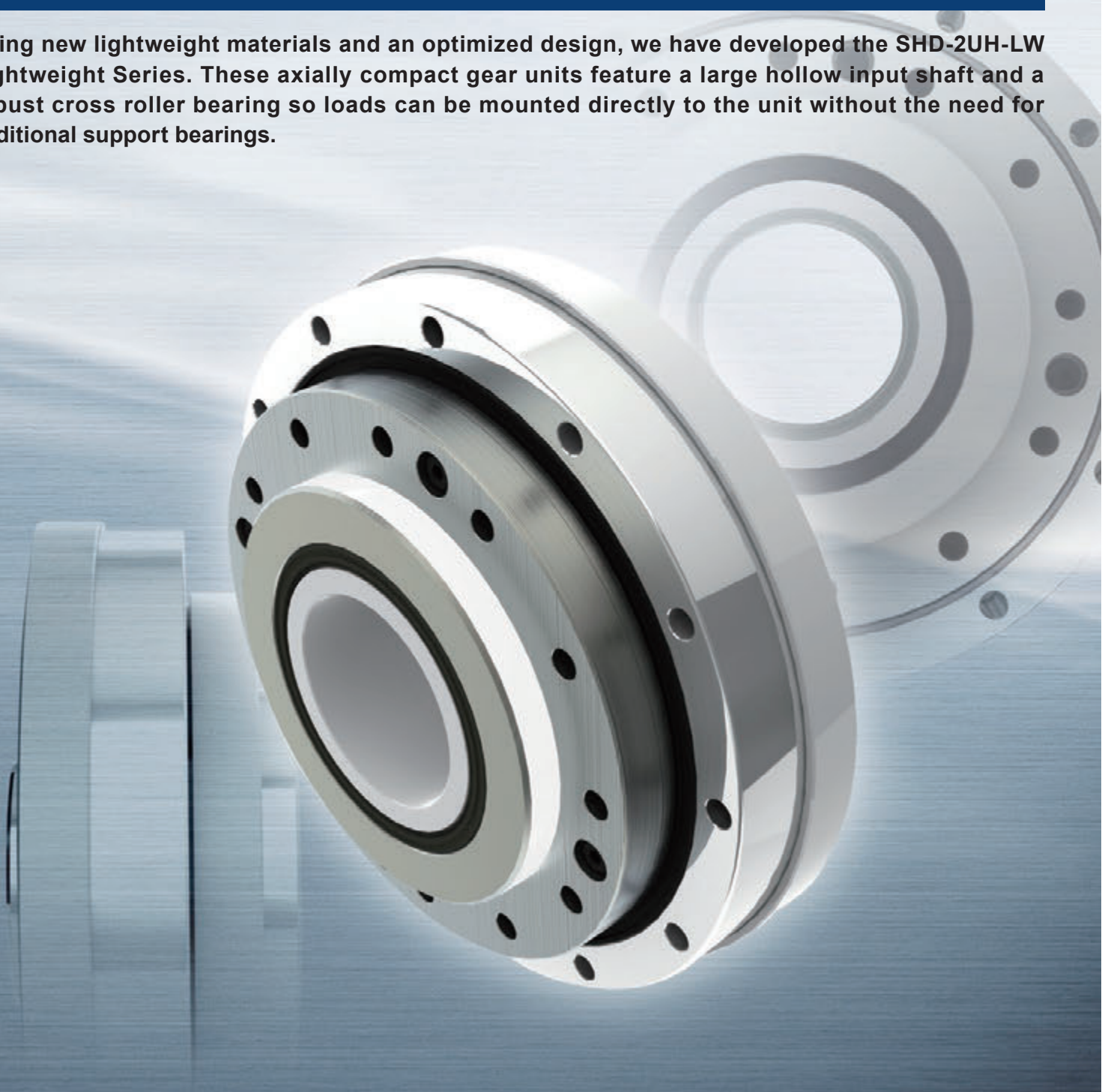
HarmonicDrive®

SHD-2UH-LW

Ultra-Flat, Lightweight, Hollow Shaft Gear Unit

Now offering a lightweight gear unit based upon our SHD Series of Ultra-Flat Hollow Shaft Gears!

Using new lightweight materials and an optimized design, we have developed the SHD-2UH-LW Lightweight Series. These axially compact gear units feature a large hollow input shaft and a robust cross roller bearing so loads can be mounted directly to the unit without the need for additional support bearings.



Ordering Code

SHD - 25 - 100 - 2UH - LW - SP

Model	Size	Gear Ratio	Type	specification 1	specification 2
SHD Series	14~40	50:1~160:1	2UH (Unit Type)	Lightweight	Special (Custom Specification) leave blank for standard product

Rating Table

Table 2-1

Size	Gear Ratio	Rated Torque at 2000 r/min		Limit for Repeated Peak Torque		Limit for Average Torque		Limit for Momentary Torque		Max. Input Speed	Max. Average Input Speed	Moment of Inertia	
		Nm	kgfm	Nm	kgfm	Nm	kgfm	Nm	kgfm	Grease	Grease	I ×10 ⁻⁴ kgm ²	J ×10 ⁻⁴ kgfms ²
14	50	3.7	0.38	12	1.2	4.8	0.49	23	2.3	8500	3500	0.064	0.065
	100	5.4	0.55	19	1.9	7.7	0.79	35	3.6				
17	50	11	1.1	23	2.3	18	1.9	48	4.9	7300	3500	0.141	0.144
	100	16	1.6	37	3.8	27	2.8	71	7.2				
20	50	17	1.7	39	4.0	24	2.4	69	7.0	6500	3500	0.271	0.276
	100	28	2.9	57	5.8	34	3.5	95	10				
	160	28	2.9	64	6.5	34	3.5	95	10				
25	50	27	2.8	69	7.0	38	3.9	127	13	5600	3500	0.793	0.809
	100	47	4.8	110	11	75	7.6	184	19				
	160	47	4.8	123	13	75	7.6	204	21				
32	50	53	5.4	151	15	75	7.6	268	27	4800	3500	2.900	2.957
	100	96	10	233	24	151	15	420	43				
	160	96	10	261	27	151	15	445	45				
40	50	96	10	281	29	137	14	480	49	4000	3000	7.432	7.578
	100	185	19	398	41	260	27	700	71				
	160	206	21	453	46	316	32	765	78				

(Note) 1. Moment of Inertia: $I = 1/4GD^2$

2. Please refer to the CSD / SHD Catalog for an explanation of terms and technical information.

Starting Torque

Values shown below vary depending on the operating condition.

Please use values as a reference.

Table 2-2

Unit: Ncm

Ratio	Size					
	14	17	20	25	32	40
50	11	39	53	79	114	177
100	8.7	37	49	73	101	157
160	—	—	48	72	97	151

Backdriving Torque

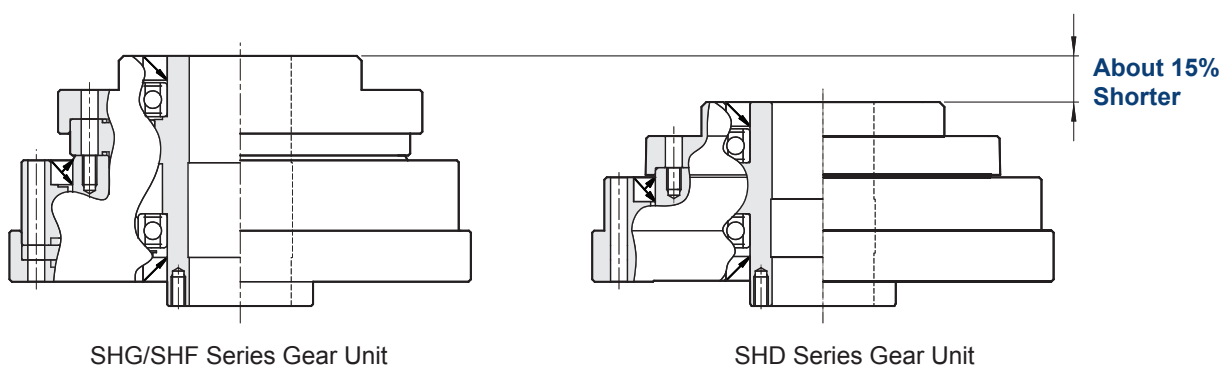
Values shown below vary depending on the operating condition.

Please use values as a reference.

Table 2-3

Unit: Nm

Ratio	Size					
	14	17	20	25	32	40
50	6.0	21	29	44	63	98
100	9.7	41	54	80	111	173
160	—	—	84	126	171	266



Weight Comparison

Table 3-1
Unit: Ncm

Ratio	Size					
	14	17	20	25	32	40
SHG/SHF-2UH Series	0.71	1	1.38	2.1	4.5	7.7
SHD-2UH-LW Lightweight	0.49	0.66	0.84	1.4	2.7	4.6
Weight Ratio	69%	66%	61%	67%	60%	60%

Accuracy

Table 3-2

		Size					
		14	17	20	25	32	40
Transmission Error	$\times 10^{-4}$ rad	4.4	4.4	2.9	2.9	2.9	2.9
	arc min	1.5	1.5	1.0	1.0	1.0	1.0

Hysteresis Loss

Table 3-3

Ratio		Size					
		14	17	20	25	32	40
50	$\times 10^{-4}$ rad	7.3	5.8	5.8	5.8	5.8	5.8
	arc min	2.5	2.0	2.0	2.0	2.0	2.0
over 100	$\times 10^{-4}$ rad	5.8	2.9	2.9	2.9	2.9	2.9
	arc min	2.0	1.0	1.0	1.0	1.0	1.0

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.

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. Please contact HDLLC if you are using oil lubricant.			

Compensation Value for Each Ratio

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

Unit Type No Load Running Torque Compensation Value

Table 4-2
Unit: Ncm

Ratio	Size	
	50	160
14	+1.0	—
17	+1.6	—
20	+2.4	-0.7
25	+4.0	-1.2
32	+7.7	-2.4
40	+13	-3.9
50	—	—

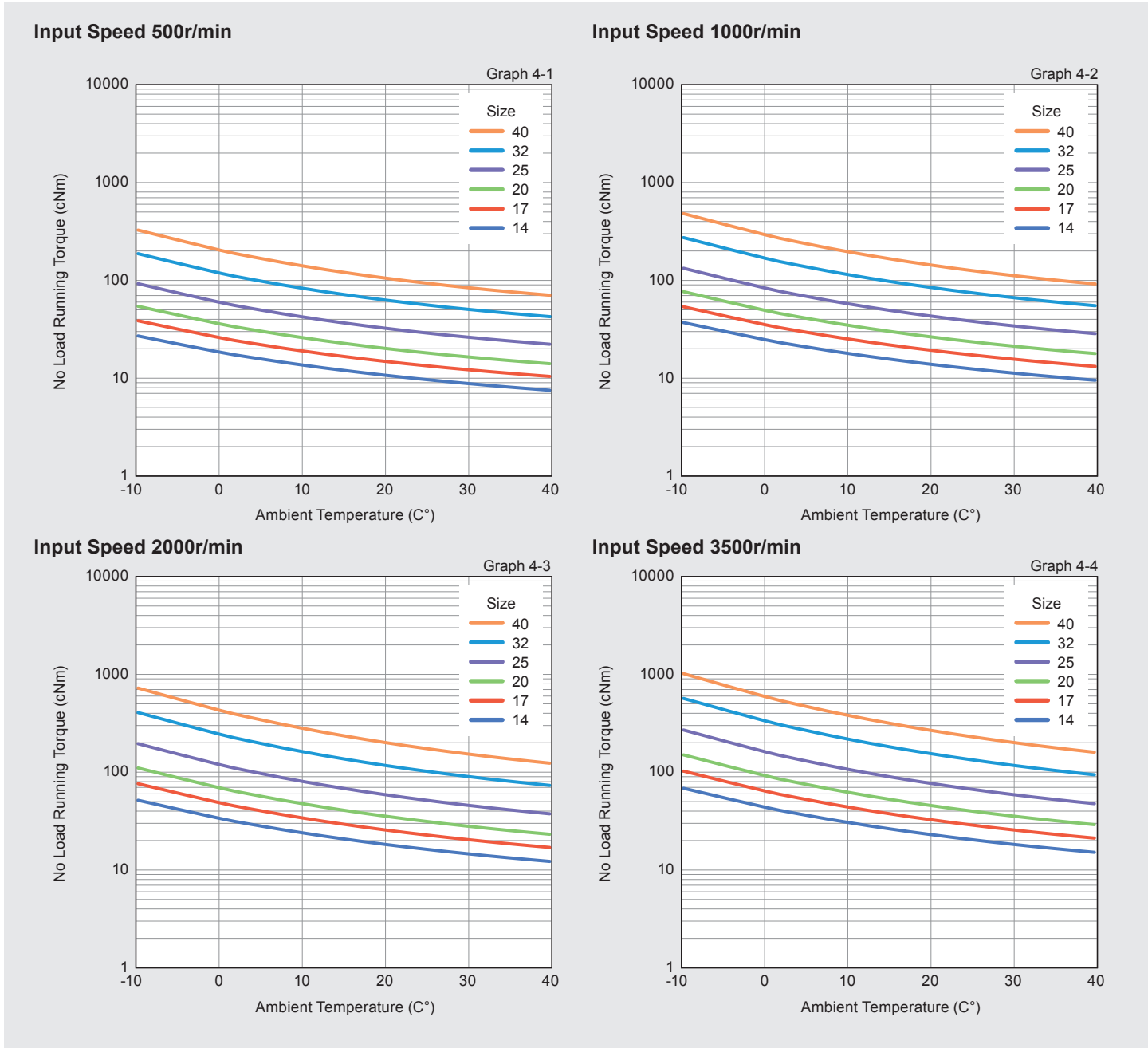
Operating temperature range

Table 4-3

Grease	SK-1A	0°C~+40°C
	SK-2	0°C~+40°C

Note : Use the high temperature side in temperature rise 40 °C or less for ambient temperature.

No Load Running Torque for Ratio 100



Efficiency

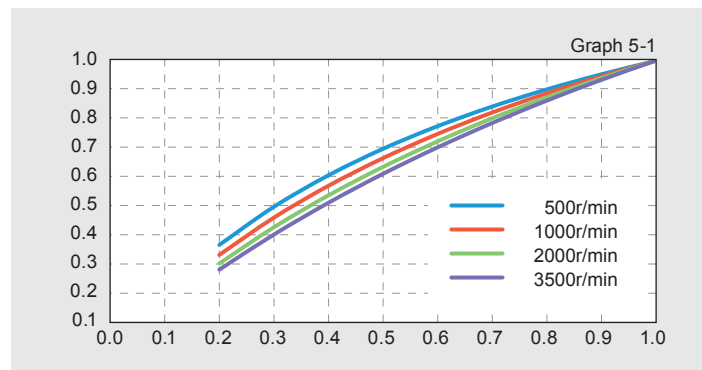
The gear efficiency is affected by many factors. Efficiency depends on the gear ratio, input speed, load torque, temperature, quantity of lubricant and type of lubricant. Efficiency values shown in the tables shown below are for rated torque. If the actual load torque is below rated torque, a compensation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

Measurement condition

Table 5-1

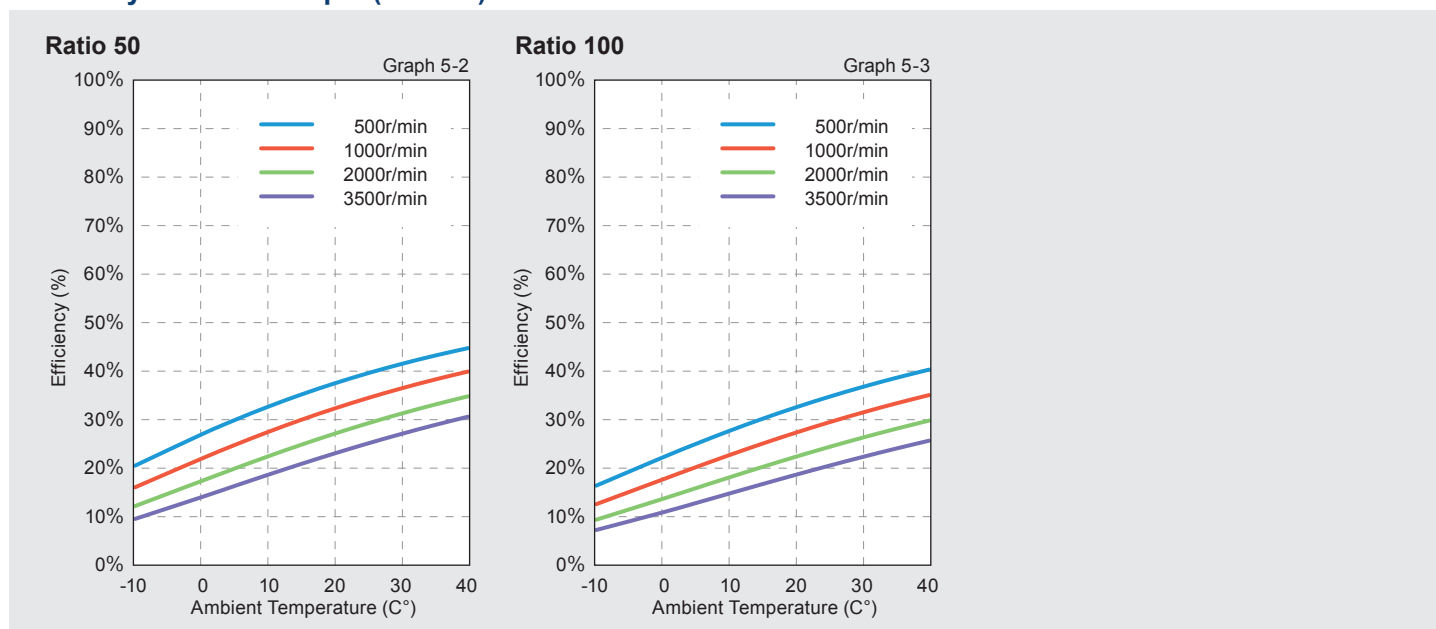
Installation	Based on recommended tolerance		
Load torque	Rated torque		
Lubricant	Grease	Name	Harmonic grease SK-1A(Size:20~40)
		Grease quantity	Recommended quantity

Load Torque $\geq$ Rated Torque : Efficiency = Efficiency from Graph5-2 thru 5-6. Load Torque < Rated Torque : Efficiency = Efficiency from Graph5-2 thru 5-6 x Compensation Coefficient from Graph 5-1.

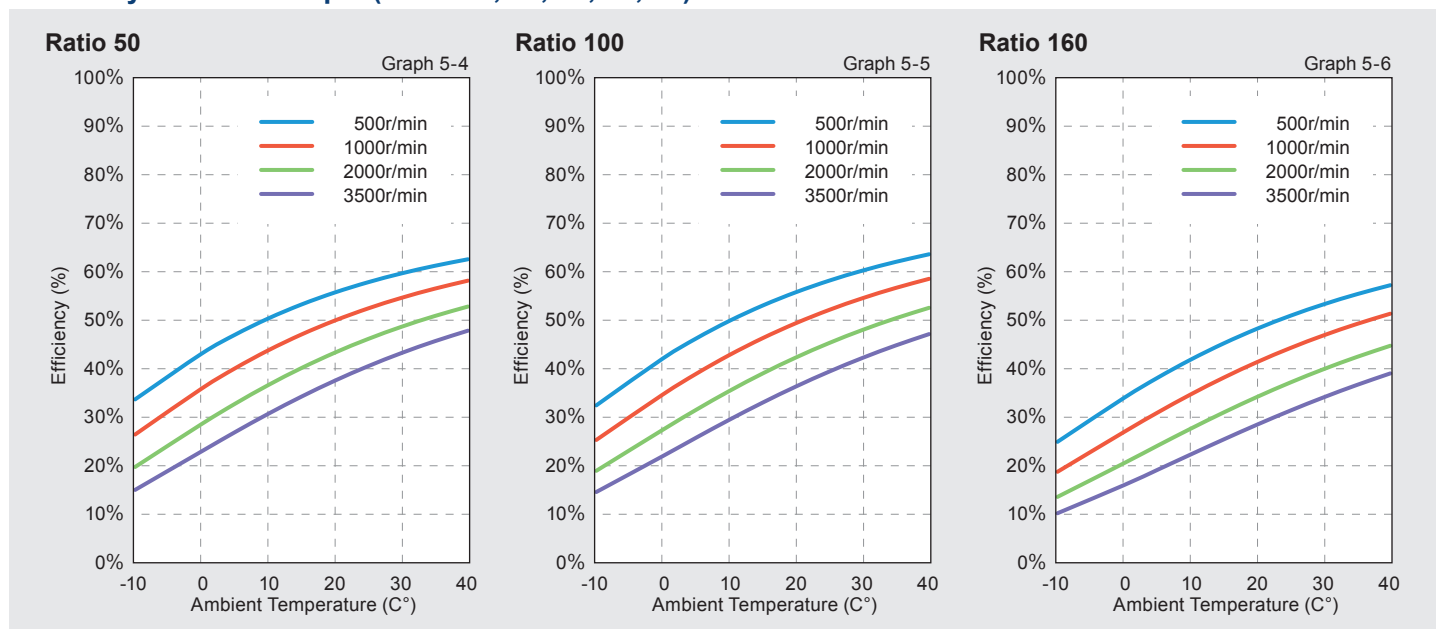


*The scale on the graph is off relative to the lines drawn on the graph

Efficiency at Rated Torque (Size 14)



Efficiency at Rated Torque (Sizes 17, 20, 25, 32, 40)





■ Dimension Table

Symbol	Size					
	14	17	20	25	32	40
ϕA h7	70	80	90	110	142	170
ϕB	52	62	73	87	114	137
ϕC h7	36	45	50	60	75	100
ϕD h7	74	84	95	115	147	175
ϕE h7	20	25	30	38	54	64
ϕF H7	14	19	21	29	41	51
G	45.5	48	42	46.5	55	65
H	12	12	5	6	7	8
I	19.5	20.5	21.5	24	28.6	33
J	14	15.5	15.5	16.5	19.4	24
K	6.5	6.5	—	—	—	—
L	9	10	10.5	10.5	12	14
M	7	8	8	10	11	14
N	6.5	7	7	6	7.5	9
O	16.6	18	17.5	20.6	24.9	29.5
ϕP (P)	(2.5)	(2.5)	25.5	33.5	48	57
Q	3	3	6	6	6	6
R	M3	M3	M3×6	M3×6	M3×6	M4×8
ϕS	64	74	84	102	132	158
T	8	12	12	12	12	12
ϕU	3.5	3.5	3.5	4.5	5.5	6.6
ϕV	43	52	61.4	76	99	120
W	8	12	12	12	12	16
X	M3×5	M3×6	M3×6	M4×7	M5×8	M6×10
	ϕ3.5×5.5	ϕ3.5×6.5	ϕ3.5×6.5	ϕ4.5×8.5	ϕ5.5×7.6	ϕ6.6×10
ϕY	36	45	—	—	—	—
Z	5.5	5.5	—	—	—	—
a	6804ZZ	6805ZZ	6806ZZ	6808ZZ	6811ZZ	6813ZZ
b	6804ZZ	6805ZZ	6806ZZ	6808ZZ	6810ZZ	6813ZZ
c	D49585	D59685	D69785	D84945	D1101226	D1321467
d	S20304.5	S25356	S30405	S38475	S54645	S64745
e	S20304.5	S25356	S30405	S38475	S50605	S64745
Weight (kg)	0.49	0.66	0.84	1.4	2.7	4.6

Specification for Cross Roller Bearing

Table 7-1

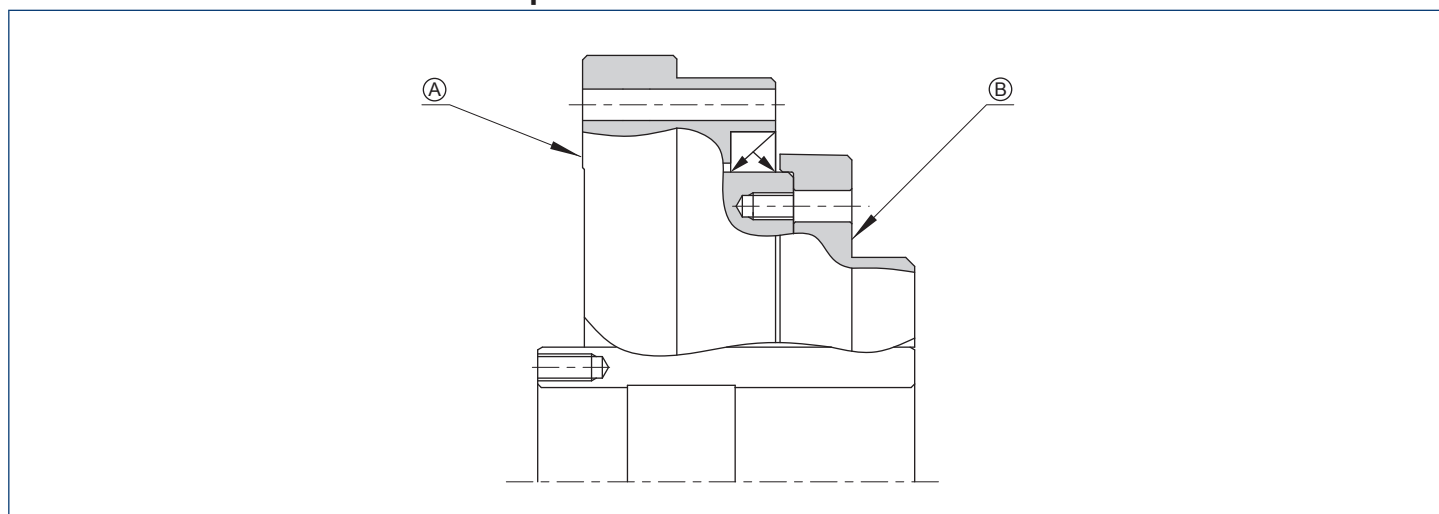
Size	Pitch Circle	Offset	Basic Dynamic Rated Load		Basic Static Rated Load		Allowable Moment Load		Moment Stiffness	
	dp	R	C		Co		Mc		Km	
	m	m	×10 ² N	kgf	×10 ² N	kgf	Nm	kgfm	×10 ⁴ Nm/rad	kgfm/arc min
14	0.0503	0.0111	29	296	43	438	37	3.8	7.08	2.1
17	0.061	0.0115	52	530	81	826	62	6.3	12.7	3.8
20	0.070	0.011	73	744	110	1122	93	9.5	21	6.2
25	0.086	0.0121	109	1111	179	1825	129	13.2	31	9.2
32	0.112	0.0173	191	1948	327	3334	290	29.6	82.1	24.4
40	0.133	0.0195	216	2203	408	4160	424	43.2	145	43.0

* 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**

Table 7-2

		Size					
		14	17	20	25	32	40
Number of screws		8	12	12	12	12	12
Size of screws		M3	M3	M3	M4	M5	M6
Pitch Circle Diameter mm		64	74	84	102	132	158
Screw Tightening Torque	Nm	2.0	2.0	2.0	4.5	9.0	15.3
	kgfm	0.20	0.20	0.20	0.46	0.92	1.56
Torque Transmitting Capacity	Nm	108	186	210	431	892	1509
	kgfm	11	19	21	44	91	154

Bolt connection to output flange and resulting transmission torque **B**

Table 7-3

		Size					
		14	17	20	25	32	40
Number of screws		8	12	12	12	12	12
Size of screws		M3	M3	M3	M4	M5	M6
Pitch Circle Diameter mm		43	52	61.4	76	99	120
Effective Thread Depth		4.5	4.5	4.5	6	8	9
Screw Tightening Torque	Nm	2.0	2.0	2.0	4.5	9.0	15.3
	kgfm	0.20	0.20	0.20	0.46	0.92	1.56
Torque Transmitting Capacity	Nm	72	130	154	321	668	1148
	kgfm	7.3	13.3	15.7	32.7	68.2	117

1. Under the premise that materials of the internal thread endure the bolt tightening torque.

2. Recommended bolt : JIS B 1176 hexagon socket head cap screw strength range : JIS B 1051 over 12.9

3. Torque coefficient : K=0.2

4. Clamp coefficient : A=1.4

5. Coefficient of friction $\mu=0.15$

* 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 a Sales Engineer for more information.)

Input Shaft Load Limits

The Hollow Shaft Unit type is supported by two deep groove single row ball bearings. To achieve peak performance, it is essential to confirm that the actual load applied to input shaft does not exceed the limits specified below.

Figure 8-1 shows the points of application of forces, which determine the Maximum Allowable Radial and Axial Loads as indicated in Graph 8-1. The maximum values, as given Graph 8-1 are valid for an average input speed of 2,000 r/min and a mean bearing life of $L_{10}=7,000h$. Example: If the hollow shaft of a SHD-40-2UH-LW unit is subjected to an axial load of 400 N, the maximum allowable radial force will be 275 N.

Bearing Specification for Input Side

Table 8-1

Size	Bearing A			Bearing B			a Overhung Distance (mm)	b Distance between Bearings (mm)	Max. Radial Load Fr (N)
	Bearing Model	Basic Dynamic Rated Load	Basic Dynamic Rated Load	Bearing Model	Basic Dynamic Rated Load	Basic Dynamic Rated Load			
		C _r (N)	C _{0r} (N)		C _r (N)	C _{0r} (N)			
14	6804ZZ	4000	2470	6804ZZ	4000	2470	16.5	20.0	179
17	6805ZZ	4500	3150	6805ZZ	4500	3150	18.0	19.5	191
20	6806ZZ	4700	3650	6806ZZ	4700	3650	15.5	17.5	199
25	6808ZZ	6350	5550	6808ZZ	6350	5550	16.5	21.0	290
32	6811ZZ	8800	8500	6810ZZ	6400	6200	19.5	26.0	410
40	6813ZZ	11900	12100	6813ZZ	11900	12100	20.5	33.5	602

SHD-2UH-LW Input Shaft Load Limit

Graph 8-1

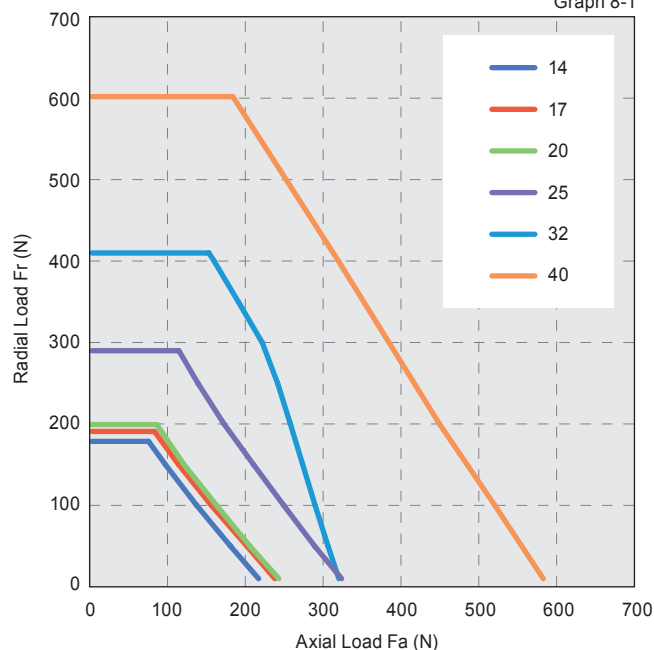
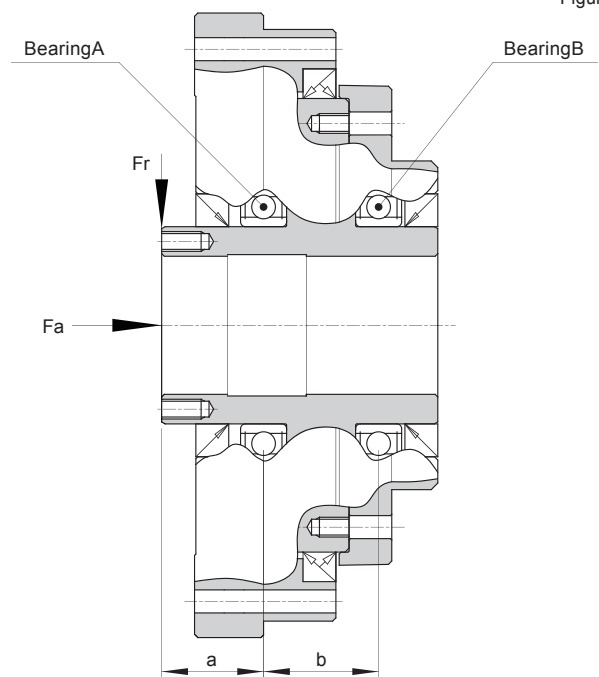


Figure 8-1



* Please contact the sales office of Harmonic Drive Systems Inc. for more information.

<http://www.hds.co.jp/>



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 LLC: 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

"HarmonicDrive" is a trademark of Harmonic Drive Systems Inc.
The academic or general nomenclature of our products "HarmonicDrive" is "strain wave gearing."
The trademark is registered in Japan, Korea and Taiwan.

HarmonicDrive®
H-E-DRIVE®

HarmonicPlanetary®
H-E-PLANETARY®

Harmonicsyn®
H-E-SYN®

HarmonicLinear®
H-E-LINEAR®

BEAM SERVO®
E-4T-4®