Features

HDUF/FB series component type

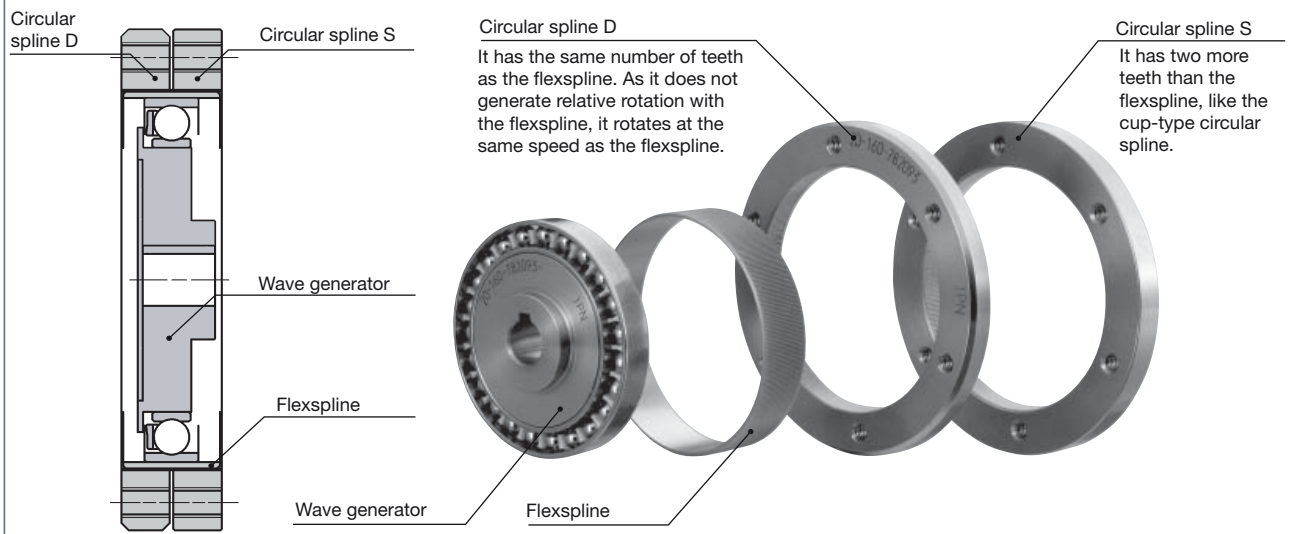
The HDUF/FB series component type has pursued flatness and thinness. It consists of four parts and operates using the same principle as the cup type series.
The flexspline of the pancake type is shaped like the flexspline of the cup type with a cut bottom and is structured to have an additional circular spline with the same number of teeth as the flexspline.

Features of HDUF/FB series

- Flat and thin shape
- Compact and simple design
- High positioning and rotational accuracies
- Coaxial input and output

Structure of the HDUF/FB series component type

Fig. 1-1



* How to tell circular spline D from circular spline S
The peripheral chamfering of circular spline D is larger than that of circular spline S.

Model and symbol

HDUF- 20 - 80 - 2 - GR

Table 2-1

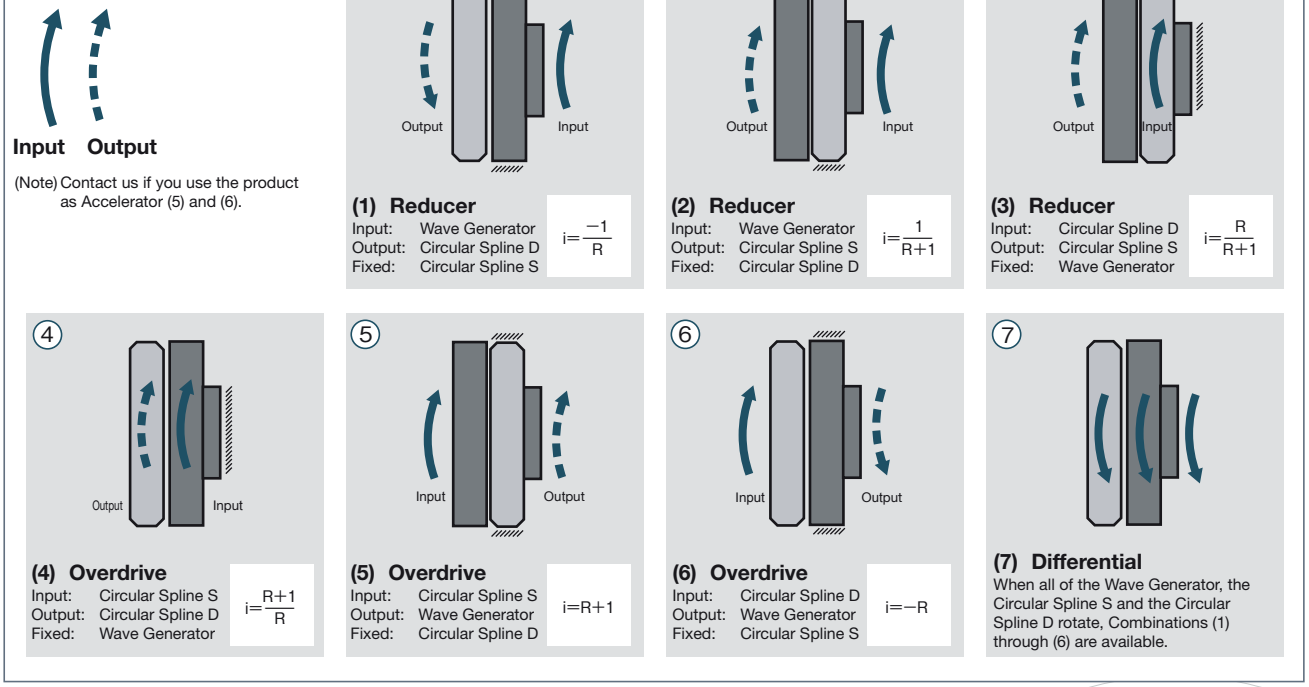
Model name	Model No.	Reduction ratio Note 1										Model	
HDUF ** FD	14	50	—	88	100	110	—	—	—	—	—	2= Component type	GR= New type * There is no G for Model 14
	20	50	—	80	100	—	—	128	—	—	160		
	25	50	—	80	100	—	120	—	—	—	160		
	32	50	78	—	100	—	—	—	131	157	—		
	40	50	—	80	100	—	—	128	—	—	160		
	50	—	—	80	100	—	120	—	—	—	160		

* The reduction ratio indicates the value for the following condition.
Input: wave generator, fixed: circular spline S, output: circular spline D

** Model names: HDUF for European markets, FB for Asia and North America

Rotational direction and reduction ratio

Fig. 2-2



Technical Data

Rating table

Table 3-1

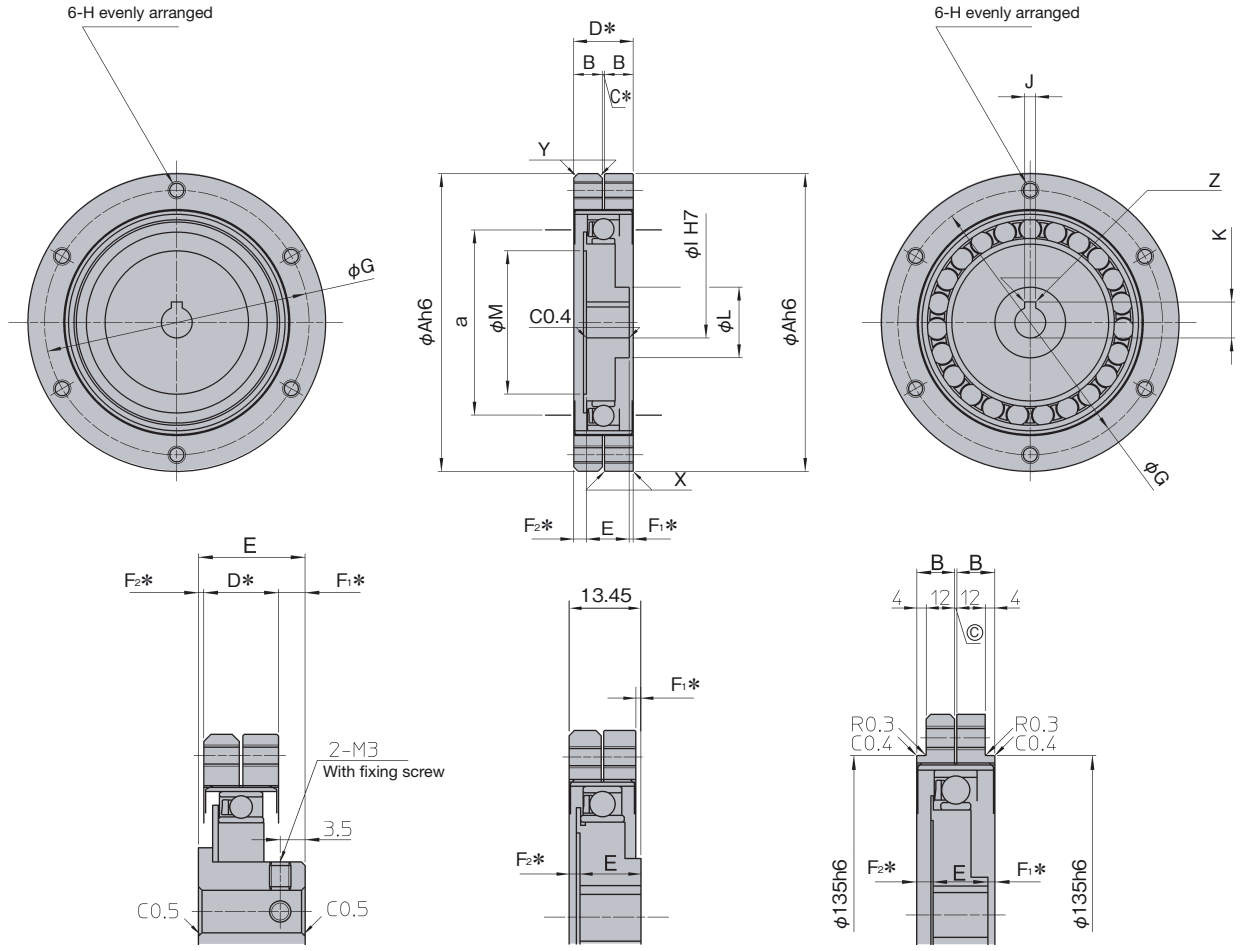
Model	Reduction ratio	Rated torque at input 2000rpm		Permissible peak torque at start/stop		Permissible max. value of ave. load torque		Instantaneous permissible max. torque		Rated input rotational speed	Permissible max. input rotational speed (rpm)		Permissible ave. input rotational speed (rpm)		Inertia moment	
		Nm	kgfm	Nm	kgfm	Nm	kgfm	Nm	kgfm	rpm	Oil lubricant	Grease lubricant	Oil lubricant	Grease lubricant	I $\times10^{-4}$kgm^2	J $\times10^{-3}$kgfms^2
14	50	2.6	0.27	3.2	0.33	3.2	0.33	6.9	0.7	2000	6000	3600	4000	2500	0.033	0.034
	88	4.9	0.5	7.8	0.8	7.8	0.8	15.7	1.6*							
	100	5.9	0.6	9.8	1.0	9.8	1.0	15.7	1.6*							
	110	5.9	0.6	9.8	1.0	9.8	1.0	15.7	1.6*							
20	50	14	1.4	18	1.8	18	1.8	34	3.5	2000	6000	3600	3600	2500	0.135	0.138
	80	17	1.7	21	2.1	21	2.1	35	3.6							
	100	22	2.2	26	2.7	25	2.5	47	4.8							
	128	24	2.4	33	3.4	25	2.5	58	5.9							
	160	24	2.4	38	3.9	25	2.5	59	6.0*							
25	50	23	2.3	30	3.1	30	3.1	54	5.5	2000	5000	3600	3000	2500	0.36	0.37
	80	31	3.2	39	4.0	39	4.0	70	7.1							
	100	39	4.0	52	5.3	52	5.3	91	9.3							
	120	39	4.0	61	6.2	61	6.2	94	9.6*							
	160	39	4.0	76	7.8	61	6.2	86	8.8*							
32	50	44	4.5	60	6.1	60	6.1	108	11	2000	4500	3600	2500	2300	1.29	1.32
	78	63	6.4	75	7.7	75	7.7	127	13							
	100	82	8.4	98	10	98	10	176	18							
	131	82	8.4	137	14	118	12	235	24*							
	157	82	8.4	157	16	118	12	235	24*							
40	50	88	9	118	12	118	12	216	22	2000	4000	3300	2000	2000	3.38	3.45
	80	118	12	147	15	147	15	265	27							
	100	157	16	186	19	186	19	343	35							
	128	167	17	235	24	235	24	372	38*							
	160	167	17	284	29	274	28	353	38*							
50	80	216	22	265	27	265	27	480	49	1700	3500	3000	1700	1700	9.9	10
	100	284	29	253	36	353	36	627	64							
	120	304	31	421	43	421	43	706	72*							
	160	304	31	510	52	490	50	666	68*							

* The value of asterisk is limited by ratcheting torque.

(Note) 1. Inertia moment: $I=\frac{1}{4}GD^2$

Outline drawing

Fig. 4-1



HDUF/FB-14 HDUF/FB-20 HDUF/FB-50

* The allowance varies depending on the part manufacturing method (cast or machined products). Contact us if the allowance is not described in the dimensions and is required.

Measurement table

Table 4-2
Unit: mm

Symbol \ Model		14	20	25	32	40	50
ϕA(g7)		50	70	85	110	135	170
B		5	6	8	10	13	16
C*		0.5	0.5	0.5	0.5	1.0	1.0
D*		10.5	12.5	16.5	20.5	27	33
E $^{0}_{-0.1}$		15.0	11.4	12.8	15.6	19.4	23.2
F₁*		3.75	0.95	0.35	0.95	1.8	2.9
F₂*		0.75	2.05	3.35	3.95	5.8	6.9
ϕG		44	60	75	100	120	150
H		M3	M4	M5	M6	M8	M10
ϕI(H7)	Standard	6	9	14	14	14	19
	Max. size	8	12	15	15	20	20
J(Js9)		—	3	5	5	5	6
K $^{+0.1}_{0}$		—	10.4	16.3	16.3	16.3	21.8
ϕL		14	20	26	26	32	32
ϕM		—	31.5	41	52	65	80
X		C0.2	C0.2	C0.2	C0.2	C0.4	C0.4
Y		C1.0	C1.0	C1.5	C1.5	C2.0	C2.0
Z		—	R0.08~0.16	R0.16~0.25	R0.16~0.25	R0.16~0.25	R0.16~0.25
a		29	42	53	69	84	105
Mass (kgf)		0.1	0.3	0.5	1.0	1.8	2.9

(Note) For Circular spline D, the outer circumference is Size Y.

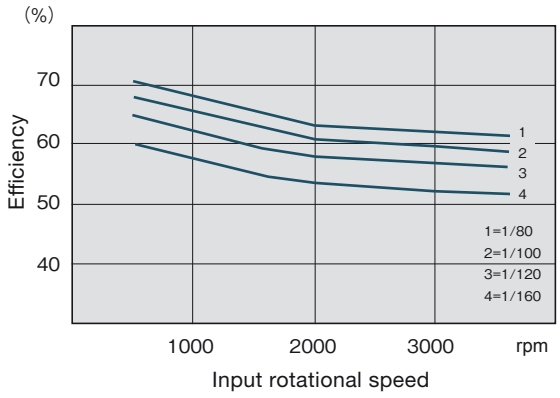
- The C, D and F₁ and F₂ sizes indicated by an asterisk are the mounting positions in the shaft direction and allowance of the three parts (wave generator, flexspline, circular spline) comprising HarmonicDrive®. Strictly observe these sizes as they affect the performance and intensity.
- Four parts (wave generator, flexspline, circular spline D, circular spline S) are not assembled when the product is delivered.

Efficiency characteristics

Efficiency varies depending on the reduction ratio and is subject to the input rotational speed, load torque and oil temperature. It looks like graph 5-1 when the product is operated at 100% of the rated load in the catalog at 40ºC.

(Note) The efficiency is increased by about 10% for the grease lubrication.

Graph 5-1



No-load running torque, starting torque, backdriving starting torque

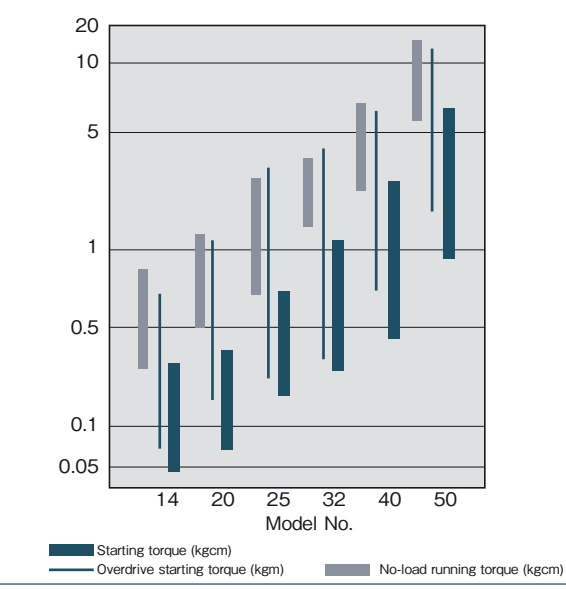
Graph 5-2 shows the result of measurement when the component has been built in as the double shaft-type reducer. The values include frictional resistance due to the oil seal of the input and output shaft, and oil bath-type lubrication.

1. No-load running torque .....This is the torque on the high-speed shaft required for rotation in a no-load condition. The value in the graph indicates the condition when the input rotational speed is 1500 rpm and the oil temperature is about 40ºC.

2. Starting torque .....This is the static torque required to start the high-speed shaft in a no-load condition.

3. Backdriving starting torque.. This is the static torque required to start the low-speed shaft in a no-load condition.

Graph 5-2



Lost motion and the spring constant

Lost motion and the spring constant of the pancake type is the value when the wave generator and one of the circular splines is fixed and when a torque is applied to the other circular spline.

Table 5-3

Model No.	Lost motion (arc min)		Spring constant (kgm/min)	
	± Load (kgm)	Standard product	Load (kgm)	Spring constant
14	0.04	41.0	0.8	0.05
20	0.12	40.0	2.5	0.35
25	0.23	37.0	4.0	0.50
32	0.46	35.0	10	1.2
40	0.92	33.0	16	2.1
50	1.73	29.0	30	4.4

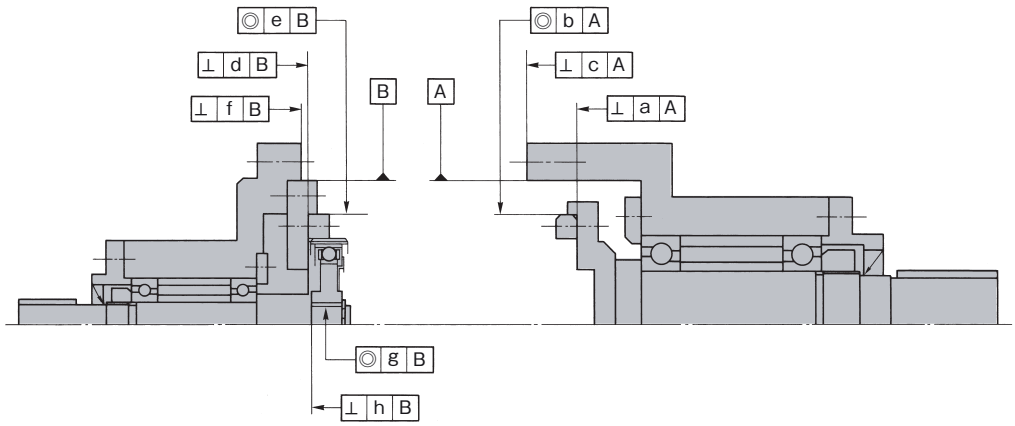
Design guide

Installation precision

Maintain the recommended precision shown in figure 6-1 and table 6-2 to fully bring out the excellent performance of HarmonicDrive® for assembled design.

Recommended precision for assembly

Fig. 6-1



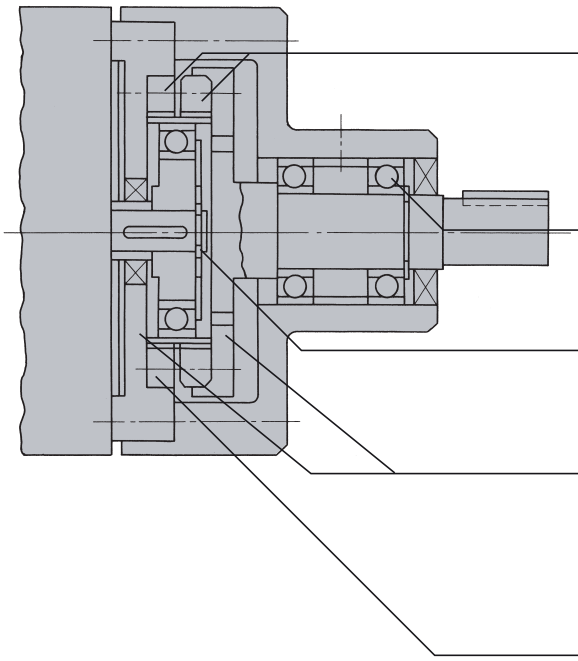
Recommended precision for assembly

Table 6-2
Unit: mm

Symbol \ Model	14	20	25	32	40	50
a	0.013	0.017	0.024	0.026	0.026	0.028
b	0.015	0.016	0.016	0.017	0.019	0.024
c	0.016	0.020	0.029	0.031	0.031	0.034
d	0.013	0.017	0.024	0.026	0.026	0.028
e	0.015	0.016	0.016	0.017	0.019	0.024
f	0.016	0.020	0.029	0.031	0.031	0.034
g	0.011	0.013	0.016	0.016	0.017	0.021
h	0.007	0.010	0.012	0.012	0.012	0.015

Precautions on installation

Fig. 6-3



Installation dimension precision

The concentricity and verticality against the input shaft hole of both the circular spline and the wave generator shall be as follows.
Concentricity: 0.03mm (T, I, R)
Verticality: 0.05/100

Roller bearing

The input shaft and the output shaft shall be supported by two points with an appropriate roller bearing distance and structure to bear all the radial load and thrust load applied to the shaft.

Shaft direction stop

As a slight thrust load is generated on the wave generator, movement in the shaft direction must be stopped.

Shaft direction stop of the flexspline

As the flexspline is disposed to move to the circular spline S side or D side during operation, a stopper should be set to prevent the flexspline from leaning. Recommended material and hardness for a stopper S45C, H_B=260 to 290 (HRC 26.4 to 29.8)

Fixing the circular spline (for oil lubrication)

Fix circular spline S. As circular spline D does not have relative rotation for the flexspline, it should be noted that the flexspline does not rotate and may not be fully lubricated if the circular spline is fixed.

Lubrication

There are two types of lubrication; oil lubrication and grease lubrication. Although oil lubrication is common, grease lubrication is applicable to intermittent operation.

■ Oil lubrication

1. Types of lubricant

Mineral oil CLP 68 (ISO VG 68) according to DIN 51517 T3.

2. Oil quantity

The oil level shall be the position shown in Table 7-2. Take action to increase the oil quantity as less oil can deteriorate the oil earlier.

Fig. 7-1

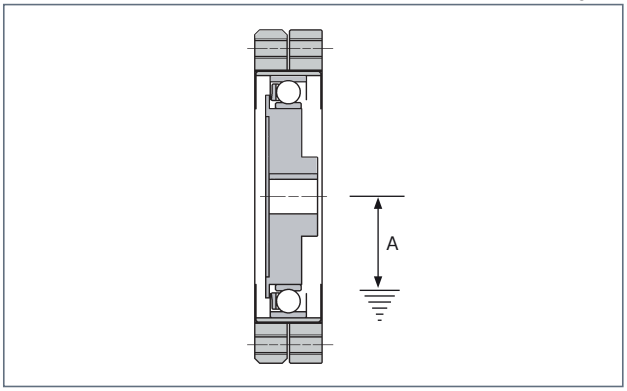


Table 7-2
Oil level position
Unit: mm

Model	14	20	25	32	40	50
A	7	12	15	19	24	29

3. Replacement of oil

First time ····· 100 hours after starting operation
Second time and after ····· Every 1000 operation hours or every 6 months

Note that you should replace the oil earlier than specified if the operating condition is demanding.

■ Grease lubrication

Different from oil lubrication, as a cooling effect is not expected from grease lubrication, it is only available for short operation.

- Operating condition: ED% ·· 10% or less, continuous operation for 10 minutes or less, the maximum permissible input rotational speed in Table 3-1 or less
- Recommended grease: ····· Harmonic grease SK-1A for model numbers 20 to 100
  Harmonic grease SK-2 for model number 14

(Note) If you use the product over ED% or the maximum permissible rotational speed, the grease will deteriorate, will not work as a lubricating mechanism and will result in damaging the reducer earlier. Extreme care should be taken.