

DATORKER® Robot Reducer

Technical Information





Multi-Axis Robot

- Pick-and-Place / Assembly / Array and Packaging / Semiconductor / Electro-Optical Industry / Automotive Industry / Food Industry
- Articulated Robot
 - Delta Robot
 - SCARA Robot
 - Wafer Robot
 - Electric Gripper
 - Integrated Electric Gripper
 - Rotary Joint



Single-Axis Robot

- Precision / Semiconductor / Medical / FPD
- KK, SK
 - KS, KA
 - KU, KE, KC



Torque Motor

Rotary Table

- Medical / Automotive Industry / Machine Tools / Machinery Industry
- RAB Series
 - RAS Series
 - RCV Series
 - RCH Series



Ballscrew

- Precision Ground / Rolled
- Super S Series
 - Super T Series
 - Mini Roller
 - Ecological & Economical Lubrication Module E2
 - Rotating Nut (R1)
 - Energy-Saving & Thermal-Controlling (Cool Type)
 - Heavy Load Series (RD)
 - Ball Spline



Linear Guideway

- Automation / Semiconductor / Medical
- Ball Type--HG, EG, WE, MG, CG
 - Quiet Type--QH, QE, QW, QR
 - Other--RG, E2, PG, SE, RC



Bearing

- Machine Tools / Robot
- Crossed Roller Bearing
 - Ballscrew Bearing
 - Linear Bearing
 - Support Unit



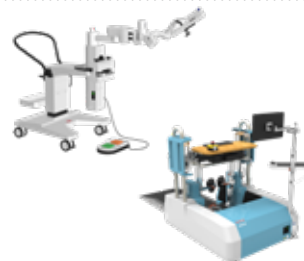
DATORKER® Robot Reducer

- Robot / Automation Equipment / Semiconductor Equipment / Machine Tools
- WUT-PO Type
 - WUI-CO Type
 - WTI-PH Type
 - WTI-AH Type



AC Servo Motor & Drive

- Semiconductor / Packaging Machine / SMT / Food Industry / LCD
- Drives--D1, D1-N, D2T/D2T-LM
 - Motors--50W-2000W



Medical Equipment

- Hospital / Rehabilitation Centers / Nursing Homes
- Robotic Gait Training System
 - Robotic Endoscope Holder



Linear Motor

- Automated Transport / AOI Application / Precision / Semiconductor
- Iron-core Linear Motor
 - Coreless Linear Motor
 - Linear Turbo Motor LMT
 - Planar Servo Motor
 - Air Bearing Platform
 - X-Y Stage
 - Gantry Systems



Torque Motor & Direct Drive Motor

- Machine Tools
- Torque Motor--TMRW Series
- Inspection / Testing Equipment / Robot
- Direct Drive Motor--DMS, DMY, DMN Series

DATORKER® Robot Reducer

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Preface

DATORKER® – Robot Reducer has the characteristics of high precision, high efficiency, high torsional rigidity and low starting torque. It is widely used in robots, automation equipment, semiconductor equipment, machine tools and other industries.

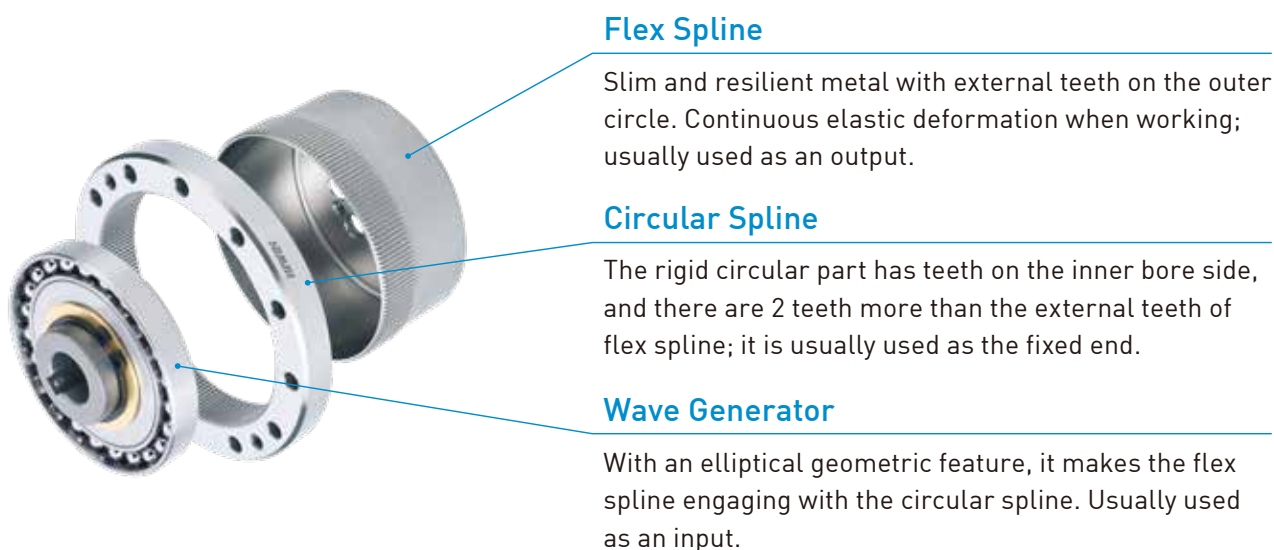
HIWIN has developed various specifications and reduction ratios to provide customers with wide range of choice. HIWIN is able to provide customized services to meet customers' various design and requirement.

1. Basic information

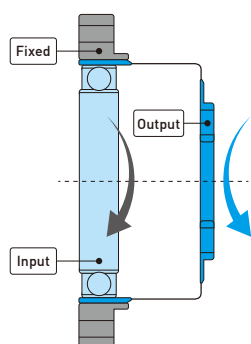
1-1 Features

- Compact and light weight – Easy for user to assemble and work with.
- High accuracy – Provides stable repeatability and positioning.
- Customization – Can be customized according to requirements.
- High torque – Widely used in automation and inspection equipment.
- Wide reduction ratio – Various choices available under same model.

1-2 Structure



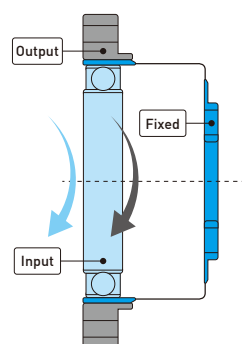
Reduction ratio and rotation direction



Input and Output with reverse direction rotation

$$\text{Reduction ratio} = \frac{-1}{R}$$

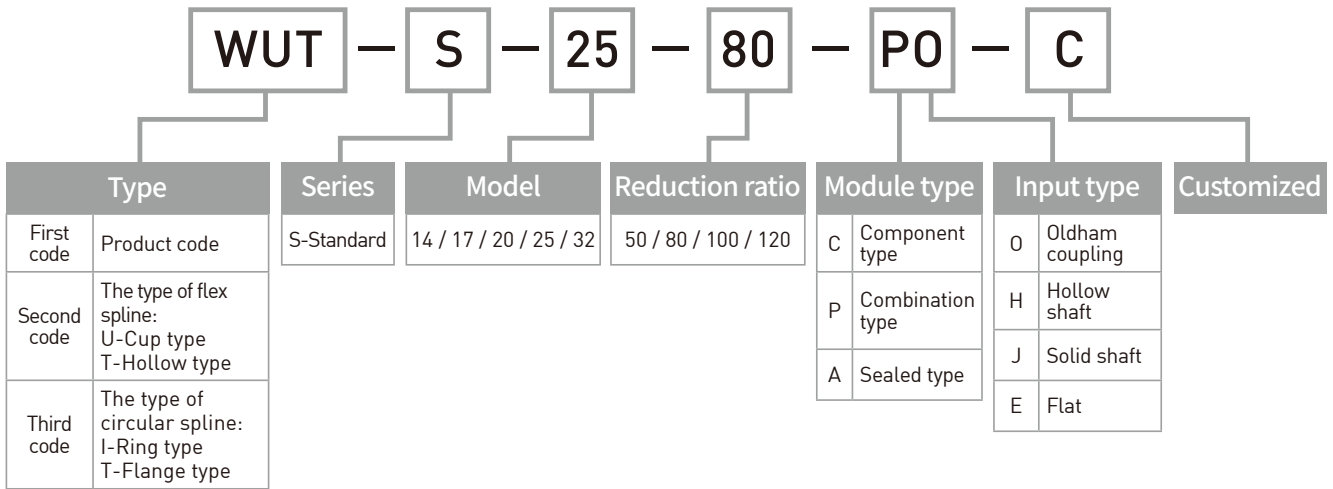
(R = No. of external teeth ÷ difference between no. of external and internal teeth)



Input and Output with the same direction rotation

$$\text{Reduction ratio} = \frac{1}{R+1}$$

1-3 Specification



1-4 Type / Function

WUT Type



Oldham Combination Type (P0)

- Input shaft self-aligning.
- Withstand axial and radial load.

WUI Type



Oldham Component Type (C0)

- Input shaft self-aligning.
- Self-assembly of parts required.

WTI Type



Hollow Combination Type (PH)

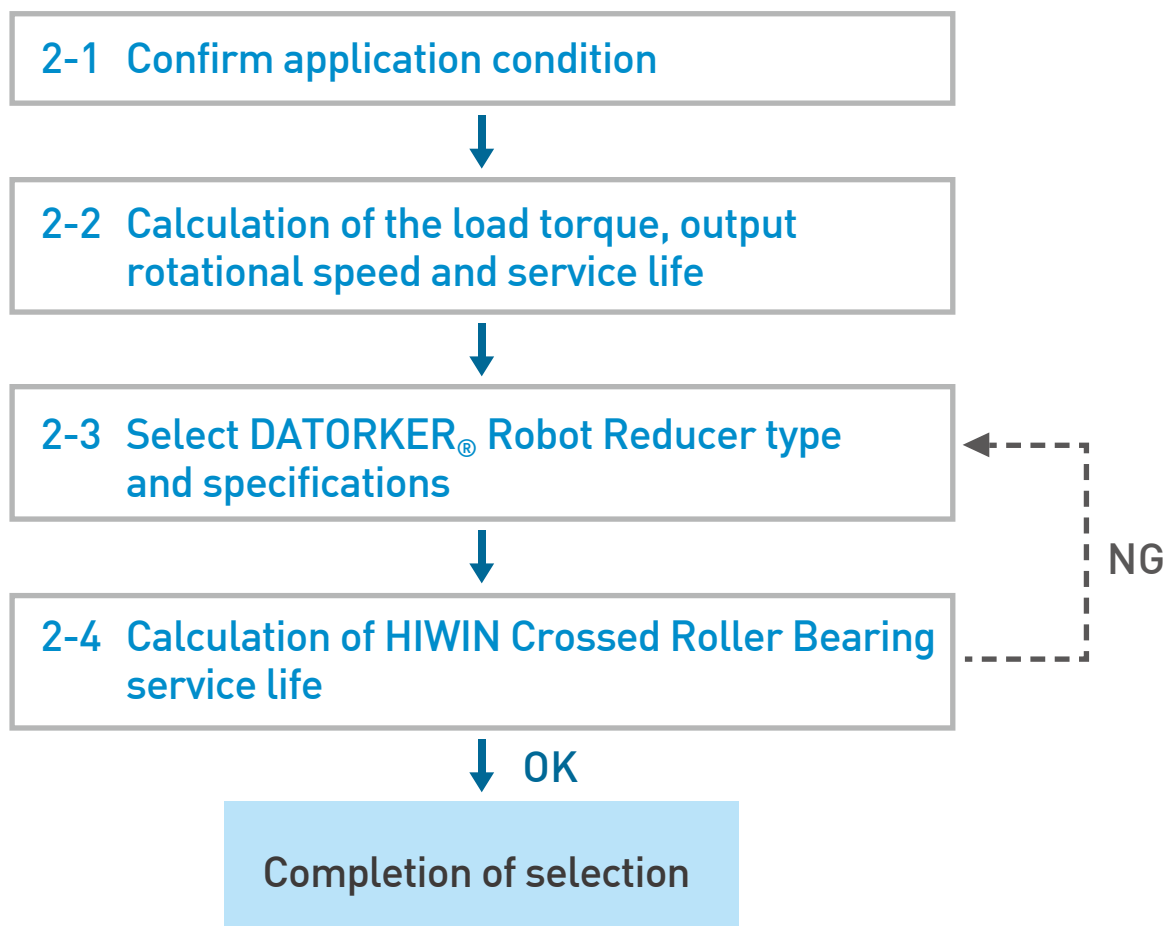
- Input hollow shaft design.
- Withstand axial and radial load.



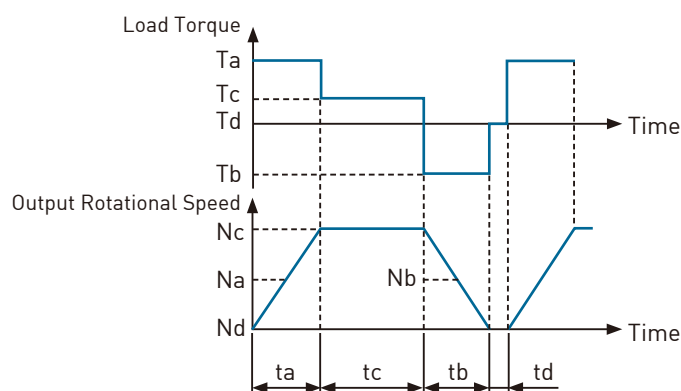
Hollow Sealed Type (AH)

- Input hollow shaft design.
- Withstand axial and radial load.
- Completely sealed design.
- User friendly design.

2. Selection Procedure

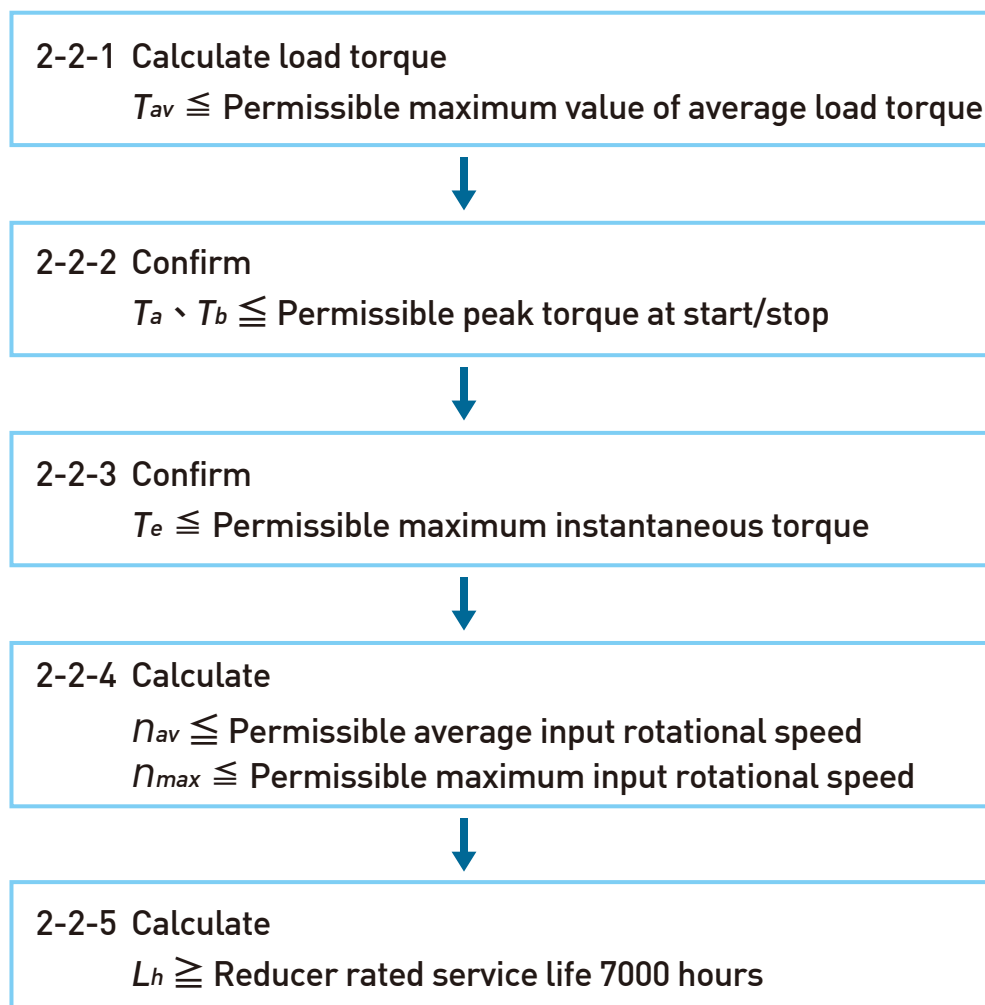


2-1 Confirm application condition



Model	Item	Load Torque	Time	Output Rotational Speed	Maximum Output Rotational Speed	Maximum Input Rotational Speed
	Start Time (Acceleration)	T_a	t_a	N_a	N_{max}	n_{max}
	Operation Time (Constant)	T_c	t_c	N_c		
	Stop Time (Deceleration)	T_b	t_b	N_b		
	Break Time	T_d	t_d	N_d		
	Impact	T_e	t_e	N_e		

2-2 Calculation of load torque, rotational speed and service life



2-2-1 Permissible maximum value of average load torque

When the input rotational speed or load torque changes, please calculate the average load torque and confirm whether it meets the rated performance table values of each specification. Please pay attention that if the value exceeds the catalog value, it may cause premature lubricant deterioration and abnormal gear wear due to heat.

Calculate average load torque
$$T_{av} = \sqrt[3]{\frac{N_1 t_1 |T_1|^3 + N_2 t_2 |T_2|^3 + \dots + N_n t_n |T_n|^3}{N_1 t_1 + N_2 t_2 + \dots + N_n t_n}}$$

2-2-2 Permissible peak torque at start/stop

During start and stop, due to the moment of inertia of the load, a load greater than the average torque will act on the reducer.

2-2-3 Permissible maximum instantaneous torque

The maximum allowable load torque when an impact occurs.

2-2-4 Permissible average input rotational speed & Permissible maximum input rotational speed

When setting the operating conditions of the reducer, do not exceed the values indicated in the rated performance table.

Calculate average output rotational speed $N_{av} = \frac{N_1 t_1 + N_2 t_2 + \dots + N_n t_n}{t_1 + t_2 + \dots + t_n}$

Calculate average input rotational speed $n_{av} = N_{av} \times R$

Calculate maximum input rotational speed $n_{max} = N_{max} \times R$

R is Reduction Ratio

2-2-5 Reducer rated service life

The operating service life of the reducer depends on the flex bearing of the wave generator. The nominal service life of the wave generator is 7000 hours. The calculation formula is as follows:

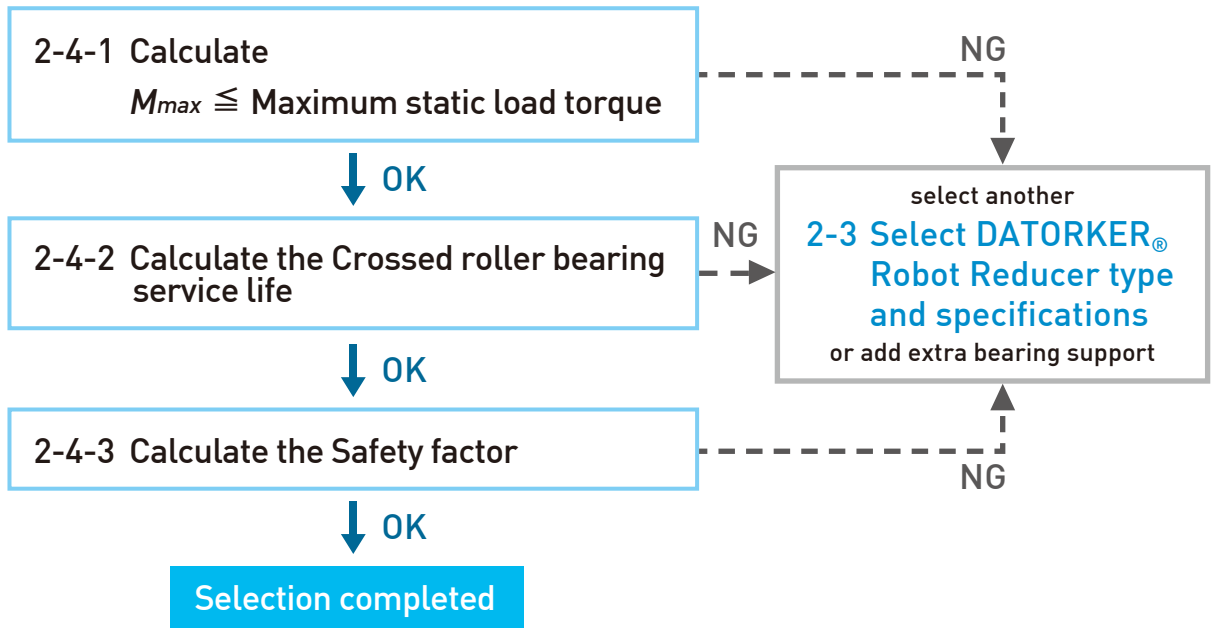
Calculate service life $L_h = 7000 \times \left(\frac{T_r}{T_{av}}\right)^3 \times \left(\frac{n_r}{n_{av}}\right)$

T_r is Rated torque, n_r is Rated rotational speed

2-3 DATORKER® type and specification selection

Select the DATORKER® model according to the operation requirements, and check the Rated performance table of each unit according to the calculation results from the previous step, to confirm if the selected model specifications will meet the application. If the reducer is installed with a crossed roller bearing, please proceed to the next step and calculate the service life of the crossed roller bearing.

2-4 Calculation of the Crossed Roller Bearing service life

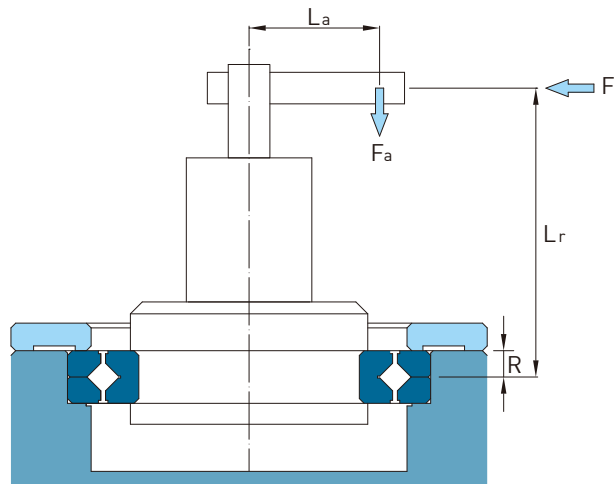


2-4-1 Maximum static load moment

The crossed roller bearing can withstand the maximum radial and maximum axial load.

Calculate maximum static load moment $M_{max} = Fr_{max} \times L_r + Fa_{max} \times L_a$

Fr is radial load, Fa is axial load



2-4-2 Calculation for Service life of Crossed roller bearings

Calculate basic service life $L = \left(\frac{C}{F_W \times P} \right)^{\frac{10}{3}}$

P is dynamic equivalent load, C is basic dynamic load rating, F_W is load factor.

Load condition	Load factor (Fw)
No impact / vibration	1 ~ 1.2
Normal	1.2 ~ 1.5
With impact & vibration	1.5 ~ 3

Calculate dynamic equivalent load $P = X \left(F_r + \frac{2M}{D_{pw}} \right) + YF_a$

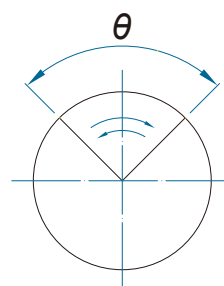
where $\frac{F_a}{F_r + 2M/D_{pw}} \leq 1.5$ for $X=1$ 、 $Y=0.45$ ° where $\frac{F_a}{F_r + 2M/D_{pw}} \geq 1.5$ for $X=0.67$ 、 $Y=0.67$ °

M is Torque, D_{pw} is pitch circle diameter

In a reciprocating oscillation application, please calculate according to the following formula

Calculate service life of oscillating $L_{oc} = \frac{180^\circ}{\theta} \times L$

θ is the angle of the oscillating



2-4-3 Calculate the Safety factor

The safety factor is determined by the basic static load rating and the static equivalent load, as follows :

Calculate Safety factor $f_s = \frac{C_o}{P_o}$

P_o is static equivalent load, C_o is basic static load rating.

Operation condition	Safety factor (f _s)
Standard operation	≥ 1.5
Bearing with vibrating load	≥ 2
High rotational speed and high accuracy	≥ 3

* The above table shows the lower limit of the static safety factor. If it is a dynamic situation, it is recommended to safety factor of 7 or more.

Calculate basic static equivalent load

$$P_o = F_r + \frac{2M}{D_{pw}} + 0.44F_a$$

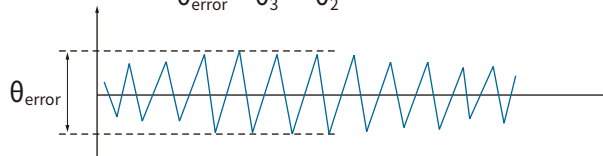
3. Definition

3-1 Angle Transmission Accuracy

When any rotation angle (θ_1) is input, the difference in the value (θ_{error}) between the theoretical output rotation angle (θ_2) and the actual output rotation angle (θ_3) is the angle transmission accuracy.

$$\theta_2 = \frac{\theta_1}{\text{reduction ratio}}$$

$$\theta_{error} = \theta_3 - \theta_2$$



3-2 Starting Torque

The maximum torque value required under no-load conditions, when the input (high speed) applies torque and the output (low speed) starts to operate.

3-3 Reversed Starting Torque

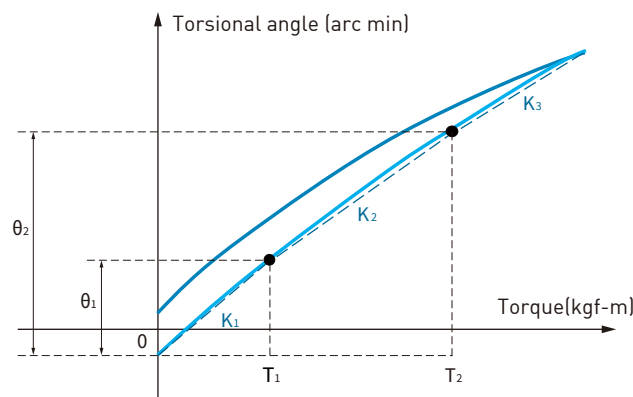
The maximum Torque value required under no-load conditions, when the output (low speed) applies torque and the input (high speed) starts to operate.

3-4 Torsional Rigidity

It is defined as the fixed input (wave generator) and applies a torque to the output (flex spline) of the Robot Reducer. The ratio generated by torque and the torsion angle.

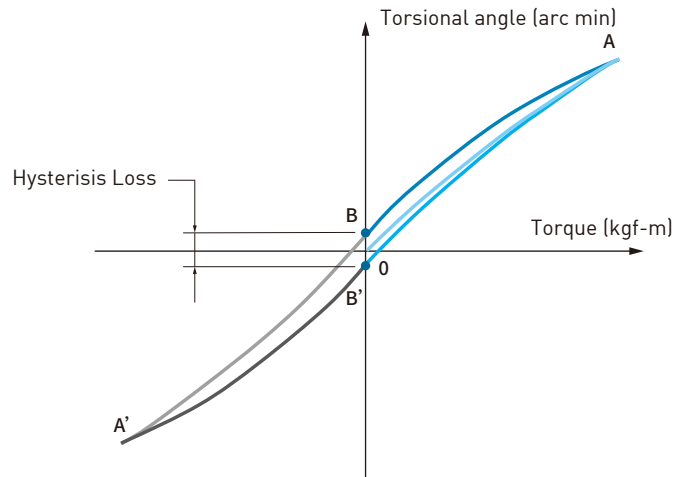
The slope of the "torque-torsion angle graph" is expressed as a spring constant. The "torque-torsion angle diagram" is divided into 3 parts, and the spring constant of each area is K_1 , K_2 and K_3 represent.

- K_1 refers to the spring constant from "0" to " T_1 "
- K_2 refers to the spring constant from " T_1 " to " T_2 "
- K_3 refers to the spring constant with a torque above " T_2 "



3-5 Hysteresis Loss

After the torque is applied to the rated value and return to "0", the torsion angle will not be completely "0", and will have some displacement (B-B'), which is called hysteresis loss. The hysteresis loss is mainly caused by internal friction. When the torque is extremely small, it is almost non-existent.



3-6 Maximum Backlash

In a mechanical system, the maximum displacement or amount of rotation or rotation of another part in a certain direction while maintaining one part stationary. The backlash of the HIWIN DATORKER® gear engage part is suppressed to "0". The source of the maximum backlash is caused by the gap between the Oldham coupling and the wave generator.

4. Product Series

4-1 WUT-PO Type

4-1-1 Technical data

Table 4-1-1 Rating table

Item Model	Reduction Ratio	Rated torque at input 2000r/min ※1		Peak torque at start/stop※2		Permissible maximum value of average load torque※3		Instantaneous permissible max. torque※4		Permissible maximum input speed	Permissible average input speed
		Nm	kgfm	Nm	kgfm	Nm	kgfm	Nm	kgfm	r/min	r/min
14	50	5.4	0.55	18	1.8	6.9	0.7	35	3.6	8500	3500
	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	50	16	1.6	34	3.5	26	2.6	70	7.1	7300	3500
	80	22	2.2	43	4.4	27	2.7	87	8.9		
	100	24	2.4	54	5.5	39	4	108	11		
	120	24	2.4	54	5.5	39	4	86	8.8		
20	50	25	2.5	56	5.7	34	3.5	98	10	6500	3500
	80	34	3.5	74	7.5	47	4.8	127	13		
	100	40	4.1	82	8.4	49	5	147	15		
	120	40	4.1	87	8.9	49	5	147	15		
25	50	39	4.0	98	10	55	5.6	186	19	5600	3500
	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		
32	50	76	7.8	216	22	108	11	382	39	4800	3500
	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		

※1 Permissible rated torque

※2 Permissible maximum torque

※3 Permissible average torque

※4 Permissible maximum value of impact

Table 4-1-2 Crossed roller bearing specifications

Item Model	Pitch circle diameter of roller	Offset amount	Basic load ratings				Permissible moment load		Moment rigidity	
	Dpw	R	Dynamic load C		Static load Co		Nm	kgfm	×10 ⁴ Nm/rad	kgfm/arc min
	m	m	kN	kgf	kN	kgf				
14	0.035	0.0095	4.7	480	6.1	620	41	4.2	4.38	1.3
17	0.0425	0.0095	5.3	540	7.6	770	64	6.5	7.75	2.3
20	0.05	0.0095	5.8	590	9.0	920	91	9.3	12.8	3.8
25	0.062	0.0115	9.6	980	15.1	1540	156	16	24.2	7.2
32	0.08	0.013	15.0	1530	25.0	2550	313	32	53.9	16

Table 4-1-3 Angle Transmission Accuracy

Reduction Ratio		Model	14	17	20	25	32
50 up	$\times 10^{-4}$ rad		4.4	4.4	2.9	2.9	2.9
	arc min		1.5	1.5	1	1	1

Table 4-1-4 Hysteresis Loss

Reduction Ratio		Model	14	17	20	25	32
50	$\times 10^{-4}$ rad		5.8	5.8	5.8	5.8	5.8
	arc min		2.0	2.0	2.0	2.0	2.0
80 up	$\times 10^{-4}$ rad		2.9	2.9	2.9	2.9	2.9
	arc min		1.0	1.0	1.0	1.0	1.0

Table 4-1-5 Maximum Backlash

Reduction Ratio		Model	14	17	20	25	32
50	$\times 10^{-5}$ rad		17.5	9.7	8.2	8.2	6.8
	arc sec		36	20	17	17	14
80	$\times 10^{-5}$ rad		11.2	6.3	5.3	5.3	4.4
	arc sec		23	13	11	11	9
100	$\times 10^{-5}$ rad		8.7	4.8	4.4	4.4	3.4
	arc sec		18	10	9	9	7
120	$\times 10^{-5}$ rad		—	3.9	3.9	3.9	2.9
	arc sec		—	8	8	8	6

Table 4-1-6 Starting Torque

Unit : cNm

Reduction Ratio		Model	14	17	20	25	32
50			4.1	6.1	7.8	15	31
80			2.8	4	4.9	9.2	19
100			2.5	3.4	4.3	8	18
120			—	3.1	3.8	7.3	15

Note : The values in this table will vary depending on the working conditions and are for reference only. The upper limit is 20% above the value in this table.

Table 4-1-7 Reversed Starting Torque

Unit : Nm

Reduction Ratio \ Model	14	17	20	25	32
50	1.6	3	4.7	9	18
80	1.6	3	4.8	9.1	19
100	1.8	3.3	5.1	9.8	20
120	—	3.5	5.5	11	22

Note : The values in this table will vary depending on the working conditions and are for reference only. The upper limit is 20% above the value in this table.

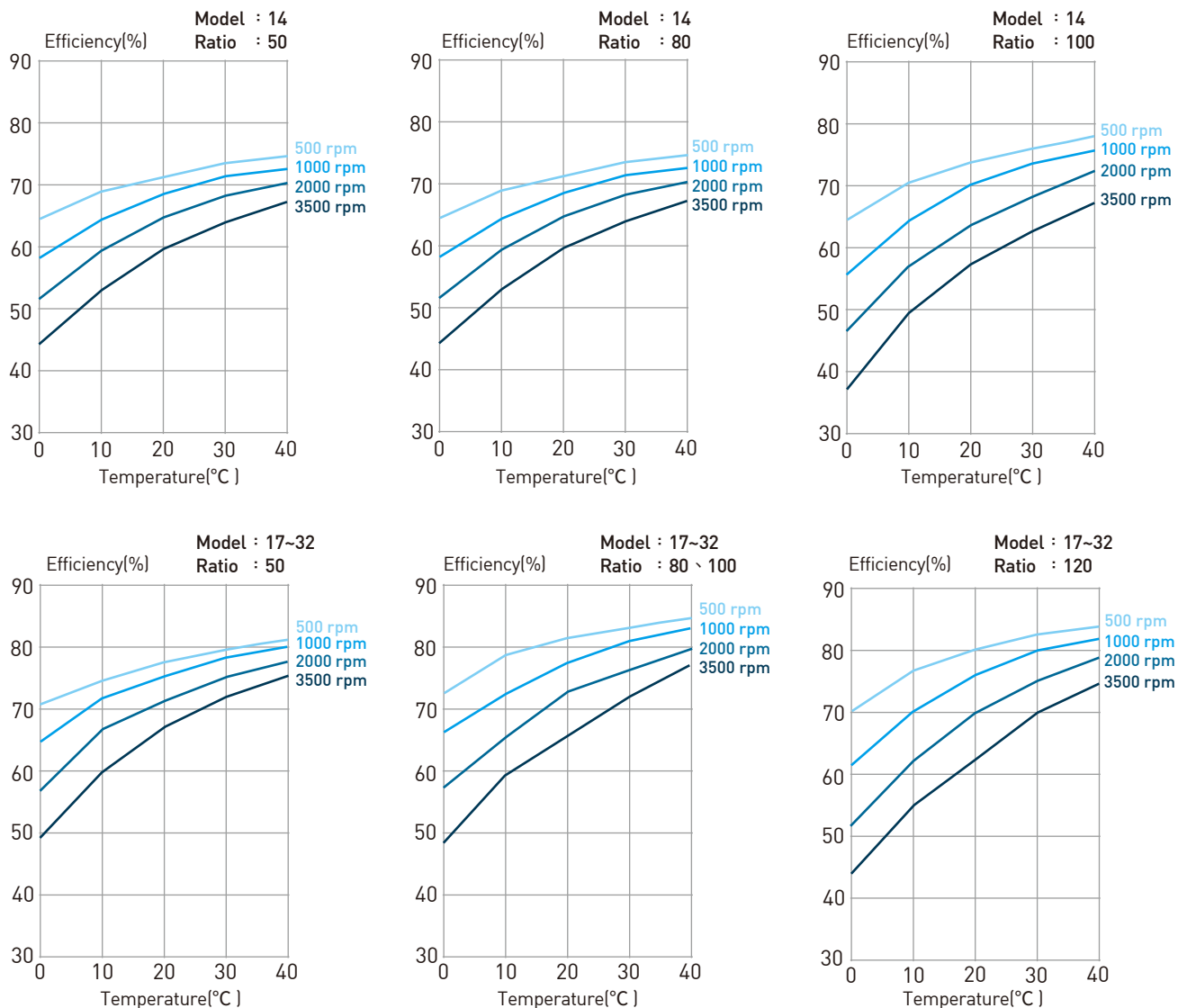
Table 4-1-8 Torsional Rigidity

Reduction Ratio \ Model		14	17	20	25	32		
T ₁	Nm	2.0	3.9	7.0	14	29		
	kgfm	0.2	0.4	0.7	1.4	3.0		
T ₂	Nm	6.9	12	25	48	108		
	kgfm	0.7	1.2	2.5	4.9	11		
50	K ₁	× 10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4	
		kgfm/arc min	0.1	0.24	0.38	0.74	1.6	
	K ₂	× 10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8	
		kgfm/arc min	0.14	0.32	0.52	1.0	2.3	
	K ₃	× 10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8	
		kgfm/arc min	0.17	0.4	0.67	1.3	2.9	
	θ ₁	× 10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5	
		arc min	2.0	1.7	1.8	1.9	1.9	
	θ ₂	× 10 ⁻⁴ rad	16	12	15.4	15.7	15.7	
		arc min	5.6	4.2	5.3	5.4	5.4	
	80 up	K ₁	× 10 ⁴ Nm/rad	0.47	1	1.6	3.1	6.7
			kgfm/arc min	0.14	0.3	0.47	0.92	2.0
K ₂		× 10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11	
		kgfm/arc min	0.18	0.4	0.75	1.5	3.2	
K ₃		× 10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12	
		kgfm/arc min	0.21	0.46	0.85	1.7	3.7	
θ ₁		× 10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4	
		arc min	1.4	1.3	1.5	1.5	1.5	
θ ₂		× 10 ⁻⁴ rad	12	9.7	11.3	11.1	11.6	
		arc min	4.2	3.3	3.9	3.8	4.0	

Note : The values are for reference only. The lower limit is 20% under the value in this table.

4-1-2 Efficiency E_R

DATORKER® efficiency would change by specification , ratio , operating conditions (speed/loading) and lubrication (lubricant type/quantity) .

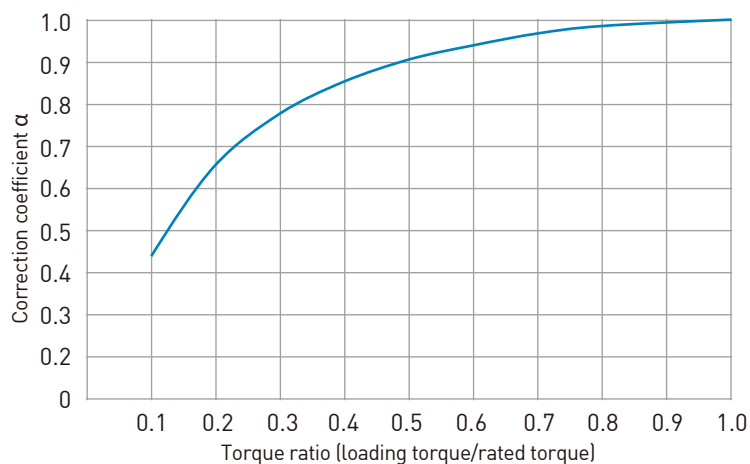


Efficiency correction coefficient α

$$\text{Efficiency} = \alpha \times E_R$$

α is correction coefficient

E_R is efficiency at the rated torque



4-1-3 No-load operating torque

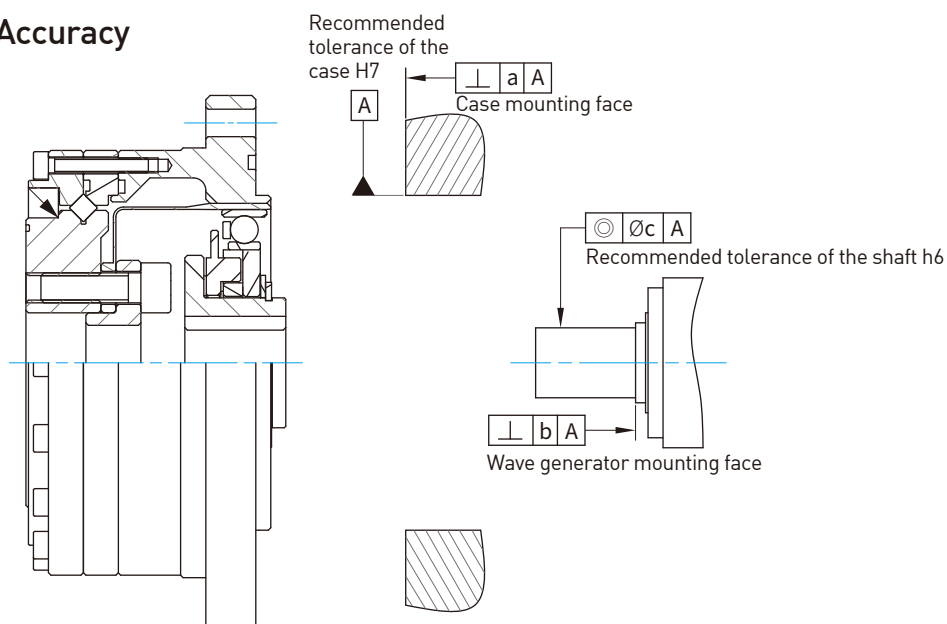
The torque necessary to drive the DATORKER® input (high-speed end) after running in at an input speed of 2000r/min under an average ambient temperature of 25° C without load for more than 2 hours.

Unit: cNm

Reduction Ratio	Input rotational speed	Model				
		14	17	20	25	32
50	500 r/min	3.2	5.1	7.3	12.8	26.1
	1000 r/min	3.9	6.1	9.1	17.8	33.1
	2000 r/min	4.6	7.6	11.8	21.8	44.1
	3500 r/min	5.9	9.6	12.7	28.8	57.1
80	500 r/min	2.3	3.8	5.5	9.7	20.3
	1000 r/min	3	4.8	7.3	14.7	27.3
	2000 r/min	3.7	6.3	10	18.7	38.3
	3500 r/min	5	8.3	10.9	25.7	51.3
100	500 r/min	2.1	3.5	5	9	19
	1000 r/min	2.8	4.5	6.8	14	26
	2000 r/min	3.5	6	9.5	18	37
	3500 r/min	4.8	8	10.4	25	50
120	500 r/min	-	3.3	4.7	8.5	18.1
	1000 r/min	-	4.3	6.5	13.5	25.1
	2000 r/min	-	5.8	9.2	17.5	36.1
	3500 r/min	-	7.8	10.1	24.5	17.2

Note : The values in this table will vary depending on the working conditions and are for reference only. The upper limit is 20% above the value in this table.

4-1-4 Installation Accuracy



Unit : mm

Mark	Model	14	17	20	25	32
a		0.011	0.015	0.017	0.024	0.026
b		0.017	0.020	0.020	0.024	0.024
		(0.008)	(0.010)	(0.010)	(0.012)	(0.012)
c		0.030	0.034	0.044	0.047	0.050
		(0.016)	(0.018)	(0.019)	(0.022)	(0.022)

Note: The value in () is the value of the wave generator (without oldham coupling).

4-1-5 Installation bolt tightening torque

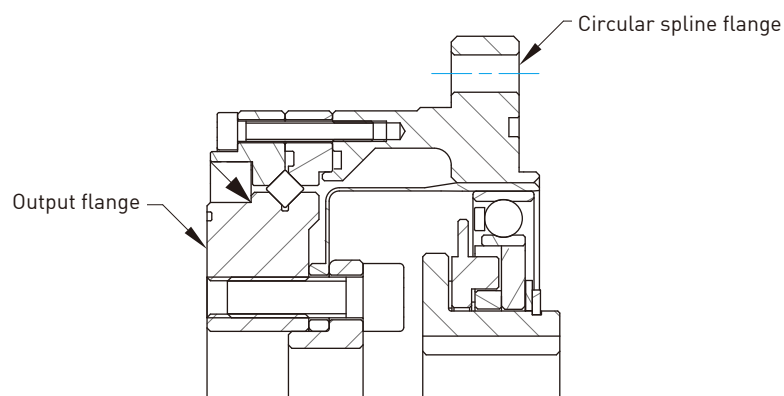


Table 4-1-9 Bolts tightening torque for Output flange

Item	Model	14	17	20	25	32
Number of bolts		6	6	8	8	8
Bolts size		M4	M5	M6	M8	M10
Installation of Bolts PCD	mm	23	27	32	42	55
Bolts tightening torque	Nm	4.5	9	15.3	37	74
	kgfm	0.46	0.92	1.56	3.8	7.6

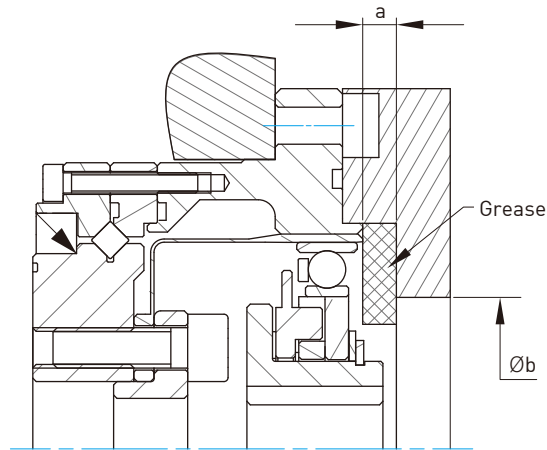
Table 4-1-10 Bolt tightening torque for Circular spline flange

Item \ Model		14	17	20	25	32
Number of bolts		6	6	6	8	12
Bolts size		M4	M4	M5	M5	M6
Installation of Bolts PCD	mm	65	71	82	96	125
	Nm	4.5	4.5	9.0	9.0	15.3
Bolts tightening torque	kgfm	0.46	0.46	0.92	0.92	1.56

Note : 1. Recommended tightening torques for the 12.9 DIN EN ISO 4762 fastening bolts DIN912 in accordance with VDI 2230 for $\mu K = \mu G = 0.125$
 2. Bolt-in depth at least 2 x thread diameter

4-1-6 Lubrication

Keep the space between the reducer and mounting flange as narrow as possible so that grease can be kept inside during operation.



Unit : mm

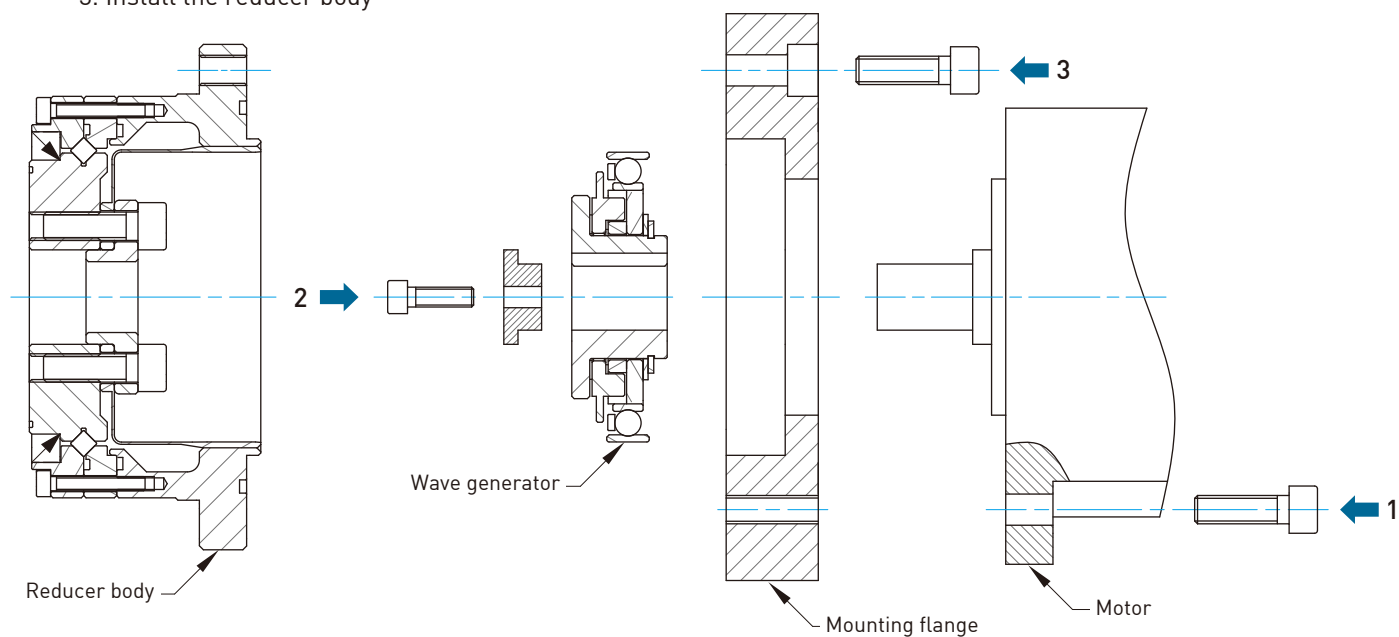
Item \ Model		14	17	20	25	32
a ※1		1	1	1.5	1.5	1.5
a ※2		3	3	4.5	4.5	4.5
Øb		16	26	30	37	37

※1 Center shaft horizontal or vertical: when the wave generator is facing downward

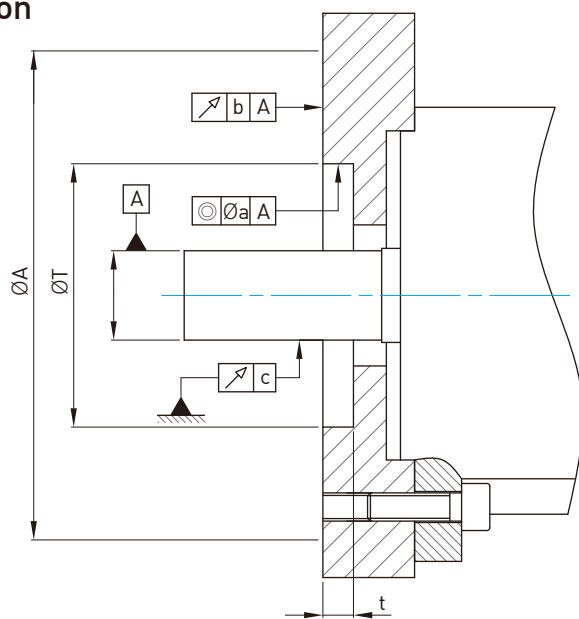
※2 Center shaft vertical: when the wave generator is facing upward

4-1-7 Installation procedure

1. Install the mounting flange on the motor mounting surface
2. Install the wave generator on the motor output shaft
3. Install the reducer body



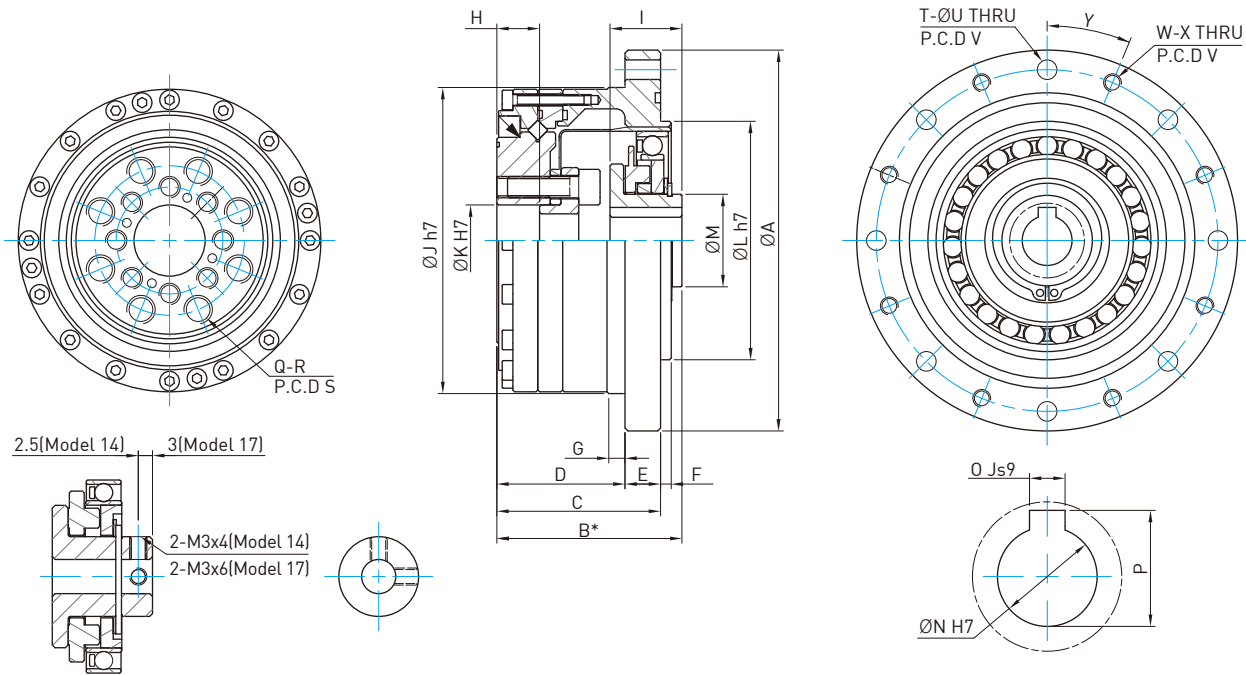
4-1-7 Motor installation



Unit : mm

Mark	Model	14	17	20	25	32
a		0.03	0.04	0.04	0.04	0.04
b		0.03	0.04	0.04	0.04	0.04
c		0.015	0.015	0.018	0.018	0.018
ØA		73	79	93	107	138
t		3	3	4.5	4.5	4.5
ØT		38H7	48H7	56H7	67H7	90H7

4-1-8 WUT-PO Type Size Chart



Mark	Model	14	17	20	25	32
ØA		73	79	93	107	138
B*		41 _{-0.9} ⁰	45 _{-0.9} ⁰	45.5 ₋₁ ⁰	52 ₋₁ ⁰	62 _{-1.1} ⁰
C		34	37	38	46	57
D		27	29	28	36	45
E		7	8	10	10	12
F		2	2	3	3	3
G		3.5	4	5	5	5
H		9.4	9.5	9	12	15
I		17.6 _{-0.1} ⁰	19.5 _{-0.1} ⁰	20.1 _{-0.1} ⁰	20.2 _{-0.1} ⁰	22 _{-0.1} ⁰
ØJ h7		56	63	72	86	113
ØK H7		11	10	14	20	26
ØL h7		38	48	56	67	90
ØM		14	18	21	26	26
ØN H7		6	8	12	14	14
O Js9		-	-	4	5	5
P		-	-	13.8 ₀ ^{+0.1}	16.3 ₀ ^{+0.1}	16.3 ₀ ^{+0.1}
Q		6	6	8	8	8
R		M4 x 8DP	M5 x 10DP	M6 x 9DP	M8 x 12DP	M10 x 15DP
S (P.C.D)		23	27	32	42	55
T		6	6	6	8	12
ØU		4.5	4.5	5.5	5.5	6.6
V (P.C.D)		65	71	82	96	125
W		6	6	6	8	12
X		M4	M4	M5	M5	M6
Y (Degree)		30°	30°	30°	22.5°	15°
Moment of Inertia (× 10 ⁻⁴ kgm ²)		0.033	0.079	0.193	0.413	1.69
Weight (kg)		0.52	0.68	0.98	1.5	3.2

*The dimension B is the fitting position and permissible tolerance in the axial direction.

4-2 WUI-CO Type

4-2-1 Technical data

Table 4-2-1 Rating table

Item Model	Reduction Ratio	Rated torque at input 2000r/min ※1		Peak torque at start/stop※2		Permissible maximum value of average load torque※3		Instantaneous permissible max. torque※4		Permissible maximum input speed r/min	Permissible average input speed r/min
		Nm	kgfm	Nm	kgfm	Nm	kgfm	Nm	kgfm		
14	50	5.4	0.55	18	1.8	6.9	0.7	35	3.6	8500	3500
	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	50	16	1.6	34	3.5	26	2.6	70	7.1	7300	3500
	80	22	2.2	43	4.4	27	2.7	87	8.9		
	100	24	2.4	54	5.5	39	4	108	11		
	120	24	2.4	54	5.5	39	4	86	8.8		
20	50	25	2.5	56	5.7	34	3.5	98	10	6500	3500
	80	34	3.5	74	7.5	47	4.8	127	13		
	100	40	4.1	82	8.4	49	5	147	15		
	120	40	4.1	87	8.9	49	5	147	15		
25	50	39	4.0	98	10	55	5.6	186	19	5600	3500
	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		
32	50	76	7.8	216	22	108	11	382	39	4800	3500
	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		

※1 Permissible rated torque

※2 Permissible maximum torque

※3 Permissible average torque

※4 Permissible maximum value of impact

Table 4-2-2 Angle Transmission Accuracy

Reduction Ratio \ Model		14	17	20	25	32
50 up	$\times 10^{-4}$ rad	4.4	4.4	2.9	2.9	2.9
	arc min	1.5	1.5	1	1	1

Table 4-2-3 Hysterisis Loss

Reduction Ratio \ Model		14	17	20	25	32
50	$\times 10^{-4}$ rad	5.8	5.8	5.8	5.8	5.8
	arc min	2.0	2.0	2.0	2.0	2.0
80 up	$\times 10^{-4}$ rad	2.9	2.9	2.9	2.9	2.9
	arc min	1.0	1.0	1.0	1.0	1.0

Table 4-2-4 Maximum Backlash

Reduction Ratio \ Model		14	17	20	25	32
50	$\times 10^{-5}$ rad	17.5	9.7	8.2	8.2	6.8
	arc sec	36	20	17	17	14
80	$\times 10^{-5}$ rad	11.2	6.3	5.3	5.3	4.4
	arc sec	23	13	11	11	9
100	$\times 10^{-5}$ rad	8.7	4.8	4.4	4.4	3.4
	arc sec	18	10	9	9	7
120	$\times 10^{-5}$ rad	—	3.9	3.9	3.9	2.9
	arc sec	—	8	8	8	6

Table 4-2-5 Starting Torque

Unit : cNm

Reduction Ratio \ Model		14	17	20	25	32
50		3.3	5.1	6.6	12	26
80		2.4	3.3	4.1	7.7	16
100		2.1	2.9	3.7	6.9	15
120		—	2.7	3.3	6.3	13

Note : The values in this table will vary depending on the working conditions and are for reference only. The upper limit is 20% above the value in this table.

Table 4-2-6 Reversed Starting Torque

Unit : Nm

Reduction Ratio \ Model	14	17	20	25	32
50	1.4	2.5	4	7.5	16
80	1.4	2.5	4.2	7.7	16
100	1.7	2.8	4.5	8.4	18
120	—	3.1	4.9	9.2	19

Note : The values in this table will vary depending on the working conditions and are for reference only. The upper limit is 20% above the value in this table.

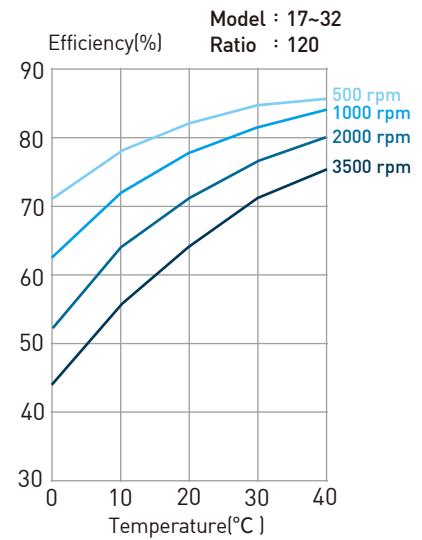
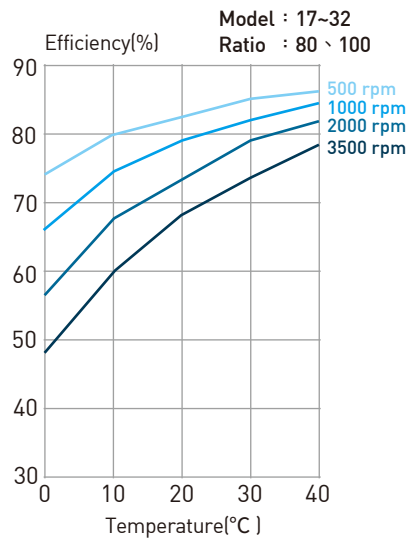
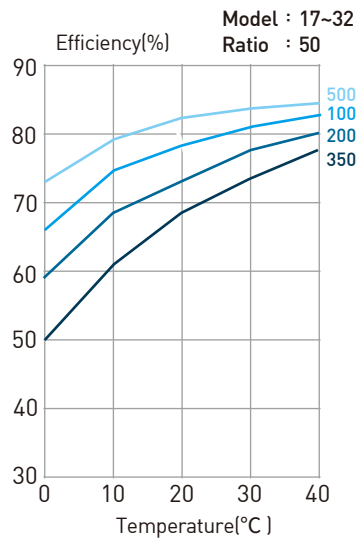
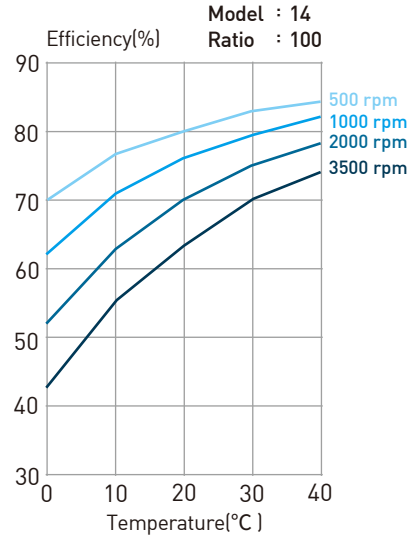
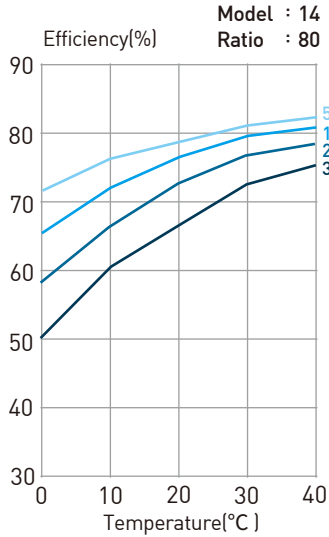
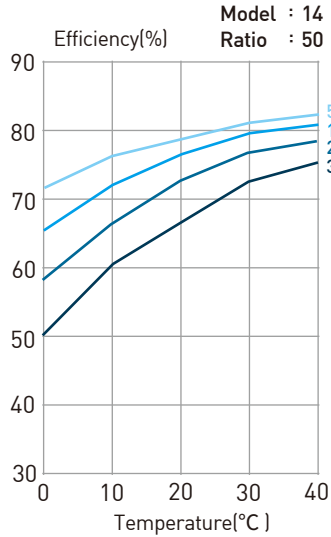
Table 4-2-7 Torsional Rigidity

Reduction Ratio \ Model		14	17	20	25	32		
T ₁	Nm	2.0	3.9	7.0	14	29		
	kgfm	0.2	0.4	0.7	1.4	3.0		
T ₂	Nm	6.9	12	25	48	108		
	kgfm	0.7	1.2	2.5	4.9	11		
50	K ₁	× 10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4	
		kgfm/arc min	0.1	0.24	0.38	0.74	1.6	
	K ₂	× 10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8	
		kgfm/arc min	0.14	0.32	0.52	1.0	2.3	
	K ₃	× 10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8	
		kgfm/arc min	0.17	0.4	0.67	1.3	2.9	
	θ ₁	× 10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5	
		arc min	2.0	1.7	1.8	1.9	1.9	
	θ ₂	× 10 ⁻⁴ rad	16	12	15.4	15.7	15.7	
		arc min	5.6	4.2	5.3	5.4	5.4	
	80 up	K ₁	× 10 ⁴ Nm/rad	0.47	1	1.6	3.1	6.7
			kgfm/arc min	0.14	0.3	0.47	0.92	2.0
K ₂		× 10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11	
		kgfm/arc min	0.18	0.4	0.75	1.5	3.2	
K ₃		× 10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12	
		kgfm/arc min	0.21	0.46	0.85	1.7	3.7	
θ ₁		× 10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4	
		arc min	1.4	1.3	1.5	1.5	1.5	
θ ₂		× 10 ⁻⁴ rad	12	9.7	11.3	11.1	11.6	
		arc min	4.2	3.3	3.9	3.8	4.0	

Note : The values are for reference only. The lower limit is 20% under the value in this table.

4-2-2 Efficiency E_R

DATORKER® efficiency would change by specification , ratio , operating conditions(speed/loading) and lubrication(lubricant type/quantity) .

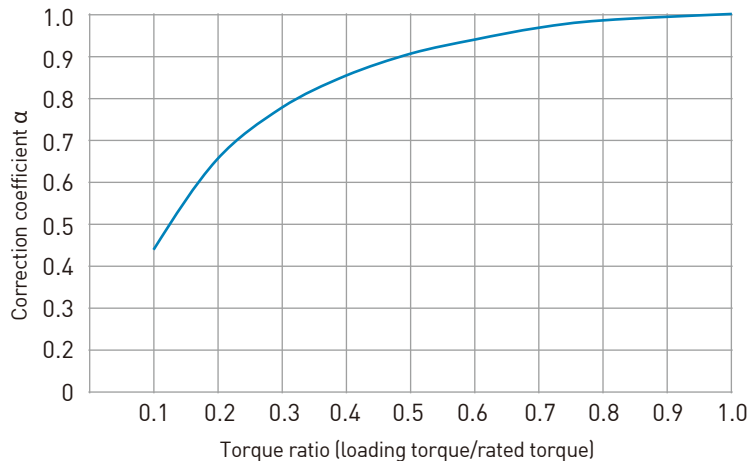


Efficiency correction coefficient α

$\text{Efficiency} = \alpha \times E_R$

α is correction coefficient

E_R is efficiency at the rated torque



4-2-3 No-load operating torque

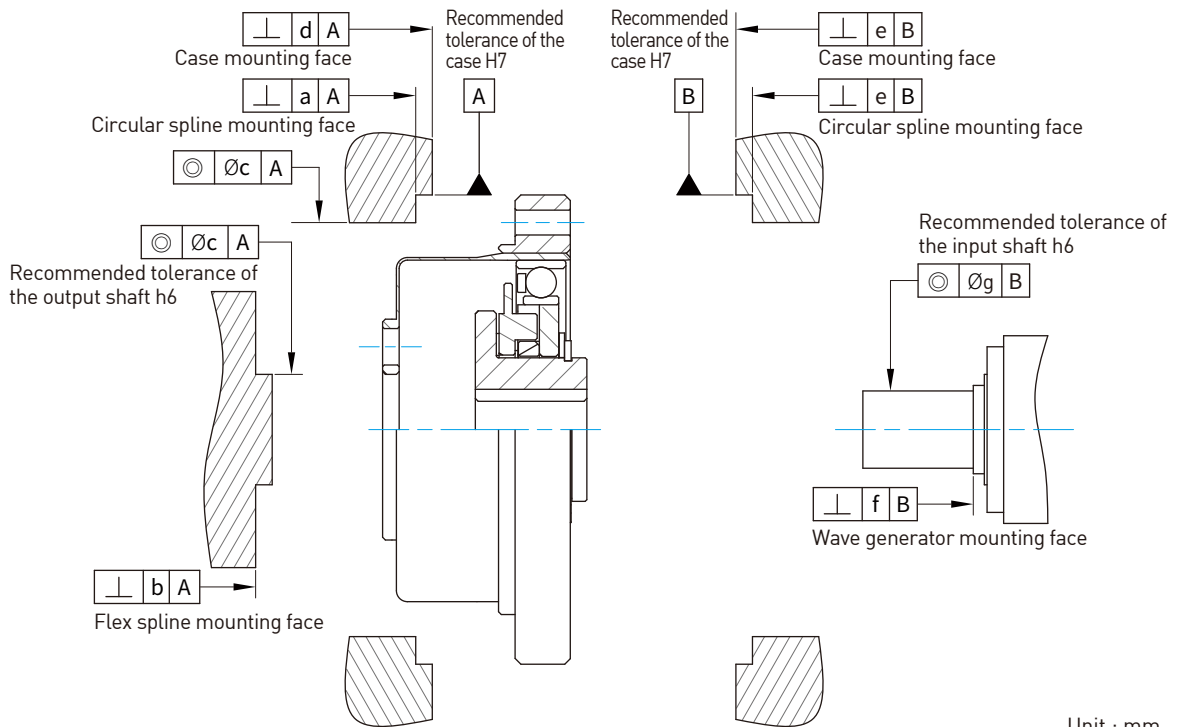
The torque necessary to drive the DATORKER® input (high-speed end) after running in at an input speed of 2000r/min under an average ambient temperature of 25° C without load for more than 2 hours.

Unit: cNm

Reduction Ratio	Input rotational speed	Model				
		14	17	20	25	32
50	500 r/min	1.8	3.4	5.1	9.7	21.2
	1000 r/min	2.3	4.4	6.9	12.5	27.2
	2000 r/min	3.1	5.8	9.4	18.5	37.2
	3500 r/min	4.2	7.9	13.4	25.5	50.2
80	500 r/min	1.4	2.6	3.9	7.6	16.8
	1000 r/min	1.9	3.6	5.7	10.4	22.8
	2000 r/min	2.7	5	8.2	16.4	32.8
	3500 r/min	3.8	7.1	12.2	23.4	45.8
100	500 r/min	1.3	2.5	3.7	7.2	16
	1000 r/min	1.8	3.5	5.5	10	22
	2000 r/min	2.6	4.9	8	16	32
	3500 r/min	3.7	7	12	23	45
120	500 r/min	-	2.4	3.5	6.9	15.4
	1000 r/min	-	3.4	5.2	9.7	21.4
	2000 r/min	-	4.8	7.8	15.7	31.4
	3500 r/min	-	6.9	11.8	22.7	44.4

Note : The values in this table will vary depending on the working conditions and are for reference only. The upper limit is 20% above the value in this table.

4-2-4 Installation Accuracy

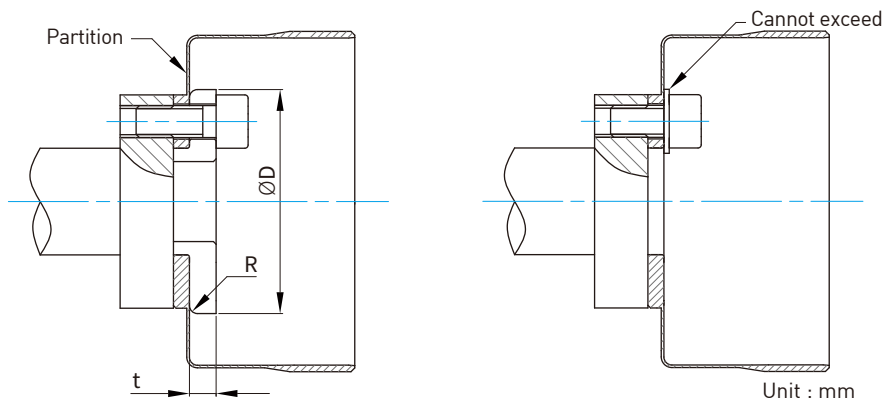


Unit : mm

Mark	Model	14	17	20	25	32
a		0.011	0.012	0.013	0.014	0.016
b		0.008	0.011	0.014	0.018	0.022
Øc		0.015	0.018	0.019	0.022	0.022
d		0.011	0.015	0.017	0.024	0.026
e		0.011	0.015	0.017	0.024	0.026
f		0.017 (0.008)	0.020 (0.010)	0.020 (0.010)	0.024 (0.012)	0.024 (0.012)
Øg		0.030 (0.016)	0.034 (0.018)	0.044 (0.019)	0.047 (0.022)	0.050 (0.022)

Note: The value in () is the value of the wave generator (without oldham coupling).

3-2-5 Recommend size of the Press plate



Unit : mm

Mark	Model	14	17	20	25	32
ØD _{-0.1} ⁰		24.5	29	34	42	55
R ₀ ^{+0.1}		1.2	1.2	1.4	1.5	2
t		2	2.5	2.5	5	7

Note : In order to avoid the sinking or loosening of the bolts on the press plate, it is recommended that: 1. The material is S45C; 2. The heat treatment hardness should be HB200~270.

4-2-6 Installation bolt tightening torque

1. Flex spline flange side

- When the load torque is less than the rated performance value in "Peak torque at start/stop" Table 4-2-1, use only bolts for installation.
- If the load torque may reach the rated performance value in "Instantaneous permissible max torque" Table 4-2-1, please use a combination of bolts and pins for installation.

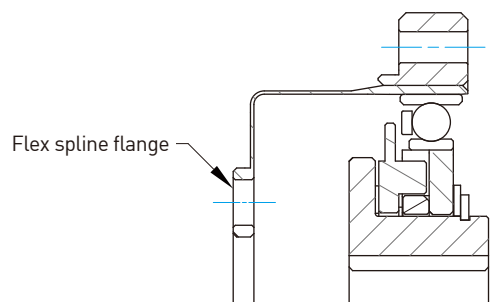


Table 4-2-8 Flex spline flange side bolt tightening torque

Item		Model	14	17	20	25	32
Number of bolts			6	6	8	8	8
Bolts size			M4	M5	M5	M6	M8
Installation of Bolts PCD		mm	17	19	24	30	40
Bolt tightening torque		Nm	4.5	9.0	9.0	15.3	37
		kgfm	0.46	0.92	0.92	1.56	3.8

Note : 1. Recommended tightening torques for the 12.9 DIN EN ISO 4762 fastening bolts DIN912 in accordance with VDI 2230 for $\mu_K = \mu_G = 0.125$
2. Bolt-in depth at least 2 x thread diameter

Table 4-2-9 Pin installation of Flex spline flange

Item		Model	14	17	20	25	32
Number of bolts			2	2	2	2	2
Pin diameter	mm		3	3	3	4	5
Pin hole PCD	mm		18.5	21.5	27	34	45
Bolt plus Pin's transmission torque		kgfm	7.5	11	17	32	74

Note : Recommended pin type: parallel pin; material : S45C-Q

2. Circular spline flange side

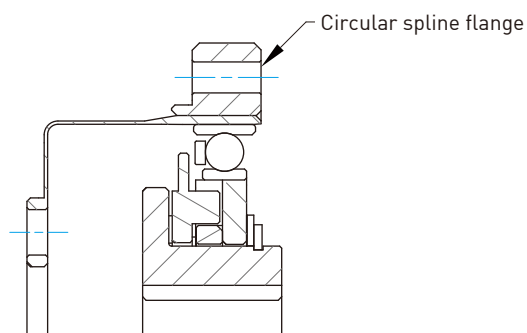
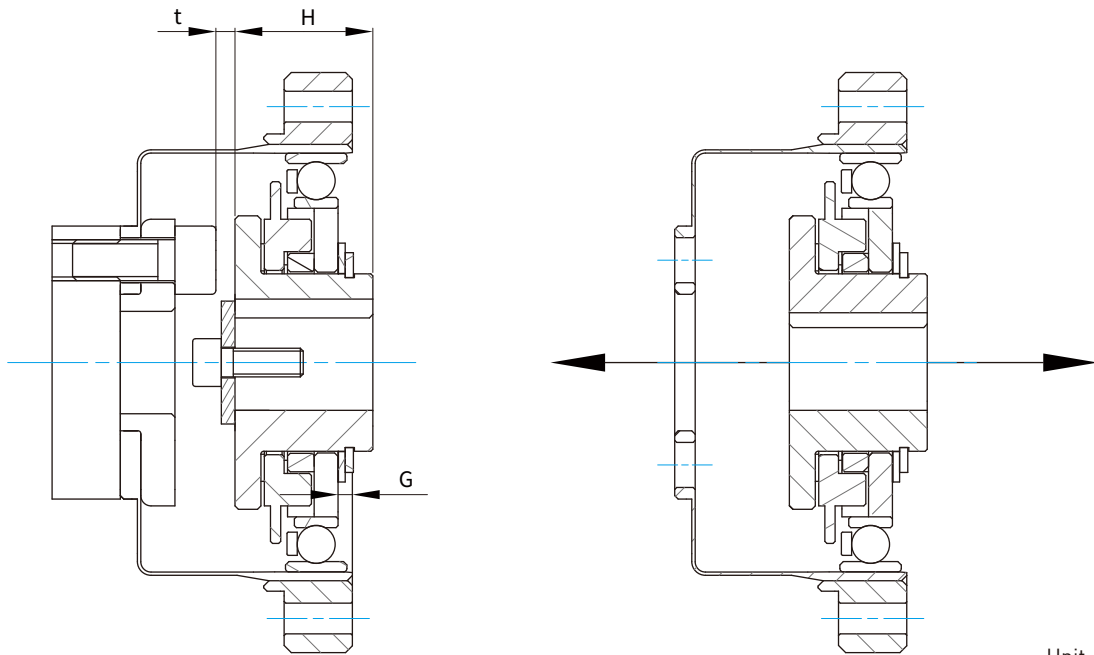


Table 4-2-10 Bolt installation of Circular spline flange

Item		Model	14	17	20	25	32
Number of bolts			6	12	12	12	12
Bolts size			M3	M3	M3	M4	M5
Installation of Bolts PCD		mm	44	54	62	75	100
Bolt tightening torque		Nm	2.0	2.0	2.0	4.5	9.0
		kgfm	0.20	0.20	0.20	0.46	0.92

Note : 1. Recommended tightening torques for the 12.9 DIN EN ISO 4762 fastening bolts DIN912 in accordance with VDI 2230 for $\mu_K = \mu_G = 0.125$
2. Bolt-in depth at least 2 x thread diameter

4-2-7 Installation of Wave generator



Unit : mm

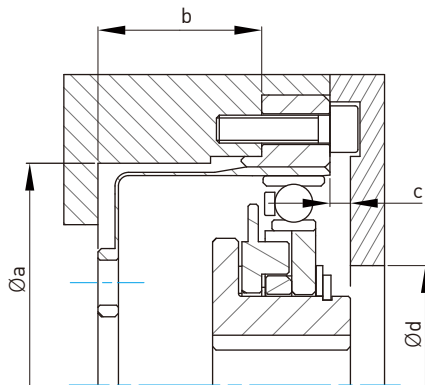
Model	14	17	20	25	32
Mark					
G	0.4	0.3	0.1	2.1	2.5
$H_{-0.1}^0$	17.6	19.5	20.1	20.2	22
t	2.5	2.5	2.9	2.8	3.8

- Note: 1. Avoid interference between the Wave generator and the locking bolt of the flex spline.
 2. Due to the elastic deformation of the flex spline, the Robot Reducer applies thrust to the Wave generator during operation. The thrust will change with the operating conditions. In any case, a mechanism that prevents slipping due to the thrust of the Wave generator must be used.

4-2-8 Lubrication

1. Recommended dimensions for the inner wall of the case

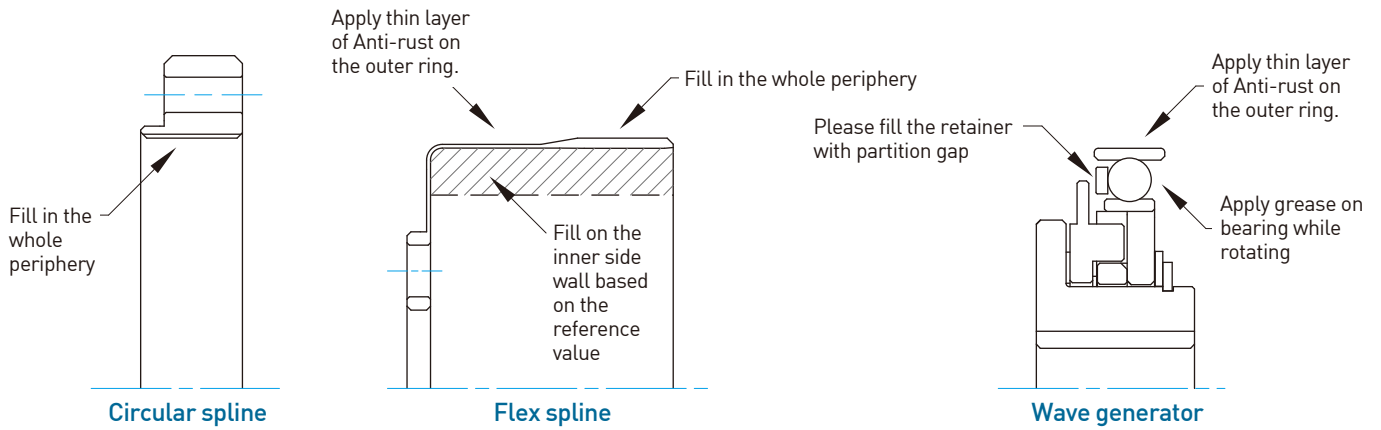
In order to avoid the splashing of excessive lubricant on other parts during operation. It is recommended to adhere to the following dimensions:



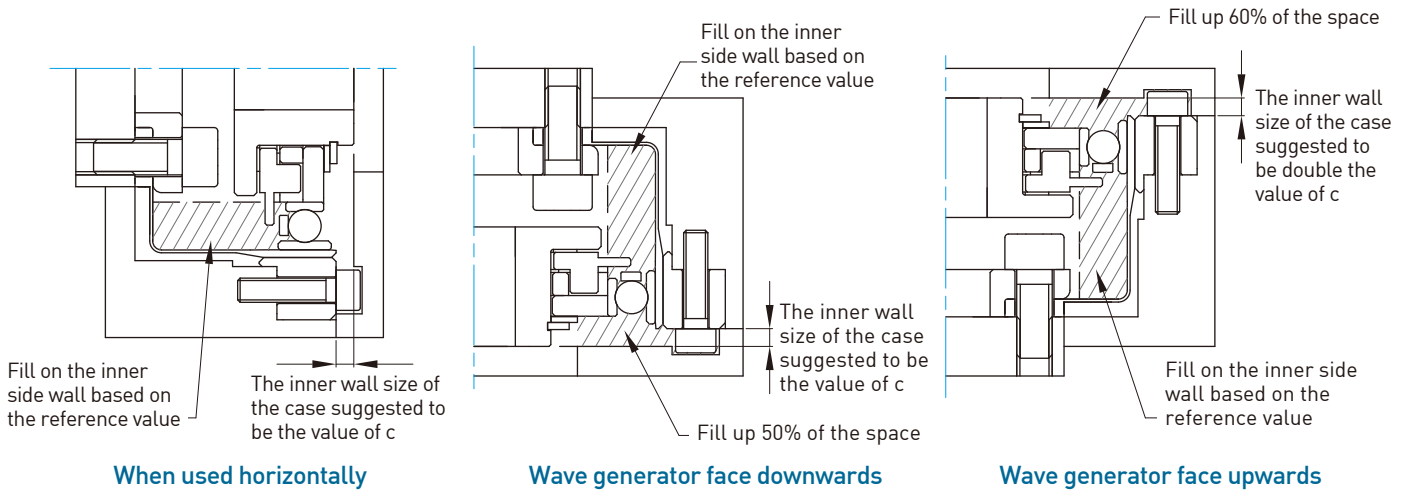
Unit : mm

Model	14	17	20	25	32
Mark					
Øa	38	45	53	66	86
b	17.1	19	20.5	23	26.8
c	1	1	1.5	1.5	1.5
Ød	16	26	30	37	37

2. Lubricant application



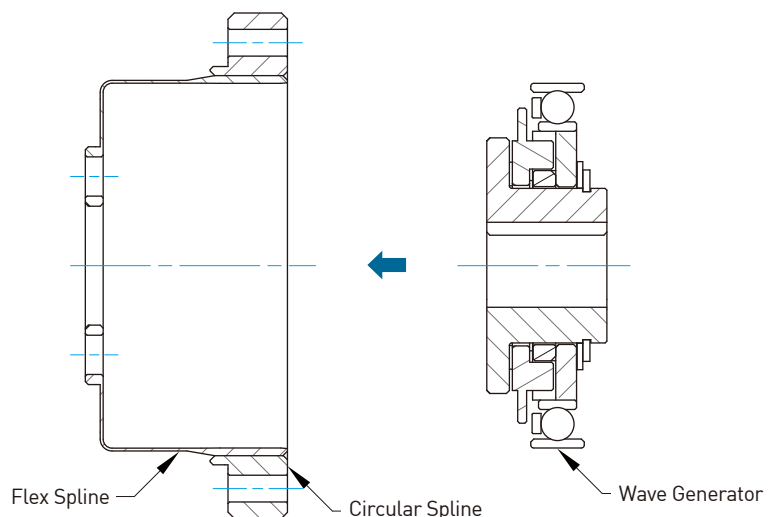
3. The key points of different application methods



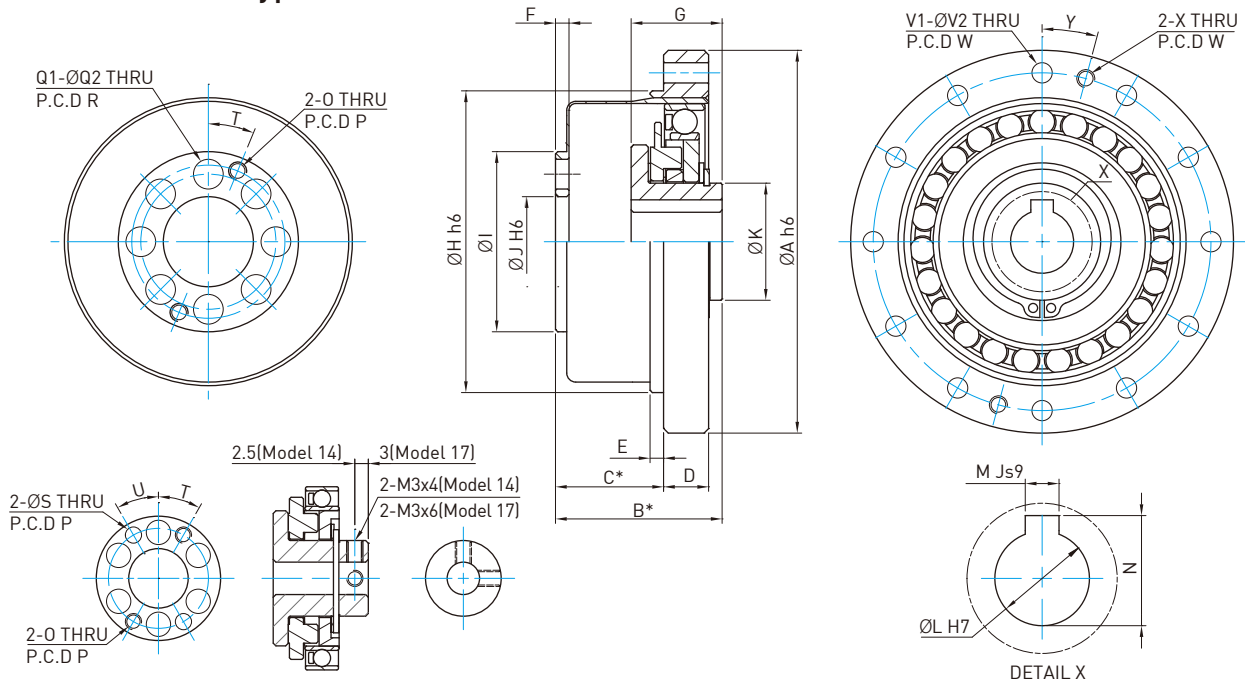
Instructions		Model	Unit : g				
			14	17	20	25	32
Used horizontally			5.5	10	16	30	60
Used vertical	Wave generator is facing down		7	12	18	35	70
	Wave generator is facing up		8.5	14	21	40	80

4-2-9 Installation sequence

Install the circular spline and flex spline into the mechanism then install the Wave generator.



4-2-10 WUI-C0 Type Size Chart


Model 14、17

Mark	Model	14	17	20	25	32
ØA h6		50	60	70	85	110
B*		28.5 _{-0.8} ⁰	32.5 _{-0.9} ⁰	33.5 _{-1.0} ⁰	37 _{-1.0} ⁰	44 _{-1.1} ⁰
C*		17.5 ₀ ^{+0.4}	20 ₀ ^{+0.5}	21.5 ₀ ^{+0.6}	24 ₀ ^{+0.6}	28 ₀ ^{+0.6}
D		6	6.5	7.5	10	14
E		2	2.5	3	3	3
F		2.4	3	3	3	3.2
G		17.6 _{-0.1} ⁰	19.5 _{-0.1} ⁰	20.1 _{-0.1} ⁰	20.2 _{-0.1} ⁰	22 _{-0.1} ⁰
ØH h6		38	48	54	67	90
ØI		23	27.2	32	40	52
ØJ H6		11	10	16	20	26
ØK		14	18	21	26	26
ØL H7		6	8	9	11	14
M Js9		-	-	3	4	5
N		-	-	10.4 ₀ ^{+0.1}	12.8 ₀ ^{+0.1}	16.3 ₀ ^{+0.1}
O		M3	M3	M3	M4	M5
P (P.C.D)		18.5	21.5	27	34	45
Q1		6	6	8	8	8
ØQ2		4.5	5.5	5.5	6.6	9
R (P.C.D)		17	19	24	30	40
S		3 ₀ ^{+0.015}	3 ₀ ^{+0.015}	-	-	-
T (Degree)		30°	30°	22.5°	22.5°	22.5°
U (Degree)		30°	30°	-	-	-
V1		6	12	12	12	12
ØV2		3.5	3.5	3.5	4.5	5.5
W (P.C.D)		44	54	62	75	100
X		M3	M3	M3	M4	M5
Y (Degree)		30°	15°	15°	15°	15°
Moment of Inertia [× 10 ⁻⁴ kgm ²]		0.033	0.079	0.193	0.413	1.69
Weight (Kg)		0.09	0.15	0.28	0.45	0.89

*The dimension B, C is the fitting position and permissible tolerance in the axial direction.

4-3 WTI-PH Type

4-3-1 Technical data

Table 4-3-1 Rating table

Item Model	Reduction Ratio	Rated torque at input 2000r/min ※1		Peak torque at start/stop※2		Permissible maximum value of average load torque※3		Instantaneous permissible max. torque※4		Permissible maximum input speed r/min	Permissible average input speed r/min
		Nm	kgfm	Nm	kgfm	Nm	kgfm	Nm	kgfm		
14	50	5.4	0.55	18	1.8	6.9	0.7	35	3.6	8500	3500
	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	50	16	1.6	34	3.5	26	2.6	70	7.1	7300	3500
	80	22	2.2	43	4.4	27	2.7	87	8.9		
	100	24	2.4	54	5.5	39	4	110	11		
	120	24	2.4	54	5.5	39	4	86	8.8		
20	50	25	2.5	56	5.7	34	3.5	98	10	6500	3500
	80	34	3.5	74	7.5	47	4.8	127	13		
	100	40	4.1	82	8.4	49	5	147	15		
	120	40	4.1	87	8.9	49	5	147	15		
25	50	39	4.0	98	10	55	5.6	186	19	5600	3500
	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		
32	50	76	7.8	216	22	108	11	382	39	4800	3500
	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		

- ※1 Permissible rated torque
- ※2 Permissible maximum torque
- ※3 Permissible average torque
- ※4 Permissible maximum value of impact

Table 4-3-2 Crossed roller bearing specifications

Item Model	Pitch circle diameter of roller	Offset amount	Basic load ratings				Permissible moment load		Moment rigidity	
			Dynamic load C		Static load Co					
			Dpw	R	kN	kgf	kN	kgf	Nm	kgfm
14	0.050	0.0217	5.8	590	8.6	880	74	7.6	8.5	2.5
17	0.060	0.0239	10.4	1060	16.3	1670	124	12.6	15.4	4.6
20	0.070	0.0255	14.6	1490	22.0	2250	187	19.1	25.2	7.5
25	0.085	0.0296	21.8	2230	35.8	3660	258	26.3	39.2	11.6
32	0.111	0.0364	38.2	3900	65.4	6680	580	59.1	100	29.6

Table 4-3-3 Angle Transmission Accuracy

Reduction Ratio \ Model		14	17	20	25	32
50 up	$\times 10^{-4}$ rad	4.4	4.4	2.9	2.9	2.9
	arc min	1.5	1.5	1	1	1

Table 4-3-4 Hysterisis Loss

Reduction Ratio \ Model		14	17	20	25	32
50	$\times 10^{-4}$ rad	5.8	5.8	5.8	5.8	5.8
	arc min	2.0	2.0	2.0	2.0	2.0
80 up	$\times 10^{-4}$ rad	2.9	2.9	2.9	2.9	2.9
	arc min	1.0	1.0	1.0	1.0	1.0

Table 4-3-5 Maximum Backlash

Reduction Ratio \ Model		14	17	20	25	32
50	$\times 10^{-5}$ rad	17.5	9.7	8.2	8.2	6.8
	arc sec	36	20	17	17	14
80	$\times 10^{-5}$ rad	11.2	6.3	5.3	5.3	4.4
	arc sec	23	13	11	11	9
100	$\times 10^{-5}$ rad	8.7	4.8	4.4	4.4	3.4
	arc sec	18	10	9	9	7
120	$\times 10^{-5}$ rad	—	3.9	3.9	3.9	2.9
	arc sec	—	8	8	8	6

Table 4-3-6 Starting Torque

Unit : cNm

Reduction Ratio \ Model		14	17	20	25	32
50		4.1	6.1	7.8	15	31
80		2.8	4	4.9	9.2	19
100		2.5	3.4	4.3	8	18
120		—	3.1	3.8	7.3	15

Note : The values in this table will vary depending on the working conditions and are for reference only. The upper limit is 20% above the value in this table.

Table 4-3-7 Reversed Starting Torque

Unit : Nm

Reduction Ratio \ Model	14	17	20	25	32
50	1.6	3	4.7	9	18
80	1.6	3	4.8	9.1	19
100	1.8	3.3	5.1	9.8	20
120	—	3.5	5.5	11	22

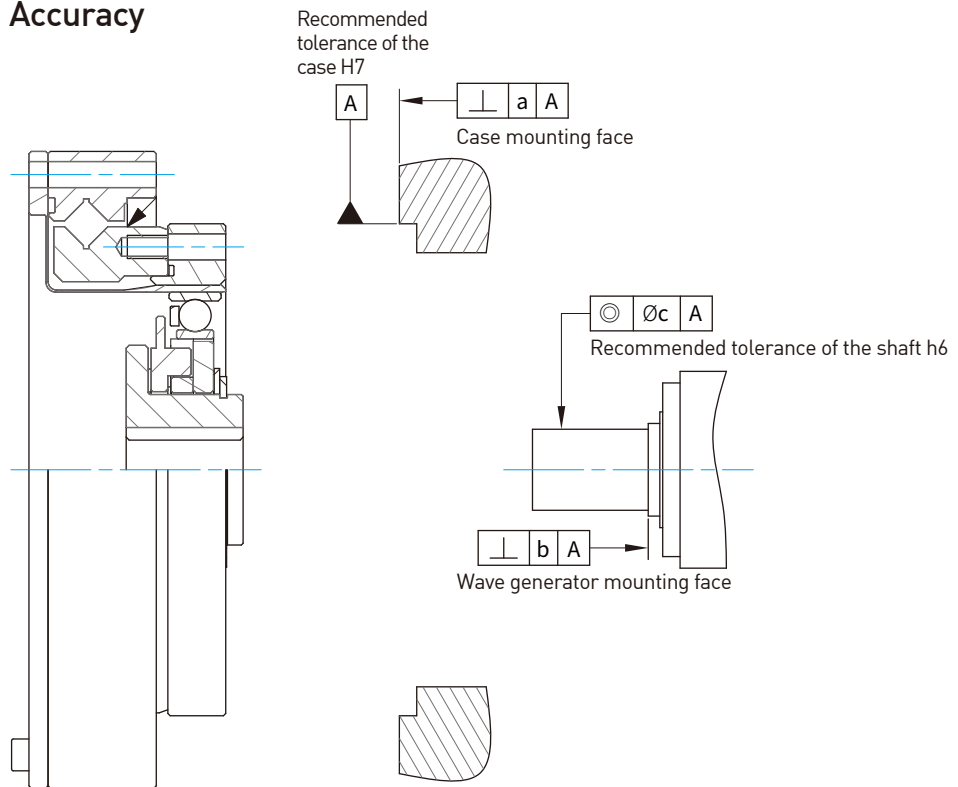
Note : The values in this table will vary depending on the working conditions and are for reference only. The upper limit is 20% above the value in this table.

Table 4-3-8 Torsional Rigidity

Reduction Ratio \ Model		14	17	20	25	32		
T ₁	Nm	2.0	3.9	7.0	14	29		
	kgfm	0.2	0.4	0.7	1.4	3.0		
T ₂	Nm	6.9	12	25	48	108		
	kgfm	0.7	1.2	2.5	4.9	11		
50	K ₁	× 10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4	
		kgfm/arc min	0.1	0.24	0.38	0.74	1.6	
	K ₂	× 10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8	
		kgfm/arc min	0.14	0.32	0.52	1.0	2.3	
	K ₃	× 10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8	
		kgfm/arc min	0.17	0.4	0.67	1.3	2.9	
	θ ₁	× 10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5	
		arc min	2.0	1.7	1.8	1.9	1.9	
	θ ₂	× 10 ⁻⁴ rad	16	12	15.4	15.7	15.7	
		arc min	5.6	4.2	5.3	5.4	5.4	
	80 up	K ₁	× 10 ⁴ Nm/rad	0.47	1	1.6	3.1	6.7
			kgfm/arc min	0.14	0.3	0.47	0.92	2.0
K ₂		× 10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11	
		kgfm/arc min	0.18	0.4	0.75	1.5	3.2	
K ₃		× 10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12	
		kgfm/arc min	0.21	0.46	0.85	1.7	3.7	
θ ₁		× 10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4	
		arc min	1.4	1.3	1.5	1.5	1.5	
θ ₂		× 10 ⁻⁴ rad	12	9.7	11.3	11.1	11.6	
		arc min	4.2	3.3	3.9	3.8	4.0	

Note : The values are for reference only. The lower limit is 20% under the value in this table.

4-3-2 Installation Accuracy



Unit : mm

Mark \ Model	14	17	20	25	32
a	0.011	0.015	0.017	0.024	0.026
b	0.017	0.020	0.020	0.024	0.024
	(0.008)	(0.010)	(0.010)	(0.012)	(0.012)
C	0.030	0.034	0.044	0.047	0.047
	(0.016)	(0.018)	(0.019)	(0.022)	(0.022)

Note: The value in () is the value of the wave generator (without oldham coupling).

4-3-3 Installation bolt tightening torque

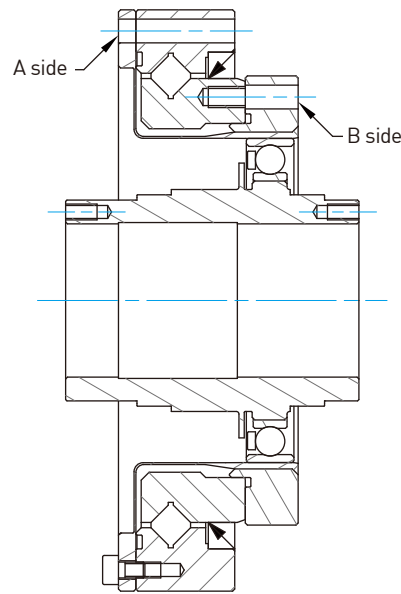


Table 4-3-9 A side mounting bolt tightening torque

Item		Model	14	17	20	25	32
Number of bolts			8	12	12	12	12
Bolts size			M3	M3	M3	M4	M5
Installation of Bolts PCD	mm		64	74	84	102	132
Bolt tightening torque	Nm		2	2	2	4.5	9
	kgfm		0.2	0.2	0.2	0.46	0.92

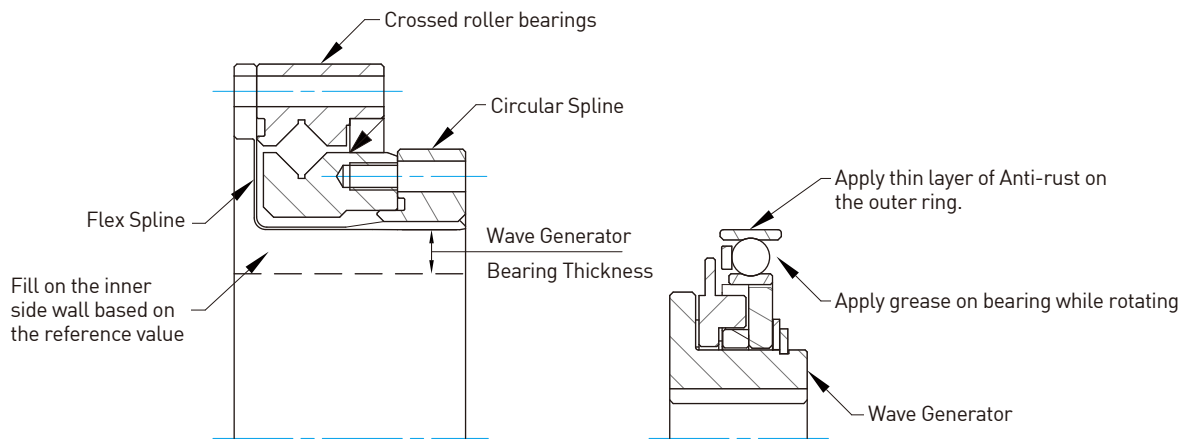
Table 4-3-10 B side mounting bolt tightening torque

Item		Model	14	17	20	25	32
Number of bolts			8	16	16	16	16
Bolts size			M3	M3	M3	M4	M5
Installation of Bolts PCD	mm		44	54	62	77	100
Bolt tightening torque	Nm		2	2	2	4.5	9
	kgfm		0.2	0.2	0.2	0.46	0.92

Note : 1. Recommended tightening torques for the 12.9 DIN EN ISO 4762 fastening bolts DIN912 in accordance with VDI 2230 for $\mu K = \mu G = 0.125$
 2. Bolt-in depth at least 2 x thread diameter

4-3-4 Lubrication

Other than the tooth space of WTI-PH Type, all other parts are not packed with lubricant. Please follow the below points for applying the lubricant.

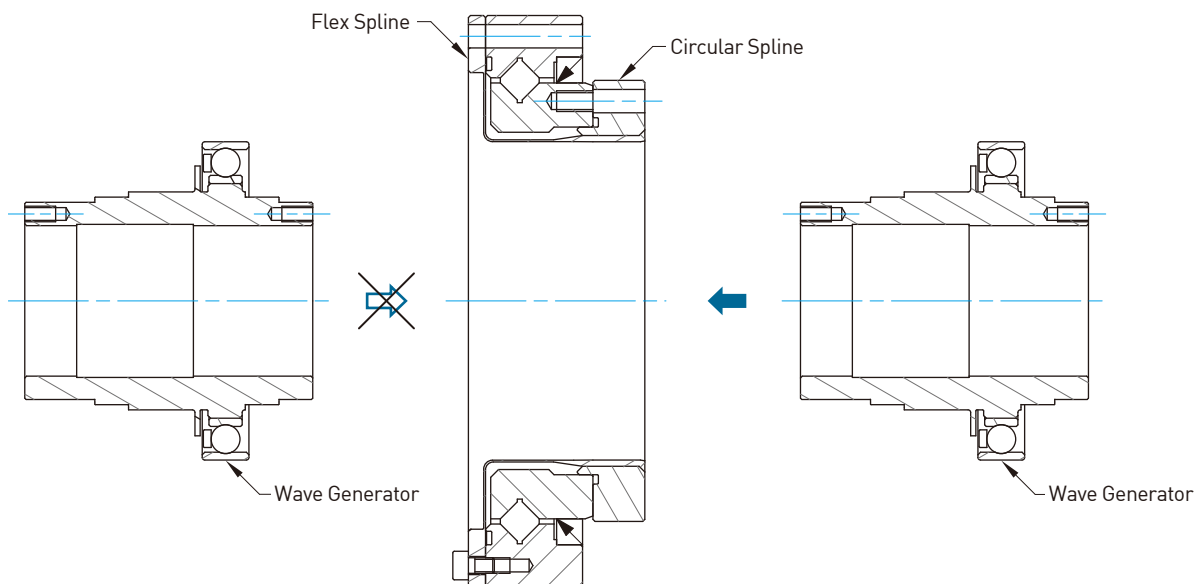


Unit : g

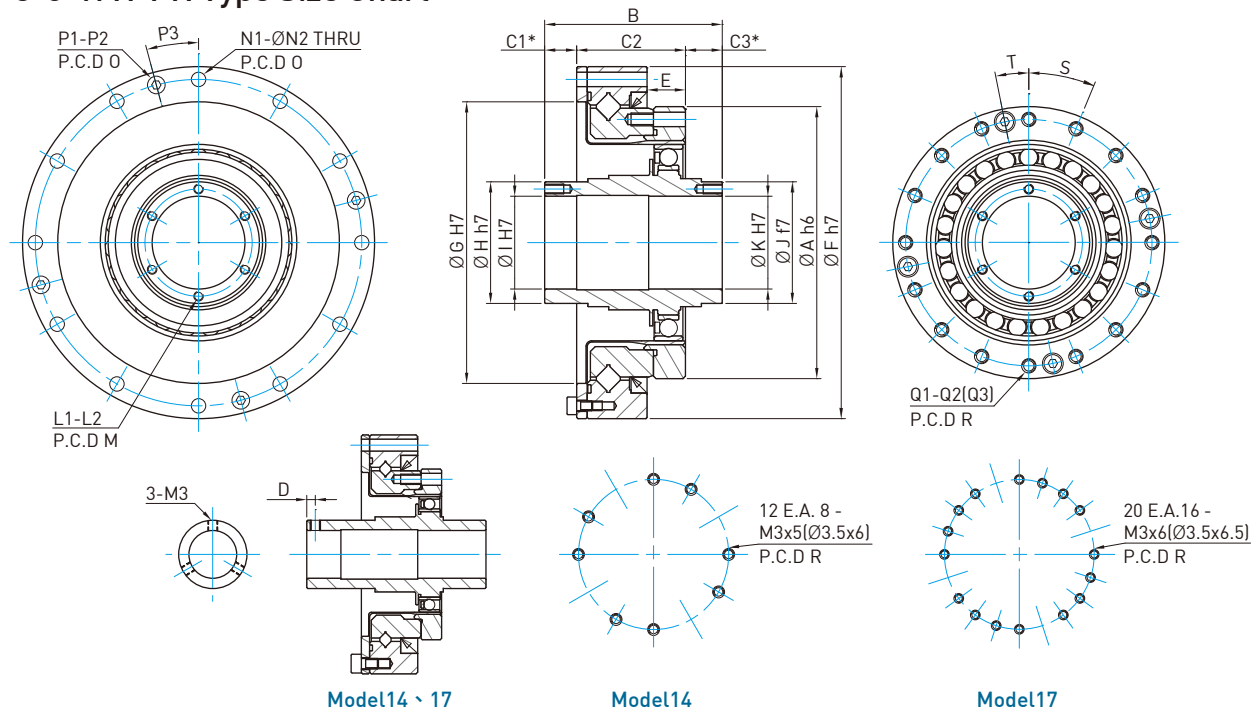
Instructions		Model	14	17	20	25	32
Used horizontally			5.8	11	18	32	64
Used vertical	Wave generator is facing down		7.5	13	19	37	74
	Wave generator is facing up		8.9	15	22	42	84

4-3-5 Installation sequence

Install the wave generator only after installing the reducer body into the case. Please note the installation sequence to avoid damage on the tooth face.



4-3-6 WTI-PH Type Size Chart



Mark	Model	14	17	20	25	32
ØA h6		50	60	70	85	110
B		52.5 ⁰ _{-0.1}	56.5 ⁰ _{-0.1}	51.5 ⁰ _{-0.1}	55.5 ⁰ _{-0.1}	65.5 ⁰ _{-0.1}
C1*		16 ^{+0.8} ₀	16 ^{+0.9} ₀	9.5 ^{+1.0} ₀	10 ^{+1.1} ₀	12 ^{+1.1} ₀
C2		23.5	26.5	29	34	42
C3*		13	14	13	11.5	11.5
D		2.5	2.5	-	-	-
E		7	7.5	8.5	12	15
ØF h7		70	80	90	110	142
ØG H7		48	60	70	88	114
ØH h7		20	25	30	38	45
ØI H7		14	19	21	29	36
ØJ f7		20	25	30	38	45
ØK H7		14	19	21	29	36
L1		3	3	2x6	2x6	2x6
L2		M3	M3	M3 x DP6	M3 x DP6	M3 x DP6
M (P.C.D)		-	-	25.5	33.5	40.5
N1		8	12	12	12	12
ØN2		3.5	3.5	3.5	4.5	5.5
O (P.C.D)		64	74	84	102	132
P1		2	4	4	4	4
P2		M3	M3	M3	M3	M4
P3 (Degree)		22.5°	15°	15°	15°	15°
Q1		12 E.A. 8	20 E.A. 16	16	16	16
Q2		M3 x 5DP	M3 x 6DP	M3 x 6DP	M4 x 7DP	M5 x 8DP
Q3		Ø3.5 x 6DP	Ø3.5 x 6.5DP	Ø3.5 x 7.5DP	Ø4.5 x 10DP	Ø5.5 x 14DP
ØR		44	54	62	77	100
S (Degree)		30°	18°	22.5°	22.5°	22.5°
T (Degree)		30°	18°	11.25°	11.25°	11.25°
Moment of Inertia (× 10 ⁻⁴ kgm ²)		0.033	0.079	0.193	0.413	1.69
Weight (Kg)		0.45	0.63	0.89	1.44	3.1

*The dimension C1, C3 is the fitting position and permissible tolerance in the axial direction.

4-4 WTI-AH Type

4-4-1 Technical data

Table 4-4-1 Rating table

Item Model	Reduction Ratio	Rated torque at input 2000r/min ※1		Peak torque at start/stop※2		Permissible maximum value of average load torque※3		Instantaneous permissible max. torque※4		Permissible maximum input speed r/min	Permissible average input speed r/min
		Nm	kgfm	Nm	kgfm	Nm	kgfm	Nm	kgfm		
14	50	5.4	0.55	18	1.8	6.9	0.7	35	3.6	8500	3500
	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	50	16	1.6	34	3.5	26	2.6	70	7.1	7300	3500
	80	22	2.2	43	4.4	27	2.7	87	8.9		
	100	24	2.4	54	5.5	39	4	110	11		
	120	24	2.4	54	5.5	39	4	86	8.8		
20	50	25	2.5	56	5.7	34	3.5	98	10	6500	3500
	80	34	3.5	74	7.5	47	4.8	127	13		
	100	40	4.1	82	8.4	49	5	147	15		
	120	40	4.1	87	8.9	49	5	147	15		
25	50	39	4.0	98	10	55	5.6	186	19	5600	3500
	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		
32	50	76	7.8	216	22	108	11	382	39	4800	3500
	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		

※1 Permissible rated torque

※2 Permissible maximum torque

※3 Permissible average torque

※4 Permissible maximum value of impact

Table 4-4-2 Crossed roller bearing specifications

Item Model	Pitch circle diameter of roller	Offset amount	Basic load ratings				Permissible moment load		Moment rigidity	
			Dpw	R	Dynamic load C		Static load Co		×10 ⁴ Nm/rad	kgfm/arc min
					kN	kgf	kN	kgf		
14	0.050	0.0217	5.8	590	8.6	880	74	7.6	8.5	2.5
17	0.060	0.0239	10.4	1060	16.3	1670	124	12.6	15.4	4.6
20	0.070	0.0255	14.6	1490	22.0	2250	187	19.1	25.2	7.5
25	0.085	0.0296	21.8	2230	35.8	3660	258	26.3	39.2	11.6
32	0.111	0.0364	38.2	3900	65.4	6680	580	59.1	100	29.6

Table 4-4-3 Angle Transmission Accuracy

Reduction Ratio		Model	14	17	20	25	32
50 up	$\times 10^{-4}$ rad		4.4	4.4	2.9	2.9	2.9
	arc min		1.5	1.5	1	1	1

Table 4-4-4 Hysterisis Loss

Reduction Ratio		Model	14	17	20	25	32
50	$\times 10^{-4}$ rad		5.8	5.8	5.8	5.8	5.8
	arc min		2.0	2.0	2.0	2.0	2.0
80 up	$\times 10^{-4}$ rad		2.9	2.9	2.9	2.9	2.9
	arc min		1.0	1.0	1.0	1.0	1.0

Table 4-4-5 Maximum Backlash

Reduction Ratio		Model	14	17	20	25	32
50	$\times 10^{-5}$ rad		17.5	9.7	8.2	8.2	6.8
	arc sec		36	20	17	17	14
80	$\times 10^{-5}$ rad		11.2	6.3	5.3	5.3	4.4
	arc sec		23	13	11	11	9
100	$\times 10^{-5}$ rad		8.7	4.8	4.4	4.4	3.4
	arc sec		18	10	9	9	7
120	$\times 10^{-5}$ rad		—	3.9	3.9	3.9	2.9
	arc sec		—	8	8	8	6

Table 4-4-6 Starting Torque

Unit : cNm

Reduction Ratio		Model	14	17	20	25	32
50			8.8	27	36	56	85
80			7.5	25	33	50	74
100			6.9	24	32	49	72
120			—	24	31	48	68

Note : The values in this table will vary depending on the working conditions and are for reference only. The upper limit is 20% above the value in this table.

Table 4-4-7 Reversed Starting Torque

Unit : Nm

Reduction Ratio \ Model		14	17	20	25	32
50	50	5.3	16	22	34	51
	80	7.2	24	31	48	70
	100	8.2	29	38	59	86
	120	—	34	45	69	97

Note : The values in this table will vary depending on the working conditions and are for reference only. The upper limit is 20% above the value in this table.

Table 4-4-8 Torsional Rigidity

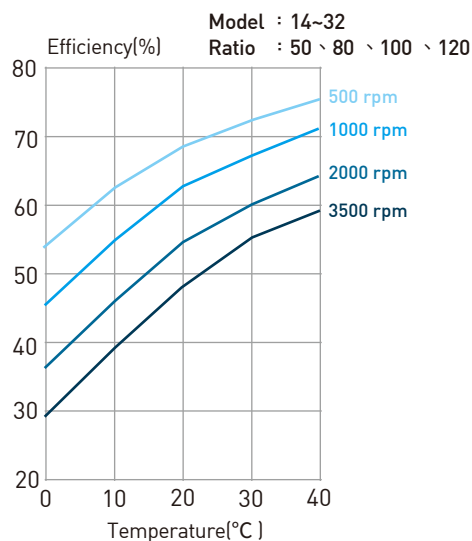
Reduction Ratio \ Model		14	17	20	25	32		
T ₁	Nm	2.0	3.9	7.0	14	29		
	kgfm	0.2	0.4	0.7	1.4	3.0		
T ₂	Nm	6.9	12	25	48	108		
	kgfm	0.7	1.2	2.5	4.9	11		
50	K ₁	× 10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4	
		kgfm/arc min	0.1	0.24	0.38	0.74	1.6	
	K ₂	× 10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8	
		kgfm/arc min	0.14	0.32	0.52	1.0	2.3	
	K ₃	× 10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8	
		kgfm/arc min	0.17	0.4	0.67	1.3	2.9	
	θ ₁	× 10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5	
		arc min	2.0	1.7	1.8	1.9	1.9	
	θ ₂	× 10 ⁻⁴ rad	16	12	15.4	15.7	15.7	
		arc min	5.6	4.2	5.3	5.4	5.4	
	80 up	K ₁	× 10 ⁴ Nm/rad	0.47	1	1.6	3.1	6.7
			kgfm/arc min	0.14	0.3	0.47	0.92	2.0
K ₂		× 10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11	
		kgfm/arc min	0.18	0.4	0.75	1.5	3.2	
K ₃		× 10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12	
		kgfm/arc min	0.21	0.46	0.85	1.7	3.7	
θ ₁		× 10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4	
		arc min	1.4	1.3	1.5	1.5	1.5	
θ ₂		× 10 ⁻⁴ rad	12	9.7	11.3	11.1	11.6	
		arc min	4.2	3.3	3.9	3.8	4.0	

Note : The values are for reference only. The lower limit is 20% under the value in this table.

4-4-2 Efficiency

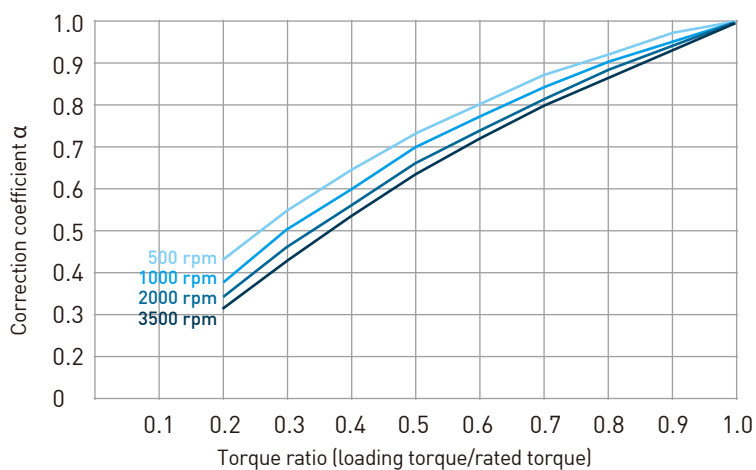
1. Rated torque E_R

DATORKER® efficiency would change by specification, ratio, operating conditions(speed/loading) and lubrication(lubricant type/quantity).



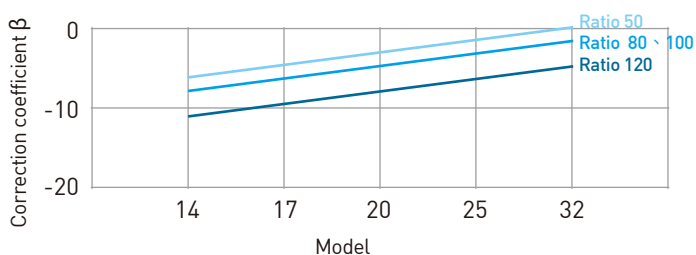
2. Correction coefficient α

Efficiency correction coefficient α by loading torque



3. Correction coefficient β

Efficiency correction coefficient β by specification



$$\text{Efficiency} = \alpha \times (E_R + \beta)$$

4-4-3 No-load operating torque

The torque necessary to drive the DATORKER® input (high-speed end) after running in at an input speed of 2000r/min under an average ambient temperature of 25° C without load for more than 2 hours.

Unit: cNm

Reduction Ratio	Input rotational speed	Model				
		14	17	20	25	32
50	500 r/min	6.3	17.8	23.6	37.2	58
	1000 r/min	7.8	21.8	28.6	49.2	76
	2000 r/min	10.1	27.8	37.6	62.2	98
	3500 r/min	14.1	36.8	48.6	89.2	138
80	500 r/min	5.4	16.4	21.5	33.8	51.5
	1000 r/min	6.9	20.4	26.5	45.8	69.5
	2000 r/min	9.2	26.4	35.5	58.8	91.5
	3500 r/min	13.2	35.4	46.5	85.8	131.5
100	500 r/min	5.2	16	21	33	50
	1000 r/min	6.7	20	26	45	68
	2000 r/min	9	26	35	58	90
	3500 r/min	13	35	46	85	130
120	500 r/min	-	15.8	20.6	32.4	48.9
	1000 r/min	-	19.8	25.6	44.4	66.9
	2000 r/min	-	25.8	34.6	57.4	88.9
	3500 r/min	-	34.8	45.6	84.4	128.9

Note : The values in this table will vary depending on the working conditions and are for reference only. The upper limit is 20% above the value in this table.

4-4-4 Installation bolt tightening torque

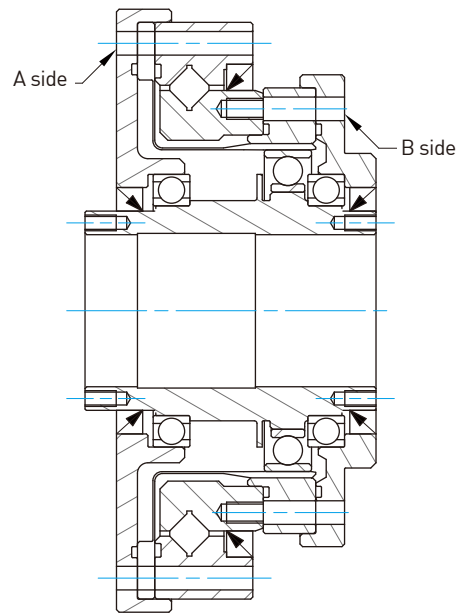


Table 4-4-9 A side mounting bolt tightening torque

Item		Model	14	17	20	25	32
Number of bolts			8	12	12	12	12
Bolts size			M3	M3	M3	M4	M5
Installation of Bolts PCD	mm		64	74	84	102	132
Bolt tightening torque	Nm		2	2	2	4.5	9
	kgfm		0.2	0.2	0.2	0.46	0.92

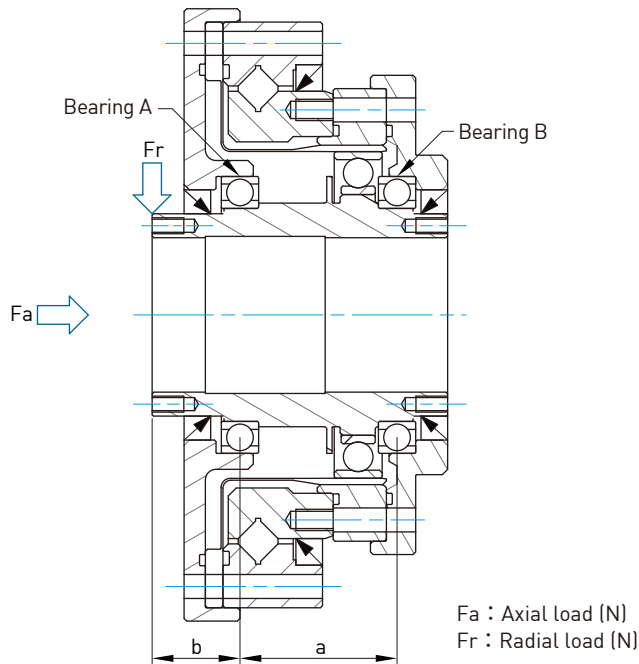
Table 4-4-10 B side mounting bolt tightening torque

Item		Model	14	17	20	25	32
Number of bolts			8	16	16	16	16
Bolts size			M3	M3	M3	M4	M5
Installation of Bolts PCD	mm		44	54	62	77	100
Bolt tightening torque	Nm		2	2	2	4.5	9
	kgfm		0.2	0.2	0.2	0.46	0.92

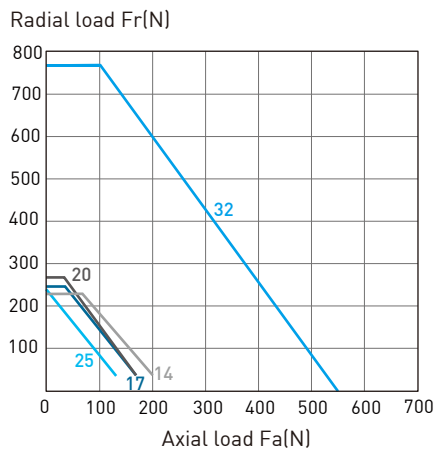
Note : 1. Recommended tightening torques for the 12.9 DIN EN ISO 4762 fastening bolts DIN912 in accordance with VDI 2230 for $\mu K = \mu G = 0.125$
 2. Bolt-in depth at least 2 x thread diameter

4-4-5 Permissible Input Load

The hollow shaft input section is supported by two deep groove bearings. To ensure proper performance of the reducer, please confirm the load applied to the input section. As shown below:

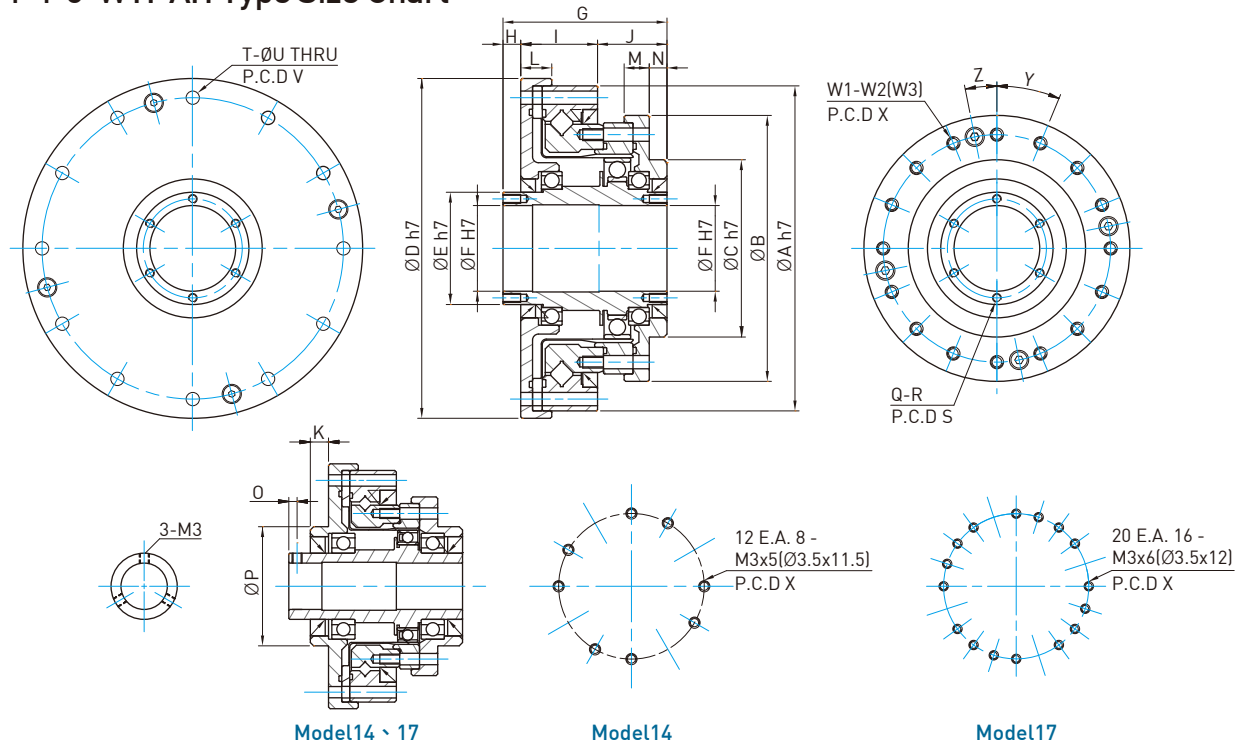


The figure below shows the average input speed of 2000rpm and the basic rated life $L_{10} = 7000$ hour.



Item	Bearing A		Bearing B		a (mm)	b (mm)	Maximum radial load Fr (N)
	Dynamic load C (kN)	Static load Co (kN)	Dynamic load C (kN)	Static load Co (kN)			
14	4.0	2.47	4.0	2.47	27	16.5	230
17	4.3	2.95	4.3	2.95	29	17.5	250
20	4.5	3.45	4.5	3.45	27	15.5	275
25	4.9	4.35	4.9	4.35	29.5	16.5	250
32	14.1	10.9	5.35	5.25	33	23	770

4-4-6 WTI-AH Type Size Chart



Mark	Model	14	17	20	25	32
ØA h7		70	80	90	110	142
ØB		54	64	75	90	115
ØC h7		36	45	50	60	85
ØD h7		74	84	95	115	147
ØE h7		20	25	30	38	45
ØF H7		14	19	21	29	36
G		52.5	56.5	51.5	55.5	65.5
H		12	12	5	6	7
I		20.5	23	25	26	32
J		20	21.5	21.5	23.5	26.5
K		5.5	5.5	-	-	-
L		9	10	10.5	10.5	12
M		8	8.5	9	8.5	9.5
N		7.5	8.5	7	6	5
O		2.5	2.5	-	-	-
P		36	45	-	-	-
Q		3	3	2x6	2x6	2x6
R		M3	M3	M3 x DP6	M3 x DP6	M3 x DP6
S (P.C.D)		-	-	25.5	33.5	40.5
T		8	12	12	12	12
ØU		3.5	3.5	3.5	4.5	5.5
V (P.C.D)		64	74	84	102	132
W1		12 E.A. 8	20 E.A. 16	16	16	16
W2		M3 x 5DP	M3 x 6DP	M3 x 6DP	M4 x 7DP	M5 x 8DP
W3		Ø3.5 x 11.5DP	Ø3.5 x 12DP	Ø3.5 x 13.5DP	Ø4.5 x 15.5DP	Ø5.5 x 20.5DP
X (P.C.D)		44	54	62	77	100
Y (Degree)		30°	18°	22.5°	22.5°	22.5°
Z (Degree)		30°	18°	11.25°	11.25°	11.25°
Moment of Inertia (×10 ⁻⁴ kgm ²)		0.091	0.193	0.404	1.07	2.85
Weight (Kg)		0.71	1.0	1.38	2.1	4.5

5. Installation Notes

5-1 Precautions for installation of reducer body

- Check the flatness of the installation plane and ensure it is not inclined
- Check case mounting part and ensure it does not interfere with the body
- When locking the bolt, temporarily tighten to half the value of the specified torque in the diagonal order before reaching the specified torque. Do not tighten the bolts to the specified torque directly.
- The surface of the product is not treated with anti-rust. If anti-rust is required, please apply on the surface.

5-2 Precautions for installation of wave generator

- To avoid excessive force on the wave generator bearing during installation, please rotate the wave generator and insert it smoothly.
- If you choose a wave generator without the Oldham mechanism, kindly ensure to keep the concentricity and perpendicularity within the recommended range. (Refer to "Assembly accuracy" of each series)

5-3 Others

- Ensure to use the specified grease in the product. (Please refer to Chapter 6. "Lubricant" of this manual)
- Avoid overload operation
- Note that the input speed should be within the specified range
- Please use a thread locker (recommended to use Loctite242) in the thread hole and avoid leakage of the thread locker

5-4 The following conditions may cause problems, please pay attention

- Overrun
- Insufficient lubricant
- Are the bearing/gear components damaged
- Poor connection with other interface components

5-5 If the following problems occur, please stop immediately and check the reducer

- The internal temperature rises over 80 degrees or the ambient temperature rises over 40 degrees
- Abnormal noise or vibration

6. Lubricant

HIWIN G11 special lubricant oil for reducer

- **Conditions and characteristics of use**

1. Load resistance
2. Wear resistance
3. Excellent shear stability
4. Suitable for robots, automation equipment, semiconductor equipment, machine tools, etc.

- **Basic Properties**

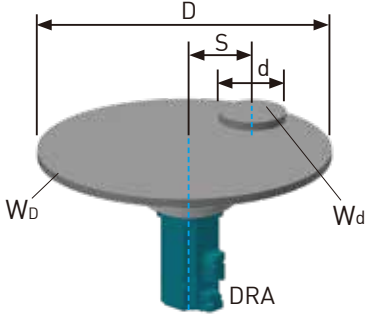
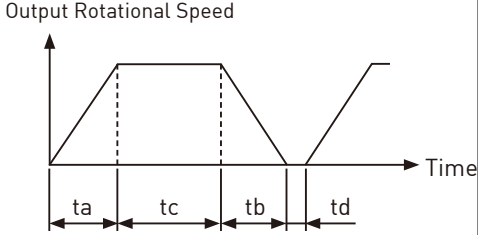
Colour	Yellow
Base oil	Mineral oil
Consistency Enhancer	Lithium soap
Service temp. (°C)	-20~130
Ambient working temperature (°C)	0~40
NLGI-grade (0.1mm)	265~295
Drop point (°C)	196

- **Packaging specifications:** 400g hard tube packed

- **Others**

1. HIWIN DATORKER® is prepacked with HIWIN G11 grease can be installed directly. Except for WUI-CO type, high speed and high torque conditions, it is recommended to apply additional grease to each part as per the Lubrication instructions in this technical manual.
2. Do not mix and use with different types of Lubricants.
3. For use in special conditions with high vibration, in clean room, vacuum, high temperature or low temperature, please contact us for more detailed evaluation.

7. DATORKER® Inquiry form

Customer Name		Date	
Basic Information	Equipment	<input type="checkbox"/> Robot _____ <input type="checkbox"/> Semi-conductor equipment _____ <input type="checkbox"/> Machine tool _____ <input type="checkbox"/> Automation equipment _____ <input type="checkbox"/> Inspection equipment _____ <input type="checkbox"/> Medical related equipment _____ <input type="checkbox"/> Others _____	
	Others	<input type="checkbox"/> Dust Proof <input type="checkbox"/> Customized Dimensions <input type="checkbox"/> Others (_____)	
Type of Reducer currently used		<input type="checkbox"/> Planetary gear reducer <input type="checkbox"/> Cycloid gear reducer <input type="checkbox"/> Hollow rotary platform <input type="checkbox"/> Harmonic reducer, Brand _____ ; Spec _____ <input type="checkbox"/> Others (_____)	
Selection	<ul style="list-style-type: none"> • Mechanism details Table diameter (D) : _____ (mm) Table weight (W_D) : _____ (kg) Workpiece diameter (d) : _____ (mm) Workpiece weight (W_d) : _____ (kg) Distance between axis center and workpiece center(S) : _____ (mm) 		<ul style="list-style-type: none"> • Operation Parameters Maximum RPM : _____ (rpm) Acceleration time (t_a) : _____ (sec) Deceleration time (t_b) : _____ (sec) Velocity time (t_c) : _____ (sec) Rest time (t_d) : _____ (sec)
			
Reduction Ratio		<input type="checkbox"/> 50 <input type="checkbox"/> 80 <input type="checkbox"/> 100 <input type="checkbox"/> 120	
Environments		<input type="checkbox"/> Normal working conditions (ambient temperature 0°C - 40°C , humidity under 80% RH) <input type="checkbox"/> Special working conditions (ambient temperature : _____ °C) <input type="checkbox"/> Harsh environment (Dusty, Cutting fluid, dirty, etc) <input type="checkbox"/> Other special conditions : _____	

DATORKER® Robot Reducer Technical Information

Publication Date : November 2020, first edition

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