



Assembly instructions

DATORKER® strain wave gear

DT-02-1-EN-2504-MA

Legal information**HIWIN GmbH**

Brücklesbünd 1

77654 Offenburg, Germany

Germany

Fon +49 781 93278-0

info@hiwin.de

hiwin.de

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Foreword

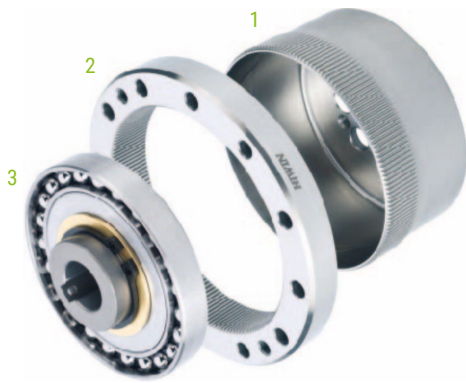
DATORKER® strain wave gears feature high precision, high efficiency, high torsional stiffness and low starting torques. They are widely used in robotics, automation technology, semiconductor technology, machine tools and many other industries.

1 Description of the DATORKER® strain wave gear

1.1 Features

- Compact and lightweight – easy handling for the customer.
- High accuracy – provides stable repeatability and positioning accuracies.
- Improved lubrication properties
- High torque – widely used in automation and metrology.
- Large coaster gear reduction range – different selection options for the same models

1.2 Structure



1. Flexible sprocket

Slim and elastic metal ring with external teeth. Continuous elastic deformation during operation. Typically used as the output side.

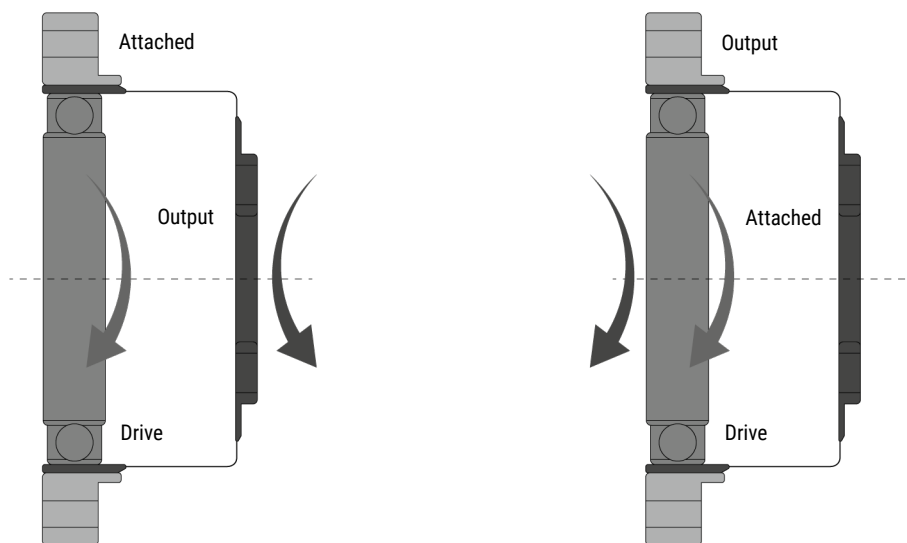
2. Rigid sprocket

Rigid metal ring with internal teeth. The internal teeth have two teeth more than the external teeth of the flexible sprocket. This is typically screwed on tightly.

3. Shaft generator

Elliptical bearing for generating the wave movement. Typically used as the drive side.

Reduction ratio and direction of rotation



Input and output with opposite direction of rotation

$$\text{Effective reduction ratio} = \frac{-1}{R}$$

(R = reduction ratio from data sheet)

Drive and output with same direction of rotation

$$\text{Effective reduction ratio} = \frac{1}{R+1}$$

1.3 Order code

Number	1	2	3	4	5	6	7	8
Order code	D	S	H	25	80	P	H	M
1	D	DATORKER® strain wave gear						
2	S	Type: S: Standard G: Heavy load						
3	H	Structure of the flexible sprocket: C: Mug form H: Hollow form						
4	25	Size: 14, 17, 20, 25, 32						
5	80	Reduction: 50, 80, 100, 120, 160						
6	P	Structure: C: Component from gearbox without bearing P: Combination of gearbox and bearing A: Combination of gearbox, bearing and seal						
7	H	Input type: O: Hub with feather key groove H: Hollow shaft J: Journal						
8	M	M: Reinforced crossed roller bearing						

1.4 Type / Function

DSC type



Combination (PO)

- Combination type (P) with gearbox and bearing
- Connection via oldham coupling
- Withstands axial and radial load
- Reduced backlash



Component (CO)

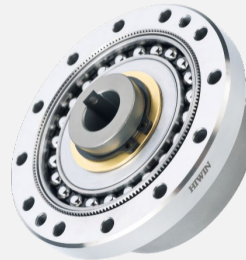
- Component type (P) with gearbox without bearing
- Connection via oldham coupling
- Self-assembly of the individual parts necessary: flexible and rigid sprocket are not screwed together
- Reduced backlash

DGC type



Combination (PO)

- Combination type (P) with gearbox and bearing
- Connection via oldham coupling
- Withstands axial and radial load
- Reduced backlash
- Increased torque



Component (CO)

- Component type (P) with gearbox without bearing
- Connection via oldham coupling
- Self-assembly of the individual parts necessary: flexible and rigid sprocket are not screwed together
- Reduced backlash
- Increased torque

DSH type



Combination (PO)

- Combination type (P) with gearbox and bearing
- Connection via oldham coupling
- Withstands axial and radial load
- Reduced backlash



Combination (PH)

- Combination type (P) with gearbox and bearing
- Connection through hollow shaft
- Withstands axial and radial load
- No backlash



Combination (AH)

- Sealed type (A) with gearbox, bearing and seal
- Connection through hollow shaft
- Withstands axial and radial load
- No backlash
- Completely sealed type.
- User-friendly design



Combination (AJ)

- Sealed type (A) with gearbox, bearing and seal
- Connection through solid shaft
- Withstands axial and radial load
- Completely sealed type.
- User-friendly design

DGH type



Combination (PO)

- Combination type (P) with gearbox and bearing
- Connection via oldham coupling
- Withstands axial and radial load
- Reduced backlash
- Increased torque



Combination (PH)

- Combination type (P) with gearbox and bearing
- Connection through hollow shaft
- Withstands axial and radial load
- No backlash
- Increased torque

DGH type



Combination (AH)

- Sealed type (A) with gearbox, bearing and seal
- Connection through hollow shaft
- Withstands axial and radial load
- No backlash
- Completely sealed type.
- User-friendly design
- Increased torque



Combination (AJ)

- Sealed type (A) with gearbox, bearing and seal
- Connection through solid shaft
- Withstands axial and radial load
- Completely sealed type.
- User-friendly design
- Increased torque

DSC-M type



Combination (PO)

- Combination type (P) with gearbox and bearing
- Connection via oldham coupling
- Withstands increased axial and radial load
- Reduced backlash



Combination (AJ)

- Sealed type (A) with gearbox, bearing and seal
- Connection through solid shaft
- Withstands increased axial and radial load
- Completely sealed type.
- User-friendly design

2 Selection procedure

2.1 Confirmation of the application condition



2.2 Calculation of the load torque, the output speed and the service life



2.3 Selection of the type and specifications of the DATORKER® strain wave gear

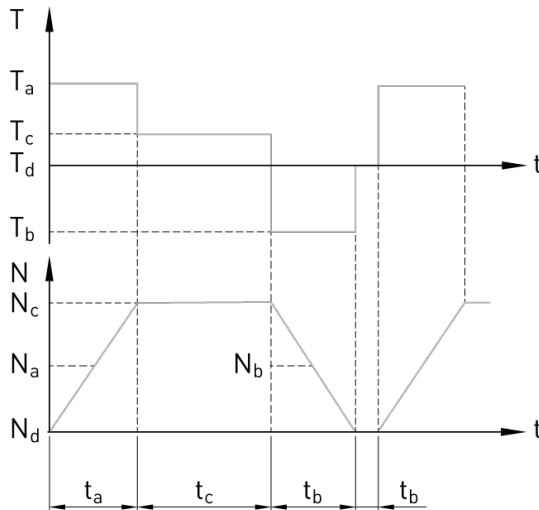


2.4 Calculation of the service life of the HIWIN crossed roller bearing



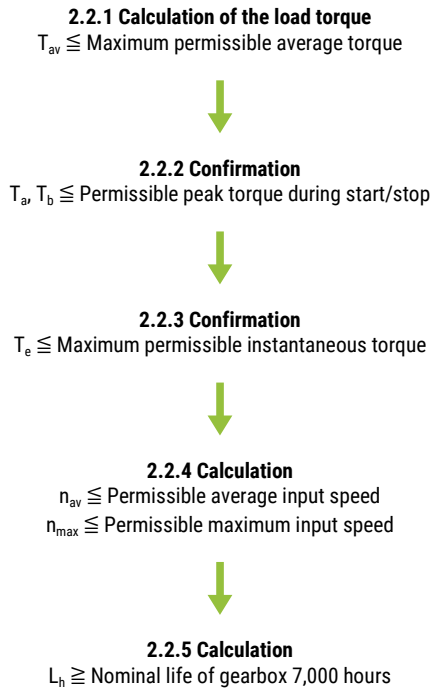
Completing the selection

2.1 Confirmation of application condition



Model \ Element	Load torque (T)	Time (t)	Output speed (N)	Maximum input speed	Maximum input speed
Start time (acceleration)	T_a	t_a	N_a	N_{max}	n_{max}
Operating time (constant)	T_c	t_c	N_c		
Stop time (deceleration)	T_b	t_b	N_b		
Switch-off time	T_d	t_d	N_d		
Impact effect	T_e	t_e	N_e		

2.2 Calculation of the load torque, speed and service life



2.2.1 Maximum permissible value of the average load torque

When the input speed or load torque changes, calculate the average load torque and check whether it is in accordance with the values in the nominal power table of each specification. Please note that a value exceeding the catalogue value may cause premature ageing of the lubricant and abnormal gear wheel wear due to heat.

Calculation of the 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 during start/stop

When starting and stopping, a greater load than the average torque is exerted on the gearbox due to the moment of inertia of the load.

2.2.3 Maximum permissible instantaneous torque

The maximum permissible instantaneous torque corresponds to the maximum permissible load torque at the time of impact.

2.2.4 Permissible average input speed and permissible maximum input speed

When setting the operating conditions of the gearbox, the values specified in the nominal power table must not be exceeded.

Calculation of the average output speed:

$$N_{av} = \frac{N_1 t_1 + N_2 t_2 + \dots + N_n t_n}{t_1 + t_2 + \dots + t_n}$$

Calculation of the average input speed:

$$n_{av} = N_{av} * R$$

Calculation of the maximum input speed

$$n_{max} = N_{max} * R$$

R = Reduction ratio

2.2.5 Nominal service life of the gearbox

The service life of the gearbox depends on the flexible bearing of the shaft generator. The nominal service life of the shaft generator is 7,000 hours. The Heavyload variant has a rated service life of 10,000 hours. The calculation formula is as follows:

Calculation of the service life

$$L_h = 7.000 \times \left(\frac{T_r}{T_{av}} \right)^3 \times \left(\frac{n_r}{n_{av}} \right)$$

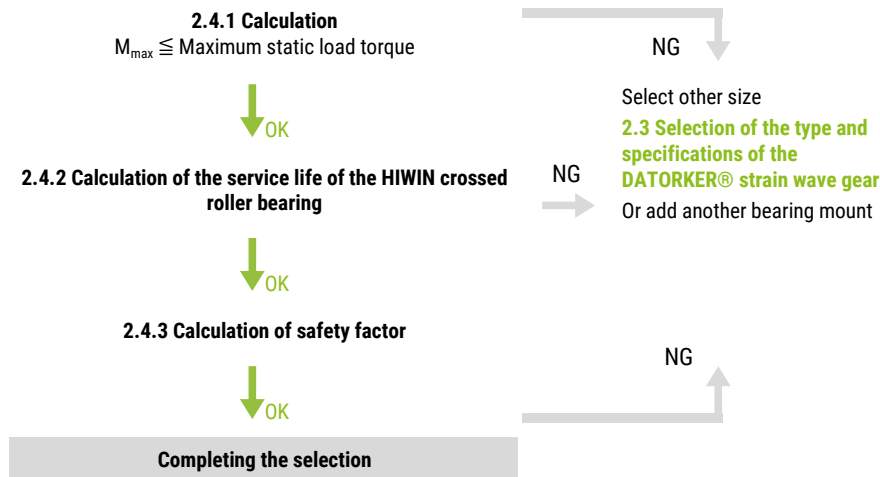
T_r = Nominal torque

n_r = Nominal speed

2.3 Selection of the DATORKER® strain wave gear, type and specification

Select the DATORKER® strain wave gear according to the operating requirements and check the nominal power table of each unit according to the calculation results from the previous step to check whether the selected model specifications match the application. If the gearbox contains 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 service life of the crossed roller bearing



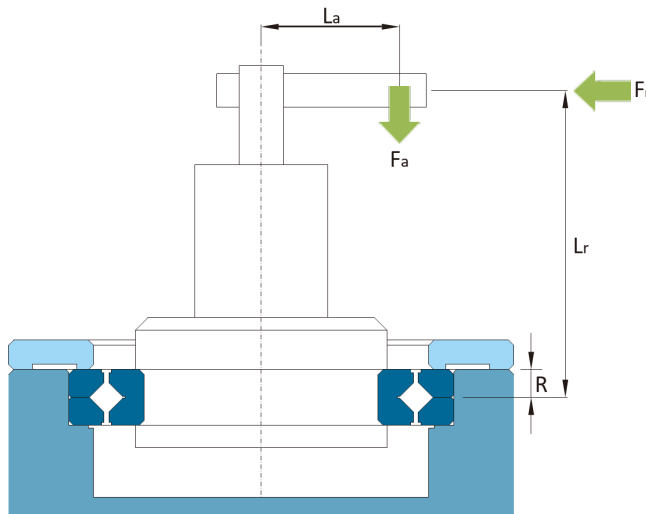
2.4.1 Maximum static load torque

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

$$\text{Calculation of static load torque } M_{\max} = F_{r_{\max}} \times L_r + F_{a_{\max}} \times L_a$$

F_r = radial load

F_a = axial load



2.4.2 Calculation of the service life of crossed roller bearings

Calculation of the basic service life

$$L = \left(\frac{C_{\text{dyn}}}{F_w * P_{\text{dyn}}} \right)^{\frac{10}{3}}$$

P_{dyn} = dynamic equivalent load

C_{dyn} = dynamic load

f_w = load factor

Load condition	Load factor (F_w)
No jolting / vibration	1 - 1.2
Normal	1.2 - 1.5
With jolting and vibration	1.5 - 3

Calculation of the dynamic equivalent load

$$P_{\text{dyn}} = X(F_r + \frac{2M}{D_{pw}}) + Y * F_a$$

with $\frac{F_a}{F_r + \frac{2M}{D_{pw}}} \leq 1,5$ mit $X = 1, Y = 0,45$ with

$\frac{F_a}{F_r + \frac{2M}{D_{pw}}} \geq 1,5$ bei $X = 0,67, Y = 0,67^\circ$

M = torque

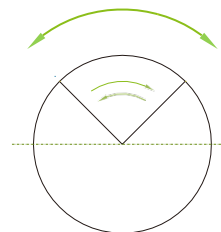
D_{pw} = hole circle diameter

For an application with short oscillations, carry out the calculation according to the following formula

Calculation of the lifetime of the vibration

$$L_{oc} = \frac{180^\circ}{\theta} * L$$

θ = angle of the oscillation



2.4.3 Calculation of safety factor

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

Calculation of safety factor

$$f_s = \frac{C_0}{P_0}$$

P_0 = static equivalent load

C_0 = static load rating

Calculation of the static equivalent load

$$P_0 = F_r + \frac{2M}{D_{pw}} + 0.44 F_a$$

Operating condition	Safety factor (f_s)
Standard operation	≥ 1.5
Bearing with vibrating load	≥ 2
High speed and high accuracy	≥ 3

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

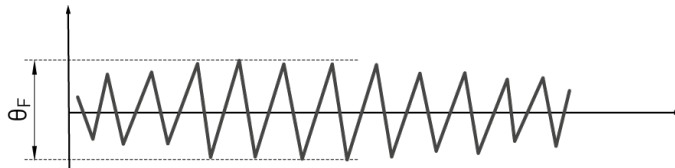
3 Definition

3.1 Accuracy of angular transmission

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

$$\theta = \frac{\theta_1}{\text{Untersetzungsverhältnis}}$$

$$\theta_{\text{Fehler}} = \theta_3 - \theta_2$$



3.2 Starting torque

The starting torque is the maximum torque value required during idling when the input (high speed) applies torque and the output (low speed) starts working.

3.3 Reverse starting torque

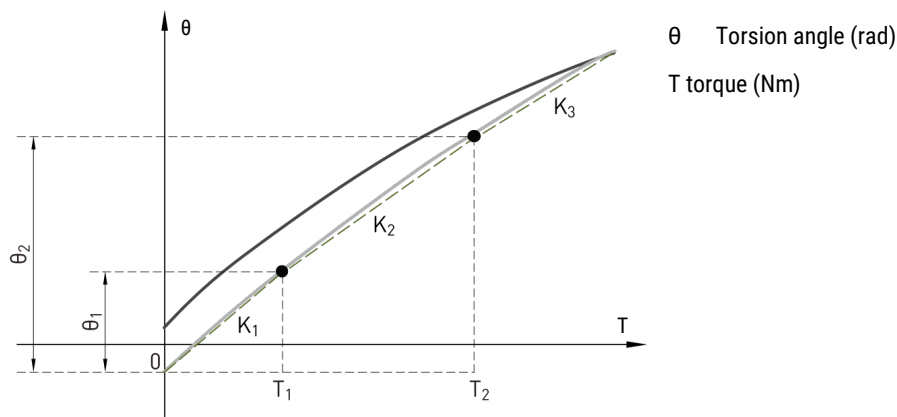
The reverse starting torque is the maximum torque value required during idling when the output (low speed) applies torque and the input (high speed) starts working.

3.4 Torsional rigidity

The torsional stiffness is defined as a fixed input (shaft generator) and applies a torque to the output (flexible sprocket) of the gearbox of the industrial robot. The ratio generated by the torque and the torsion angle.

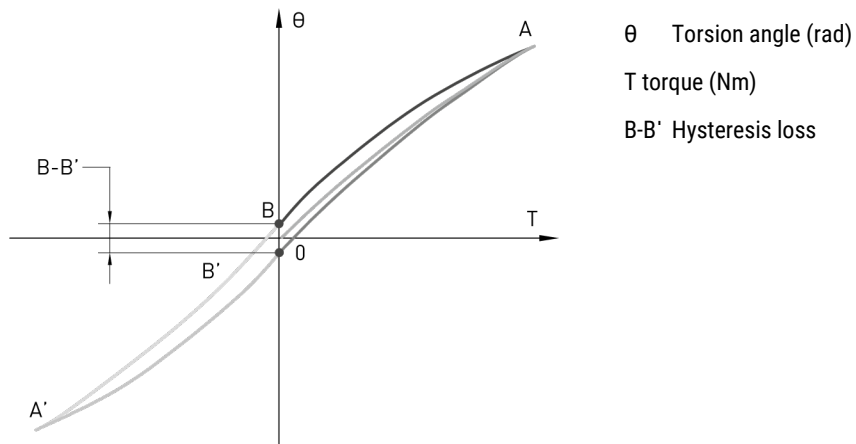
The slope of the “torque torsion angle diagram” is expressed as a spring constant. The “torque torsion angle diagram” is divided into three parts and the spring constant of each section represents K_1 , K_2 and K_3 .

- 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 at the nominal value and reset to "0", the torsion angle is not completely "0" and has 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, maximum backlash describes the maximum displacement or rotation in a given direction while a part is held stationary. The backlash of the HIWIN DATORKER® strain wave gear is damped to "0". The source of maximum backlash is caused by the gap between the coupling and the shaft generator. This applies to all types equipped with an oldham coupling.

4 Product series

4.1 DSC-PO type

4.1.1 Technical data

Table 4.1: Valuation table

Model	Reduction	Nominal torque at 2000 rpm	Peak torque at start/stop	Maximum average torque	Collision torque	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	5.4	18.0	6.9	35.0	8,500	3,500
	80	7.8	23.0	11.0	47.0		
	100	7.8	28.0	11.0	54.0		
17	50	16.0	34.0	26.0	70.0	7,300	3,500
	80	22.0	43.0	27.0	87.0		
	100	24.0	54.0	39.0	108.0		
	120	24.0	54.0	39.0	86.0		
20	50	25.0	56.0	34.0	98.0	6,500	3,500
	80	34.0	74.0	47.0	127.0		
	100	40.0	82.0	49.0	147.0		
	120	40.0	87.0	49.0	147.0		
	160	40.0	92.0	49.0	147.0		
25	50	39.0	98.0	55.0	186.0	5,600	3,500
	80	63.0	137.0	87.0	255.0		
	100	67.0	157.0	108.0	284.0		
	120	67.0	167.0	108.0	304.0		
	160	67.0	176.0	108.0	314.0		
32	50	76.0	216.0	108.0	382.0	4,800	3,500
	80	118.0	304.0	167.0	568.0		
	100	137.0	333.0	216.0	647.0		
	120	137.0	353.0	216.0	686.0		
	160	137.0	372.0	216.0	686.0		

Table 4.2: Crossed roller bearing specifications

Model	Centre circle diameter of the rollers	Offset	Basic load ratings		Permitted torque	Torque stiffness
	Dpw	R	Dynamic load C_{dyn}	Static load C_0		
	m	m	kN	kN		
14	0.0350	0.0095	4.7	6.1	41	4.38
17	0.0425	0.0095	5.3	7.6	64	7.75
20	0.0500	0.0095	5.8	9.0	91	12.80
25	0.0620	0.0115	9.6	15.1	156	24.20
32	0.0800	0.0130	15.0	25.0	313	53.90

Table 4.3: Accuracy of angular transmission

Model		14	17	20	25	32
Reduction ratio						
50 - 160	$\times 10^{-4}$ rad	4.4	4.4	2.9	2.9	2.9

Table 4.4: Hysteresis loss

Model		14	17	20	25	32
Reduction ratio						
50	$\times 10^{-4}$ rad	5.8	5.8	5.8	5.8	5.8
80 - 160	$\times 10^{-4}$ rad	2.9	2.9	2.9	2.9	2.9

Table 4.5: Maximum backlash of oldham coupling

Model		14	17	20	25	32
Reduction ratio						
50	$\times 10^{-5}$ rad	17.5	9.7	8.2	8.2	6.8
80	$\times 10^{-5}$ rad	11.2	6.3	5.3	5.3	4.4
100	$\times 10^{-5}$ rad	8.7	4.8	4.4	4.4	3.4
120	$\times 10^{-5}$ rad	-	3.9	3.9	3.9	2.9
160	$\times 10^{-5}$ rad	-	-	2.9	2.9	2.4

Table 4.6: Starting torque (unit cNm)

Model		14	17	20	25	32
Reduction ratio						
50		4.1	6.1	7.8	15.0	31
80		2.8	4.0	4.9	9.2	19
100		2.5	3.4	4.3	8.0	18
120		-	3.1	3.8	7.3	15
160		-	-	3.3	6.3	14.0

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

Table 4.7: Reverse starting torque (unit Nm)

Reduction ratio	Model	14	17	20	25	32
50		1.6	3.0	4.7	9.0	18
80		1.6	3.0	4.8	9.1	19
100		1.8	3.3	5.1	9.8	20
120		–	3.5	5.5	11.0	22
160		–	–	6.4	13.0	26.0

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

Table 4.8: Torsional rigidity

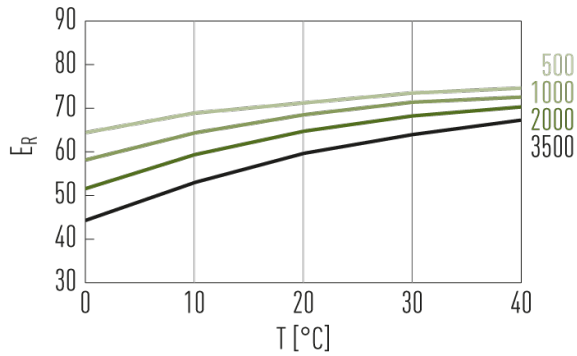
Reduction ratio	Model	14	17	20	25	32	
T ₁	Nm	2.0	3.9	7.0	14.0	29.0	
T ₂	Nm	6.9	12.0	25.0	48.0	108.0	
50	K ₁	×10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad	16.0	12.0	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad	0.47	1.0	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11.0
	K ₃	×10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12.0
	θ ₁	×10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad	12.0	9.7	11.3	11.1	11.6

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

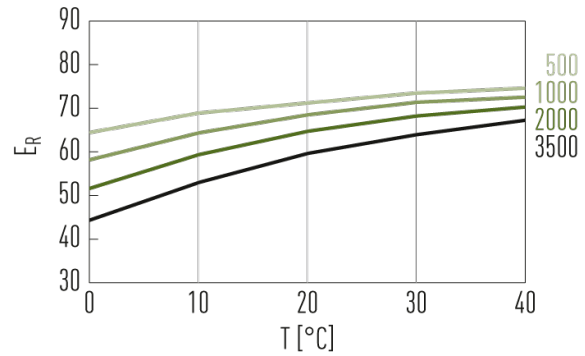
4.1.2 Efficiency E_R

The efficiency of DATORKER® strain wave gears changes depending on the specification, ratio, operating conditions (speed/load) and lubrication (lubricant type/amount).

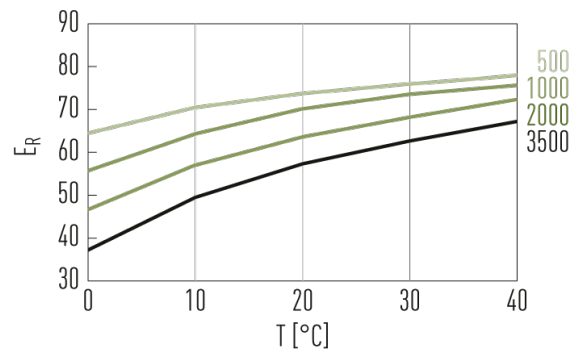
Model: 14, ratio: 50



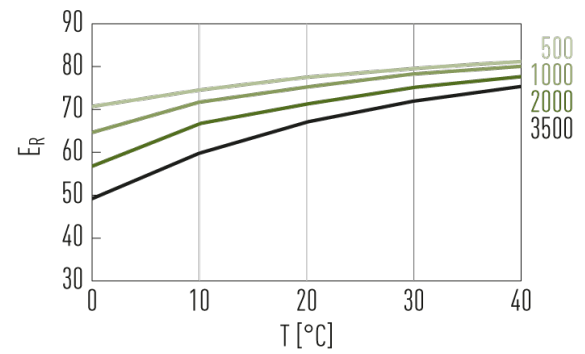
Model: 14, ratio: 80



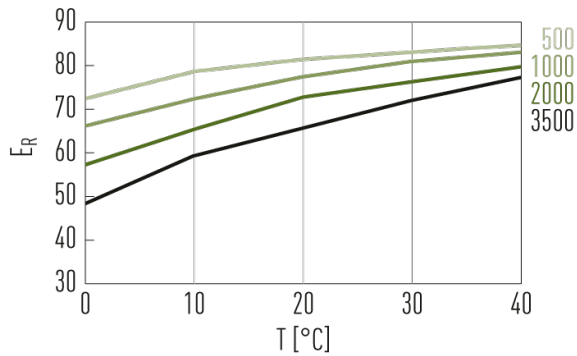
Model: 14, ratio: 100



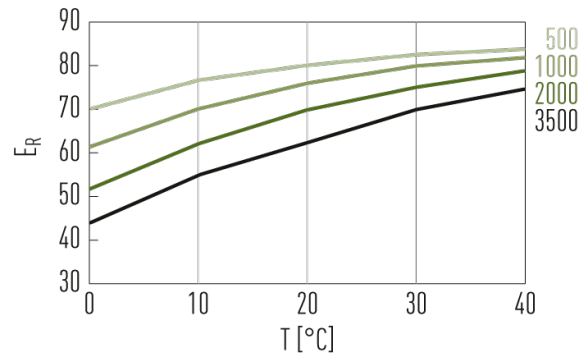
Model: 17-32, ratio: 50



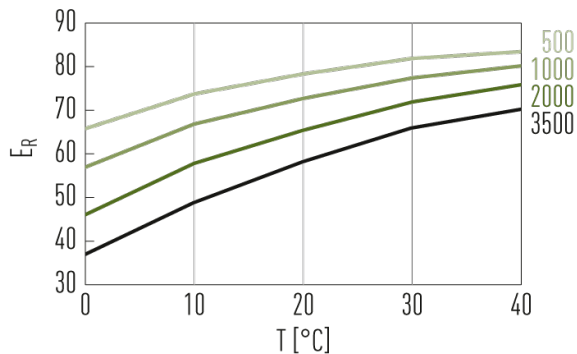
Model: 17-32, ratio: 80, 100



Model: 17-32, ratio: 120



Model: 20-32, ratio: 160

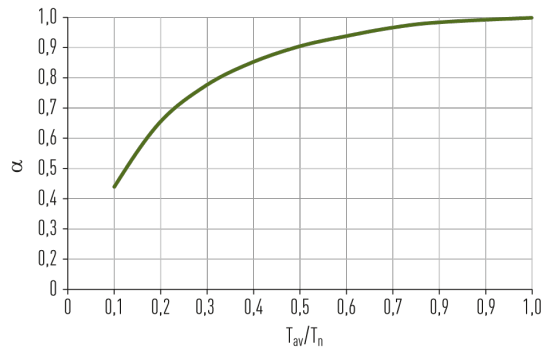


Correction coefficient α

Efficiency = $\alpha \times \eta_{ER}$

α = correction coefficient

ER = efficiency at nominal torque



4.1.3 Idling operating torque

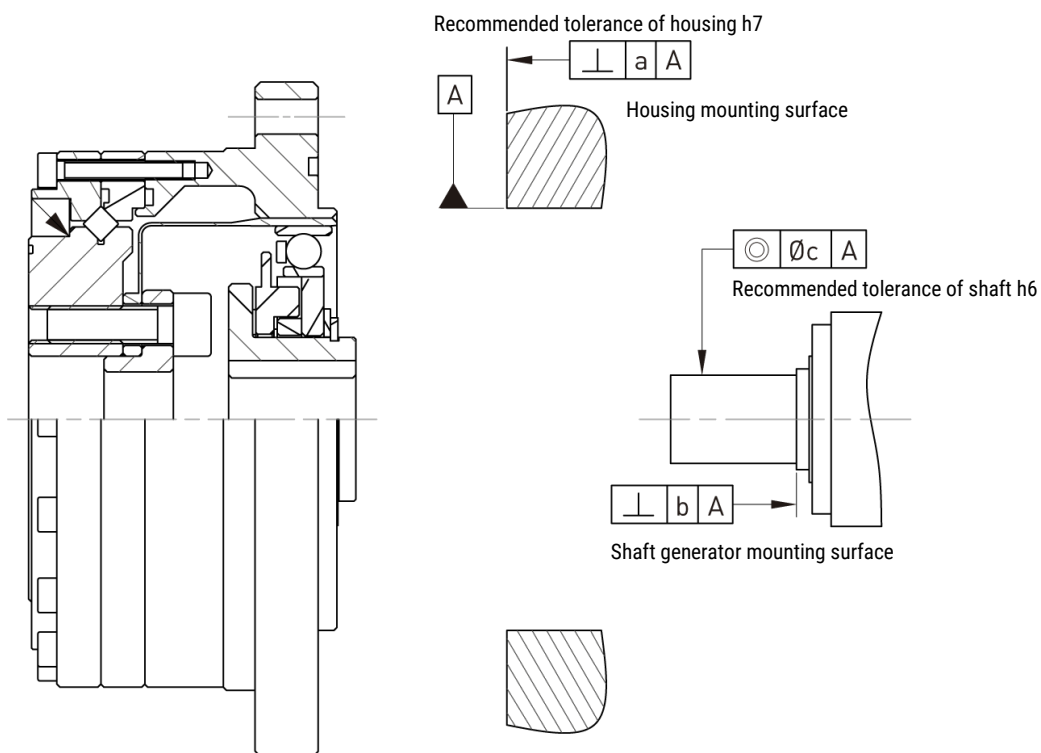
The idling operating torque is the torque required to drive the DATORKER® strain wave gear input (high speed end) after more than 2 hours at an input speed of 2,000 rpm at an average ambient temperature of 25 °C without load.

Unit: cNm

Reduction ratio	Input speed	Model				
		14	17	20	25	32
50	500 rpm	3.2	5.1	7.3	12.8	26.1
	1,000 rpm	3.9	6.1	9.1	17.8	33.1
	2,000 rpm	4.6	7.6	11.8	21.8	44.1
	3,500 rpm	5.9	9.6	12.7	28.8	57.1
80	500 rpm	2.3	3.8	5.5	9.7	20.3
	1,000 rpm	3.0	4.8	7.3	14.7	27.3
	2,000 rpm	3.7	6.3	10.0	18.7	38.3
	3,500 rpm	5.0	8.3	10.9	25.7	51.3
100	500 rpm	2.1	3.5	5.0	9.0	19.0
	1,000 rpm	2.8	4.5	6.8	14.0	26.0
	2,000 rpm	3.5	6.0	9.5	18.0	37.0
	3,500 rpm	4.8	8.0	10.4	25.0	50.0
120	500 rpm	–	3.3	4.7	8.5	18.1
	1,000 rpm	–	4.3	6.5	13.5	25.1
	2,000 rpm	–	5.8	9.2	17.5	36.1
	3,500 rpm	–	7.8	10.1	24.5	47.2
160	500 rpm	–	–	4.2	7.8	16.8
	1,000 rpm	–	–	6.0	12.8	23.8
	2,000 rpm	–	–	8.7	16.8	34.8
	3,500 rpm	–	–	9.6	23.8	47.8

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

4.1.4 Installation accuracy

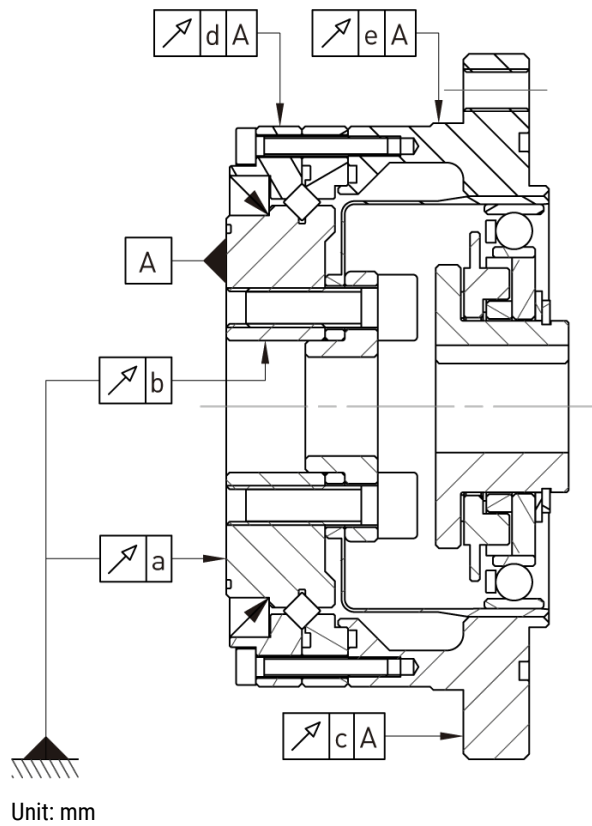


Unit: mm

	Model	14	17	20	25	32
Labelling						
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 shaft generator (without coupling).

4.1.5 Mechanical accuracy



	Model	14	17	20	25	32
Labelling						
a		0.010	0.010	0.010	0.015	0.015
b		0.010	0.012	0.012	0.013	0.013
c		0.024	0.026	0.038	0.045	0.056
d		0.010	0.010	0.010	0.010	0.010
e		0.038	0.038	0.047	0.049	0.054

4.1.6 Tightening torques for mounting screw

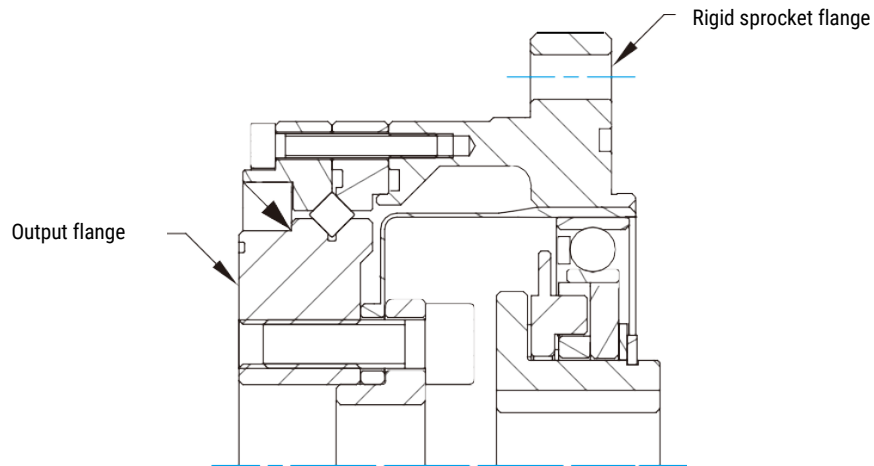


Table 4.9: Screw tightening torque for the output flange

Element		Model	14	17	20	25	32
Number of screws				6	8	8	8
Screw size				M5	M6	M8	M10
Installation of PCD screws	mm		23	27	32	42	55
Tightening torque for screws	Nm		4.5	9	15.3	37	74

Table 4.10: Screw tightening torque for the rigid sprocket flange

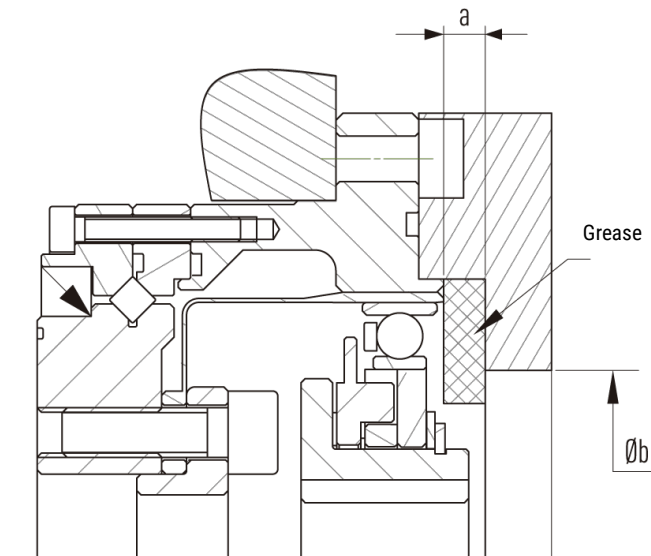
Element		Model	14	17	20	25	32
Number of screws			6	6	8	8	8
Screw size			M4	M4	M5	M5	M6
Installation of PCD screws	mm		65	71	82	96	125
Tightening torque for screws	Nm		4.5	4.5	9.0	9.0	15.3

Note:

1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu_K = \mu_G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.1.7 Lubrication

Keep the distance between the gearbox and the mounting flange as small as possible so that the grease remains inside during operation.



Unit mm

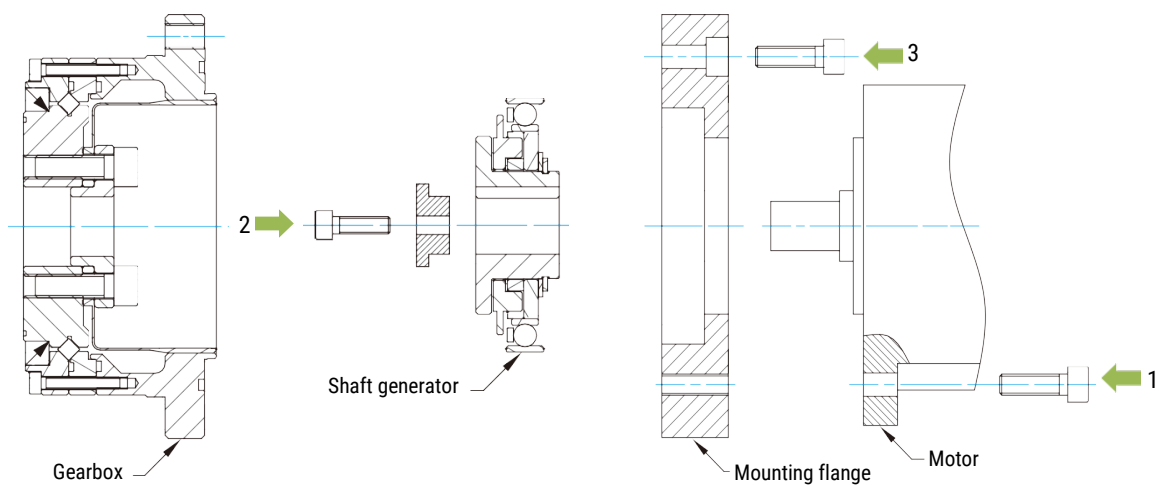
Element	Model 14	17	20	25	32
a ¹⁾	1	1	1.5	1.5	1.5
a ²⁾	3	3	4.5	4.5	4.5
Øb	16	26	30.0	37.0	37.0

1) Medium wave horizontal or vertical: when the shaft generator is pointing downwards

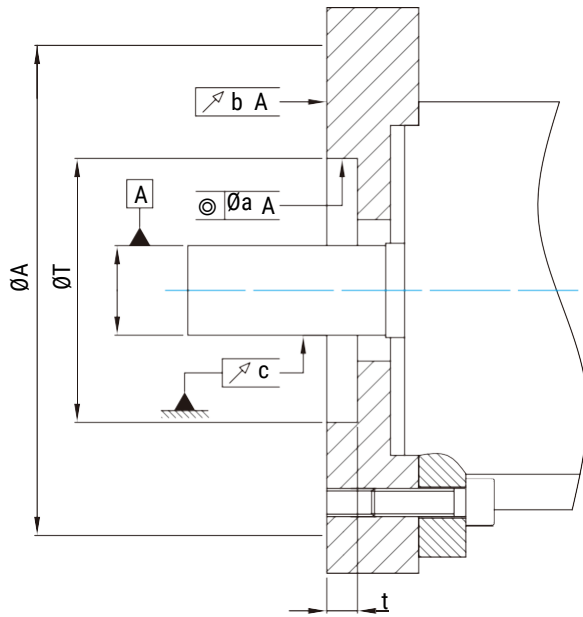
2) Medium wave vertical: when the shaft generator is pointing upwards

4.1.8 Installation procedure

1. Install the mounting flange on the motor mounting surface
2. Install the shaft generator on the motor output shaft
3. Install the gearbox



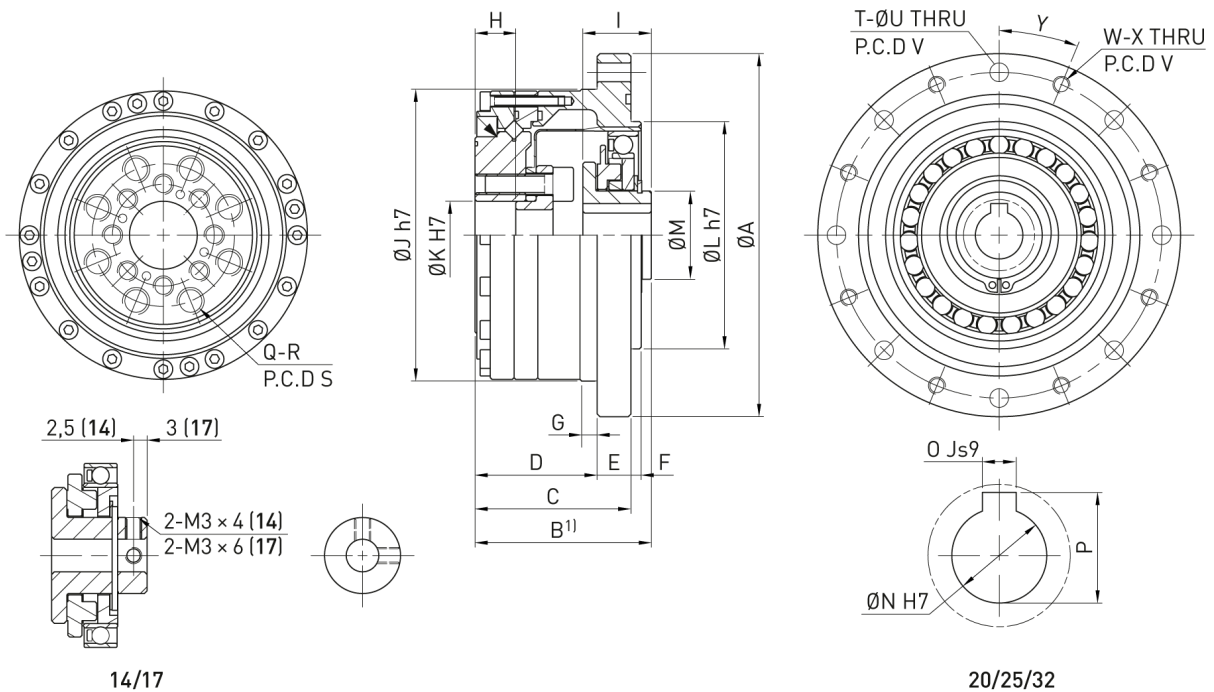
4.1.9 Installation of motor



Unit mm

Labelling	Model 14	17	20	25	32
a	0.030	0.040	0.040	0.040	0.040
b	0.030	0.040	0.040	0.040	0.040
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

4.1.10 DSC-PO type, size chart



Labelling	Model 14	17	20	25	32
ØA	73	79	93	107	138
B*	41 ⁰ _{-0.9}	45 ⁰ _{-0.9}	45.5 ⁰ ₋₁	52 ⁰ ₋₁	62 ⁰ _{-1.1}

Labelling	Model	14	17	20	25	32
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 _{-0,1}	19,5 ⁰ _{-0,1}	20,1 ⁰ _{-0,1}	20,2 ⁰ _{-0,1}	22 ⁰ _{-0,1}
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 ^{+0,1} ₀	16,3 ^{+0,1} ₀	16,3 ^{+0,1} ₀
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 (degrees)		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

Dimensions without unit in mm

*Dimension B is the mounting position and the permissible tolerance in axial direction.

4.2 DSC-CO type

4.2.1 Technical data

Table 4.11: Valuation table

Model	Reduction	Nominal torque at 2000 rpm	Peak torque at start/stop	Maximum average torque	Collision torque	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	5.4	18.0	6.9	35.0	8,500	3,500
	80	7.8	23.0	11.0	47.0		
	100	7.8	28.0	11.0	54.0		
17	50	16.0	34.0	26.0	70.0	7,300	3,500
	80	22.0	43.0	27.0	87.0		
	100	24.0	54.0	39.0	108.0		
	120	24.0	54.0	39.0	86.0		
20	50	25.0	56.0	34.0	98.0	6,500	3,500
	80	34.0	74.0	47.0	127.0		
	100	40.0	82.0	49.0	147.0		
	120	40.0	87.0	49.0	147.0		
	160	40.0	92.0	49.0	147.0		
25	50	39.0	98.0	55.0	186.0	5,600	3,500
	80	63.0	137.0	87.0	255.0		
	100	67.0	157.0	108.0	284.0		
	120	67.0	167.0	108.0	304.0		
	160	67.0	176.0	108.0	314.0		
32	50	76.0	216.0	108.0	382.0	4,800	3,500
	80	118.0	304.0	167.0	568.0		
	100	137.0	333.0	216.0	647.0		
	120	137.0	353.0	216.0	686.0		
	160	137.0	372.0	216.0	686.0		

Table 4.12: Accuracy of angular transmission

Model		14	17	20	25	32
Reduction ratio						
50 - 160	$\times 10^{-4}$ rad	4.4	4.4	2.9	2.9	2.9

Table 4.13: Hysteresis loss

Model		14	17	20	25	32
Reduction ratio						
50	$\times 10^{-4}$ rad	5.8	5.8	5.8	5.8	5.8
80 - 160	$\times 10^{-4}$ rad	2.9	2.9	2.9	2.9	2.9

Table 4.14: Maximum backlash of oldham coupling

Reduction ratio		Model	14	17	20	25	32
50	$\times 10^{-5}$ rad		17.5	9.7	8.2	8.2	6.8
80	$\times 10^{-5}$ rad		11.2	6.3	5.3	5.3	4.4
100	$\times 10^{-5}$ rad		8.7	4.8	4.4	4.4	3.4
120	$\times 10^{-5}$ rad		-	3.9	3.9	3.9	2.9
160	$\times 10^{-5}$ rad		-	-	2.9	2.9	2.4

Table 4.15: Starting torque (unit cNm)

Reduction ratio		Model	14	17	20	25	32
50			3.3	5.1	6.6	12.0	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
160			-	-	2.9	5.5	12

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

Table 4.16: Reverse starting torque (unit Nm)

Reduction ratio		Model	14	17	20	25	32
50			1.4	2.5	4.0	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
160			-	-	5.8	11	23

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

Table 4.17: Torsional rigidity

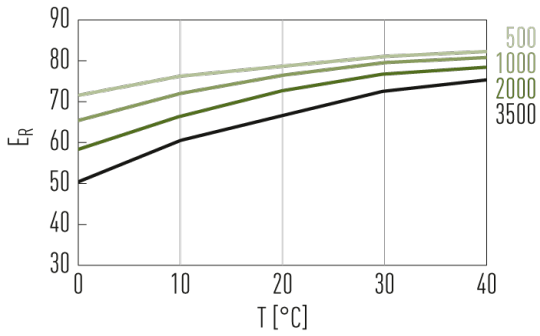
Reduction ratio			Model	14	17	20	25	32
T ₁		Nm		2.0	3.9	7.0	14.0	29.0
T ₂		Nm		6.9	12.0	25.0	48.0	108.0
50	K ₁	×10 ⁴ Nm/rad		0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad		0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad		0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad		5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad		16.0	12.0	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad		0.47	1.0	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad		0.61	1.4	2.5	5.0	11.0
	K ₃	×10 ⁴ Nm/rad		0.71	1.6	2.9	5.7	12.0
	θ ₁	×10 ⁻⁴ rad		4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad		12.0	9.7	11.3	11.1	11.6

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

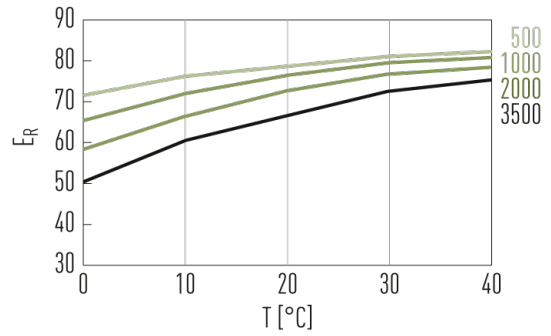
4.2.2 Efficiency E_R

The efficiency of DATORKER® strain wave gears changes depending on the specification, ratio, operating conditions (speed/load) and lubrication (lubricant type/amount).

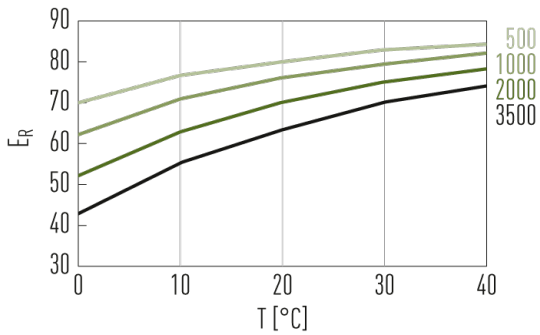
Model: 14, ratio: 50



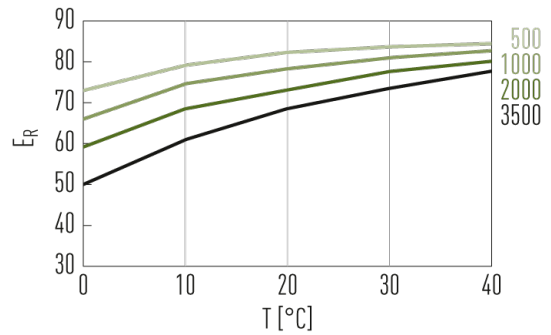
Model: 14, ratio: 80



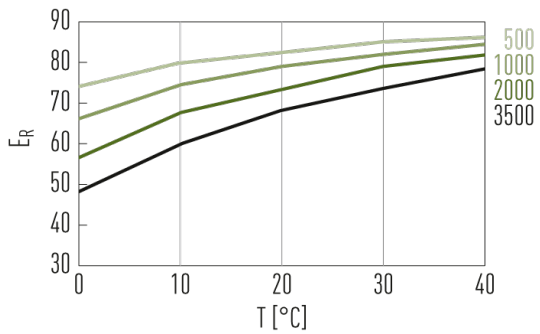
Model: 14, ratio: 100



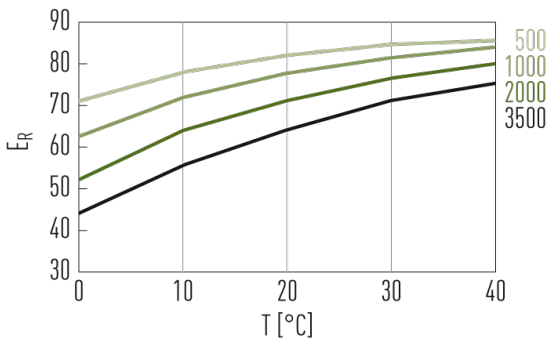
Model: 17-32, ratio: 50



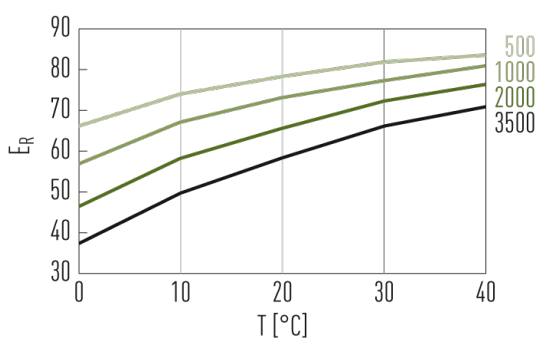
Model: 17-32, ratio: 80, 100



Model: 17-32, ratio: 120



Model: 20-32, ratio: 160

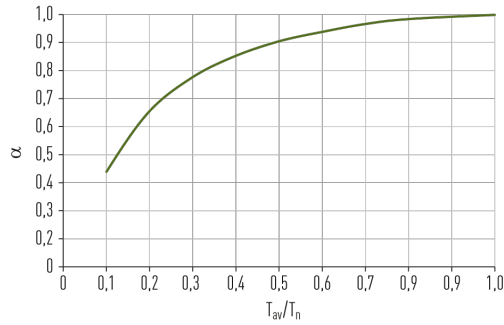


Correction coefficient α

Efficiency = $\alpha \times \eta_{ER}$

α = correction coefficient

ER = efficiency at nominal torque



4.2.3 Idling operating torque

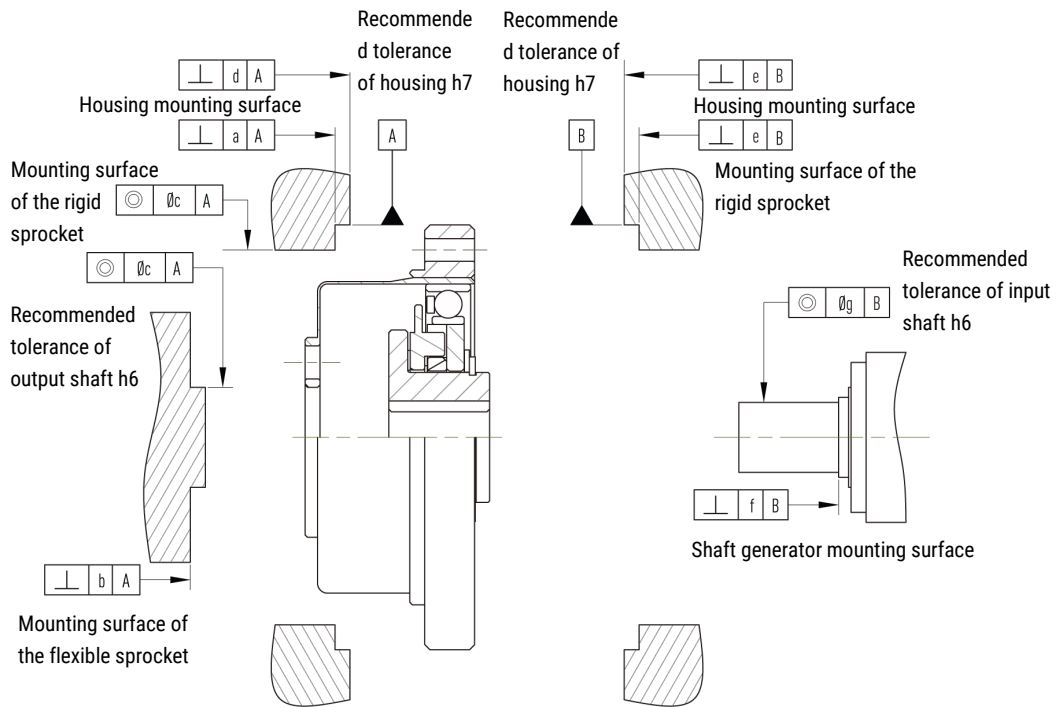
The idling operating torque is the torque required to drive the DATORKER® strain wave gear input (high speed end) after more than 2 hours at an input speed of 2,000 rpm at an average ambient temperature of 25 °C without load.

Unit: cNm

Reduction ratio	Input speed	Model				
		14	17	20	25	32
50	500 rpm	1.8	3.4	5.1	9.7	21.2
	1,000 rpm	2.3	4.4	6.9	12.5	27.2
	2,000 rpm	3.1	5.8	9.4	18.5	37.2
	3,500 rpm	4.2	7.9	13.4	25.5	50.2
80	500 rpm	1.4	2.6	3.9	7.6	16.8
	1,000 rpm	1.9	3.6	5.7	10.4	22.8
	2,000 rpm	2.7	5.0	8.2	16.4	32.8
	3,500 rpm	3.8	7.1	12.2	23.4	45.8
100	500 rpm	1.3	2.5	3.7	7.2	16.0
	1,000 rpm	1.8	3.5	5.5	10.0	22.0
	2,000 rpm	2.6	4.9	8.0	16.0	32.0
	3,500 rpm	3.7	7.0	12.0	23.0	45.0
120	500 rpm	–	2.4	3.5	6.9	15.4
	1,000 rpm	–	3.4	5.2	9.7	21.4
	2,000 rpm	–	4.8	7.8	15.7	31.4
	3,500 rpm	–	6.9	11.8	22.7	44.4
160	500 rpm	–	–	3.4	6.6	14.8
	1,000 rpm	–	–	5.2	9.4	20.8
	2,000 rpm	–	–	7.7	15.4	30.8
	3,500 rpm	–	–	11.7	22.4	43.8

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

4.2.4 Installation accuracy

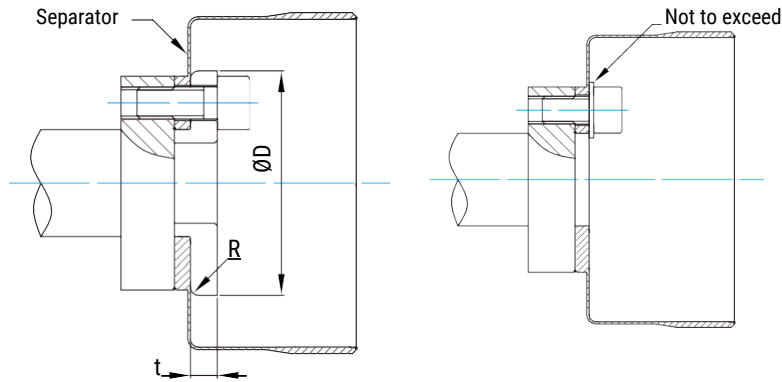


Unit: mm

	Model	14	17	20	25	32
Labelling						
a		0.011	0.012	0.013	0.014	0.016
b		0.008	0.011	0.014	0.018	0.022
∅c		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)
∅g		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 shaft generator (without coupling).

4.2.5 Recommended size of the pressing plate



Unit: mm

Labelling	Model	14	17	20	25	32
$\varnothing D_{-0,1}^0$		24.5	29.0	34.0	42.0	55.0
$R_0^{+0,1}$		1.2	1.2	1.4	1.5	2.0
t		2.0	2.5	2.5	5.0	7.0

Note: Note: To prevent the screws on the press plate from sinking or loosening, the following is recommended:

1. Material S45C.
2. The heat treatment hardness grade should be HB200 - 270.

4.2.6 Tightening torque for mounting screw

1. Side of the flexible sprocket:

- If the load torque is below the nominal power value in Table 4.11: Valuation table "Peak torque during start/stop", use only screws for installation.
- If the load torque can reach the nominal power value given in Table 4.11: Valuation table "Maximum permissible collision moment", use a combination of screws and pins for installation.

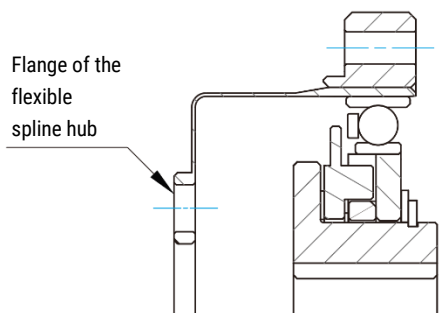


Table 4.18: Flange-side screw tightening torque of the flexible sprocket

Element	Model	14	17	20	25	32
Number of screws		6	6	8	8	8
Screw size		M4	M5	M5	M6	M8
Installation of PCD screws	mm	17	19	24	30	40
Tightening torque for screws	Nm	4.5	9.0	9.0	15.3	37

Note:

1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

Table 4.19: Installation of the flexible sprocket with the help of a pin

Element	Model	14	17	20	25	32
Number of screws		2	2	2	2	2
Pin diameter	mm	3	3	3	4	5
Pinhole PCD	mm	18.5	21.5	27	34	45
Screw plus transmission torque of the pin	kgfm	7.5	11	17	32	74

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

2. Side of the rigid sprocket flange

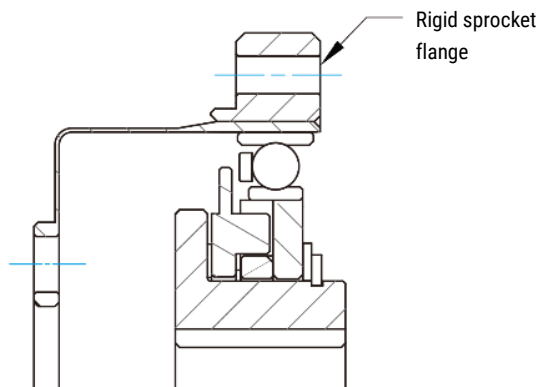


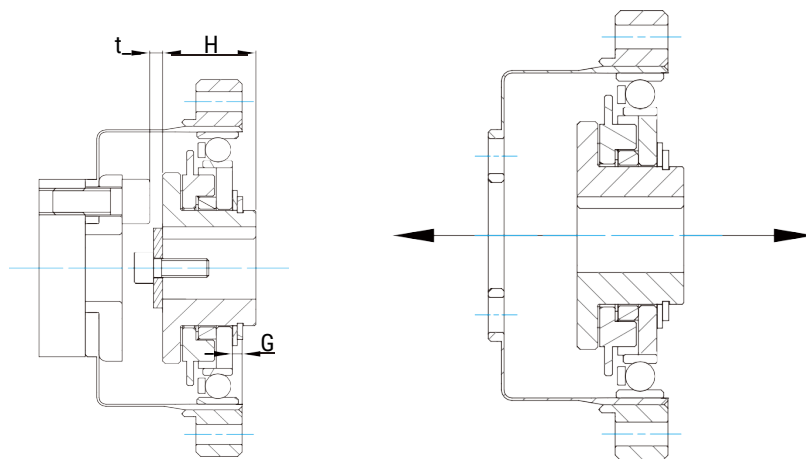
Table 4.20: Installation the rigid sprocket flange with the help of a screw

Element	Model	14	17	20	25	32
Number of screws		6	12	12	12	12
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	44	54	62	75	100
Tightening torque for screws	Nm	2.0	2.0	2.0	4.5	9.0

Note:

1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.2.7 Installation of the shaft generator



Unit: mm

Modelling	Model	14	17	20	25	32
G		0.4	0.3	0.1	2.1	2.5
H ⁰ _{-0,1}		17.6	19.5	20.1	20.2	22.0
t		2.5	2.5	2.9	2.8	3.8

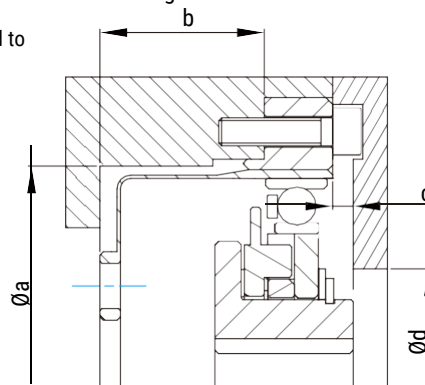
Note:

1. Avoid interference between the shaft generator and the screw of the flexible sprocket.
2. Due to the elastic deformation of the flexible sprocket, the gearbox causes a displacement of the shaft generator during operation. The displacement changes with the operating conditions. In any case, a mechanism must be used to prevent slippage due to displacement of the shaft generator.

4.2.8 Lubrication

1. Recommended dimensions of the inner wall of the housing

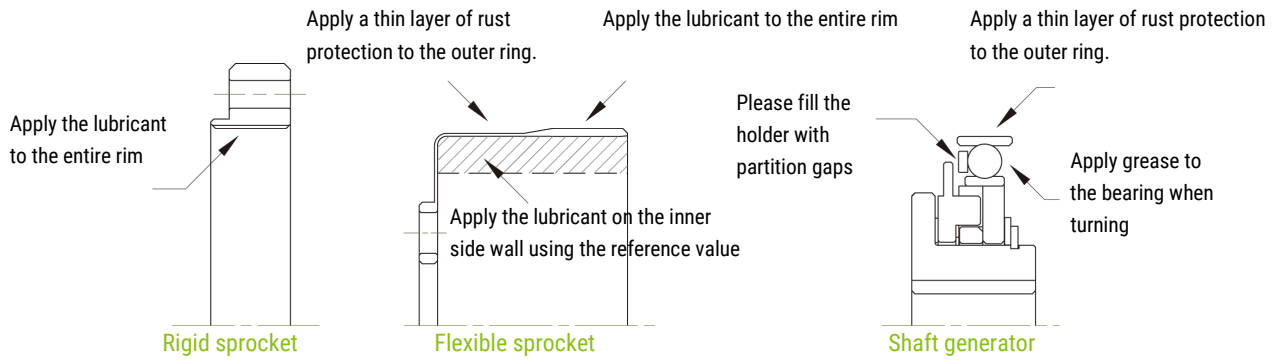
Keeping the following dimensions is recommended to avoid too much lubricant splashing on other parts during operation:



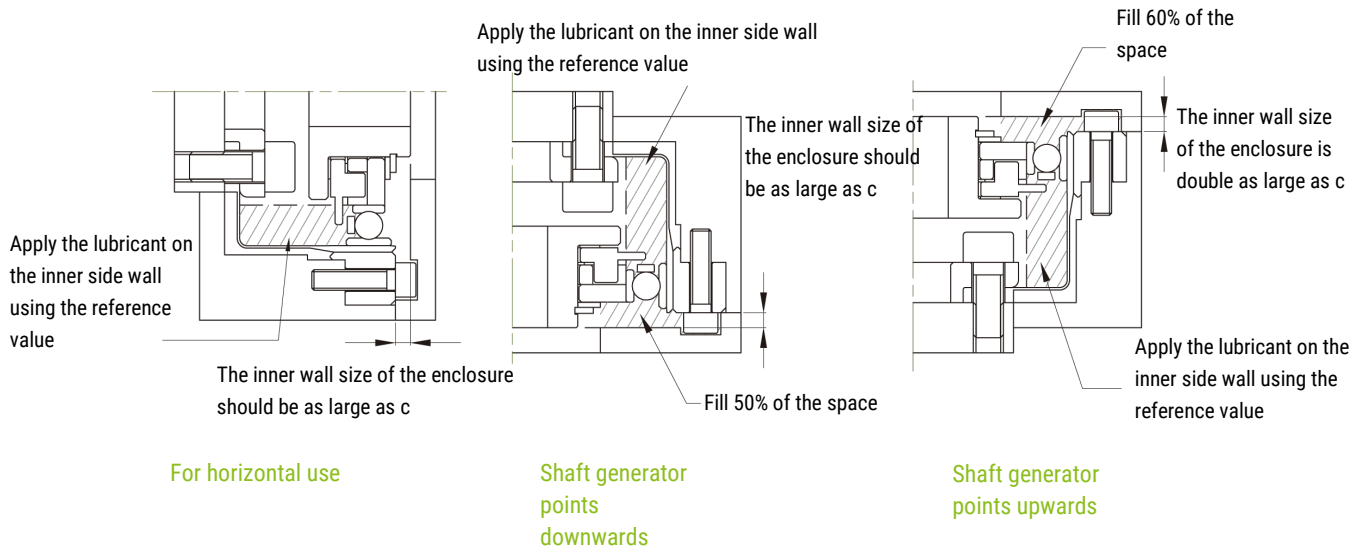
Unit: mm

Modelling	Model	14	17	20	25	32
Øa		38.0	45.0	53.0	66.0	86.0
b		17.1	19.0	20.5	23.0	26.8
c		1.0	1.0	1.5	1.5	1.5
Ød		16.0	26.0	30.0	37.0	37.0

2. Lubricant application



3. The most important points of different application methods

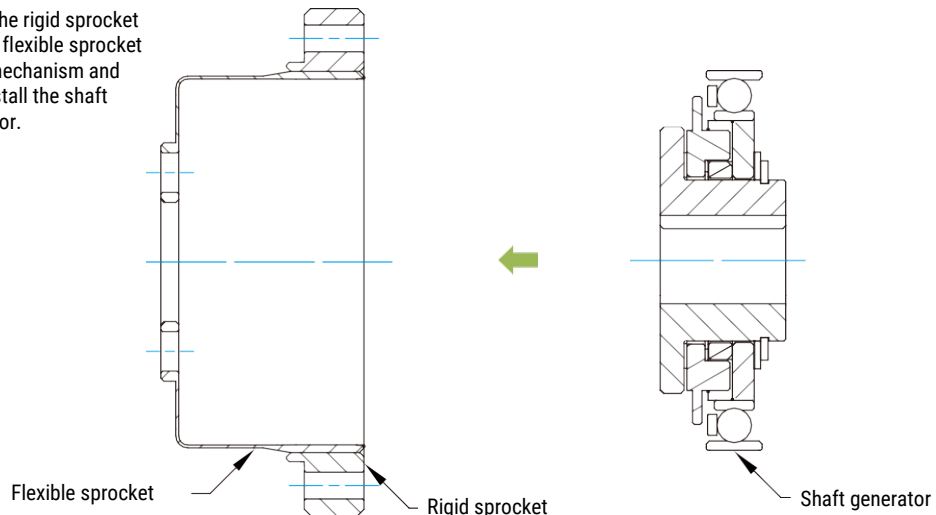


Unit: g

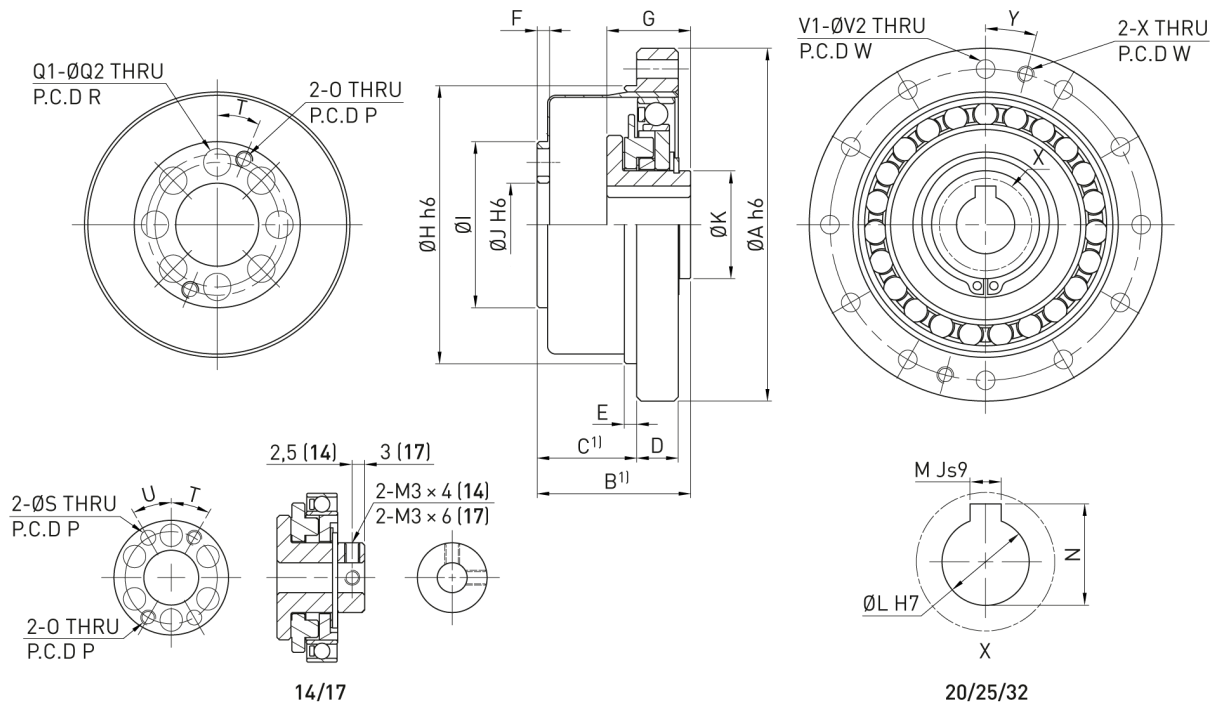
		Model 14	17	20	25	32
Instructions						
Horizontal use		5.5	10	16	30	60
Vertical use	Shaft generator points downwards	7.0	12	18	35	70
	Shaft generator points upwards	8.5	14	21	40	80

4.2.9 Installation procedure

Install the rigid sprocket and the flexible sprocket in the mechanism and then install the shaft generator.



4.2.10 DSC-CO type, size chart



	Model	14	17	20	25	32
Labelling						
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
J 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 (degrees)		30°	30°	22.5°	22.5°	22.5°
U (degrees)		30°	30°	-	-	-
V1		6	12	12	12	12
ØV2		3.5	3.5	3.5	4.5	5.5

Labelling	Model	14	17	20	25	32
W (P.C.D)		44	54	62	75	100
X		M3	M3	M3	M4	M5
Y (degrees)		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

Dimensions without unit in mm

*Dimension B, C is the mounting position and the permissible tolerance in axial direction.

4.3 DSH-PO type

4.3.1 Technical data

Table 4.21: Valuation table

Model	Reduction	Nominal torque at 2000 rpm ¹⁾	Peak torque at start/stop ²⁾	Maximum average torque ³⁾	Collision torque ⁴⁾	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	5.4	18	6.9	35	8,500	3,500
	80	7.8	23	11	47		
	100	7.8	28	11	54		
17	50	16	34	26	70	7,300	3,500
	80	22	43	27	87		
	100	24	54	39	110		
	120	24	54	39	86		
20	50	25	56	34	98	6,500	3,500
	80	34	74	47	127		
	100	40	82	49	147		
	120	40	87	49	147		
	160	40	92	49	147		
25	50	39	98	55	186	5,600	3,500
	80	63	137	87	255		
	100	67	157	108	284		
	120	67	167	108	304		
	160	67	176	108	314		
32	50	76	216	108	382	4,800	3,500
	80	118	304	167	568		
	100	137	333	216	647		
	120	137	353	216	686		
	160	137	372	216	686		

¹⁾ Permissible nominal torque

²⁾ Maximum permissible torque

³⁾ Permissible average torque

⁴⁾ Maximum permissible value of impact

Table 4.22: Crossed roller bearing specifications

Model	Hole circle diameter of the roller	Offset amount	Basic load ratings		Permissible torque load	Torque stiffness
	Dpw	R	Dynamic load C	Normal load Co		
	m	m	kN	kN	Nm	$\times 10^4$ Nm/rad
14	0.050	0.0217	5.8	8.6	74	8.5
17	0.060	0.0239	10.4	16.3	124	15.4
20	0.070	0.0255	14.6	22.0	187	25.2
25	0.085	0.0296	21.8	35.8	258	39.2
32	0.111	0.0364	38.2	65.4	580	100

Table 4.23: Accuracy of angular transmission

		Model	14	17	20	25	32
Reduction ratio							
50 - 160	$\times 10^{-4}$ rad		4.4	4.4	2.9	2.9	2.9

Table 4.24: Hysteresis loss

		Model	14	17	20	25	32
Reduction ratio							
50	$\times 10^{-4}$ rad		5.8	5.8	5.8	5.8	5.8
80 - 160	$\times 10^{-4}$ rad		2.9	2.9	2.9	2.9	2.9

Table 4.25: Maximum Backlash

		Model	14	17	20	25	32
Reduction ratio							
50	$\times 10^{-4}$ rad		17.5	9.7	8.2	8.2	6.8
80	$\times 10^{-4}$ rad		11.2	6.3	5.3	5.3	4.4
100	$\times 10^{-5}$ rad		8.7	4.8	4.4	4.4	3.4
120	$\times 10^{-5}$ rad		—	3.9	3.9	3.9	2.9
160	$\times 10^{-5}$ rad		—	—	2.9	2.9	2.4

Table 4.26: Starting torque (unit cNm)

		Model	14	17	20	25	32
Reduction ratio							
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
160			-	-	3.3	4.3	14.0

Table 4.27: 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
160		-	-	3.3	4.3	14.0

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

Table 4.28: Reverse 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
160		-	-	6.4	13.0	26.0

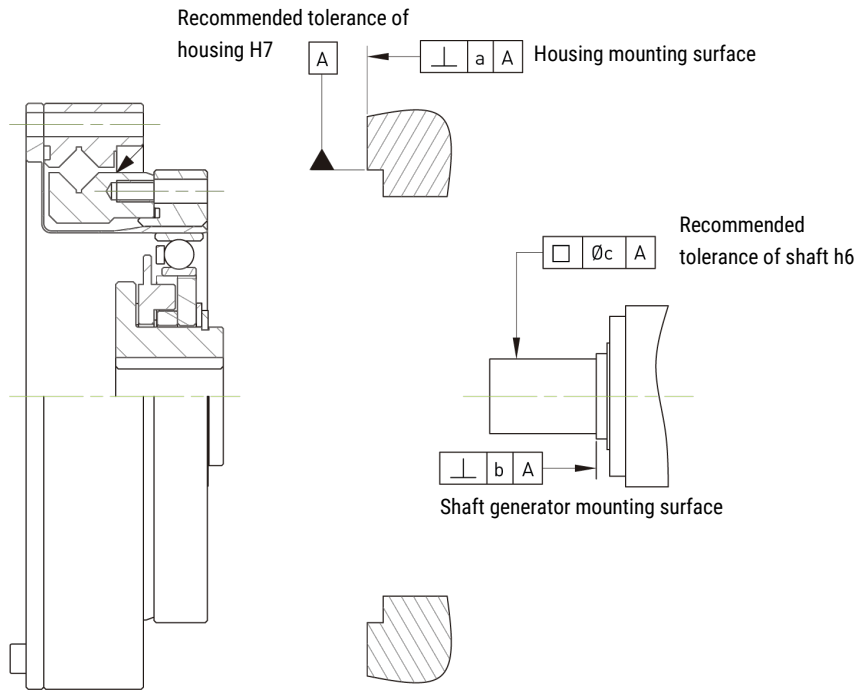
Note: The values in this table vary depending on the working conditions and are for reference purposes only. The upper limit is 20 % above the value in this table.

Table 4.29: Torsional rigidity

Reduction ratio	Model	14	17	20	25	32	
T ₁	Nm	2.0	3.9	7.0	14	29	
T ₂	Nm	6.9	12	25	48	108	
50	K ₁	×10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad	16	12	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad	0.47	1	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11
	K ₃	×10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12
	θ ₁	×10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad	12	9.7	11.3	11.1	11.6

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

4.3.2 Installation accuracy



Unit: mm

Labelling	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 shaft generator (without Oldham coupling).

4.3.3 Tightening torque for mounting screw

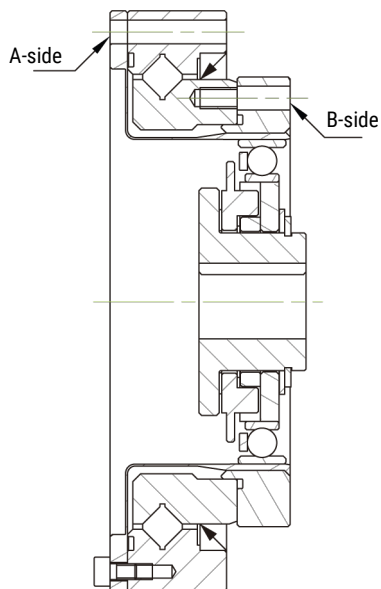


Table 4.30: Mounting screw tightening torque on the A-side

Element		Model 14	17	20	25	32
Number of screws		8	12	12	12	12
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	64	74	84	102	132
Screw tightening torque	Nm	2	2	2	4.5	9

Table 4.31: Mounting screw tightening torque on the B-side

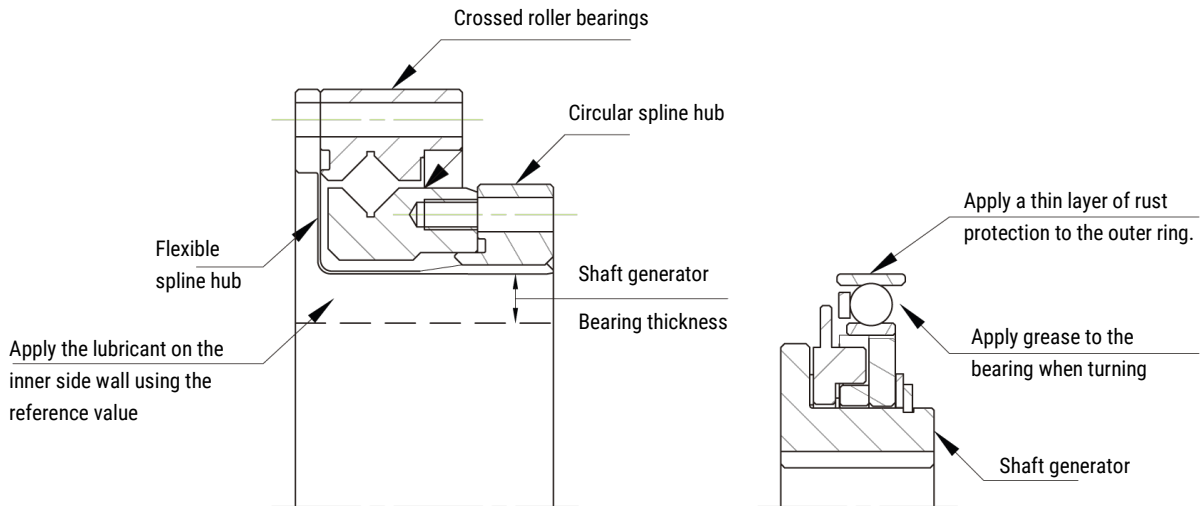
Element		Model 14	17	20	25	32
Number of screws		8	16	16	16	16
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	44	54	62	77	100
Screw tightening torque	Nm	2	2	2	4.5	9

Note:

1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.3.4 Lubrication

With the exception of the tooth area of the DSH-PO type, all other parts are not filled with lubricant. Please observe the following points for applying the lubricant.

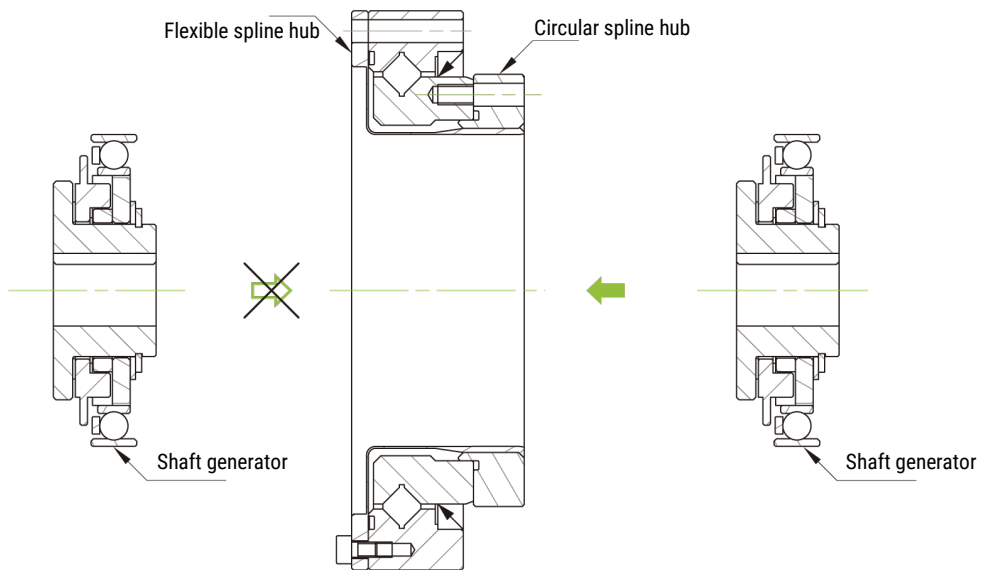


Unit: g

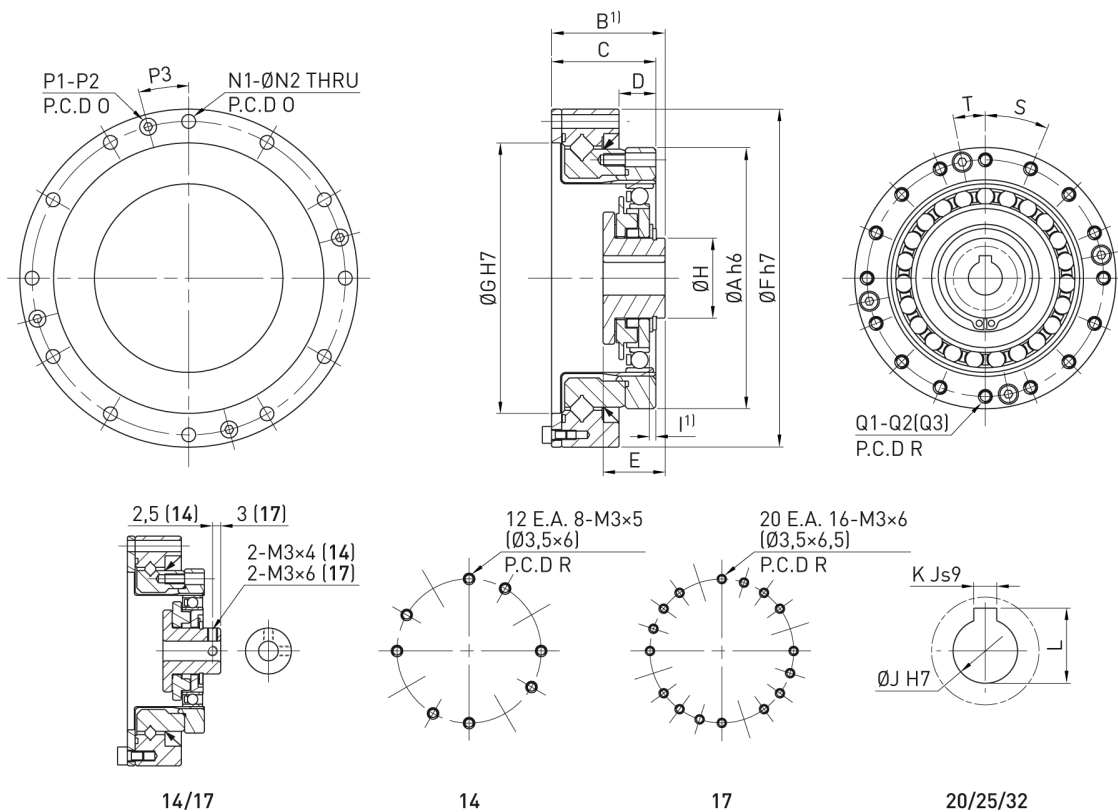
Instructions		Model 14	17	20	25	32
Horizontal use		5.8	11	18	32	64
Vertical use	Shaft generator points downwards	7.5	13	19	37	74
	Shaft generator points upwards	8.9	15	22	42	84

4.3.5 Installation procedure

Do not install the shaft generator until you have installed the reducer in the housing. Please observe the installation sequence to prevent damage to the tooth surface.



4.3.6 DSH-PO type, size chart



Unit: mm

Labelling	Model	14	17	20	25	32
ØA h6		50	60	70	85	110
B*		28,5 ⁰ _{-0,8}	32,5 ⁰ _{-0,9}	33,5 ⁰ ₋₁	37 ⁰ _{-1,1}	44 ⁰ _{-1,1}
C		23.5	26.5	29	34	42
D		7	7.5	8.5	12	15
E		17,6 ⁰ _{-0,1}	19,5 ⁰ _{-0,1}	20,1 ⁰ _{-0,1}	20,2 ⁰ _{-0,1}	22 ⁰ _{-0,1}

Labelling	Model	14	17	20	25	32
ØF h7		70	80	90	110	142
ØG H7		48	60	70	88	114
ØH		14	18	21	26	26
l*		0.4	0.3	0.1	2.1	2.5
ØJ H7		6	8	9	11	14
K Js9		-	-	3	4	5
L		-	-	10,4 ₀ ^{+0,1}	12,8 ₀ ^{+0,1}	16,3 ₀ ^{+0,1}
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 (degrees)		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)		0.41	0.57	0.81	1.31	2.94

*Dimension B, l is the mounting position and the permissible tolerance in axial direction.

4.4 DSH-PH type

4.4.1 Technical data

Table 4.32: Valuation table

Model	Reduction	Nominal torque at 2000 rpm	Peak torque at start/stop	Maximum average torque	Collision torque	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	5.4	18.0	6.9	35.0	8,500	3,500
	80	7.8	23.0	11.0	47.0		
	100	7.8	28.0	11.0	54.0		
17	50	16.0	34.0	26.0	70.0	7,300	3,500
	80	22.0	43.0	27.0	87.0		
	100	24.0	54.0	39.0	108.0		
	120	24.0	54.0	39.0	86.0		
20	50	25.0	56.0	34.0	98.0	6,500	3,500
	80	34.0	74.0	47.0	127.0		
	100	40.0	82.0	49.0	147.0		
	120	40.0	87.0	49.0	147.0		
	160	40.0	92.0	49.0	147.0		
25	50	39.0	98.0	55.0	186.0	5,600	3,500
	80	63.0	137.0	87.0	255.0		
	100	67.0	157.0	108.0	284.0		
	120	67.0	167.0	108.0	304.0		
	160	67.0	176.0	108.0	314.0		
32	50	76.0	216.0	108.0	382.0	4,800	3,500
	80	118.0	304.0	167.0	568.0		
	100	137.0	333.0	216.0	647.0		
	120	137.0	353.0	216.0	686.0		
	160	137.0	372.0	216.0	686.0		

Table 4.33: Crossed roller bearing specifications

Model	Centre circle diameter of the rollers	Offset	Basic load ratings		Permitted torque	Torque stiffness
	Dpw	R	Dynamic load C _{dyn}	Static load C ₀		
	m	m	kN	kN	Nm	×10 ⁴ Nm/rad
14	0.050	0.0217	5.8	8.6	74	8.5
17	0.060	0.0239	10.4	16.3	124	15.4
20	0.070	0.0255	14.6	22.0	187	25.2
25	0.085	0.0296	21.8	35.8	258	39.2
32	0.111	0.0364	38.2	65.4	580	100.0

Table 4.34: Accuracy of angular transmission

Reduction ratio		Model	14	17	20	25	32
50 - 160	$\times 10^{-4}$ rad		4.4	4.4	2.9	2.9	2.9

Table 4.35: 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
80 - 160	$\times 10^{-4}$ rad		2.9	2.9	2.9	2.9	2.9

Table 4.36: Starting torque (unit cNm)

Reduction ratio		Model	14	17	20	25	32
50			4.1	6.1	7.8	15.0	31
80			2.8	4.0	4.9	9.2	19
100			2.5	3.4	4.3	8.0	18
120			-	3.1	3.8	7.3	15
160			-	-	3.3	6.3	14

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

Table 4.37: Reverse starting torque (unit Nm)

Reduction ratio		Model	14	17	20	25	32
50			1.6	3.0	4.7	9.0	18
80			1.6	3.0	4.8	9.1	19
100			1.8	3.3	5.1	9.8	20
120			-	3.5	5.5	11.0	22
160			-	-	6.4	13	26

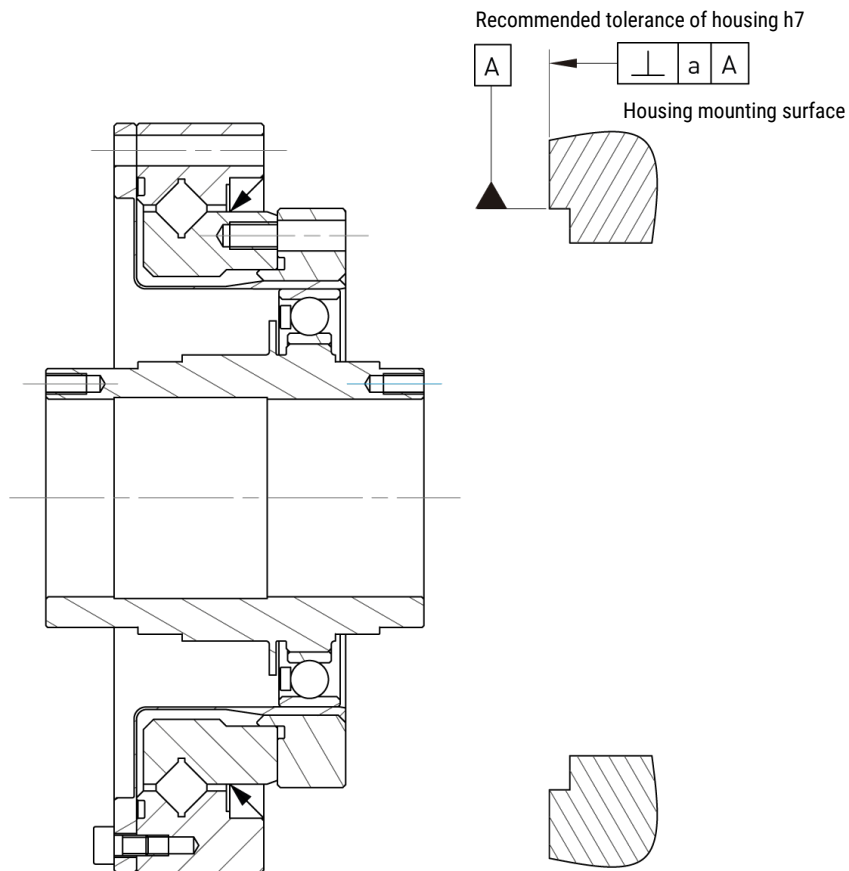
Note: The values in this table vary depending on the working conditions and are for reference purposes only. The upper limit is 20 % above the value in this table.

Table 4.38: Torsional rigidity

Reduction ratio		Model	14	17	20	25	32
T ₁	Nm		2.0	3.9	7.0	14.0	29.0
T ₂	Nm		6.9	12.0	25.0	48.0	108.0
50	K ₁	×10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad	16.0	12.0	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad	0.47	1.0	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11.0
	K ₃	×10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12.0
	θ ₁	×10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad	12.0	9.7	11.3	11.1	11.6

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

4.4.2 Installation accuracy



Unit: mm

	Model	14	17	20	25	32
Labelling						
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 shaft generator (without coupling).

4.4.3 Tightening torque for mounting screw

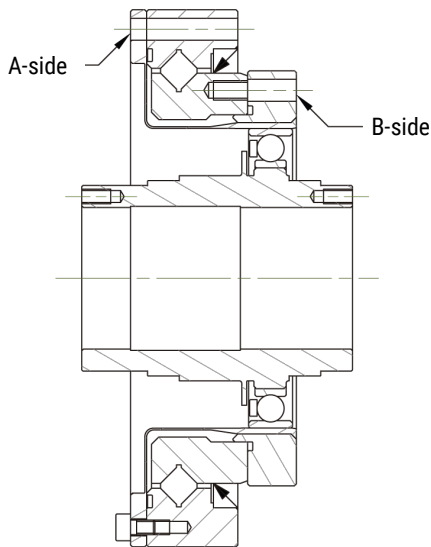


Table 4.39: Mounting screw tightening torque on the A-side

Element	Model	14	17	20	25	32
Number of screws		8	12	12	12	12
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	64	74	84	102	132
Tightening torque for screws	Nm	2	2	2	4.5	9

Table 4.40: Mounting screw tightening torque on the B-side

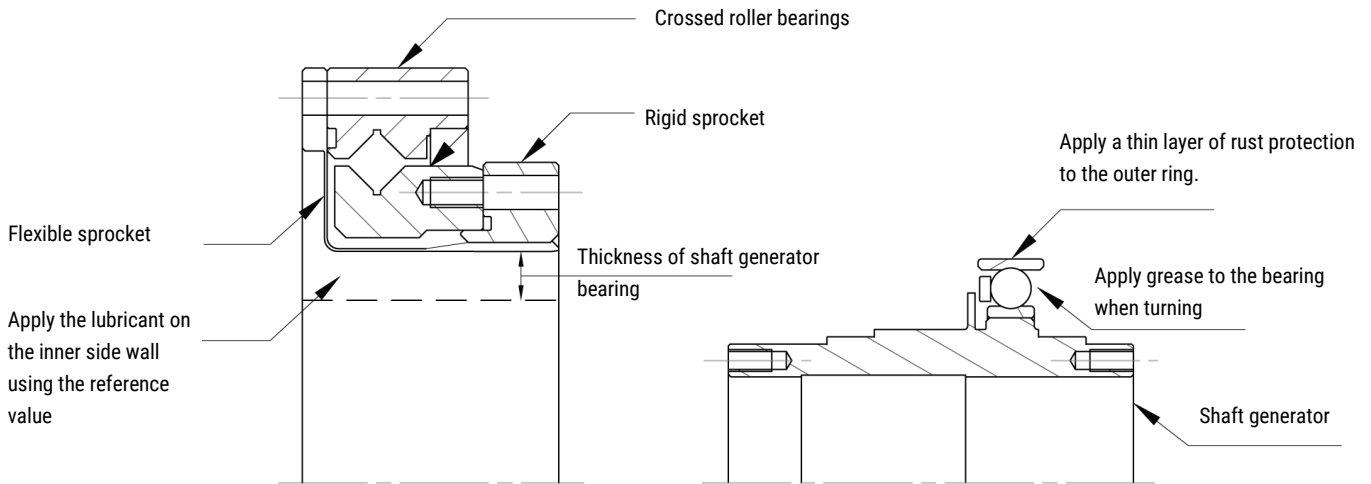
Element	Model	14	17	20	25	32
Number of screws		8	16	16	16	16
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	44	54	62	77	100
Tightening torque for screws	Nm	2	2	2	4.5	9

Note:

1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.4.4 Lubrication

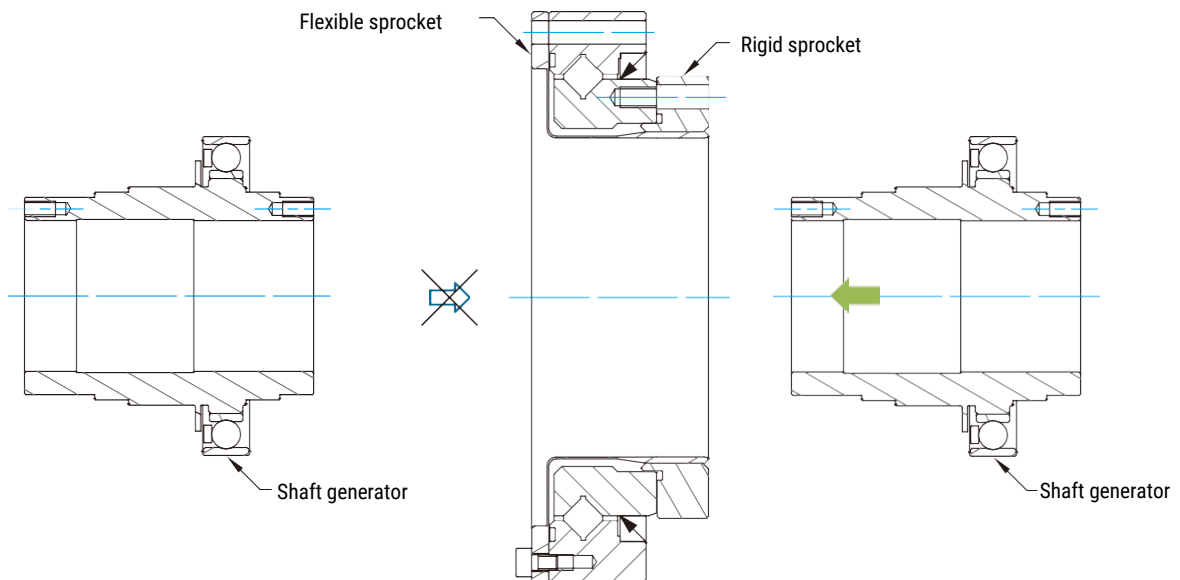
With the exception of the inner tooth area of the DSH-PH type, all other parts are not filled with lubricant. Please observe the following points when applying the lubricant.



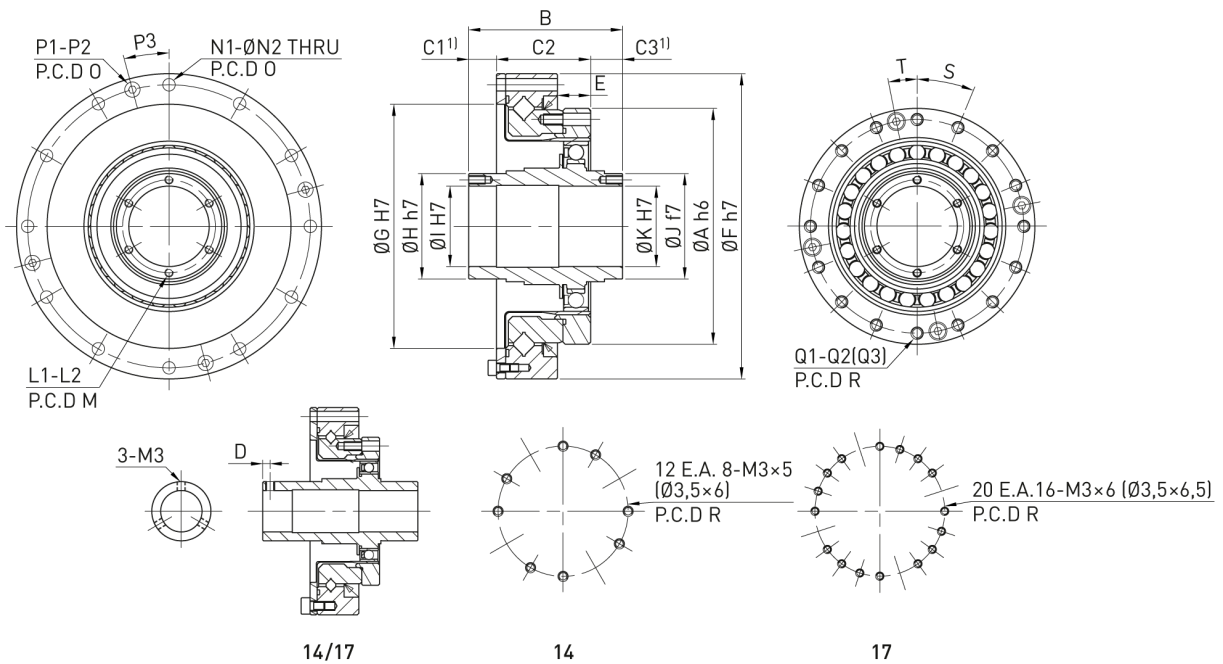
Unit: g

		Model 14	17	20	25	32
Instructions						
Horizontal use		5.8	11	18	32	64
Vertical use	Shaft generator points downwards	7.5	13	19	37	74
	Shaft generator points upwards	8.9	15	22	42	84

4.4.5 Installation procedure



4.4.6 DSH-PH type, size chart



Modelling	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	16 ^{+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°

Labelling	Model	14	17	20	25	32
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 (degrees)		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

Dimensions without unit in mm

*Dimension C1, C3 is the mounting position and the permissible tolerance in axial direction.

4.5 DSH-AH type

4.5.1 Technical data

Table 4.41: Valuation table

Model	Reduction	Nominal torque at 2000 rpm	Peak torque at start/stop	Maximum average torque	Collision torque	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	5.4	18.0	6.9	35.0	8,500	3,500 1100 ¹⁾
	80	7.8	23.0	11.0	47.0		
	100	7.8	28.0	11.0	54.0		
17	50	16.0	34.0	26.0	70.0	7,300	3,500 1100 ¹⁾
	80	22.0	43.0	27.0	87.0		
	100	24.0	54.0	39.0	108.0		
	120	24.0	54.0	39.0	86.0		
20	50	25.0	56.0	34.0	98.0	6,500	3,500 1100 ¹⁾
	80	34.0	74.0	47.0	127.0		
	100	40.0	82.0	49.0	147.0		
	120	40.0	87.0	49.0	147.0		
	160	40.0	92.0	49.0	147.0		
25	50	39.0	98.0	55.0	186.0	5,600	3,500 1000 ¹⁾
	80	63.0	137.0	87.0	255.0		
	100	67.0	157.0	108.0	284.0		
	120	67.0	167.0	108.0	304.0		
	160	67.0	176.0	108.0	314.0		
32	50	76.0	216.0	108.0	382.0	4,800	3,500 1000 ¹⁾
	80	118.0	304.0	167.0	568.0		
	100	137.0	333.0	216.0	647.0		
	120	137.0	353.0	216.0	686.0		
	160	137.0	372.0	216.0	686.0		

¹⁾Valid for type DGH-AH, DSH-AH when using radial shaft seals on the hollow shaft

Table 4.42: Crossed roller bearing specifications

Model	Centre circle diameter of the rollers	Offset	Basic load ratings		Permitted torque	Torque stiffness
	Dpw	R	Dynamic load C _{dyn}	Static load C ₀		
	m	m	kN	kN	Nm	×10 ⁴ Nm/rad
14	0.050	0.0217	5.8	8.6	74	8.5
17	0.060	0.0239	10.4	16.3	124	15.4
20	0.070	0.0255	14.6	22.0	187	25.2
25	0.085	0.0296	21.8	35.8	258	39.2
32	0.111	0.0364	38.2	65.4	580	100.0

Table 4.43: Accuracy of angular transmission

Reduction ratio		Model	14	17	20	25	32
50 - 160	$\times 10^{-4}$ rad		4.4	4.4	2.9	2.9	2.9

Table 4.44: 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
80 - 160	$\times 10^{-4}$ rad		2.9	2.9	2.9	2.9	2.9

Table 4.45: 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
160			-	-	31	67	67

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

Table 4.46: Reverse starting torque (unit Nm)

Reduction ratio		Model	14	17	20	25	32
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
160			-	-	59	90	128

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

Table 4.47: Torsional rigidity

Reduction ratio		Model	14	17	20	25	32
T ₁	Nm		2.0	3.9	7.0	14.0	29.0
T ₂	Nm		6.9	12.0	25.0	48.0	108.0
50	K ₁	×10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad	16.0	12.0	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad	0.47	1.0	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11.0
	K ₃	×10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12.0
	θ ₁	×10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad	12.0	9.7	11.3	11.1	11.6

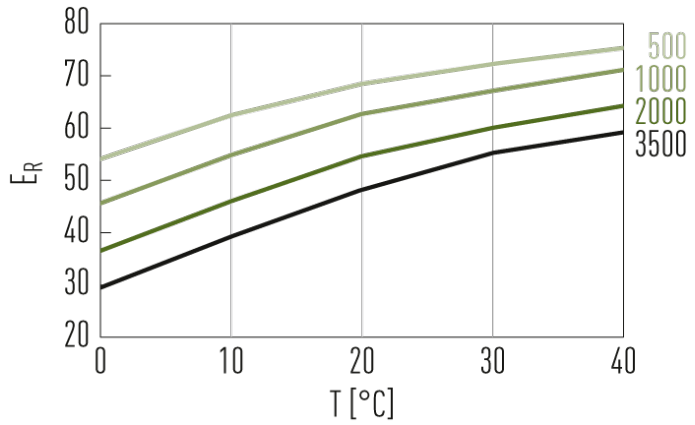
Note: The values are for reference purposes only. The lower limit is 20 % below the value in this table.

4.5.2 Efficiency E_R

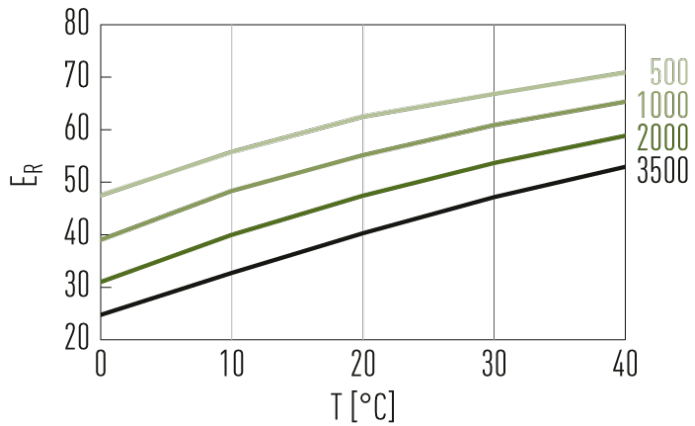
1. Nominal torque E_R

The efficiency of DATORKER® strain wave gears changes depending on the specification, ratio, operating conditions (speed/load) and lubrication (lubricant type/amount).

Model: 14-32, ratio: 50, 80, 100, 120

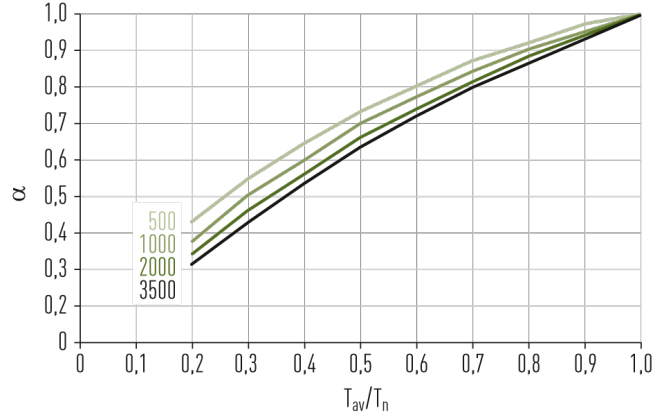


Model: 20-32, ratio: 160



2. Correction coefficient α

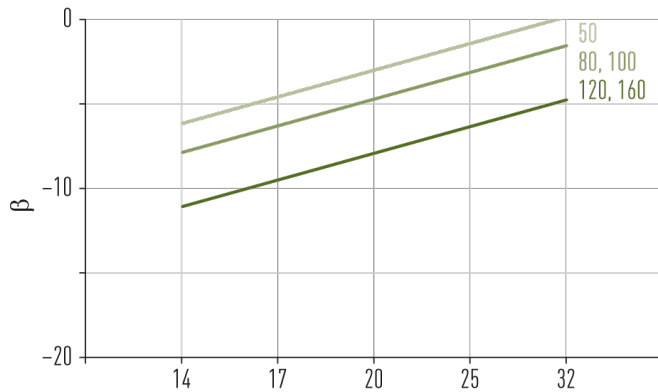
Coefficient for correcting efficiency α according to load torque



3. Correction coefficient β

Coefficient for correcting efficiency β according to specification

Efficiency = $\alpha \times E_R$



4.5.3 Idling operating torque

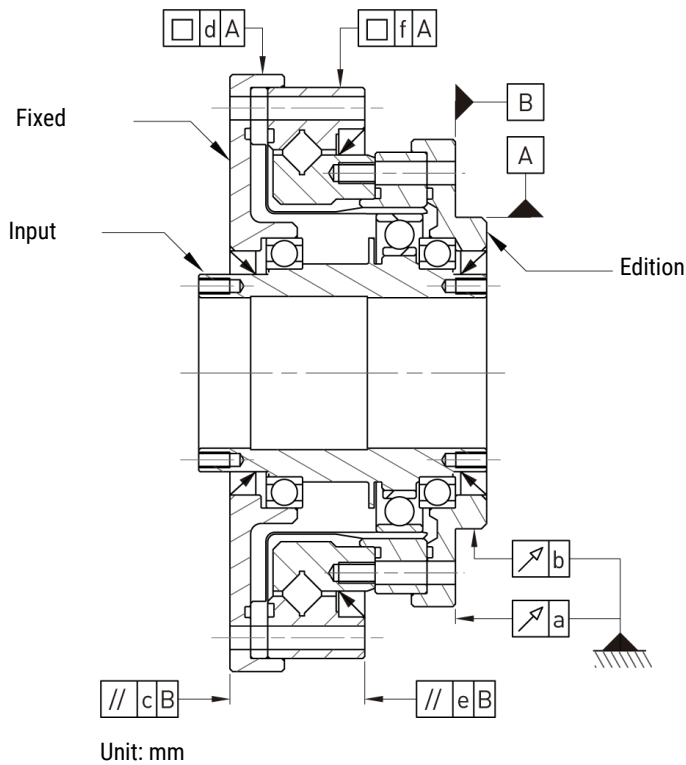
The idling operating torque is the torque required to drive the DATORKER® strain wave gear input (high speed end) after more than 2 hours at an input speed of 2,000 rpm at an average ambient temperature of 25 °C without load.

Unit: cNm

Reduction ratio	Input speed	Model				
		14	17	20	25	32
50	500 rpm	6.3	17.8	23.6	37.2	58.0
	1,000 rpm	7.8	21.8	28.6	49.2	76.0
	2,000 rpm	10.1	27.8	37.6	62.2	98.0
	3,500 rpm	14.1	36.8	48.6	89.2	138.0
80	500 rpm	5.4	16.4	21.5	33.8	51.5
	1,000 rpm	6.9	20.4	26.5	45.8	69.5
	2,000 rpm	9.2	26.4	35.5	58.8	91.5
	3,500 rpm	13.2	35.4	46.5	85.8	131.5
100	500 rpm	5.2	16.0	21.0	33.0	50.0
	1,000 rpm	6.7	20.0	26.0	45.0	68.0
	2,000 rpm	9.0	26.0	35.0	58.0	90.0
	3,500 rpm	13.0	35.0	46.0	85.0	130.0
120	500 rpm	–	15.8	20.6	32.4	48.9
	1,000 rpm	–	19.8	25.6	44.4	66.9
	2,000 rpm	–	25.8	34.6	57.4	88.9
	3,500 rpm	–	34.8	45.6	84.4	128.9
160	500 rpm	–	–	20.2	31.7	47.5
	1,000 rpm	–	–	25.2	43.7	65.5
	2,000 rpm	–	–	34.2	56.7	87.5
	3,500 rpm	–	–	45.2	83.7	127.5

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

4.5.4 Mechanical accuracy



	Model	14	17	20	25	32
Labelling						
a		0.033	0.038	0.040	0.046	0.054
b		0.035	0.035	0.039	0.041	0.047
c		0.064	0.071	0.079	0.085	0.104
d		0.053	0.050	0.059	0.061	0.072
e		0.040	0.045	0.051	0.057	0.065
f		0.038	0.038	0.047	0.049	0.054

4.5.5 Tightening torque for mounting screw

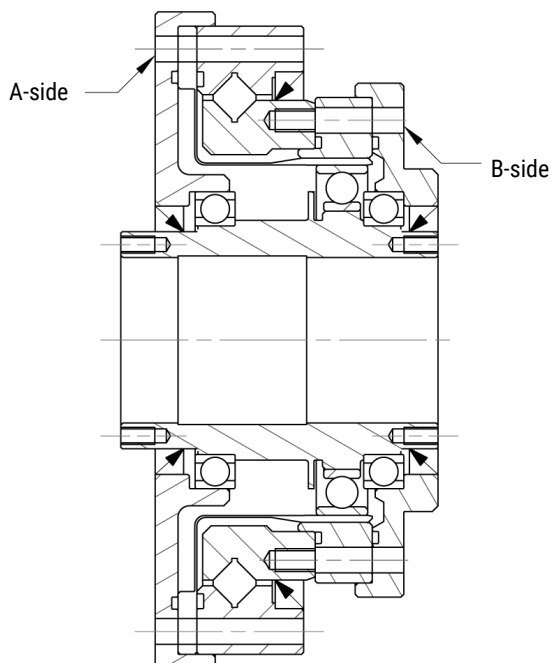


Table 4.48: Mounting screw tightening torque on the A-side

Element		Model 14	17	20	25	32
Number of screws		8	12	12	12	12
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	64	74	84	102	132
Tightening torque for screws	Nm	2	2	2	4.5	9

Table 4.49: Mounting screw tightening torque on the B-side

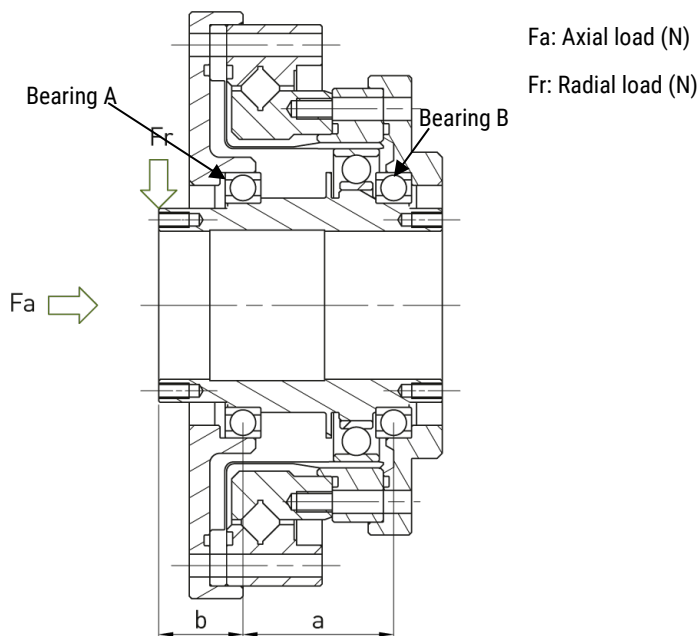
Element		Model 14	17	20	25	32
Number of screws		8	16	16	16	16
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	44	54	62	77	100
Tightening torque for screws	Nm	2	2	2	4.5	9

Note:

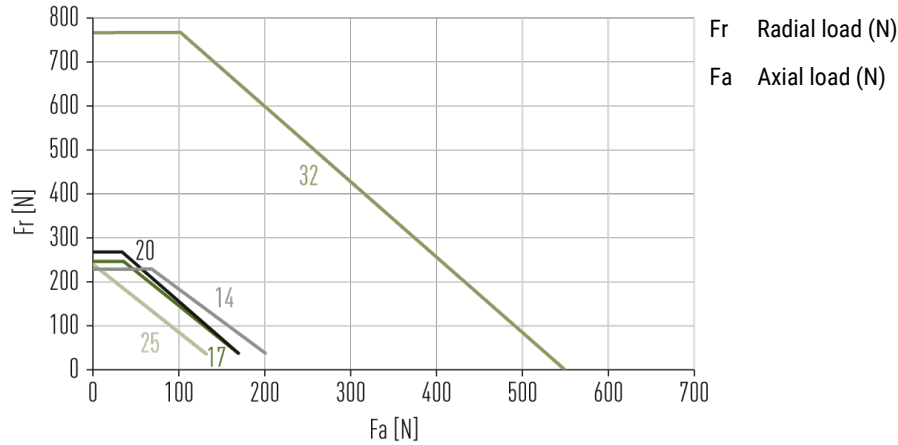
1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.5.6 Permissible input load

The hollow shaft is supported by two deep groove ball bearings. To ensure proper performance of the gearbox, confirm the load on the hollow shaft. As shown below:

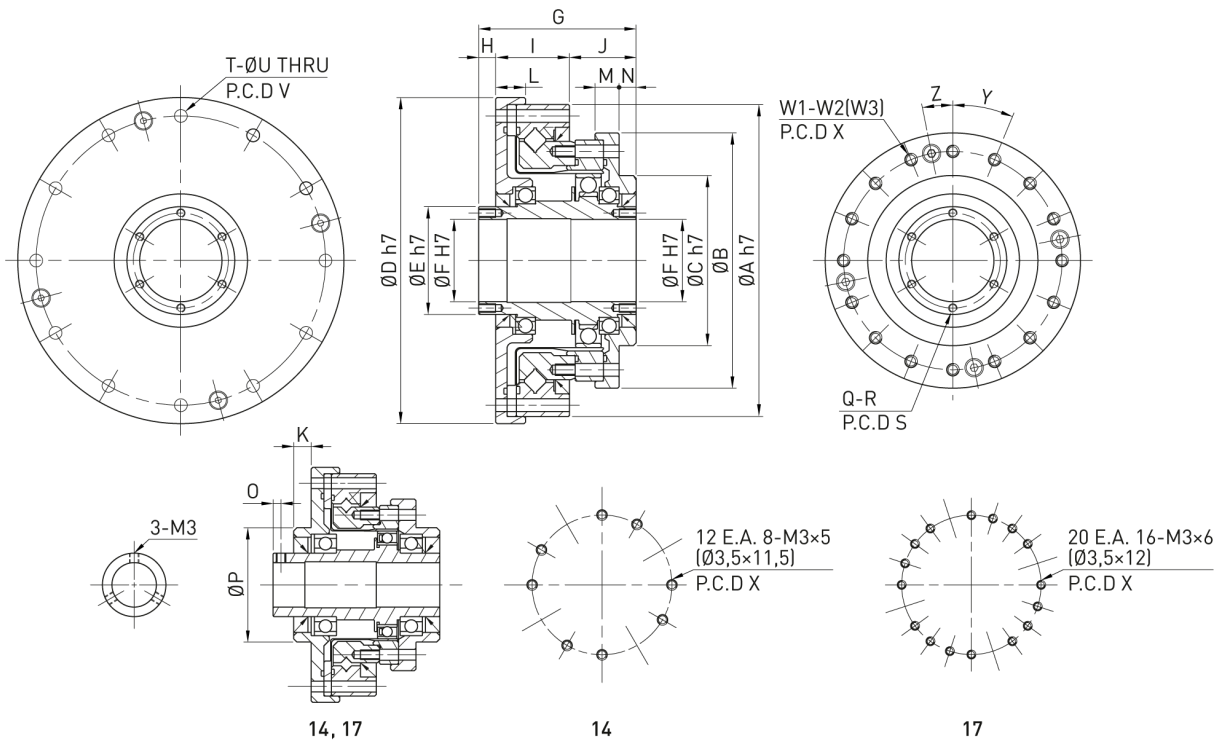


The following figure shows the average input speed of 2,000 rpm and the basic nominal service life $L_{10} = 7,000$ hours.



Element	Bearing A		Bearing B		a (mm)	b (mm)	Maximum radial load Fr(N)
	Dynamic load C_{dyn} (kN)	Static load C_0 (kN)	Dynamic load C_{dyn} (kN)	Static load C_0 (kN)			
Model 14	4.0	2.47	4.00	2.47	27.0	16.5	230
Model 17	4.3	2.95	4.30	2.95	29.0	17.5	250
Model 20	4.5	3.45	4.50	3.45	27.0	15.5	275
Model 25	4.9	4.35	4.90	4.35	29.5	16.5	250
Model 32	14.1	10.90	5.35	5.25	33.0	23.0	770

4.5.7 DSH-AH type, size chart



	Model 14	17	20	25	32
Labelling					
ØA h7	70	80	90	110	142
ØB	54	64	75	90	115

Modell	14	17	20	25	32
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	2 x 6	2 x 6	2 x 6
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 (degrees)	30°	18°	22.5°	22.5°	22.5°
Z (degrees)	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

Dimensions without unit in mm

4.6 DSH-AJ type

4.6.1 Technical data

Table 4.50: Valuation table

Model	Reduction	Nominal torque at 2000 rpm ¹⁾	Peak torque at start/stop ²⁾	Maximum average torque ³⁾	Collision torque ⁴⁾	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	5.4	18	6.9	35	8,500	3,500
	80	7.8	23	11	47		
	100	7.8	28	11	54		
17	50	16	34	26	70	7,300	3,500
	80	22	43	27	87		
	100	24	54	39	110		
	120	24	54	39	86		
20	50	25	56	34	98	6,500	3,500
	80	34	74	47	127		
	100	40	82	49	147		
	120	40	87	49	147		
	160	40	92	49	147		
25	50	39	98	55	186	5,600	3,500
	80	63	137	87	255		
	100	67	157	108	284		
	120	67	167	108	304		
	160	67	176	108	314		
32	50	76	216	108	382	4,800	3,500
	80	118	304	167	568		
	100	137	333	216	647		
	120	137	353	216	686		
	160	137	372	216	686		

¹⁾ Permissible nominal torque

²⁾ Maximum permissible torque

³⁾ Permissible average torque

⁴⁾ Maximum permissible value of impact

Table 4.51: Crossed roller bearing specifications

Model	Hole circle diameter of the roller	Offset amount	Basic load ratings		Permissible torque load	Torque stiffness
	Dpw	R	Dynamic load C	Normal load Co		
	m	m	kN	kN	Nm	×10 ⁴ Nm/rad
14	0.050	0.0217	5.8	8.6	74	8.5
17	0.060	0.0239	10.4	16.3	124	15.4
20	0.070	0.0255	14.6	22.0	187	25.2
25	0.085	0.0296	21.8	35.8	258	39.2
32	0.111	0.0364	38.2	65.4	580	100

Table 4.52: Accuracy of angular transmission

Reduction ratio		Model	14	17	20	25	32
50 - 160	$\times 10^{-4}$ rad		4.4	4.4	2.9	2.9	2.9

Table 4.53: 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
80 - 160	$\times 10^{-4}$ rad		2.9	2.9	2.9	2.9	2.9

Table 4.54: Starting torque (unit cNm)

Reduction ratio		Model	14	17	20	25	32
50			5.7	9.7	14	22	41
80			4.4	7.2	11	15	29
100			3.7	6.5	9.9	14	27
120			-	6.2	9.3	13	24
160			-	-	8.6	12.0	23.0

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

Table 4.55: Reverse starting torque (unit Nm)

Reduction ratio		Model	14	17	20	25	32
50			3.4	5.8	8.4	13	25
80			4.2	6.9	10	15	28
100			4.5	7.8	12	17	33
120			-	8.9	13	19	34
160			-	-	17.0	23.0	43.0

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

Table 4.56: Torsional rigidity

Reduction ratio			Model	14	17	20	25	32
T ₁		Nm		2.0	3.9	7.0	14	29
T ₂		Nm		6.9	12	25	48	108
50	K ₁	×10 ⁴ Nm/rad		0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad		0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad		0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad		5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad		16	12	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad		0.47	1	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad		0.61	1.4	2.5	5.0	11
	K ₃	×10 ⁴ Nm/rad		0.71	1.6	2.9	5.7	12
	θ ₁	×10 ⁻⁴ rad		4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad		12	9.7	11.3	11.1	11.6

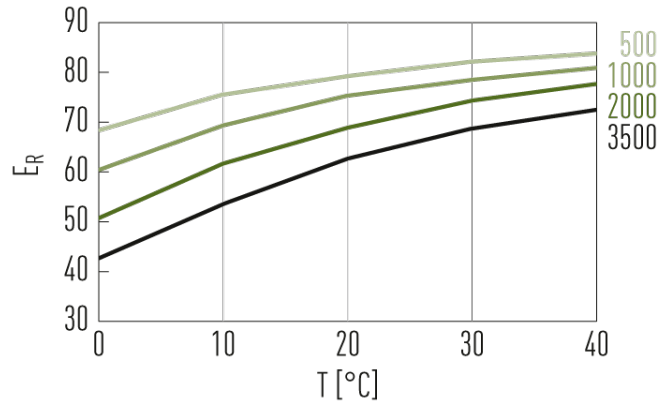
Note: The values are for reference purposes only. The lower limit is 20 % below the value in this table.

4.6.2 Efficiency E_R

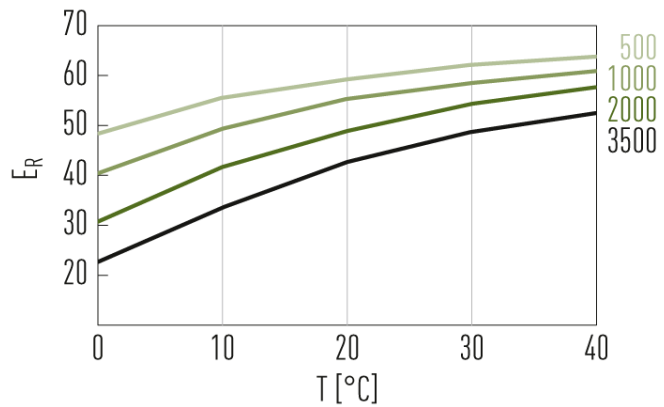
1. Nominal torque E_R

The efficiency of DATORKER® strain wave gears changes depending on the specification, ratio, operating conditions (speed/load) and lubrication (lubricant type/amount).

Model: 14-32, ratio: 50, 80, 100, 120

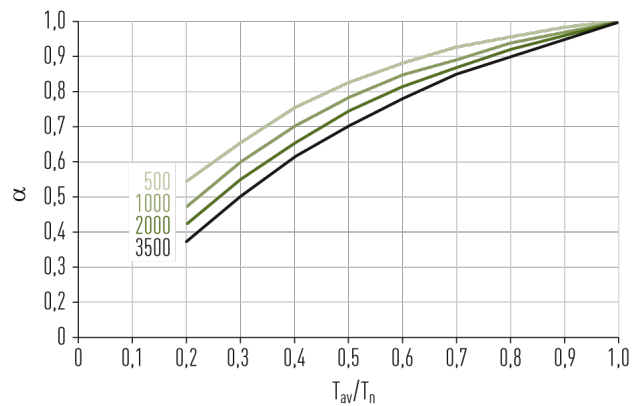


Model: 20-32, ratio: 160



2. Correction coefficient α

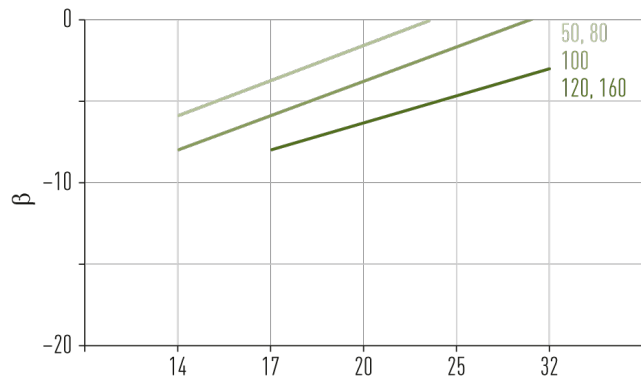
Coefficient for correcting efficiency α according to load torque



3. Correction coefficient β

Coefficient for correcting efficiency β according to specification

Efficiency = $\alpha \times E_R$



4.6.3 Idling operating torque

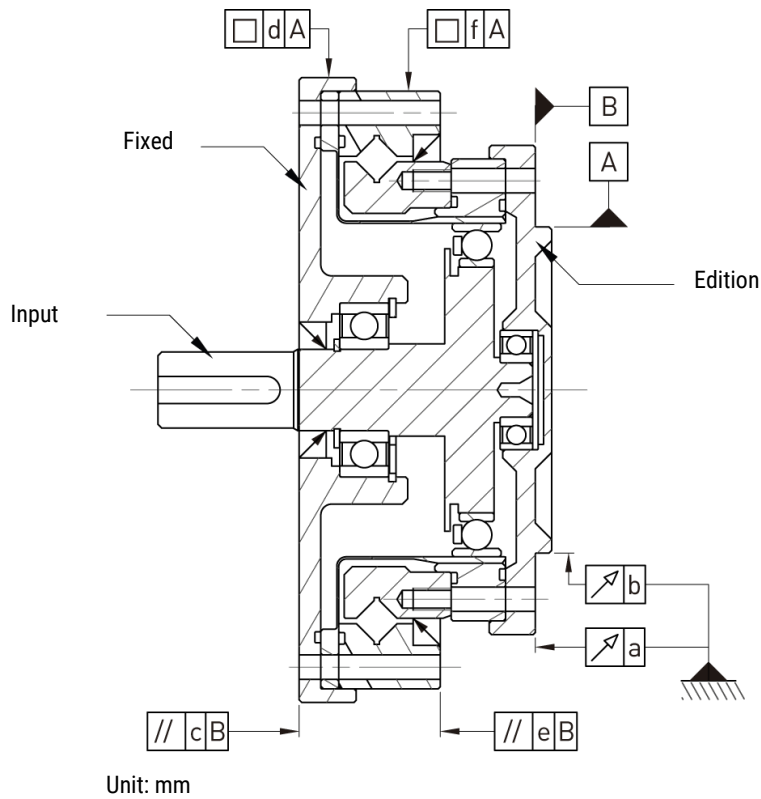
The idling operating torque is the torque required to drive the DATORKER® strain wave gear input (high speed end) after more than 2 hours at an input speed of 2,000 rpm at an average ambient temperature of 25 °C without load.

Unit: cNm

Reduction ratio	Input speed	Model				
		14	17	20	25	32
50	500 rpm	3.9	8	11.6	18.2	31
	1,000 rpm	4.7	9.8	14.6	22.2	38
	2,000 rpm	5.8	12.8	19.6	28.2	53
	3,500 rpm	7	14.8	22.6	35.2	68
80	500 rpm	3	6.6	9.5	14.8	24.5
	1,000 rpm	3.8	8.4	12.5	18.8	31.5
	2,000 rpm	4.9	11.4	17.5	24.8	46.5
	3,500 rpm	6.1	13.4	20.5	31.8	61.5
100	500 rpm	2.8	6.2	9	14	23
	1,000 rpm	3.6	8	12	18	30
	2,000 rpm	4.7	11	17	24	45
	3,500 rpm	5.9	13	20	31	60
120	500 rpm	–	6	8.6	13.4	21.9
	1,000 rpm	–	7.8	11.6	17.4	28.9
	2,000 rpm	–	10.8	16.6	23.4	43.9
	3,500 rpm	–	12.8	19.6	30.4	58.9
160	500 rpm	–	–	8.2	12.7	20.5
	1,000 rpm	–	–	11.2	16.7	27.5
	2,000 rpm	–	–	16.2	22.7	42.5
	3,500 rpm	–	–	19.2	29.7	57.5

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

4.6.4 Mechanical accuracy



	Model	14	17	20	25	32
Labelling						
a		0.033	0.038	0.040	0.046	0.054
b		0.035	0.035	0.039	0.041	0.047
c		0.064	0.071	0.079	0.085	0.104
d		0.053	0.050	0.059	0.061	0.072
e		0.040	0.045	0.051	0.057	0.065
f		0.038	0.038	0.047	0.049	0.054

4.6.5 Tightening torque for mounting screw

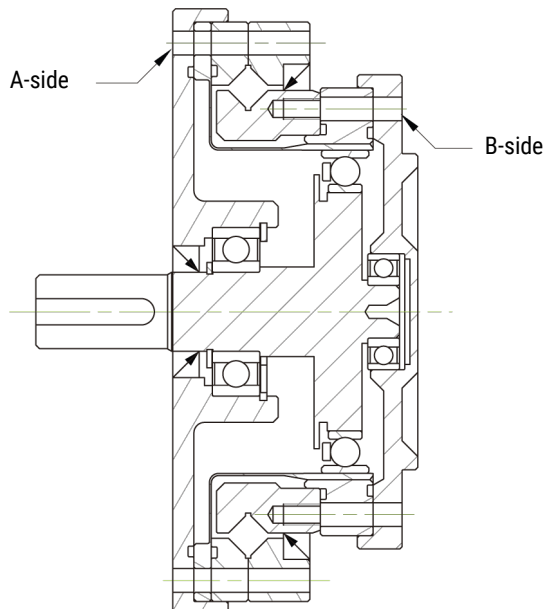


Table 4.57: Mounting screw tightening torque on the A-side

Element		Model 14	17	20	25	32
Number of screws		8	12	12	12	12
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	64	74	84	102	132
Tightening torque for screws	Nm	2	2	2	4.5	9

Table 4.58: Mounting screw tightening torque on the B-side

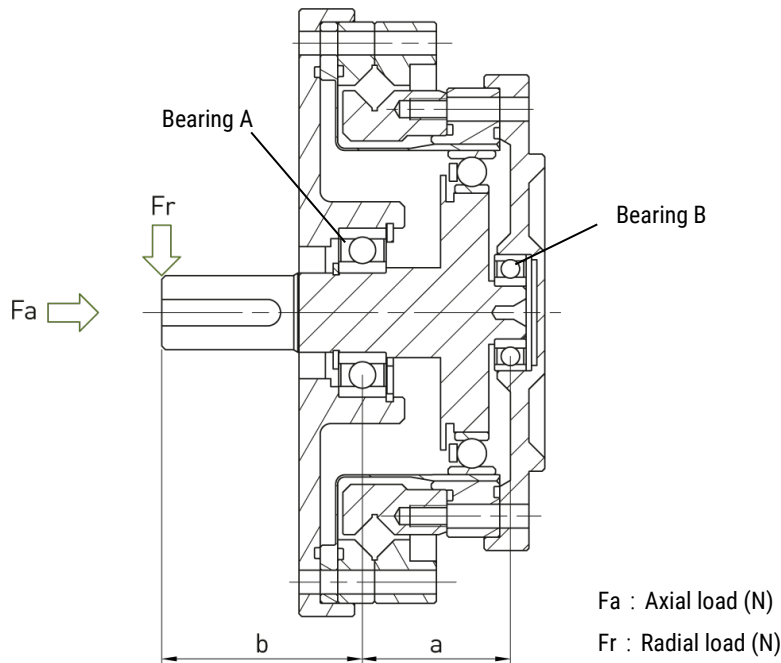
Element		Model 14	17	20	25	32
Number of screws		8	16	16	16	16
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	44	54	62	77	100
Tightening torque for screws	Nm	2	2	2	4.5	9

Note:

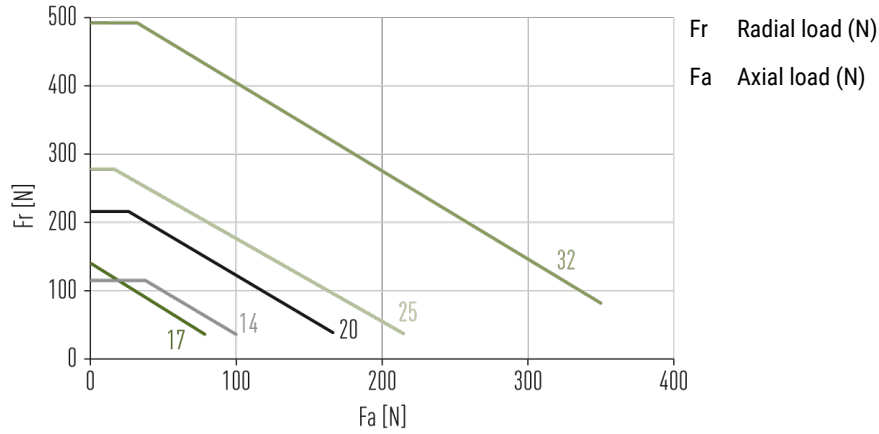
1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.6.6 Permissible input load

The hollow shaft is supported by two deep groove ball bearings. To ensure proper performance of the gearbox, confirm the load on the hollow shaft. As shown below:

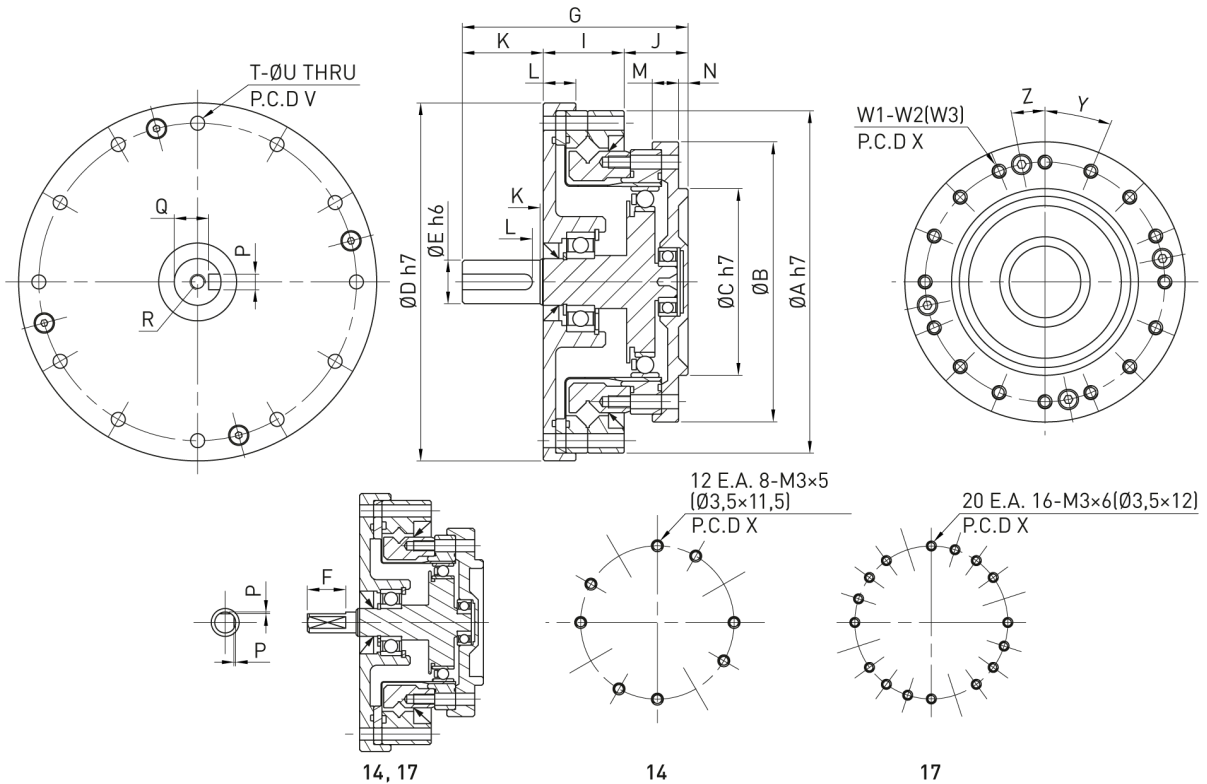


The following figure shows the average input speed of 2,000 rpm and the basic nominal service life $L_{10} = 7,000$ hours.



Model	Bearing A		Bearing B		a (mm)	b (mm)	Maximum radial load Fr(N)
	Dynamic load C_{dyn} (kN)	Static load C_0 (kN)	Dynamic load C_{dyn} (kN)	Static load C_0 (kN)			
14	2.24	0.91	1.08	0.43	20	14	110
17	2.7	1.27	1.61	0.71	23.5	21	135
20	4.35	2.26	2.24	0.91	26.5	23.3	210
25	5.6	2.83	2.7	1.27	28	28	270
32	9.4	5	4.35	2.26	36	27	490

4.6.7 DSH-AJ type, size chart



Unit: mm

Modell	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 h6	6	8	10	14	14
ØF	11	12	16.5	22.5	22.5
G	50.5	56	63.5	72.5	84.5
H	15	17	21	26	26
I	20.5	23	25	26	32
J	15	16	17.5	20.5	26.5
K	14	16	20	25	25
L	9	10	10.5	10.5	12
M	8	8.5	9	8.5	9.5
N	2.5	3	3	3	5
P	0.5	0.5	$3_{-0,029}^{-0,004}$	$5_{-0,03}^0$	$5_{-0,03}^0$
Q	-	-	8.2	11	11
R	-	-	M3 x 6DP	M5 x 10DP	M5 x 10DP
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 (degrees)	30°	18°	22.5°	22.5°	22.5°
Z (degrees)	30°	18°	11.25°	11.25°	11.25°
Moment of inertia (×10 ⁻⁴ kgm ²)	0.025	0.059	0.137	0.32	1.2
Weight (kg)	0.66	0.94	1.38	2.1	4.4

4.7 DSC-PO-M type

4.7.1 Technical data

Table 4.59: Valuation table

Model	Reduction	Nominal torque at 2000 rpm ¹⁾	Peak torque at start/stop ²⁾	Maximum average torque ³⁾	Collision torque ⁴⁾	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	5.4	18	6.9	35	8,500	3,500
	80	7.8	23	11	47		
	100	7.8	28	11	54		
17	50	16	34	26	70	7,300	3,500
	80	22	43	27	87		
	100	24	54	39	110		
	120	24	54	39	86		
20	50	25	56	34	98	6,500	3,500
	80	34	74	47	127		
	100	40	82	49	147		
	120	40	87	49	147		
	160	40	92	49	147		
25	50	39	98	55	186	5,600	3,500
	80	63	137	87	255		
	100	67	157	108	284		
	120	67	167	108	304		
	160	67	176	108	314		
32	50	76	216	108	382	4,800	3,500
	80	118	304	167	568		
	100	137	333	216	647		
	120	137	353	216	686		
	160	137	372	216	686		

¹⁾ Permissible nominal torque

²⁾ Maximum permissible torque

³⁾ Permissible average torque

⁴⁾ Maximum permissible value of impact

Table 4.60: Crossed roller bearing specifications

Model	Hole circle diameter of the roller	Offset amount	Basic load ratings		Permissible torque load	Torque stiffness
	Dpw	R	Dynamic load C	Normal load Co		
	m	m	kN	kN	Nm	×10 ⁴ Nm/rad
14	0.0465	0.014	8.25	11.4	73	7.9
17	0.059	0.014	10.7	14.8	114	13.7
20	0.070	0.016	21.0	27.0	172	24.0
25	0.088	0.018	21.8	35.8	254	39.2
32	0.114	0.02	34.5	59	578	120.3

Table 4.61: Accuracy of angular transmission

Reduction ratio		Model	14	17	20	25	32
50 - 160	$\times 10^{-4}$ rad		4.4	4.4	2.9	2.9	2.9

Table 4.62: 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
80 - 160	$\times 10^{-4}$ rad		2.9	2.9	2.9	2.9	2.9

Table 4.63: Maximum Backlash

Reduction ratio		Model	14	17	20	25	32
50	$\times 10^{-4}$ rad		17.5	9.7	8.2	8.2	6.8
80	$\times 10^{-4}$ rad		11.2	6.3	5.3	5.3	4.4
100	$\times 10^{-5}$ rad		8.7	4.8	4.4	4.4	3.4
120	$\times 10^{-5}$ rad		—	3.9	3.9	3.9	2.9
160	$\times 10^{-5}$ rad		—	—	2.9	2.9	2.4

Table 4.64: 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
160			-	-	3.3	6.3	14

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

Table 4.65: Reverse 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
160			-	-	6.4	13.0	26

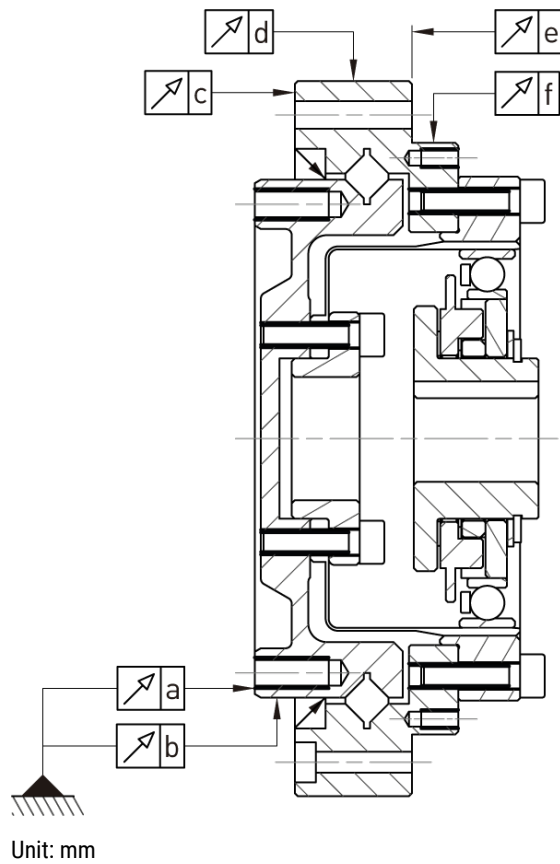
Note: The values in this table vary depending on the working conditions and are for reference purposes only. The upper limit is 20 % above the value in this table.

Table 4.66: Torsional rigidity

Reduction ratio		Model	14	17	20	25	32
T ₁	Nm		2.0	3.9	7.0	14	29
T ₂	Nm		6.9	12	25	48	108
50	K ₁	×10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad	16	12	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad	0.47	1	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11
	K ₃	×10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12
	θ ₁	×10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad	12	9.7	11.3	11.1	11.6

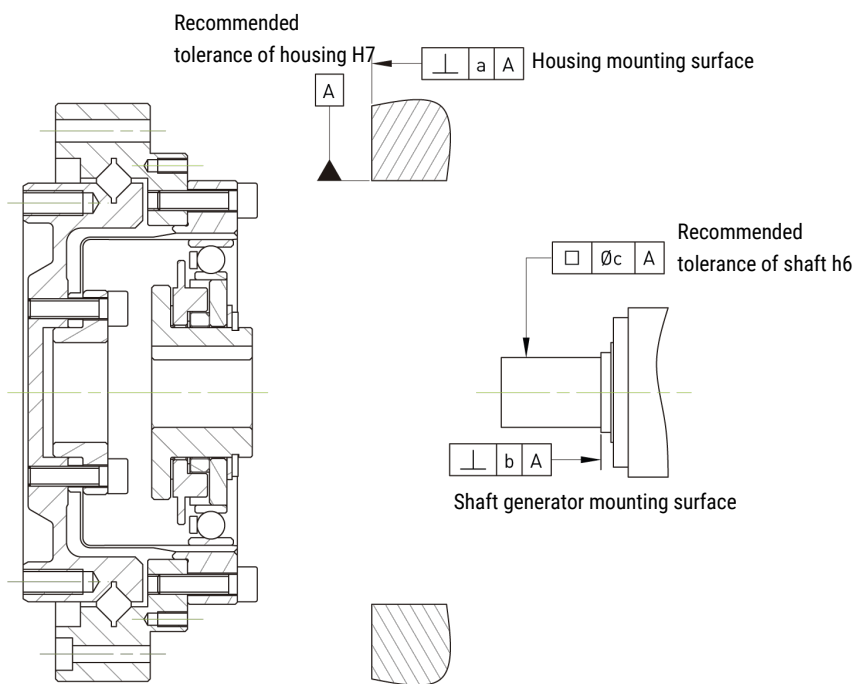
Note: The values are for reference purposes only. The lower limit is 20 % below the value in this table.

4.7.2 Mechanical accuracy



	Model	14	17	20	25	32
Labelling						
a		0.010	0.010	0.010	0.010	0.012
b		0.010	0.010	0.010	0.010	0.010
c		0.010	0.010	0.010	0.010	0.012
d		0.010	0.010	0.010	0.010	0.010
e		0.020	0.020	0.020	0.020	0.020
f		0.015	0.015	0.015	0.015	0.015

4.7.3 Installation accuracy



Unit: mm

Labelling	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 shaft generator (without Oldham coupling).

4.7.4 Assembly screw installation

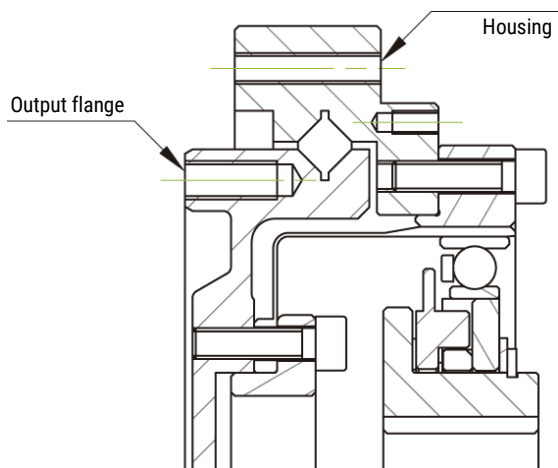


Table 4.67: Mounting screw tightening torque on the A-side

Element	Model	14	17	20	25	32
Number of screws		12	12	12	12	12
Screw size		M3	M4	M4	M5	M6
Installation of PCD screws	mm	43	52	62	76	96
Screw tightening torque	Nm	2.3	5.1	5.1	10	17.4

Table 4.68: Mounting screw tightening torque on the B-side

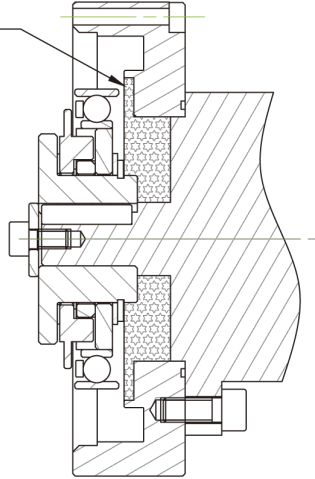
Element	Model	14	17	20	25	32
Number of screws		8	12	12	12	12
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	68	80	89	105	135
Screw tightening torque	Nm	2.3	2.3	2.3	5.1	10

Note:

1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.7.5 Lubrication

Apply to the inside of the flange using the reference value

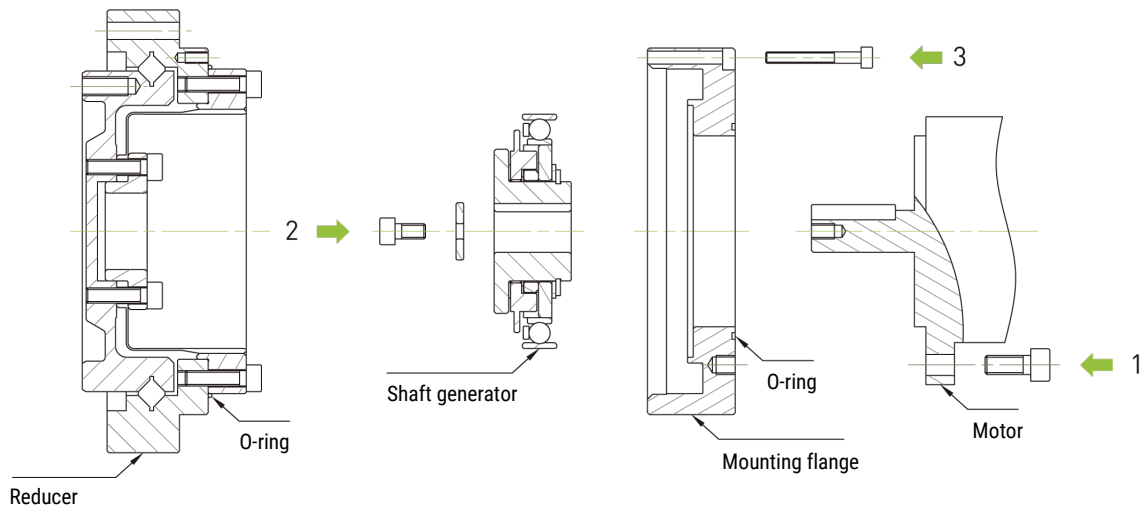


Unit: g

	Model 14	17	20	25	32
Standard grease amount	5.5	10	16	40	60

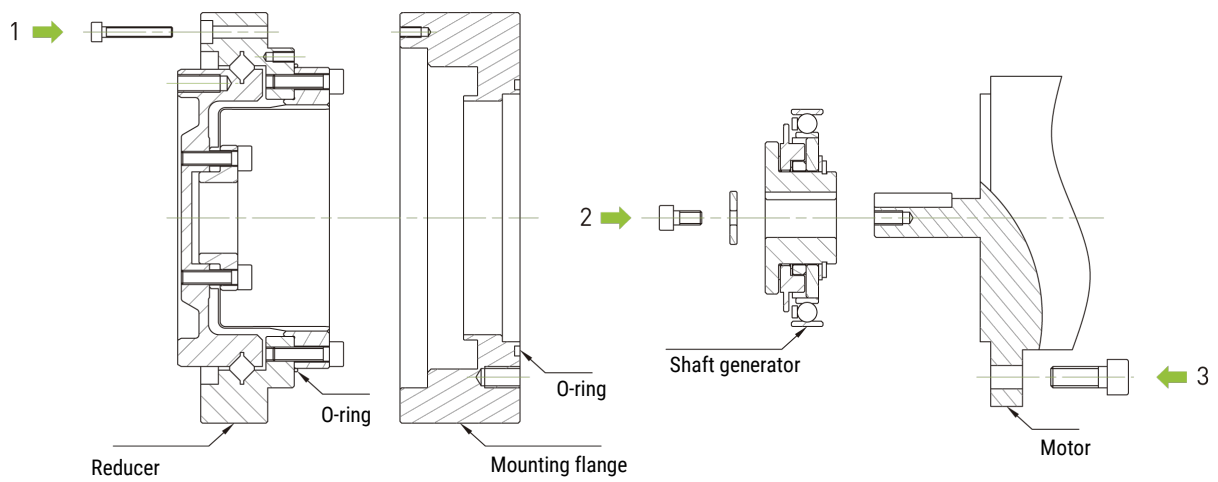
4.7.6 Installation procedure

Mounting surface type A



- ▶ 1. Install the mounting flange on the motor mounting surface
- ▶ 2. Install the mounting flange on the motor output shaft
- ▶ 3. Install the body of the transition piece

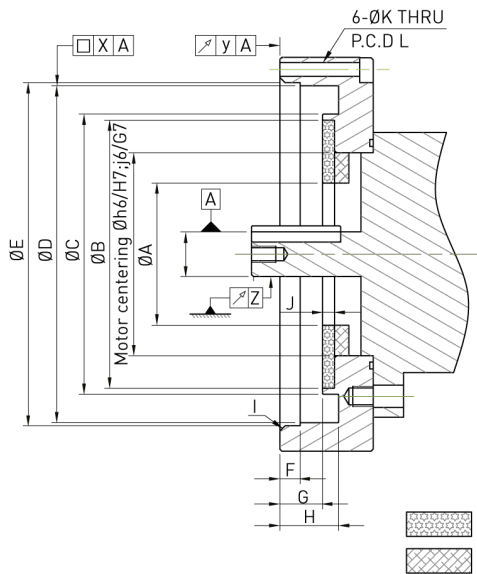
Mounting surface type B



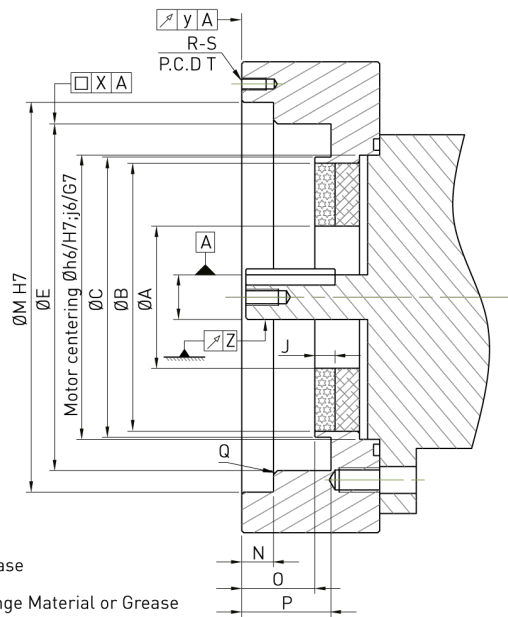
- ▶ 1. Install the reducer on the surface of the mounting flange
- ▶ 2. Install the mounting flange on the motor output shaft
- ▶ 3. Install the mounting flange on the motor mounting surface

4.7.7 Installation of motor

Mounting surface type A



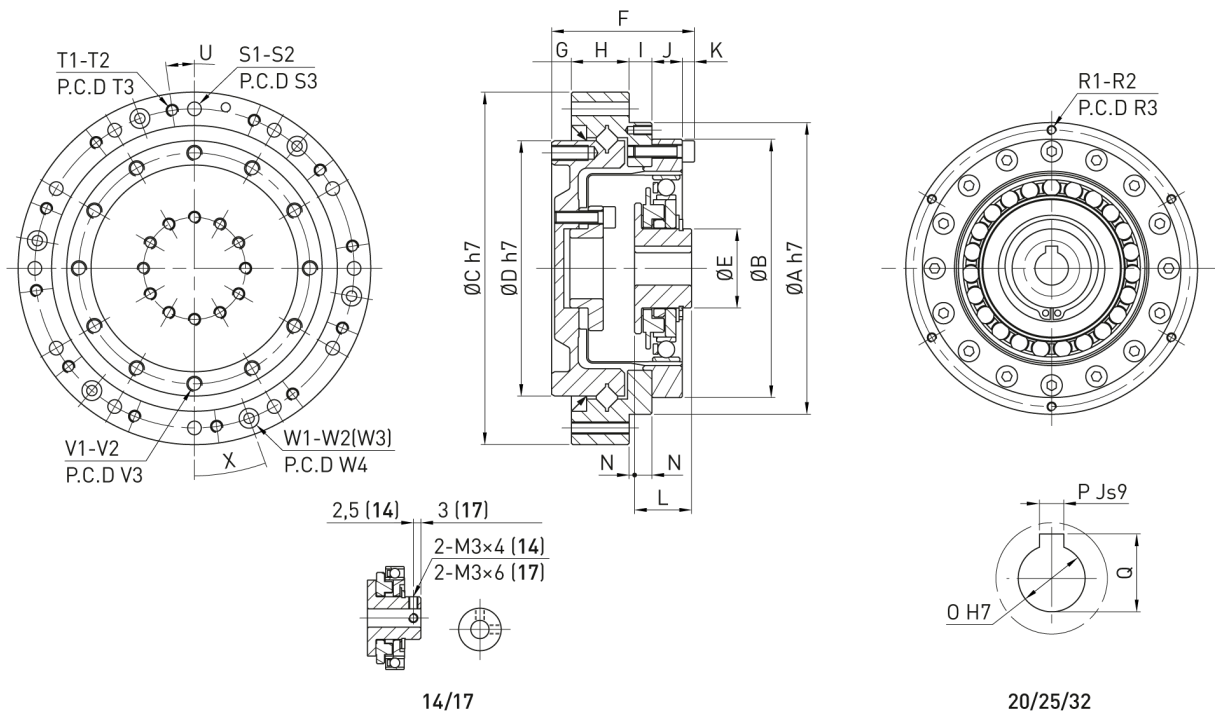
Mounting surface type B



Labelling	Model 14	17	20	25	32
ØA	16	26	30	37	37
ØB	36.5	47	53	66	86
ØC	37,5 ⁰ _{-0,1}	48 ⁰ _{-0,1}	55 ⁰ _{-0,1}	69 ⁰ _{-0,1}	90,5 ⁰ _{-0,1}
ØD	50 ^{+0,027} ₀	60 ^{+0,034} ₀	70 ^{+0,036} ₀	85 ^{+0,050} ₀	110 ^{+0,055} ₀
ØE	50,4 ^{+0,1} ₀	60,4 ^{+0,1} ₀	70,4 ^{+0,1} ₀	85,4 ^{+0,1} ₀	110,4 ^{+0,1} ₀
F	2.5	3	3	5	6.5
G	6,5 ^{+0,1} ₀	7 ^{+0,1} ₀	8 ^{+0,1} ₀	10,5 ^{+0,1} ₀	14,5 ^{+0,1} ₀
H	9,5 ^{+0,1} ₀	10 ^{+0,1} ₀	11 ^{+0,1} ₀	14,5 ^{+0,1} ₀	19,5 ^{+0,1} ₀
I	1 ⁰ _{-0,1}	1,3 ⁰ _{-0,1}	1,3 ⁰ _{-0,1}	1,3 ⁰ _{-0,1}	1,3 ⁰ _{-0,1}
J	1	1.5	1.5	1.5	2
ØK	2.9	3.4	3.4	3.4	4.5
L(P.C.D)	55	66	76	91	118
ØM	60	72	82	96	125
N	4,3 ^{+0,1} ₀	6,3 ^{+0,1} ₀	6,9 ^{+0,1} ₀	7,8 ^{+0,1} ₀	9,8 ^{+0,1} ₀
O	10,5 ^{+0,1} ₀	13 ^{+0,1} ₀	14,6 ^{+0,1} ₀	18 ^{+0,1} ₀	24 ^{+0,1} ₀
P	13,5 ^{+0,1} ₀	16 ^{+0,1} ₀	17,6 ^{+0,1} ₀	22 ^{+0,1} ₀	29 ^{+0,1} ₀
Q	0,7 ⁰ _{-0,1}	1 ⁰ _{-0,1}	1 ⁰ _{-0,1}	1 ⁰ _{-0,1}	1 ⁰ _{-0,1}
R	4	6	6	6	6
S	M2,5	M2,5	M2,5	M3	M4
T(P.C.D)	68	78	88	105	135
X	0.030	0.034	0.044	0.047	0.050
Y	0.030	0.040	0.040	0.040	0.040
Z	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 shaft generator (without Oldham coupling).

4.7.8 DSC-PO-M type, size chart



Labelling	Model 14	17	20	25	32
ØA h7	60	72	82	96	125
ØB	50 ^{+0,01} _{-0,015}	60 ^{+0,01} _{-0,02}	70 ^{+0,01} _{-0,02}	85 ^{+0,01} _{-0,025}	110 ^{+0,01} _{-0,025}
ØC h7	78	88	98	116	148
ØD h7	49	59	69	84	110
ØE	14	18	21	26	26
F	30	34	40	47	59
G	5	5	5.7	6.5	6.5
H	12	13.5	17.2	19	24
I	4	6	6.6	7.5	9.5
J	6	6.5	7.5	10	14
K	3	3	3	4	5
L	17,6 ⁰ _{-0,1}	19,5 ⁰ _{-0,1}	20,1 ⁰ _{-0,1}	20,2 ⁰ _{-0,1}	22 ⁰ _{-0,1}
M (flange type A)	6,6 ^{+0,4} ₀	7 ^{+0,45} ₀	8,1 ^{+0,5} ₀	7,2 ^{+0,5} ₀	6 ^{+0,55} ₀
N (flange type B)	2,6 ^{+0,4} ₀	1 ^{+0,45} ₀	1,5 ^{+0,5} ₀	0,3 ^{+0,5} ₀	3,5 ^{+0,55} ₀
Ø0 H7	6	8	9	11	14
P Js9	-	-	3	4	5
Q	-	-	10.4	12.8	16.3
R1	6	6	6	6	6
R2	M2.5 x 4DP	M3 x 6DP	M3 x 6DP	M3 x 6DP	M4 x 8DP
R3 (P.C.D)	55	66	76	91	118
S1	8	12	12	12	12
ØS2	3.4	3.4	3.4	4.5	5.5
S3 (P.C.D)	68	80	89	105	135

Labelling	Model	14	17	20	25	32
T1		8	12	12	12	12
T2		M3 x 7.8DP	M3	M3	M4	M5
T3 (P.C.D)		68	80	89	105	135
U (degrees)		15°	10°	10°	8°	10°
V1		12	12	12	12	12
V2		M3 x 6DP	M4 x 8DP	M4 x 8DP	M5 x 10DP	M6 x 10DP
V3 (P.C.D)		43	52	62	76	96
W1		4	6	6	6	6
W2		Ø5.5 x 3DP	Ø5.5 x 3DP	Ø5.5 x 3DP	Ø6.5 x 3.4DP	Ø8 x 4.4DP
ØW3		2.9	2.9	2.9	3.4	4.5
W4 (P.C.D)		68	78	88	105	135
X (degrees)		30°	20°	20°	20°	20°
Moment of inertia ($\times 10^{-4}$ kgm ²)		0.033	0.079	0.193	0.413	1.69
Weight (kg)		0.54	0.79	1.30	1.95	3.90

4.8 DSC-AJ-M type

4.8.1 Technical data

Table 4.69: Valuation table

Model	Reduction	Nominal torque at 2000 rpm ¹⁾	Peak torque at start/stop ²⁾	Maximum average torque ³⁾	Collision torque ⁴⁾	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	5.4	18	6.9	35	8,500	3,500
	80	7.8	23	11	47		
	100	7.8	28	11	54		
17	50	16	34	26	70	7,300	3,500
	80	22	43	27	87		
	100	24	54	39	110		
	120	24	54	39	86		
20	50	25	56	34	98	6,500	3,500
	80	34	74	47	127		
	100	40	82	49	147		
	120	40	87	49	147		
	160	40	92	49	147		
25	50	39	98	55	186	5,600	3,500
	80	63	137	87	255		
	100	67	157	108	284		
	120	67	167	108	304		
	160	67	176	108	314		
32	50	76	216	108	382	4,800	3,500
	80	118	304	167	568		
	100	137	333	216	647		
	120	137	353	216	686		
	160	137	372	216	686		

¹⁾ Permissible nominal torque

²⁾ Maximum permissible torque

³⁾ Permissible average torque

⁴⁾ Maximum permissible value of impact

Table 4.70: Crossed roller bearing specifications

Model	Hole circle diameter of the roller	Offset amount	Basic load ratings		Permissible torque load	Torque stiffness
	Dpw	R	Dynamic load C	Normal load Co		
	m	m	kN	kN	Nm	×10 ⁴ Nm/rad
14	0.0465	0.014	8.25	11.4	73	7.9
17	0.059	0.014	10.7	14.8	114	13.7
20	0.070	0.016	21	27	172	24
25	0.088	0.018	21.8	35.8	254	39.2
32	0.114	0.02	34.5	59	578	120.3

Table 4.71: Accuracy of angular transmission

Reduction ratio		Model	14	17	20	25	32
50 - 160	$\times 10^{-4}$ rad		4.4	4.4	2.9	2.9	2.9

Table 4.72: 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
80 - 160	$\times 10^{-4}$ rad		2.9	2.9	2.9	2.9	2.9

Table 4.73: Starting torque (unit cNm)

Reduction ratio		Model	14	17	20	25	32
50			5.7	9.7	14	22	41
80			4.4	7.2	11	15	29
100			3.7	6.5	9.9	14	27
120			-	6.2	9.3	13	24
160			-	-	8.6	12.0	23.0

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

Table 4.74: Reverse starting torque (unit Nm)

Reduction ratio		Model	14	17	20	25	32
50			3.4	5.8	8.4	13	25
80			4.2	6.9	10	15	28
100			4.5	7.8	12	17	33
120			-	8.9	13	19	34
160			-	-	17.0	23.0	43.0

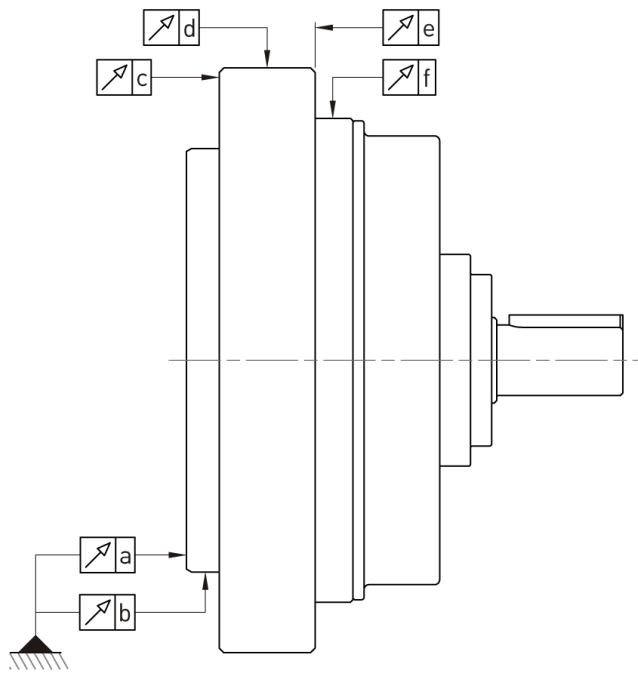
Note: The values in this table vary depending on the working conditions and are for reference purposes only. The upper limit is 20 % above the value in this table.

Table 4.75: Torsional rigidity

Reduction ratio		Model	14	17	20	25	32
T ₁	Nm		2.0	3.9	7.0	14	29
T ₂	Nm		6.9	12	25	48	108
50	K ₁	×10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad	16	12	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad	0.47	1	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11
	K ₃	×10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12
	θ ₁	×10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad	12	9.7	11.3	11.1	11.6

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

4.8.2 Mechanical accuracy



Unit: mm

Labelling	Model	14	17	20	25	32
a		0.010	0.010	0.010	0.010	0.012
b		0.010	0.010	0.010	0.010	0.010
c		0.010	0.010	0.010	0.010	0.012
d		0.010	0.010	0.010	0.010	0.010
e		0.020	0.020	0.020	0.020	0.020
f		0.015	0.015	0.015	0.015	0.015

4.8.3 Tightening torques for mounting screw

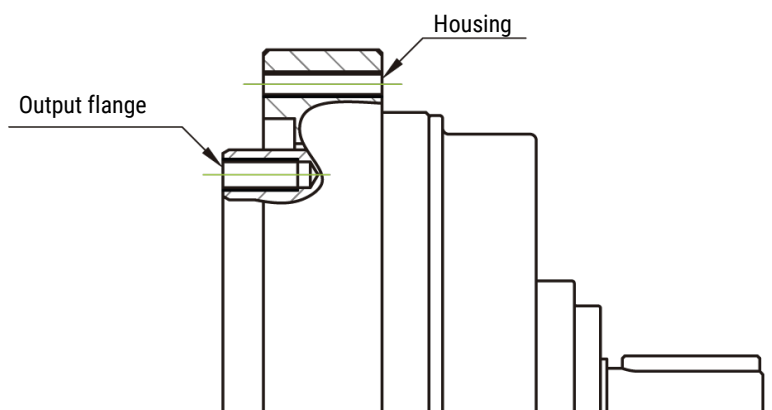


Table 4.76: Mounting screw tightening torque on the A-side

Element		Model	14	17	20	25	32
Number of screws			12	12	12	12	12
Screw size			M3	M4	M4	M5	M6
Installation of PCD screws	mm		43	52	62	76	96
Tightening torque for screws	Nm		2.3	5.1	5.1	10	17.4

Table 4.77: Mounting screw tightening torque on the B-side

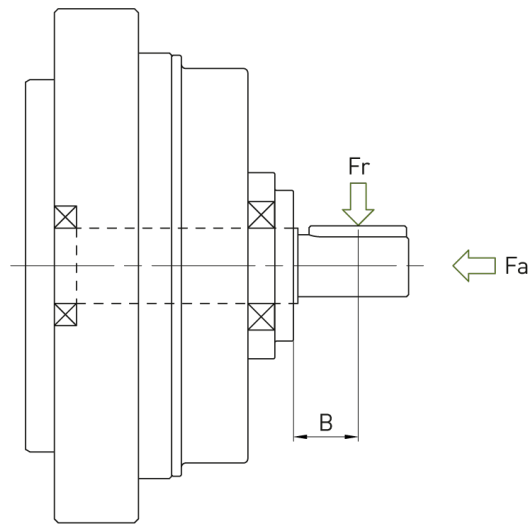
Element		Model	14	17	20	25	32
Number of screws			8	12	12	12	12
Screw size			M3	M3	M3	M4	M5
Installation of PCD screws	mm		68	80	89	105	135
Tightening torque for screws	Nm		2.3	2.3	2.3	5.1	10

Note:

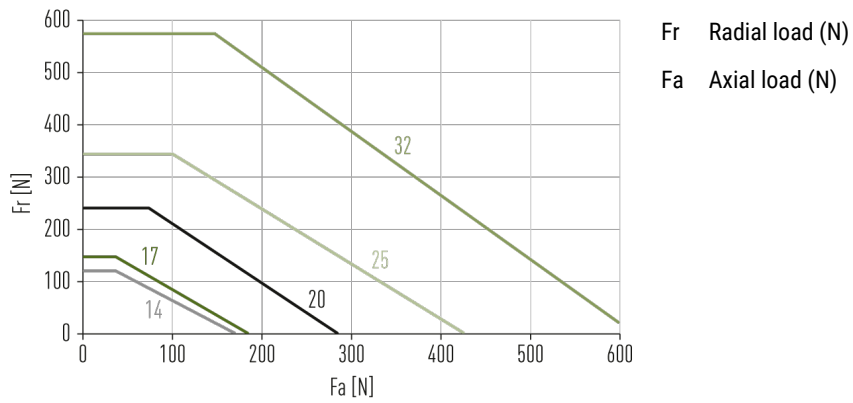
1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.8.4 Permissible input load

To ensure proper performance of the gearbox, please confirm the load acting on the area on the drive side. As shown below:

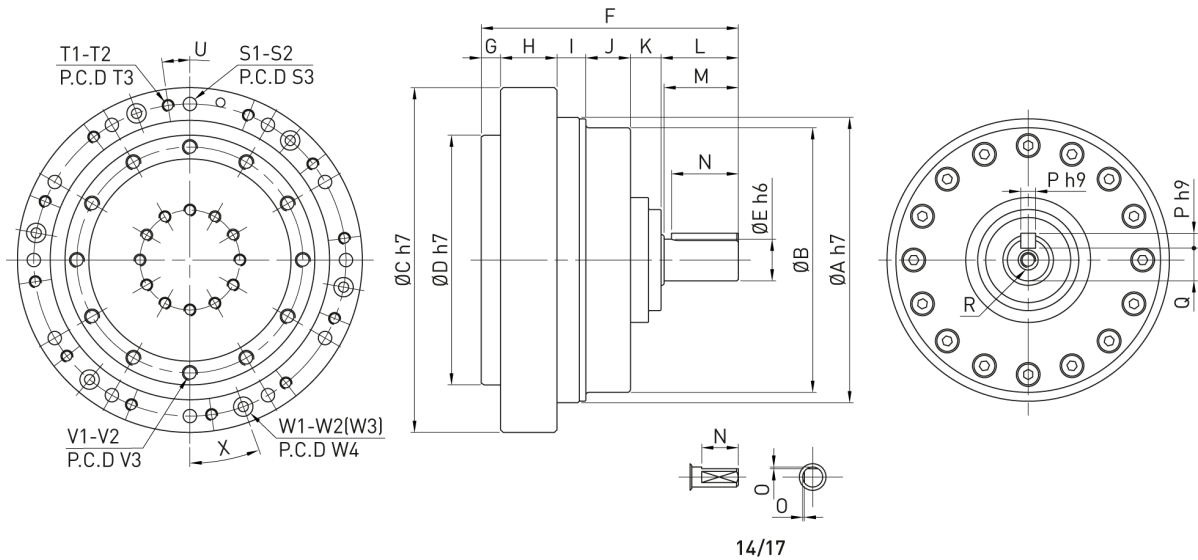


The following figure shows the average input speed of 2,000 rpm and the basic nominal service life $L_{10} = 7,000$ hours.



		Model	14	17	20	25	32
Element							
Offset (B)	mm		7	8	10	12.5	12.5
Maximum radial load (Fr)	N		118	145	232	342	567

4.8.5 DSC-AJ-M type, size chart



Unit: mm

Labelling	Model 14	17	20	25	32
ØA h7	60	72	82	96	125
ØB	53	64	74	89	116
ØC h7	78	88	98	116	148
ØD h7	49	59	69	84	110
ØE h6	6	8	10	14	14
F	55	61.5	73.5	86.5	100.5
G	5	5	5.7	6.5	6.5
H	12	13.5	17.2	19	24
I	5.7	8.2	8.8	9.7	12.7
J	9.8	9.8	11.5	15	20
K	7.5	8	9.3	10.3	11.3
L	15	17	21	26	26
M	14	16	20	25	25
N	11	12	16.5	22.5	22.5
O	0.5	0.5	-	-	-
P h9	-	-	3	5	5
Q	-	-	8,2 ⁰ _{-0,1}	11 ⁰ _{-0,1}	11 ⁰ _{-0,1}
R	-	-	M3 x 6DP	M5 x 10DP	M5 x 10DP
S1	8	12	12	12	12
ØS2	3.4	3.4	3.4	4.5	5.5
S3 (P.C.D)	68	80	89	105	135
T1	8	12	12	12	12
T2	M3 x 7.8DP	M3	M3	M4	M5
T3 (P.C.D)	68	80	89	105	135
U (degrees)	15°	10°	10°	8°	10°

Modell	14	17	20	25	32
V1	12	12	12	12	12
V2	M3 x 6DP	M4 x 8DP	M4 x 8DP	M5 x 10DP	M6 x 10DP
V3 (P.C.D)	43	52	62	76	96
W1	4	6	6	6	6
W2	Ø5.5 x 3DP	Ø5.5 x 3DP	Ø5.5 x 3DP	Ø6.5 x 3.4DP	Ø8 x 4.4DP
ØW3	2.9	2.9	2.9	3.4	4.5
W4 (P.C.D)	68	78	88	105	135
X (degrees)	30°	20°	20°	20°	20°
Moment of inertia (×10 ⁻⁴ kgm ²)	0.025	0.059	0.137	0.32	1.20
Weight (kg)	0.64	0.95	1.40	2.50	5.40

4.9 DGC-PO type

4.9.1 Technical data

Table 4.78: Valuation table

Model	Reduction	Nominal torque at 2000 rpm	Peak torque at start/stop	Maximum average torque	Collision torque	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	7.0	23.0	9.0	46.0	8,500	3,500
	80	10.0	30.0	14.0	58.0		
	100	10.0	36.0	14.0	58.0		
17	50	21.0	44.0	34.0	91.0	7,300	3,500
	80	29.0	56.0	35.0	109.0		
	100	31.0	70.0	51.0	109.0		
	120	31.0	70.0	51.0	109.0		
20	50	33.0	73.0	44.0	127.0	6,500	3,500
	80	44.0	96.0	61.0	165.0		
	100	52.0	107.0	64.0	191.0		
	120	52.0	113.0	64.0	191.0		
	160	52.0	120.0	64.0	191.0		
25	50	51.0	127.0	72.0	242.0	5,600	3,500
	80	82.0	178.0	113.0	332.0		
	100	87.0	204.0	140.0	369.0		
	120	87.0	217.0	140.0	395.0		
	160	87.0	229.0	140.0	408.0		
32	50	99.0	281.0	140.0	497.0	4,800	3,500
	80	153.0	395.0	217.0	738.0		
	100	178.0	433.0	281.0	841.0		
	120	178.0	459.0	281.0	842.0		
	160	178.0	484.0	281.0	842.0		

Table 4.79: Crossed roller bearing specifications

Model	Centre circle diameter of the rollers	Offset	Basic load ratings		Permitted torque	Torque stiffness
	Dpw	R	Dynamic load C _{dyn}	Static load C ₀		
	m	m	kN	kN	Nm	×10 ⁴ Nm/rad
14	0.0350	0.0095	4.7	6.1	41	4.38
17	0.0425	0.0095	5.3	7.6	64	7.75
20	0.0500	0.0095	5.8	9.0	91	12.80
25	0.0620	0.0115	9.6	15.1	156	24.20
32	0.0800	0.0130	15.0	25.0	313	53.90

Table 4.80: Accuracy of angular transmission

Reduction ratio		Model	14	17	20	25	32
50 - 160	$\times 10^{-4}$ rad		4.4	4.4	2.9	2.9	2.9

Table 4.81: 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
80 - 160	$\times 10^{-4}$ rad		2.9	2.9	2.9	2.9	2.9

Table 4.82: Maximum backlash of oldham coupling

Reduction ratio		Model	14	17	20	25	32
50	$\times 10^{-5}$ rad		17.5	9.7	8.2	8.2	6.8
80	$\times 10^{-5}$ rad		11.2	6.3	5.3	5.3	4.4
100	$\times 10^{-5}$ rad		8.7	4.8	4.4	4.4	3.4
120	$\times 10^{-5}$ rad		-	3.9	3.9	3.9	2.9
160	$\times 10^{-5}$ rad		-	-	2.9	2.9	2.4

Table 4.83: Starting torque (unit cNm)

Reduction ratio		Model	14	17	20	25	32
50			4.5	6.7	8.6	17.0	34.0
80			3.1	4.4	5.4	10.0	21.0
100			2.8	3.7	4.7	8.8	20.0
120			-	3.4	4.2	8.0	17.0
160			-	-	3.6	6.9	15.0

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

Table 4.84: Reverse starting torque (unit Nm)

Reduction ratio	Model	14	17	20	25	32
50		1.8	3.3	5.2	9.9	20.0
80		1.8	3.3	5.3	10.0	21.0
100		2.0	3.6	5.6	11.0	22.0
120		-	3.9	6.1	12.0	24.0
160		-	-	7.0	14.0	29.0

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

Table 4.85: Torsional rigidity

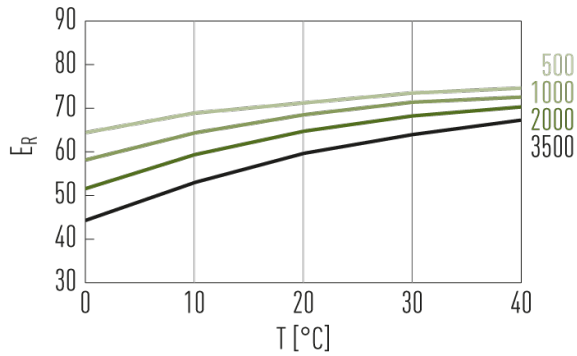
Reduction ratio	Model	14	17	20	25	32	
T ₁	Nm	2.0	3.9	7.0	14.0	29.0	
T ₂	Nm	6.9	12.0	25.0	48.0	108.0	
50	K ₁	×10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad	16.0	12.0	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad	0.47	1.0	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11.0
	K ₃	×10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12.0
	θ ₁	×10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad	12.0	9.7	11.3	11.1	11.6

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

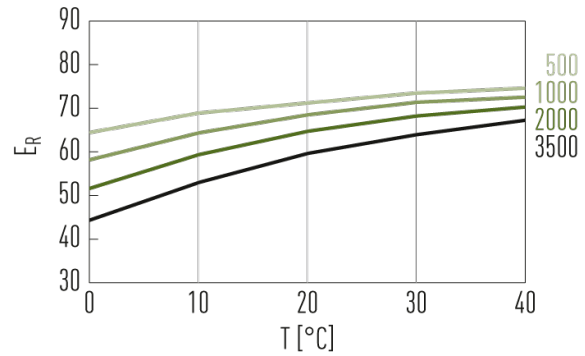
4.9.2 Efficiency E_R

The efficiency of DATORKER® strain wave gears changes depending on the specification, ratio, operating conditions (speed/load) and lubrication (lubricant type/amount).

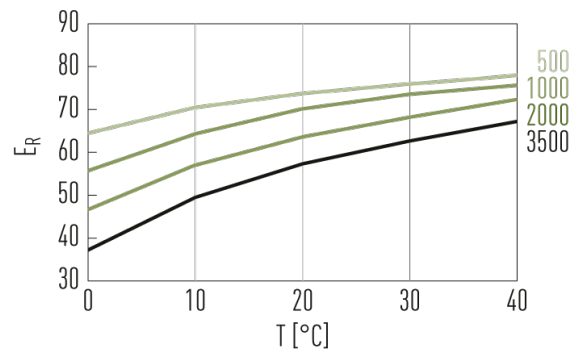
Model: 14, ratio: 50



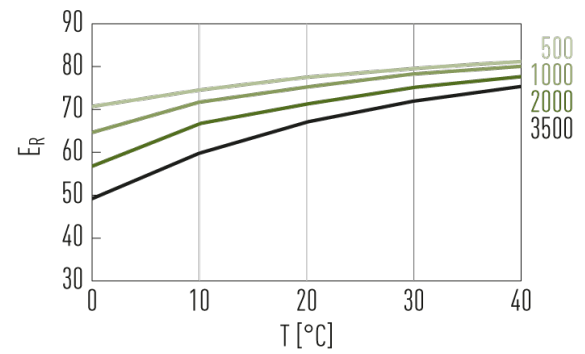
Model: 14, ratio: 80



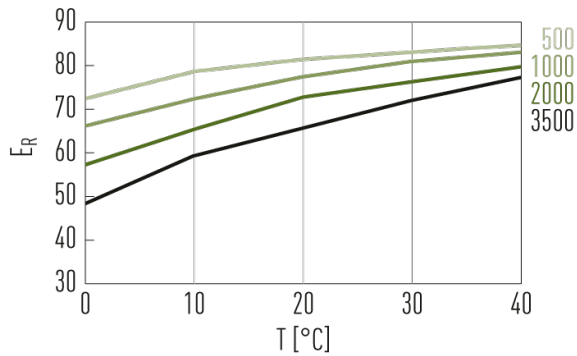
Model: 14, ratio: 100



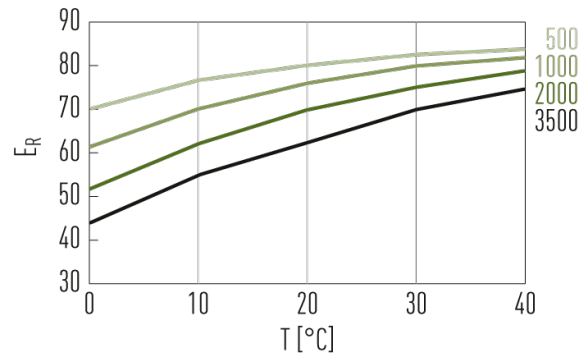
Model: 17-32, ratio: 50



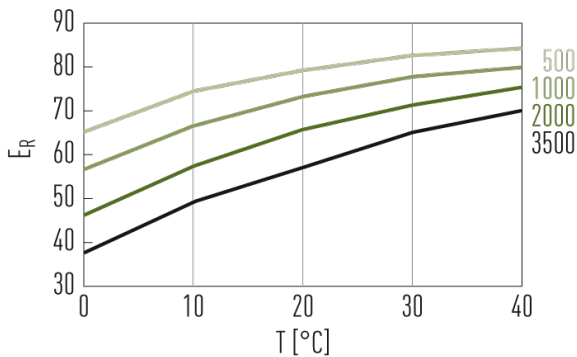
Model: 17-32, ratio: 80, 100



Model: 17-32, ratio: 120



Model: 20-32, ratio: 160

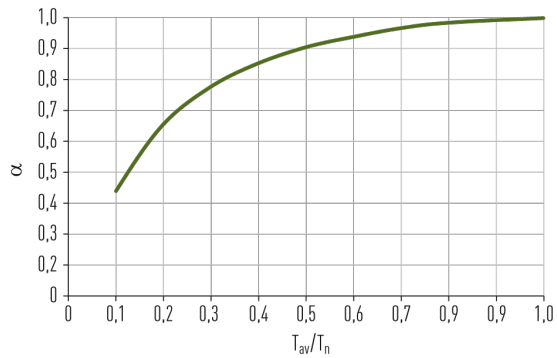


Correction coefficient α

Efficiency = $\alpha \times \eta_{ER}$

α = correction coefficient

ER = efficiency at nominal torque



4.9.3 Idling operating torque

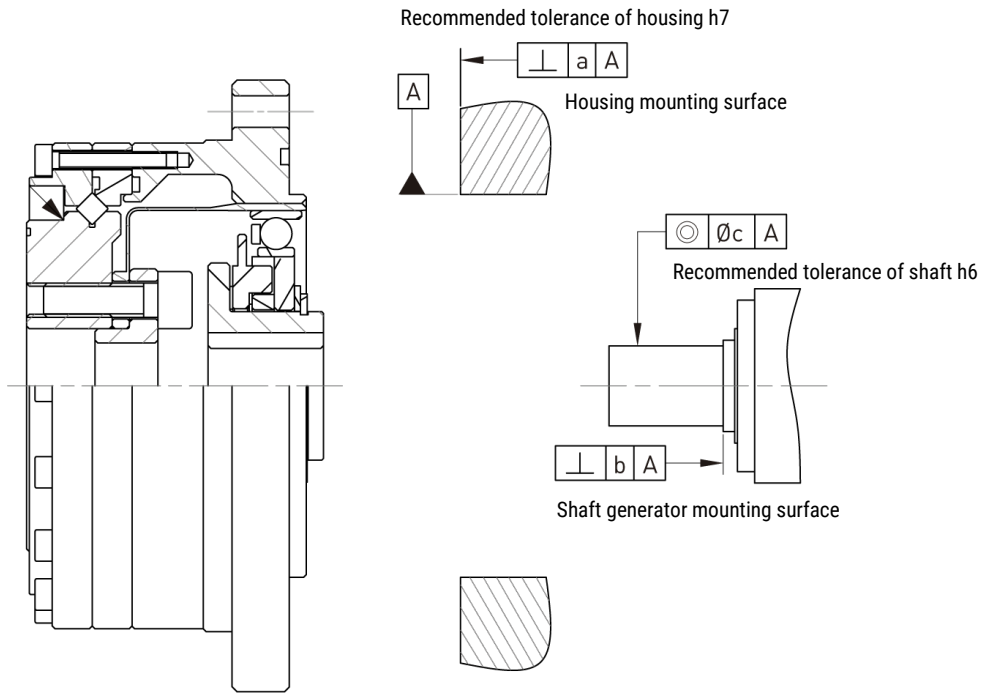
The idling operating torque is the torque required to drive the DATORKER® strain wave gear input (high speed end) after more than 2 hours at an input speed of 2,000 rpm at an average ambient temperature of 25 °C without load.

Unit: cNm

Reduction ratio	Input speed	Model				
		14	17	20	25	32
50	500 rpm	3.2	5.1	7.3	12.8	26.1
	1,000 rpm	3.9	6.1	9.1	17.8	33.1
	2,000 rpm	4.6	7.6	11.8	21.8	44.1
	3,500 rpm	5.9	9.6	12.7	28.8	57.1
80	500 rpm	2.3	3.8	5.5	9.7	20.3
	1,000 rpm	3.0	4.8	7.3	14.7	27.3
	2,000 rpm	3.7	6.3	10.0	18.7	38.3
	3,500 rpm	5.0	8.3	10.9	25.7	51.3
100	500 rpm	2.1	3.5	5.0	9.0	19.0
	1,000 rpm	2.8	4.5	6.8	14.0	26.0
	2,000 rpm	3.5	6.0	9.5	18.0	37.0
	3,500 rpm	4.8	8.0	10.4	25.0	50.0
120	500 rpm	-	3.3	4.7	8.5	18.1
	1,000 rpm	-	4.3	6.5	13.5	25.1
	2,000 rpm	-	5.8	9.2	17.5	36.1
	3,500 rpm	-	7.8	10.1	24.5	49.2
160	500 rpm	-	-	4.2	7.8	16.8
	1,000 rpm	-	-	6	12.8	23.8
	2,000 rpm	-	-	8.7	16.8	34.8
	3,500 rpm	-	-	9.6	23.8	47.8

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

4.9.4 Installation accuracy

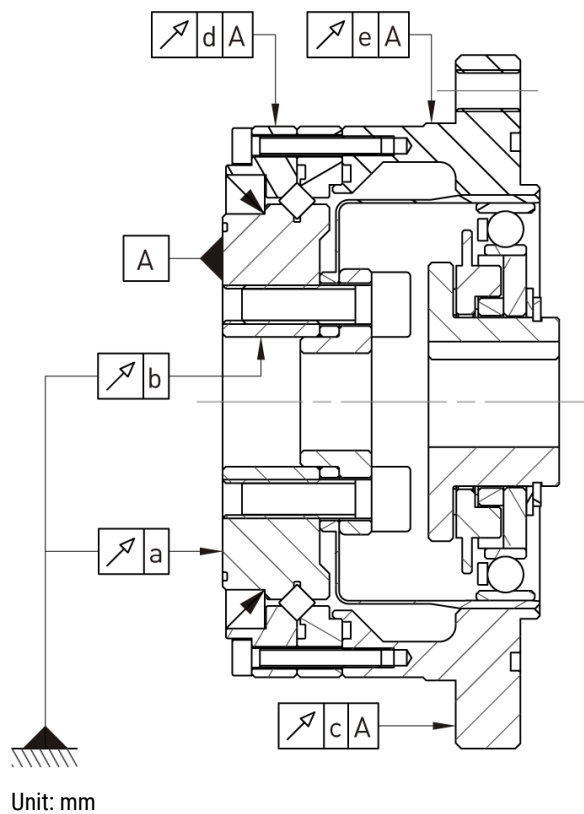


Unit: mm

	Model	14	17	20	25	32
Labelling						
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 shaft generator (without coupling).

4.9.5 Mechanical accuracy



Labelling	Model	14	17	20	25	32
a		0.010	0.010	0.010	0.015	0.015
b		0.010	0.012	0.012	0.013	0.013
c		0.024	0.026	0.038	0.045	0.056
d		0.010	0.010	0.010	0.010	0.010
e		0.038	0.038	0.047	0.049	0.054

4.9.6 Tightening torques for mounting screw

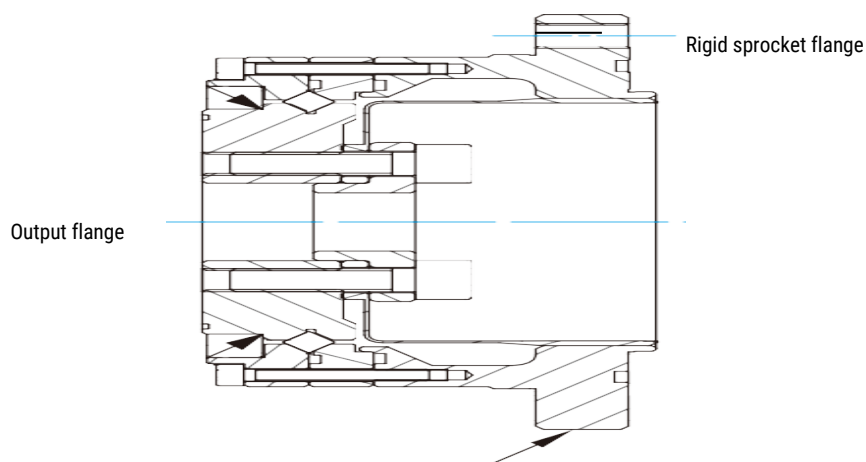


Table 4.86: Screw tightening torque for the output flange

Element		Model	14	17	20	25	32
Number of screws			6	6	8	8	8
Screw size			M4	M5	M6	M8	M10
Installation of PCD screws	mm		23	27	32	42	55
Tightening torque for screws	Nm		5.4	10.8	18.4	45.0	89.0

Table 4.87: Screw tightening torque for the rigid sprocket flange

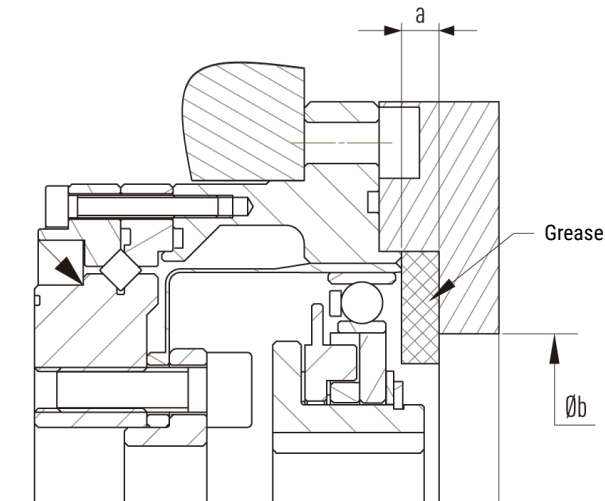
Element		Model	14	17	20	25	32
Number of screws			8	8	8	10	12
Screw size			M4	M4	M5	M5	M6
Installation of PCD screws	mm		65	71	82	96	125
Tightening torque for screws	Nm		4.5	4.5	9.0	9.0	15.3

Note:

1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.9.7 Lubrication

Keep the distance between the gearbox and the mounting flange as small as possible so that the grease remains inside during operation.



Unit mm

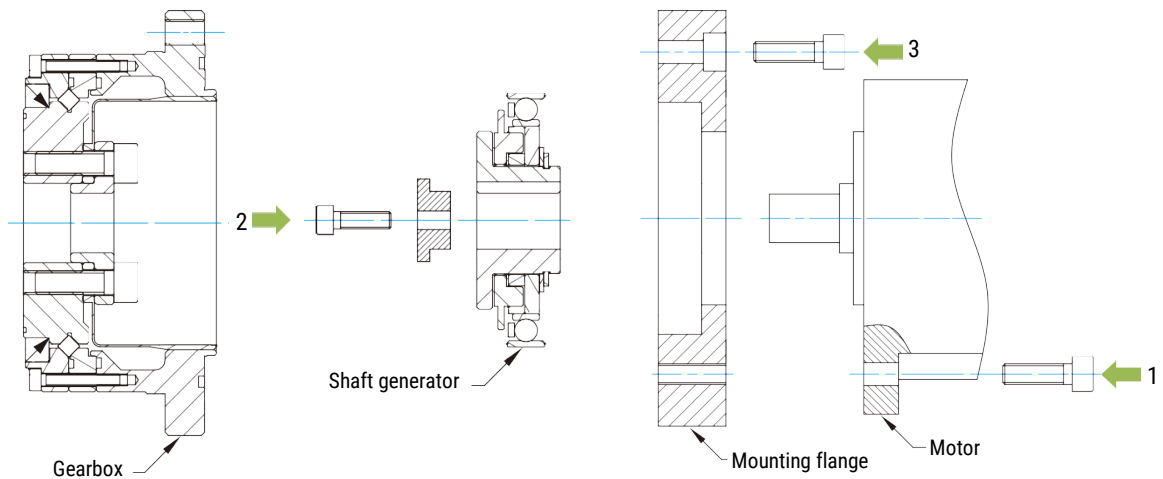
Element	Model 14	17	20	25	32
a ¹⁾	1	1	1.5	1.5	1.5
a ²⁾	3	3	4.5	4.5	4.5
Øb	16	26	30.0	37.0	37.0

1) Medium wave horizontal or vertical: when the shaft generator is pointing downwards

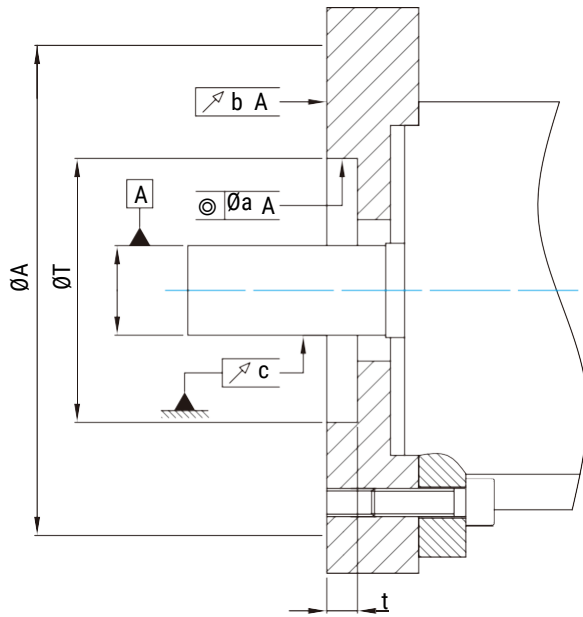
2) Medium wave vertical: when the shaft generator is pointing upwards

4.9.8 Installation procedure

1. Install the mounting flange on the motor mounting surface
2. Install the shaft generator on the motor output shaft
3. Install the gearbox



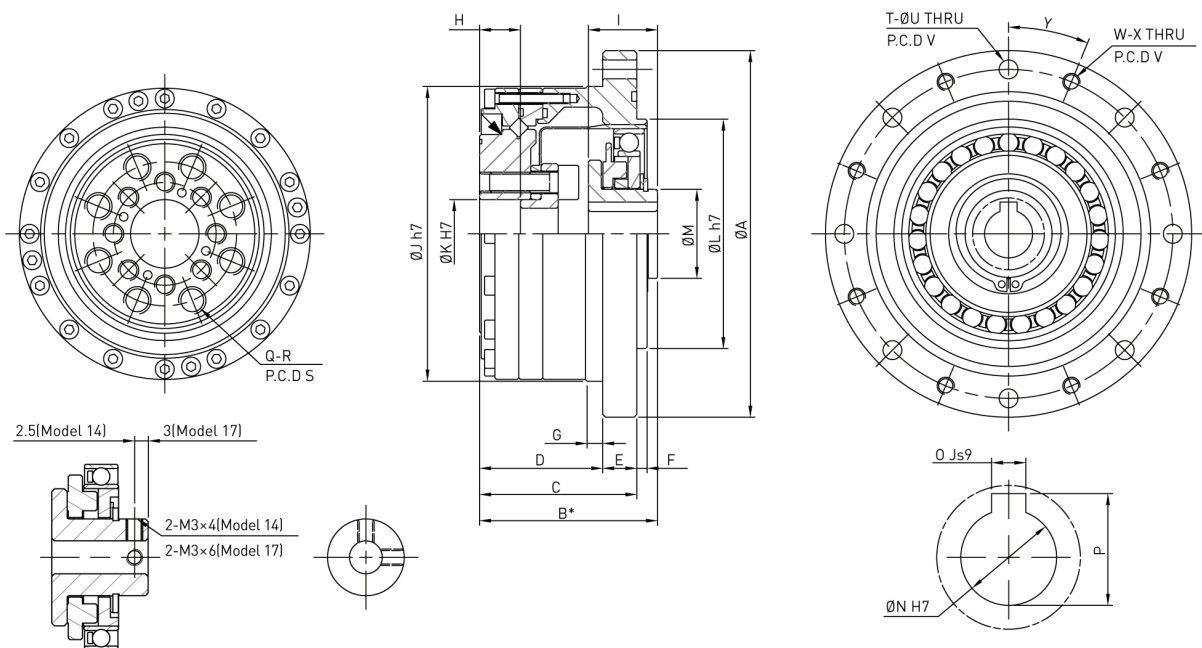
4.9.9 Installation of motor



Unit mm

Labelling	Model 14	17	20	25	32
a	0.030	0.040	0.040	0.040	0.040
b	0.030	0.040	0.040	0.040	0.040
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

4.9.10 DGC-PO type, size chart



Labelling	Model 14	17	20	25	32
ØA	73	79	93	107	138
B*	41 ⁰ _{-0.9}	45 ⁰ _{-0.9}	45.5 ⁰ ₋₁	52 ⁰ ₋₁	62 ⁰ _{-1.1}
C	34	37	38	46	57

Labelling	Model	14	17	20	25	32
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 _{-0,1}	19,5 ⁰ _{-0,1}	20,1 ⁰ _{-0,1}	20,2 ⁰ _{-0,1}	22 ⁰ _{-0,1}
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 ^{+0,1} ₀	16,3 ^{+0,1} ₀	16,3 ^{+0,1} ₀
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 (degrees)		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

Dimensions without unit in mm

*Dimension B is the mounting position and the permissible tolerance in axial direction.

4.10 DGC-CO type

4.10.1 Technical data

Table 4.88: Valuation table

Model	Reduction	Nominal torque at 2000 rpm	Peak torque at start/stop	Maximum average torque	Collision torque	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	7.0	23.0	9.0	46.0	8,500	3,500
	80	10.0	30.0	14.0	61.0		
	100	10.0	36.0	14.0	70.0		
17	50	21.0	44.0	34.0	91.0	7,300	3,500
	80	29.0	56.0	35.0	113.0		
	100	31.0	70.0	51.0	143.0		
	120	31.0	70.0	51.0	112.0		
20	50	33.0	73.0	44.0	127.0	6,500	3,500
	80	44.0	96.0	61.0	165.0		
	100	52.0	107.0	64.0	191.0		
	120	52.0	113.0	64.0	191.0		
	160	52.0	120.0	64.0	191.0		
25	50	51.0	127.0	72.0	242.0	5,600	3,500
	80	82.0	178.0	113.0	332.0		
	100	87.0	204.0	140.0	369.0		
	120	87.0	217.0	140.0	395.0		
	160	87.0	229.0	140.0	408.0		
32	50	99.0	281.0	140.0	497.0	4,800	3,500
	80	153.0	395.0	217.0	738.0		
	100	178.0	433.0	281.0	841.0		
	120	178.0	459.0	281.0	892.0		
	160	178.0	484.0	281.0	892.0		

Table 4.89: Accuracy of angular transmission

Model		14	17	20	25	32
Reduction ratio						
50 - 160	$\times 10^{-4}$ rad	4.4	4.4	2.9	2.9	2.9

Table 4.90: Hysteresis loss

Model		14	17	20	25	32
Reduction ratio						
50	$\times 10^{-4}$ rad	5.8	5.8	5.8	5.8	5.8
80 - 160	$\times 10^{-4}$ rad	2.9	2.9	2.9	2.9	2.9

Table 4.91: Maximum backlash of oldham coupling

Reduction ratio		Model	14	17	20	25	32
50	$\times 10^{-5}$ rad		17.5	9.7	8.2	8.2	6.8
80	$\times 10^{-5}$ rad		11.2	6.3	5.3	5.3	4.4
100	$\times 10^{-5}$ rad		8.7	4.8	4.4	4.4	3.4
120	$\times 10^{-5}$ rad		-	3.9	3.9	3.9	2.9
160	$\times 10^{-5}$ rad		-	-	2.9	2.9	2.4

Table 4.92: Starting torque (unit cNm)

Reduction ratio		Model	14	17	20	25	32
50			3.6	5.6	7.3	13.0	29.0
80			2.6	3.6	4.5	8.5	18.0
100			2.3	3.2	4.1	7.6	17.0
120			-	3.0	3.6	6.9	14.0
160			-	-	3.2	6.1	13.0

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

Table 4.93: Reverse starting torque (unit Nm)

Reduction ratio		Model	14	17	20	25	32
50			1.5	2.8	4.4	8.3	18.0
80			1.5	2.8	4.6	8.5	18.0
100			1.9	3.1	5.0	9.2	20.0
120			-	3.4	5.4	10.0	21.0
160			-	-	6.4	12.0	25.0

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

Table 4.94: Torsional rigidity

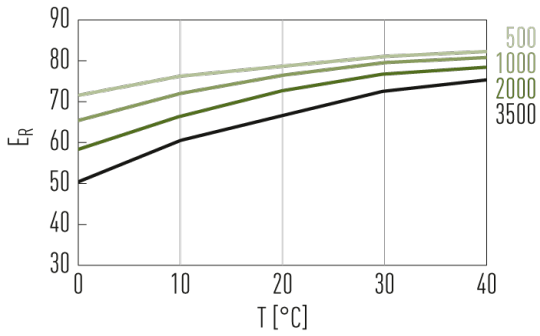
Reduction ratio		Model	14	17	20	25	32
T ₁	Nm		2.0	3.9	7.0	14.0	29.0
T ₂	Nm		6.9	12.0	25.0	48.0	108.0
50	K ₁	×10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad	16.0	12.0	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad	0.47	1.0	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11.0
	K ₃	×10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12.0
	θ ₁	×10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad	12.0	9.7	11.3	11.1	11.6

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

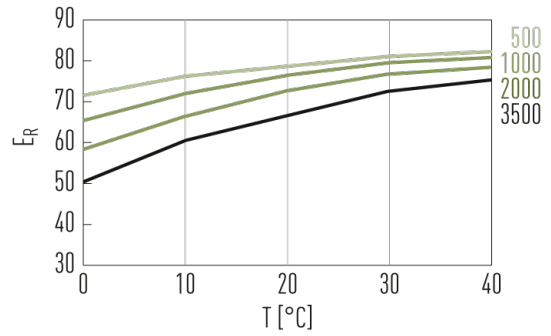
4.10.2 Efficiency E_R

The efficiency of DATORKER® strain wave gears changes depending on the specification, ratio, operating conditions (speed/load) and lubrication (lubricant type/amount).

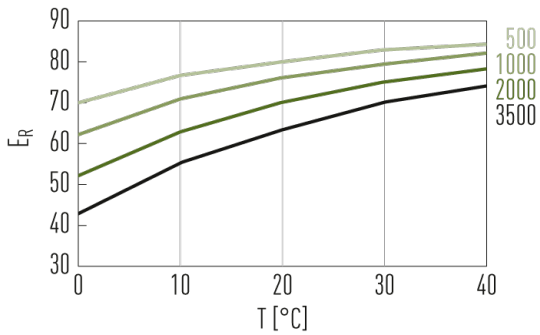
Model: 14, ratio: 50



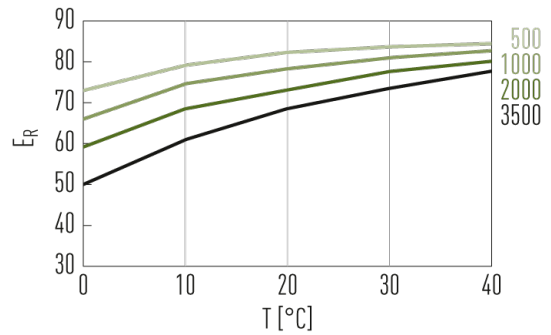
Model: 14, ratio: 80



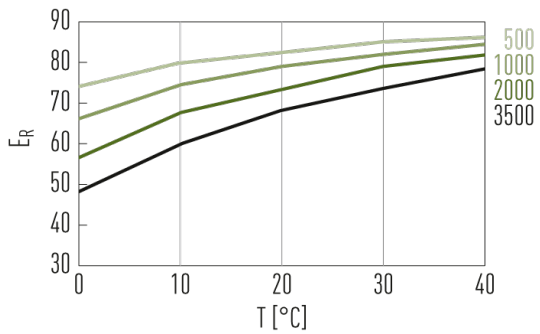
Model: 14, ratio: 100



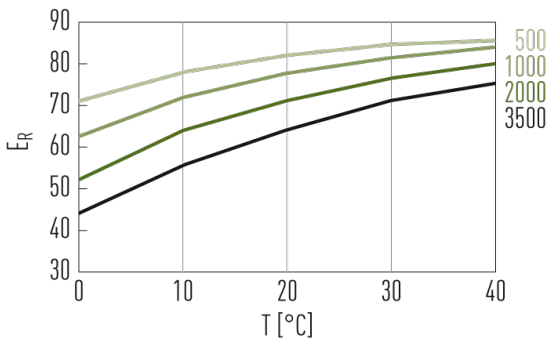
Model: 17-32, ratio: 50



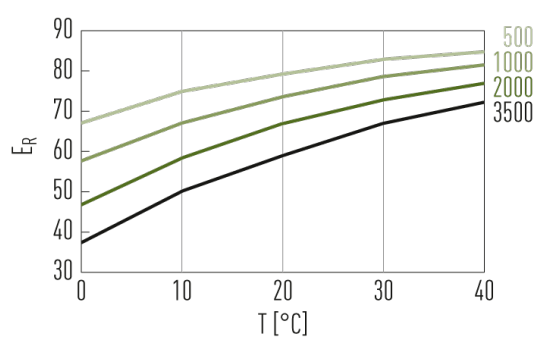
Model: 17-32, ratio: 80, 100



Model: 17-32, ratio: 120



Model: 20-32, ratio: 160

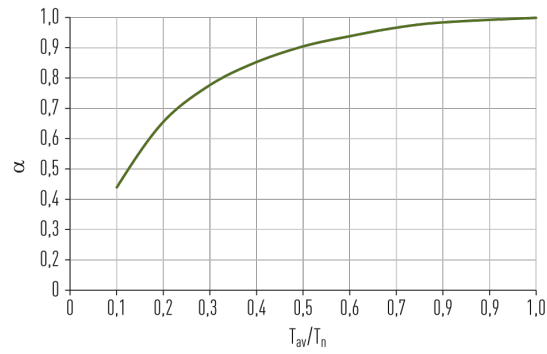


Correction coefficient α

Efficiency = $\alpha \times \eta_{ER}$

α = correction coefficient

ER = efficiency at nominal torque



4.10.3 Idling operating torque

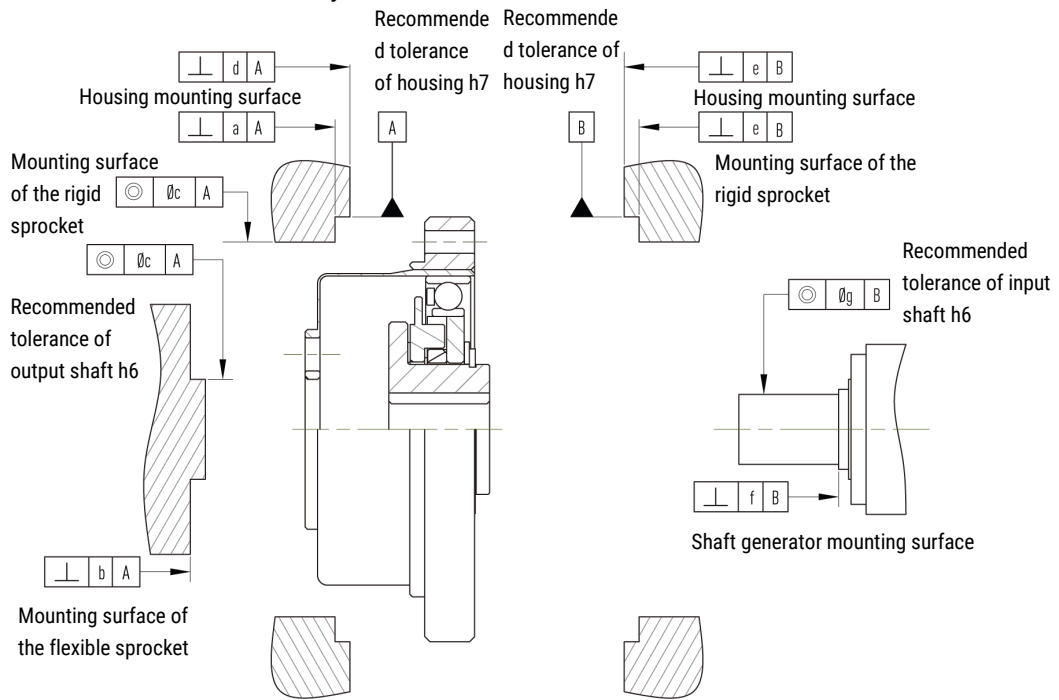
The idling operating torque is the torque required to drive the DATORKER® strain wave gear input (high speed end) after more than 2 hours at an input speed of 2,000 rpm at an average ambient temperature of 25 °C without load.

Unit: cNm

Reduction ratio	Input speed	Model				
		14	17	20	25	32
50	500 rpm	1.8	3.4	5.1	9.7	21.2
	1,000 rpm	2.3	4.4	6.9	12.5	27.2
	2,000 rpm	3.1	5.8	9.4	18.5	37.2
	3,500 rpm	4.2	7.9	13.4	25.5	50.2
80	500 rpm	1.4	2.6	3.9	7.6	16.8
	1,000 rpm	1.9	3.6	5.7	10.4	22.8
	2,000 rpm	2.7	5.0	8.2	16.4	32.8
	3,500 rpm	3.8	7.1	12.2	23.4	45.8
100	500 rpm	1.3	2.5	3.7	7.2	16.0
	1,000 rpm	1.8	3.5	5.5	10.0	22.0
	2,000 rpm	2.6	4.9	8.0	16.0	32.0
	3,500 rpm	3.7	7.0	12.0	23.0	45.0
120	500 rpm	-	2.4	3.5	6.9	15.4
	1,000 rpm	-	3.4	5.2	9.7	21.4
	2,000 rpm	-	4.8	7.8	15.7	31.4
	3,500 rpm	-	6.9	11.8	22.7	44.4
160	500 rpm	-	-	3.4	6.6	14.8
	1,000 rpm	-	-	5.2	9.4	20.8
	2,000 rpm	-	-	7.7	15.4	30.8
	3,500 rpm	-	-	11.7	22.4	43.8

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

4.10.4 Installation accuracy

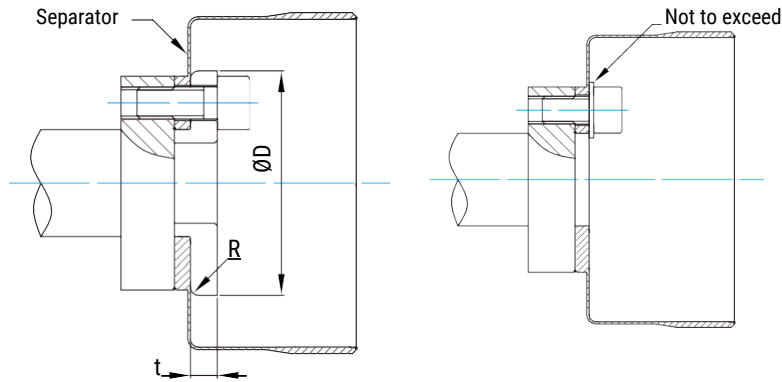


Unit: mm

Modelling	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 shaft generator (without coupling).

4.10.5 Recommended size of the pressing plate



Unit: mm

Modelling	Model	14	17	20	25	32
$\varnothing D_{-0,1}^0$		24.5	29.0	34.0	42.0	55.0
$R_0^{+0,1}$		1.2	1.2	1.4	1.5	2.0
t		2.0	2.5	2.5	5.0	7.0

Note: Note: To prevent the screws on the press plate from sinking or loosening, the following is recommended:

1. Material S45C.
2. The heat treatment hardness grade should be HB200 - 270.

4.10.6 Tightening torque for mounting screw

1. Side of the flexible sprocket:

- If the load torque is below the nominal power value in Table 4.11: Valuation table "Peak torque during start/stop", use only screws for installation.
- If the load torque can reach the nominal power value given in Table 4.11: Valuation table "Maximum permissible collision moment", use a combination of screws and pins for installation.

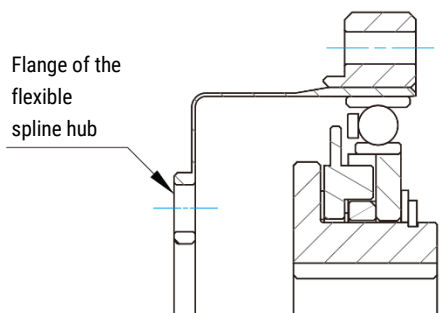


Table 4.95: Flange-side screw tightening torque of the flexible sprocket

Element	Model	14	17	20	25	32
Number of screws		6	6	8	8	8
Screw size		M4	M5	M5	M6	M8
Installation of PCD screws	mm	17	19	24	30	40
Tightening torque for screws	Nm	5.4	10.8	10.8	18.4	44.4

Note:

1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

Table 4.96: Installation of the flexible sprocket with the help of a pin

Element		Model 14	17	20	25	32
Number of screws		4	4	4	4	4
Pin diameter	mm	3	3	3	4	5
Pinhole PCD	mm	18.5	21.5	27	34	45
Screw plus transmission torque of the pin	kgfm	12.0	17.0	25.0	49.0	110.0

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

2. Side of the rigid sprocket flange

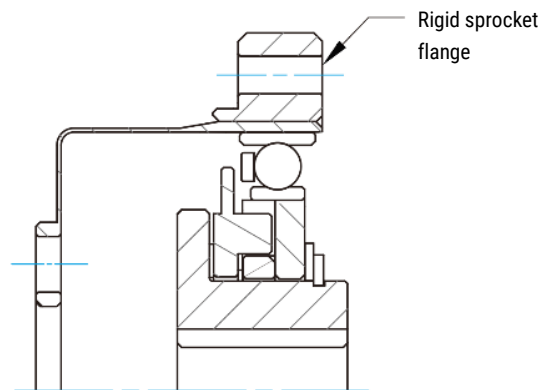


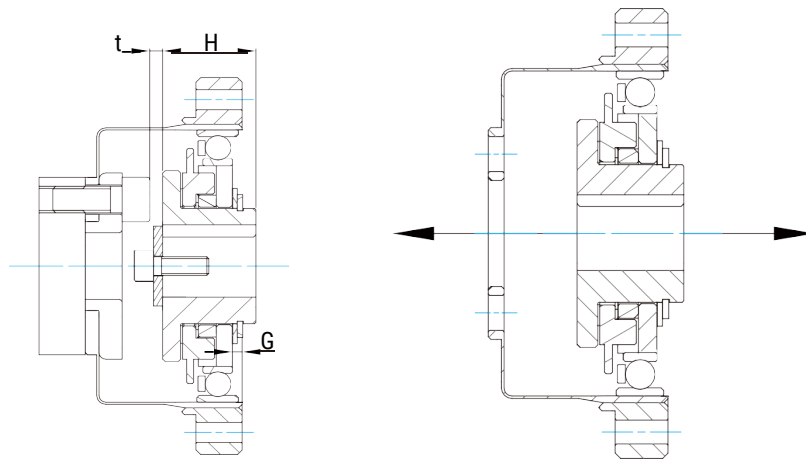
Table 4.97: Installation the rigid sprocket flange with the help of a screw

Element		Model 14	17	20	25	32
Number of screws		8	16	16	16	16
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	44	54	62	75	100
Tightening torque for screws	Nm	2.0	2.0	2.0	4.5	9.0

Note:

1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.10.7 Installation of the shaft generator



Unit: mm

Modelling	Model	14	17	20	25	32
G		1.4	1.6	1.5	3.5	4.2
$H_{-0,1}^0$		18.5	20.7	21.5	21.6	23.6
t		1.6	1.3	1.5	1.4	2.2

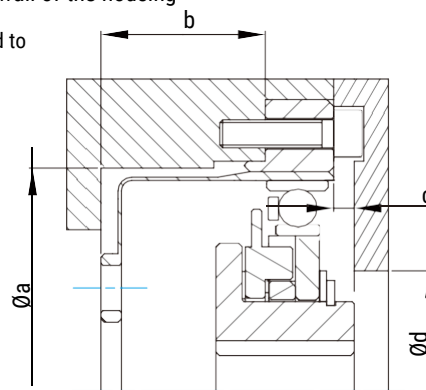
Note:

1. Avoid interference between the shaft generator and the screw of the flexible sprocket.
2. Due to the elastic deformation of the flexible sprocket, the gearbox causes a displacement of the shaft generator during operation. The displacement changes with the operating conditions. In any case, a mechanism must be used to prevent slippage due to displacement of the shaft generator.

4.10.8 Lubrication

1. Recommended dimensions of the inner wall of the housing

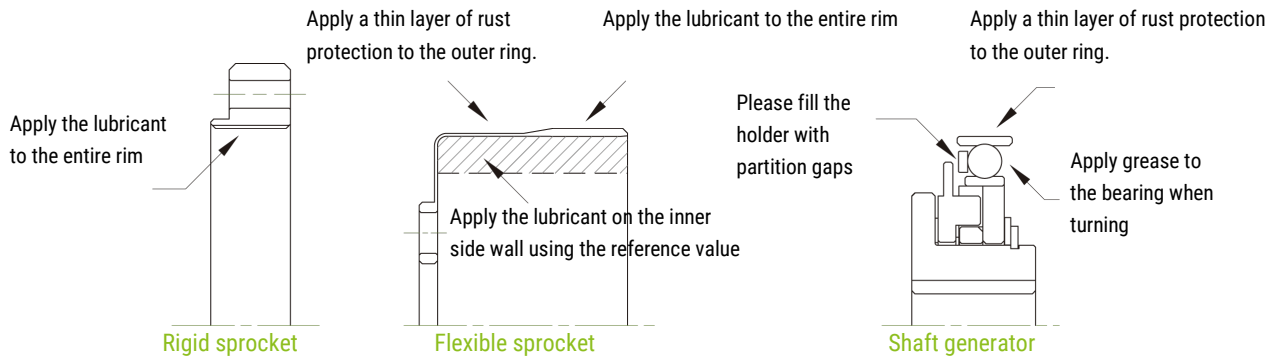
Keeping the following dimensions is recommended to avoid too much lubricant splashing on other parts during operation:



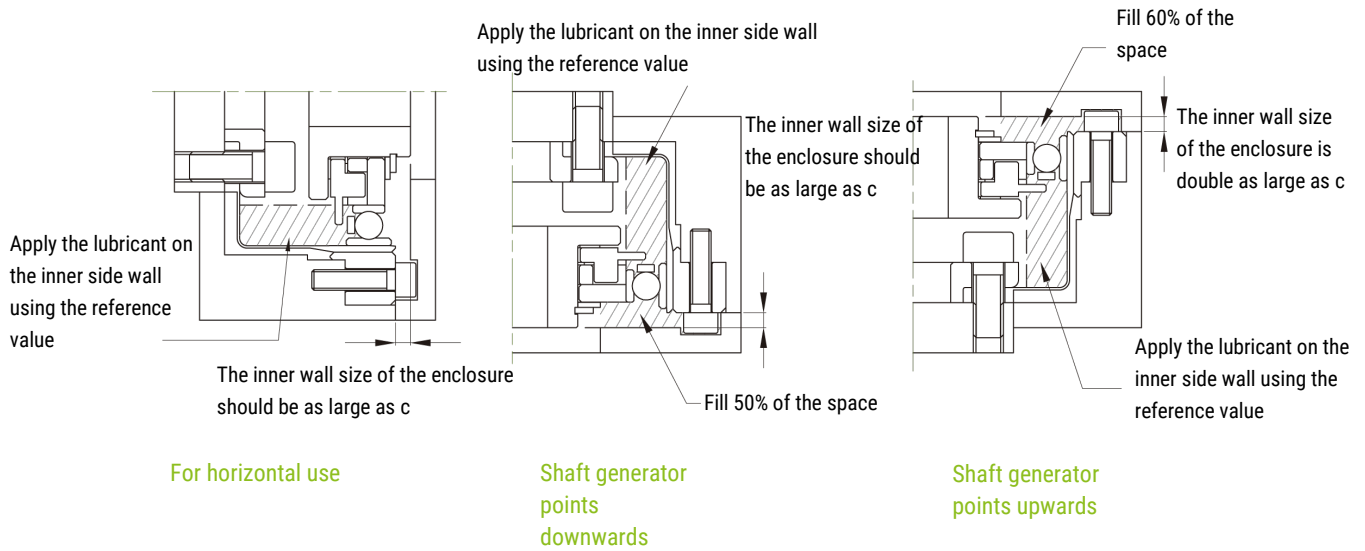
Unit: mm

Modelling	Model	14	17	20	25	32
Øa		38.0	45.0	53.0	66.0	86.0
b		17.1	19.0	20.5	23.0	26.8
c		1.0	1.0	1.5	1.5	1.5
Ød		16.0	26.0	30.0	37.0	37.0

2. Lubricant application



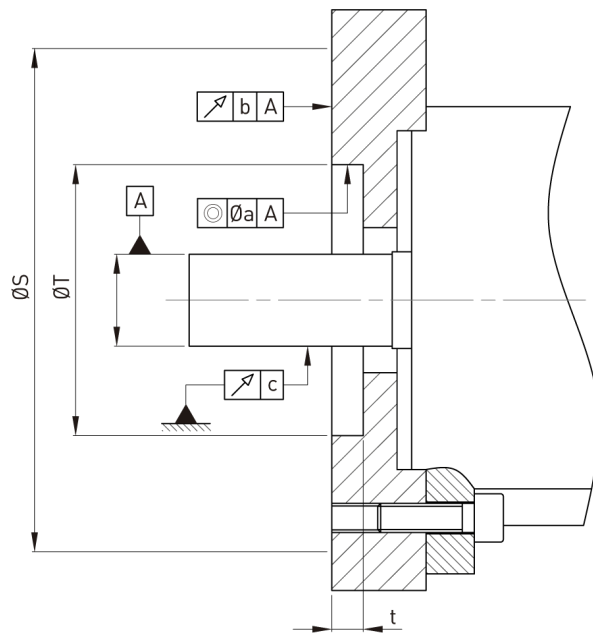
3. The most important points of different application methods



Unit: g

		Model	14	17	20	25	32
Instructions							
Horizontal use			5.5	10	16	30	60
Vertical use	Shaft generator points downwards		7.0	12	18	35	70
	Shaft generator points upwards		8.5	14	21	40	80

4.10.9 Installation of motor

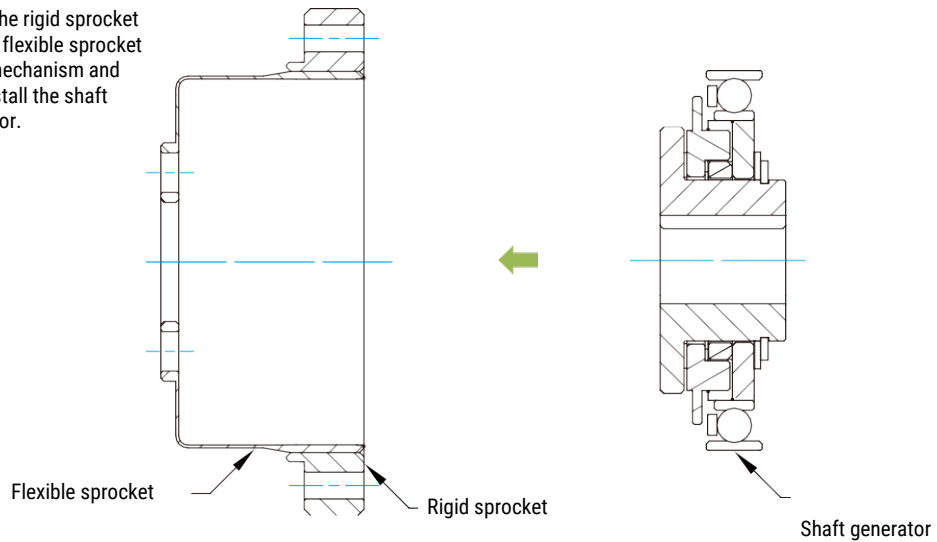


Unit: mm

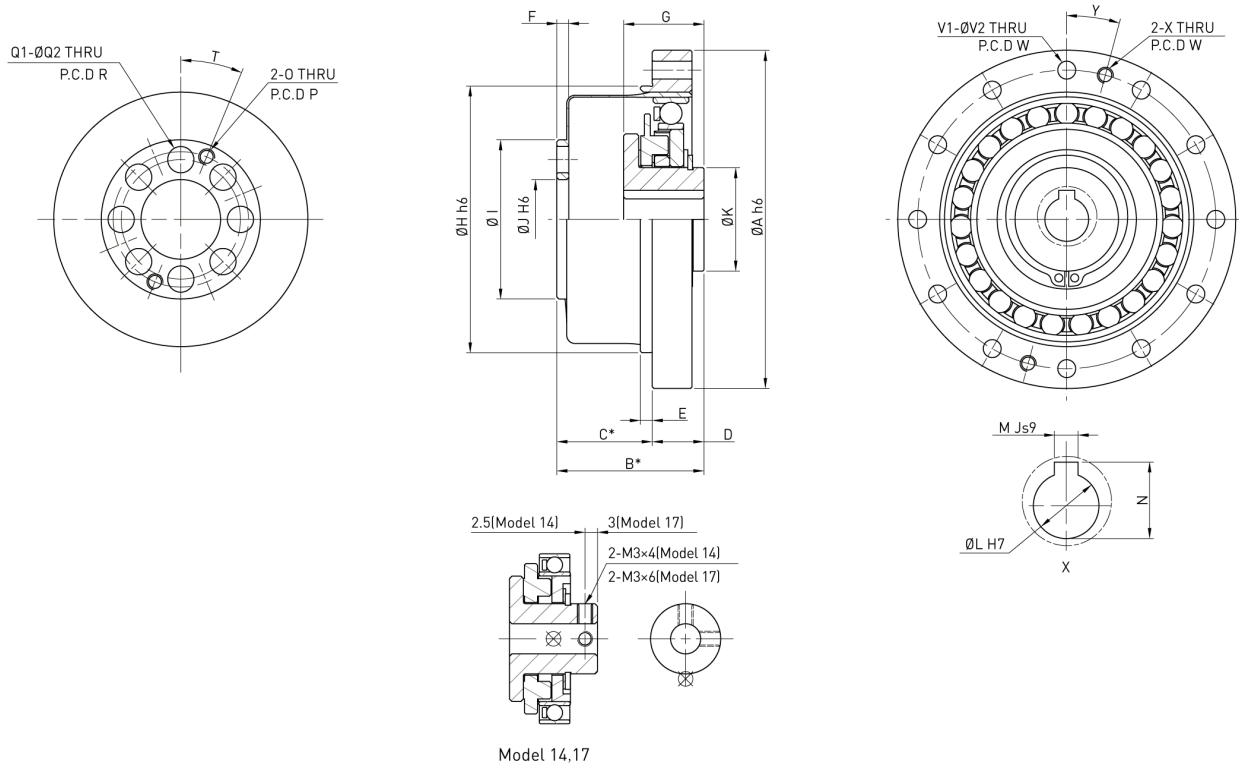
Modelling	Model	14	17	20	25	32
a		0.03	0.04	0.04	0.04	0.04
b		0.03	0.04	0.04	0.04	0.04
c		0.015	0.015	0.018	0.018	0.018
ØT H6		50	60	70	85	110

4.10.10 Installation procedure

Install the rigid sprocket and the flexible sprocket in the mechanism and then install the shaft generator.



4.10.11 DGC-CO type, size chart



	Model 14	17	20	25	32
Labelling					
ØA h6	50	60	70	85	110
B*	28,5 ⁰ _{-0,4}	32,5 ⁰ _{-0,4}	33,5 ⁰ _{-0,4}	37 ⁰ _{-0,5}	44 ⁰ _{-0,6}
C*	17,5 ^{0,4} ₀	20 ^{+0,5} ₀	21,5 ^{+0,6} ₀	24 ^{+0,6} ₀	28 ^{+0,6} ₀
D	6	6.5	7.5	10	14
E	2	2.5	3	3	3
F	2.4	3	3	3	3.2
G	18,5 ⁰ _{-0,1}	20,7 ⁰ _{-0,1}	21,5 ⁰ _{-0,1}	21,6 ⁰ _{-0,1}	23,6 ⁰ _{-0,1}
ØH h6	38	48	54	67	90
ØI	23	27.2	32	40	52
J H6	11	10	16	20	26

Labelling	Model	14	17	20	25	32
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
T (degrees)		30°	30°	22.5°	22.5°	22.5°
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 (degrees)		22.5°	11.25°	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)		0.09	0.15	0.28	0.45	0.89

Dimensions without unit in mm

*Dimension B, C is the mounting position and the permissible tolerance in axial direction.

4.11 DGH-PO type

4.11.1 Technical data

Table 4.98: Valuation table

Model	Reduction	Nominal torque at 2000 rpm ¹⁾	Peak torque at start/stop ²⁾	Maximum average torque ³⁾	Collision torque ⁴⁾	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	7.0	23.0	9.0	46.0	8,500	3,500
	80	10.0	30.0	14.0	61.0		
	100	10.0	36.0	14.0	70.0		
17	50	21.0	44.0	34.0	91.0	7,300	3,500
	80	29.0	56.0	35.0	113.0		
	100	31.0	70.0	51.0	143.0		
	120	31.0	70.0	51.0	112.0		
20	50	33.0	73.0	44.0	127.0	6,500	3,500
	80	44.0	96.0	61.0	165.0		
	100	52.0	107.0	64.0	191.0		
	120	52.0	113.0	64.0	191.0		
	160	52.0	120.0	64.0	191.0		
25	50	51.0	127.0	72.0	242.0	5,600	3,500
	80	82.0	178.0	113.0	332.0		
	100	87.0	204.0	140.0	369.0		
	120	87.0	217.0	140.0	395.0		
	160	87.0	229.0	140.0	408.0		
32	50	99.0	281.0	140.0	497.0	4,800	3,500
	80	153.0	395.0	217.0	738.0		
	100	178.0	433.0	281.0	841.0		
	120	178.0	459.0	281.0	892.0		
	160	178.0	484.0	281.0	892.0		

¹⁾ Permissible nominal torque

²⁾ Maximum permissible torque

³⁾ Permissible average torque

⁴⁾ Maximum permissible value of impact

Table 4.99: Crossed roller bearing specifications

Model	Hole circle diameter of the roller	Offset amount	Basic load ratings		Permissible torque load	Torque stiffness
	Dpw	R	Dynamic load C	Normal load Co		
	m	m	kN	kN	Nm	×10 ⁴ Nm/rad
14	0.050	0.0217	5.8	8.6	74	8.5
17	0.060	0.0239	10.4	16.3	124	15.4
20	0.070	0.0255	14.6	22.0	187	25.2
25	0.085	0.0296	21.8	35.8	258	39.2
32	0.111	0.0364	38.2	65.4	580	100

Table 4.100: Accuracy of angular transmission

Reduction ratio		Model	14	17	20	25	32
50 - 160	$\times 10^{-4}$ rad		4.4	4.4	2.9	2.9	2.9

Table 4.101: 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
80 - 160	$\times 10^{-4}$ rad		2.9	2.9	2.9	2.9	2.9

Table 4.102: Maximum Backlash

Reduction ratio		Model	14	17	20	25	32
50	$\times 10^{-4}$ rad		17.5	9.7	8.2	8.2	6.8
80	$\times 10^{-4}$ rad		11.2	6.3	5.3	5.3	4.4
100	$\times 10^{-5}$ rad		8.7	4.8	4.4	4.4	3.4
120	$\times 10^{-5}$ rad		—	3.9	3.9	3.9	2.9
160	$\times 10^{-5}$ rad		—	—	2.9	2.9	2.4

Table 4.103: Starting torque (unit cNm)

Reduction ratio		Model	14	17	20	25	32
50			4.5	6.7	8.6	17	34
80			3.1	4.4	5.4	10.0	21.0
100			2.8	3.7	4.7	8.8	20.0
120			-	3.4	4.2	8.0	17.0
160			-	-	3.6	6.9	15.0

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

Table 4.104: Reverse starting torque (unit Nm)

Reduction ratio		Model	14	17	20	25	32
50			1.8	3.3	5.2	9.9	20.0
80			1.8	3.3	5.3	10.0	21.0
100			2.0	3.6	5.6	11.0	22.0
120			-	3.9	6.1	12.0	24.0
160			-	-	7.0	14.0	29.0

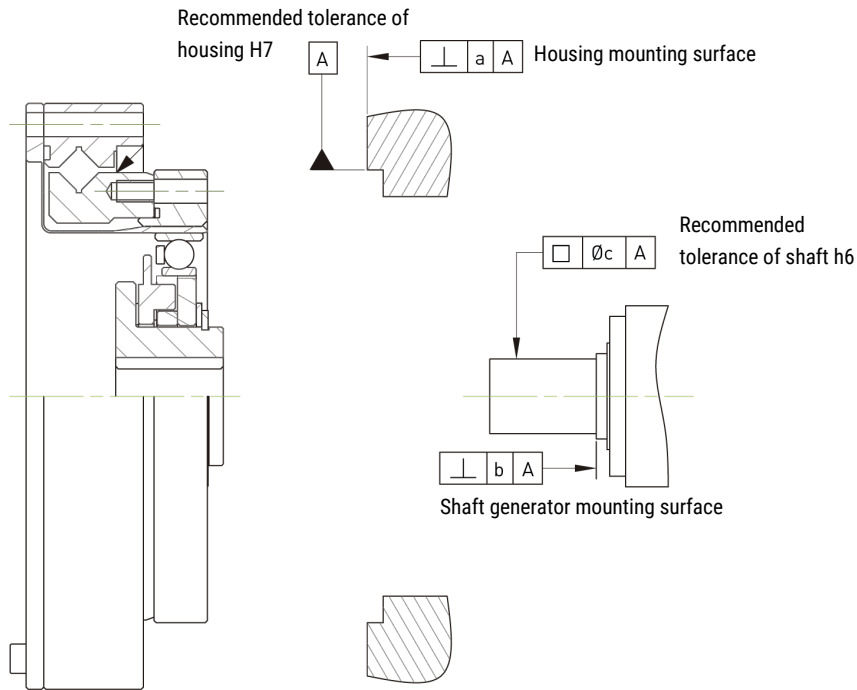
Note: The values in this table vary depending on the working conditions and are for reference purposes only. The upper limit is 20 % above the value in this table.

Table 4.105: Torsional rigidity

Reduction ratio			Model	14	17	20	25	32
T ₁		Nm		2.0	3.9	7.0	14	29
T ₂		Nm		6.9	12	25	48	108
50	K ₁	×10 ⁴ Nm/rad		0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad		0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad		0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad		5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad		16	12	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad		0.47	1	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad		0.61	1.4	2.5	5.0	11
	K ₃	×10 ⁴ Nm/rad		0.71	1.6	2.9	5.7	12
	θ ₁	×10 ⁻⁴ rad		4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad		12	9.7	11.3	11.1	11.6

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

4.11.2 Installation accuracy



Unit: mm

Labelling	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 shaft generator (without Oldham coupling).

4.11.3 Tightening torque for mounting screw

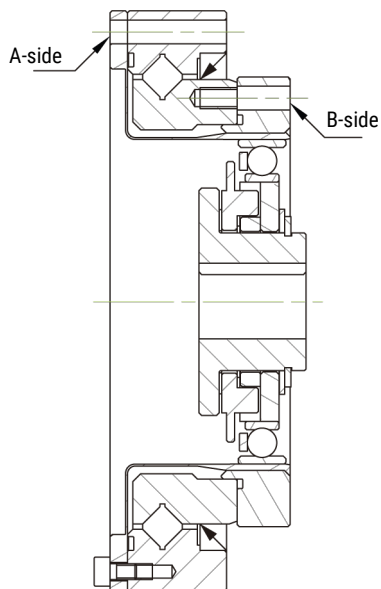


Table 4.106: Mounting screw tightening torque on the A-side

Element		Model	14	17	20	25	32
Number of screws			8	12	12	12	12
Screw size			M3	M3	M3	M4	M5
Installation of PCD screws	mm		64	74	84	102	132
Screw tightening torque	Nm		2.4	2.4	2.4	5.4	10.8

Table 4.107: Mounting screw tightening torque on the B-side

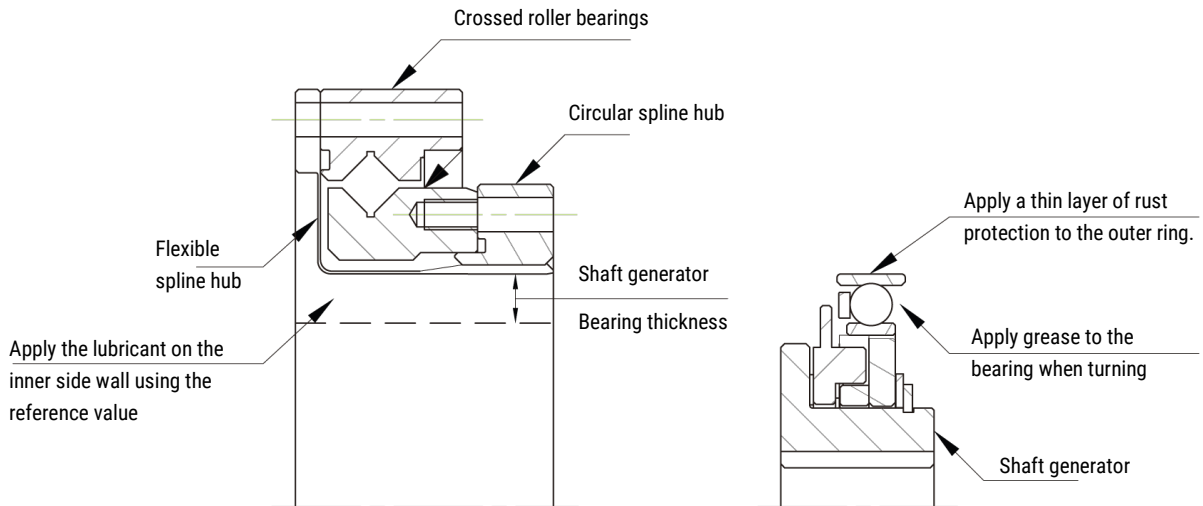
Element		Model	14	17	20	25	32
Number of screws			8	16	16	16	16
Screw size			M3	M3	M3	M4	M5
Installation of PCD screws	mm		44	54	62	77	100
Screw tightening torque	Nm		2.4	2.4	2.4	5.4	10.8

Note:

1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.11.4 Lubrication

With the exception of the tooth area of the DSH-PO type, all other parts are not filled with lubricant. Please observe the following points for applying the lubricant.

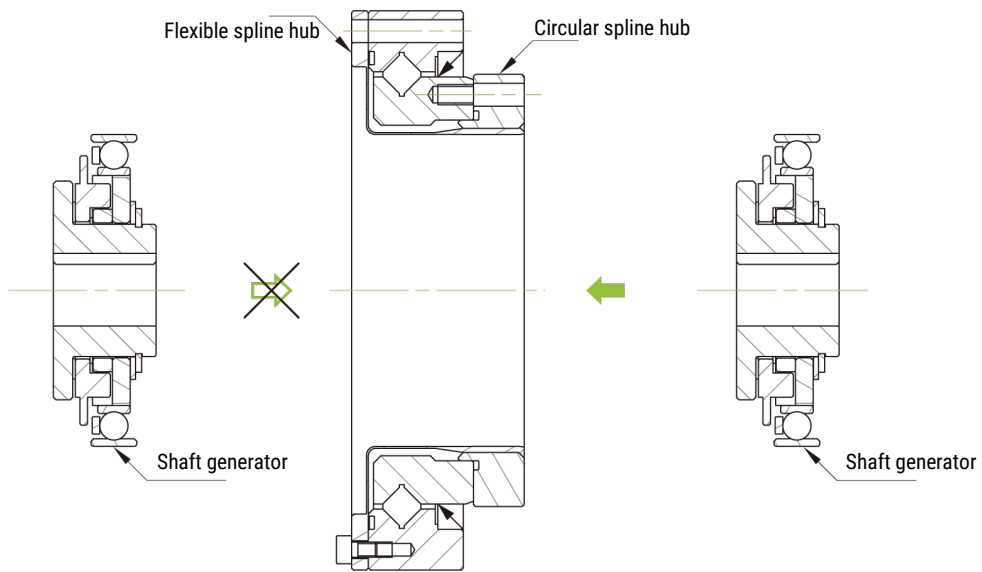


Unit: g

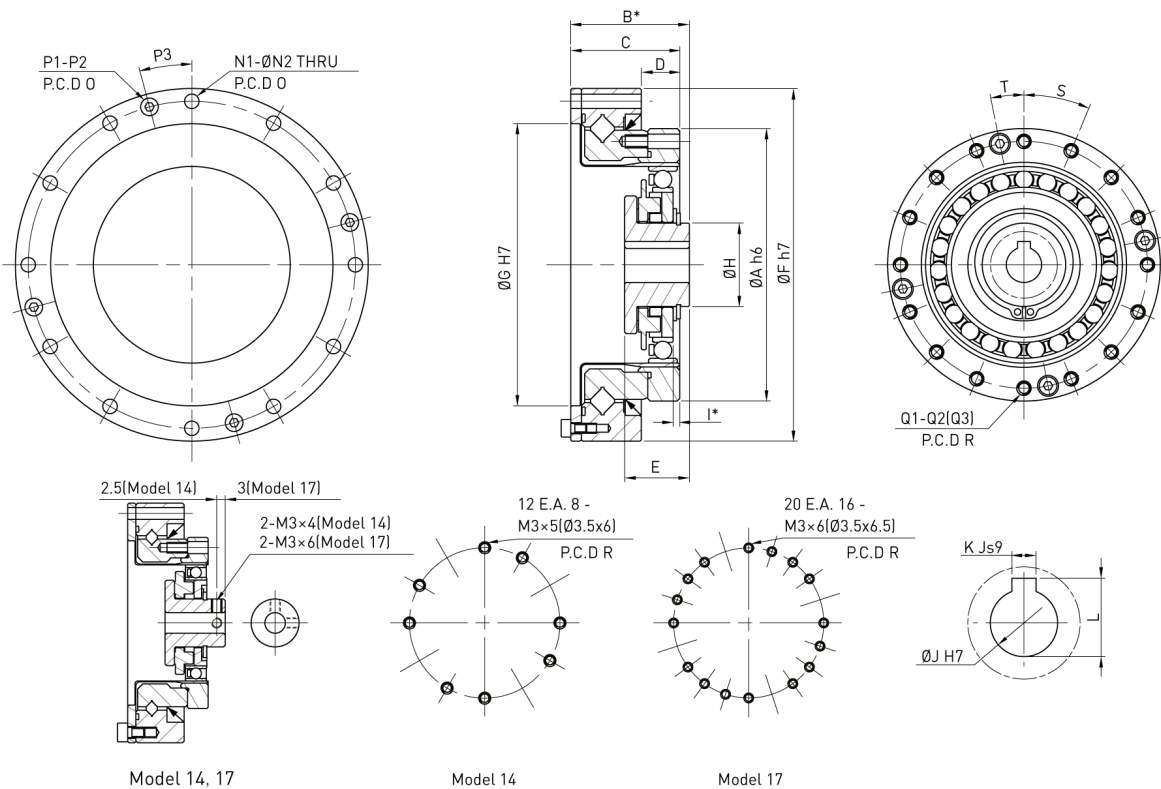
Instructions		Model	14	17	20	25	32
Horizontal use			5.8	11	18	32	64
Vertical use	Shaft generator points downwards		7.5	13	19	37	74
	Shaft generator points upwards		8.9	15	22	42	84

4.11.5 Installation procedure

Do not install the shaft generator until you have installed the reducer in the housing. Please observe the installation sequence to prevent damage to the tooth surface.



4.11.6 DGH-PO type, size chart



Unit: mm

Labelling	Model 14	17	20	25	32
ØA h6	50	60	70	85	110
B*	28,5 ⁰ _{-0,4}	32,5 ⁰ _{-0,9}	33,5 ⁰ _{-0,4}	37 ⁰ _{-0,5}	44 ⁰ _{-0,6}
C	23.5	26.5	29	34	42
D	7	7.5	8.5	12	15
E	18,5 ⁰ _{-0,1}	20,7 ⁰ _{-0,1}	21,5 ⁰ _{-0,1}	21,6 ⁰ _{-0,1}	23,6 ⁰ _{-0,1}

Labelling	Model 14	17	20	25	32
ØF h7	70	80	90	110	142
ØG H7	48	60	70	88	114
ØH	14	18	21	26	26
l*	0.4	0.3	0.1	2.1	2.5
ØJ H7	6	8	9	11	14
K Js9	-	-	3	4	5
L	-	-	10,4 ₀ ^{+0,1}	12,8 ₀ ^{+0,1}	16,3 ₀ ^{+0,1}
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 (degrees)	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)	0.41	0.57	0.81	1.31	2.94

*Dimension B, l is the mounting position and the permissible tolerance in axial direction.

4.12 DGH-PH type

4.12.1 Technical data

Table 4.108: Valuation table

Model	Reduction	Nominal torque at 2000 rpm	Peak torque at start/stop	Maximum average torque	Collision torque	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	7.0	23.0	9.0	46.0	8,500	3,500
	80	10.0	30.0	14.0	61.0		
	100	10.0	36.0	14.0	70.0		
17	50	21.0	44.0	34.0	91.0	7,300	3,500
	80	29.0	56.0	35.0	113.0		
	100	31.0	70.0	51.0	143.0		
	120	31.0	70.0	51.0	112.0		
20	50	33.0	73.0	44.0	127.0	6,500	3,500
	80	44.0	96.0	61.0	165.0		
	100	52.0	107.0	64.0	191.0		
	120	52.0	113.0	64.0	191.0		
	160	52.0	120.0	64.0	191.0		
25	50	51.0	127.0	72.0	242.0	5,600	3,500
	80	82.0	178.0	113.0	332.0		
	100	87.0	204.0	140.0	369.0		
	120	87.0	217.0	140.0	395.0		
	160	87.0	229.0	140.0	408.0		
32	50	99.0	281.0	140.0	497.0	4,800	3,500
	80	153.0	395.0	217.0	738.0		
	100	178.0	433.0	281.0	841.0		
	120	178.0	459.0	281.0	892.0		
	160	178.0	484.0	281.0	892.0		

Table 4.109: Crossed roller bearing specifications

Model	Centre circle diameter of the rollers	Offset	Basic load ratings		Permitted torque	Torque stiffness
	Dpw	R	Dynamic load C _{dyn}	Static load C ₀		
	m	m	kN	kN	Nm	×10 ⁴ Nm/rad
14	0.050	0.0217	5.8	8.6	74	8.5
17	0.060	0.0239	10.4	16.3	124	15.4
20	0.070	0.0255	14.6	22.0	187	25.2
25	0.085	0.0296	21.8	35.8	258	39.2
32	0.111	0.0364	38.2	65.4	580	100.0

Table 4.110: Accuracy of angular transmission

Reduction ratio		Model	14	17	20	25	32
50 - 160	$\times 10^{-4}$ rad		4.4	4.4	2.9	2.9	2.9

Table 4.111: 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
80 - 160	$\times 10^{-4}$ rad		2.9	2.9	2.9	2.9	2.9

Table 4.112: Starting torque (unit cNm)

Reduction ratio		Model	14	17	20	25	32
50			4.5	6.7	8.6	17.0	34.0
80			3.1	4.4	5.4	10.0	21.0
100			2.8	3.7	4.7	8.8	20.0
120			-	3.4	4.2	8.0	17.0
160			-	-	3.6	6.9	15.0

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

Table 4.113: Reverse starting torque (unit Nm)

Reduction ratio		Model	14	17	20	25	32
50			1.8	3.3	5.2	9.9	20.0
80			1.8	3.3	5.3	10.0	21.0
100			2.0	3.6	5.6	11.0	22.0
120			-	3.9	6.1	12.0	24.0
160			-	-	7.0	14.0	29.0

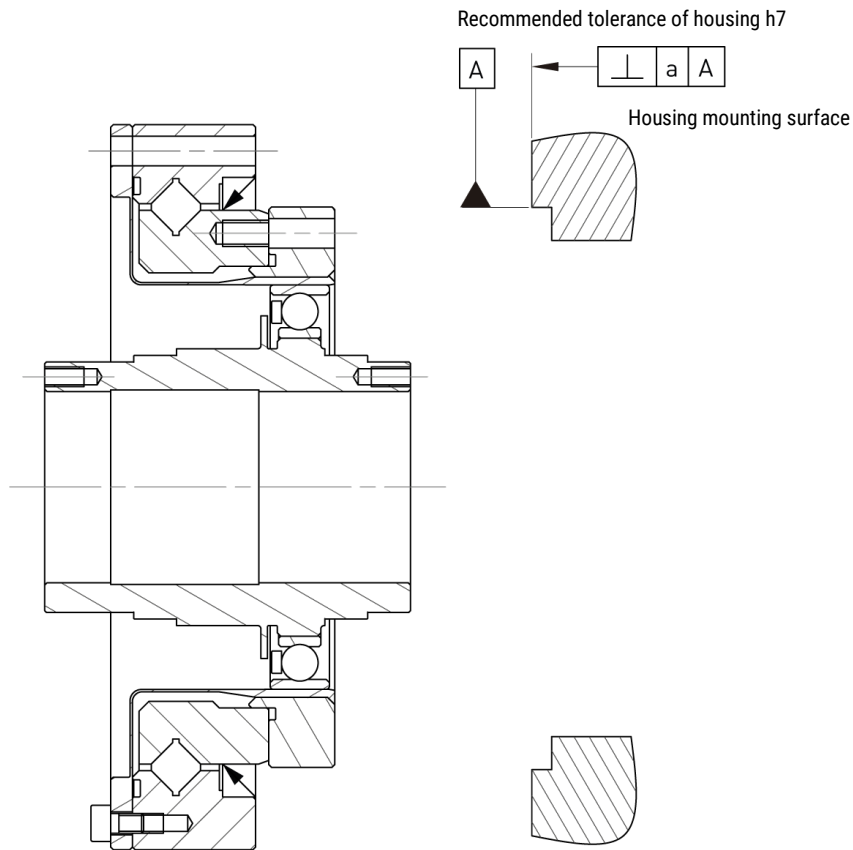
Note: The values in this table vary depending on the working conditions and are for reference purposes only. The upper limit is 20 % above the value in this table.

Table 4.114: Torsional rigidity

Reduction ratio		Model	14	17	20	25	32
T ₁	Nm		2.0	3.9	7.0	14.0	29.0
T ₂	Nm		6.9	12.0	25.0	48.0	108.0
50	K ₁	×10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad	16.0	12.0	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad	0.47	1.0	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11.0
	K ₃	×10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12.0
	θ ₁	×10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad	12.0	9.7	11.3	11.1	11.6

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

4.12.2 Installation accuracy



Unit: mm

Labelling	Model	14	17	20	25	32
a		0.011	0.015	0.017	0.024	0.026

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

4.12.3 Tightening torque for mounting screw

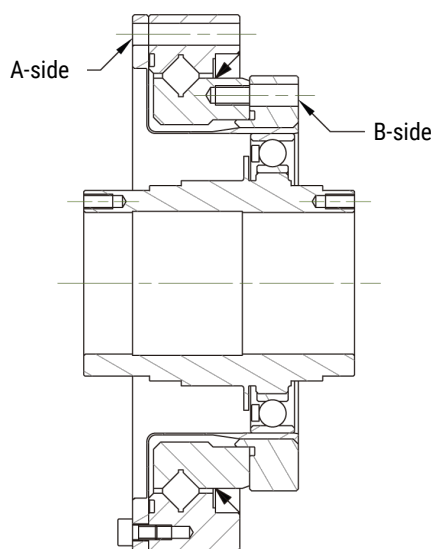


Table 4.115: Mounting screw tightening torque on the A-side

Element		Model	14	17	20	25	32
Number of screws			8	12	12	12	12
Screw size			M3	M3	M3	M4	M5
Installation of PCD screws	mm		64	74	84	102	132
Tightening torque for screws	Nm		2.4	2.4	2.4	5.4	10.8

Table 4.116: Mounting screw tightening torque on the B-side

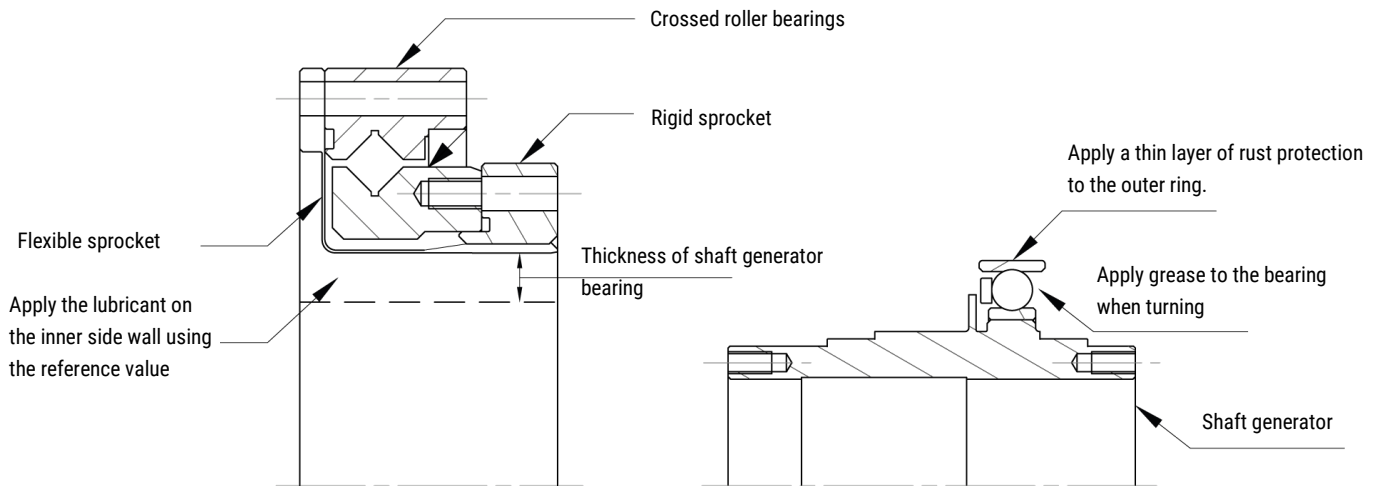
Element		Model	14	17	20	25	32
Number of screws			8	16	16	16	16
Screw size			M3	M3	M3	M4	M5
Installation of PCD screws	mm		44	54	62	77	100
Tightening torque for screws	Nm		2.4	2.4	2.4	5.4	10.8

Note:

1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.12.4 Lubrication

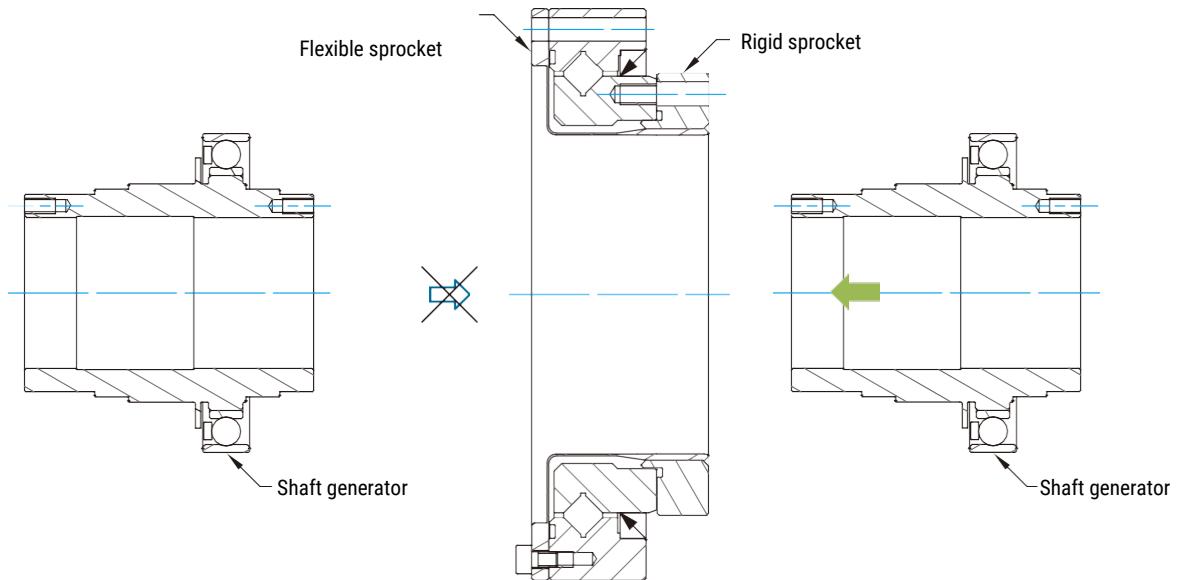
With the exception of the inner tooth area of the DSH-PH type, all other parts are not filled with lubricant. Please observe the following points when applying the lubricant.



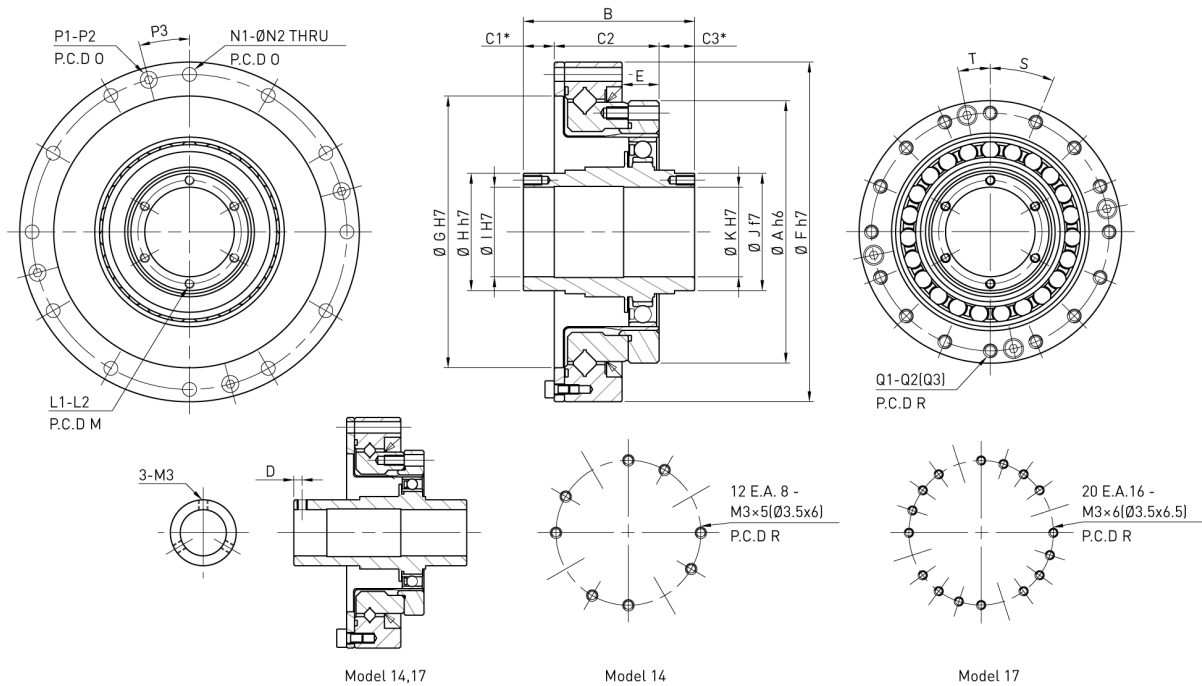
Unit: g

Instructions		Model	14	17	20	25	32
Horizontal use			5.8	11	18	32	64
Vertical use	Shaft generator points downwards		7.5	13	19	37	74
	Shaft generator points upwards		8.9	15	22	42	84

4.12.5 Installation procedure



4.12.6 DGH-PH type, size chart



Labelling	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 ^{+0,4} ₀	16 ^{+0,4} ₀	16 ^{+0,4} ₀	10 ^{+0,5} ₀	12 ^{+0,6} 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

Labelling	Model	14	17	20	25	32
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 (degrees)		30°	18°	11.25°	11.25°	11.25°
Moment of inertia (10 ⁻⁴ kgm ²)		0.091	0.193	0.404	1.070	2.85
Weight (kg)		0.45	0.63	0.89	1.44	3.1

Dimensions without unit in mm

*Dimension C1, C3 is the mounting position and the permissible tolerance in axial direction.

4.13 DGH-AH type

4.13.1 Technical data

Table 4.117: Valuation table

Model	Reduction	Nominal torque at 2000 rpm	Peak torque at start/stop	Maximum average torque	Collision torque	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	7.0	23.0	9.0	46.0	8,500	3,500 1100 ¹⁾
	80	10.0	30.0	14.0	61.0		
	100	10.0	36.0	14.0	70.0		
17	50	21.0	44.0	34.0	91.0	7,300	3,500 1100 ¹⁾
	80	29.0	56.0	35.0	113.0		
	100	31.0	70.0	51.0	143.0		
	120	31.0	70.0	51.0	112.0		
20	50	33.0	73.0	44.0	127.0	6,500	3,500 1100 ¹⁾
	80	44.0	96.0	61.0	165.0		
	100	52.0	107.0	64.0	191.0		
	120	52.0	113.0	64.0	191.0		
	160	52.0	120.0	64.0	191.0		
25	50	51.0	127.0	72.0	242.0	5,600	3,500 1000 ¹⁾
	80	82.0	178.0	113.0	332.0		
	100	87.0	204.0	140.0	369.0		
	120	87.0	217.0	140.0	395.0		
	160	87.0	229.0	140.0	408.0		
32	50	99.0	281.0	140.0	497.0	4,800	3,500 1000 ¹⁾
	80	153.0	395.0	217.0	738.0		
	100	178.0	433.0	281.0	841.0		
	120	178.0	459.0	281.0	892.0		
	160	178.0	484.0	281.0	892.0		

1) Valid for type DGH-AH, DSH-AH when using radial shaft seals on the hollow shaft

Table 4.118: Crossed roller bearing specifications

Model	Centre circle diameter of the rollers	Offset	Basic load ratings		Permitted torque	Torque stiffness
	Dpw	R	Dynamic load C _{dyn}	Static load C ₀		
	m	m	kN	kN	Nm	×10 ⁴ Nm/rad
14	0.050	0.0217	5.8	8.6	74	8.5
17	0.060	0.0239	10.4	16.3	124	15.4
20	0.070	0.0255	14.6	22.0	187	25.2
25	0.085	0.0296	21.8	35.8	258	39.2
32	0.111	0.0364	38.2	65.4	580	100.0

Table 4.119: Accuracy of angular transmission

Reduction ratio		Model	14	17	20	25	32
50 - 160	$\times 10^{-4}$ rad		4.4	4.4	2.9	2.9	2.9

Table 4.120: 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
80 - 160	$\times 10^{-4}$ rad		2.9	2.9	2.9	2.9	2.9

Table 4.121: 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
160			-	-	31	47	67

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

Table 4.122: Reverse starting torque (unit Nm)

Reduction ratio		Model	14	17	20	25	32
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
160			-	-	59	90	128

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

Table 4.123: Torsional rigidity

Reduction ratio		Model	14	17	20	25	32
T ₁	Nm		2.0	3.9	7.0	14.0	29.0
T ₂	Nm		6.9	12.0	25.0	48.0	108.0
50	K ₁	×10 ⁴ Nm/rad	0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad	0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad	0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad	5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad	16.0	12.0	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad	0.47	1.0	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad	0.61	1.4	2.5	5.0	11.0
	K ₃	×10 ⁴ Nm/rad	0.71	1.6	2.9	5.7	12.0
	θ ₁	×10 ⁻⁴ rad	4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad	12.0	9.7	11.3	11.1	11.6

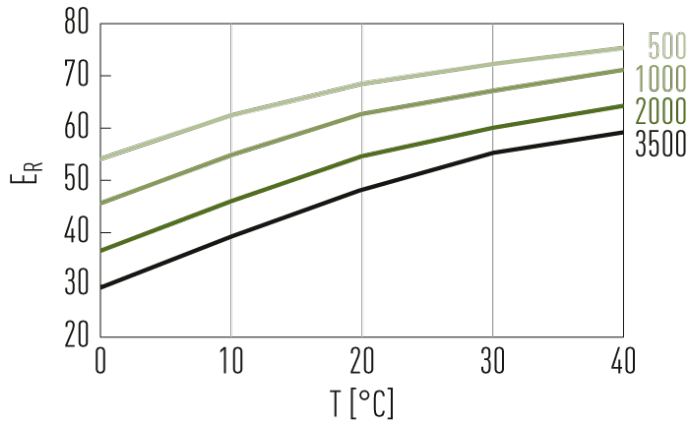
Note: The values are for reference purposes only. The lower limit is 20 % below the value in this table.

4.13.2 Efficiency E_R

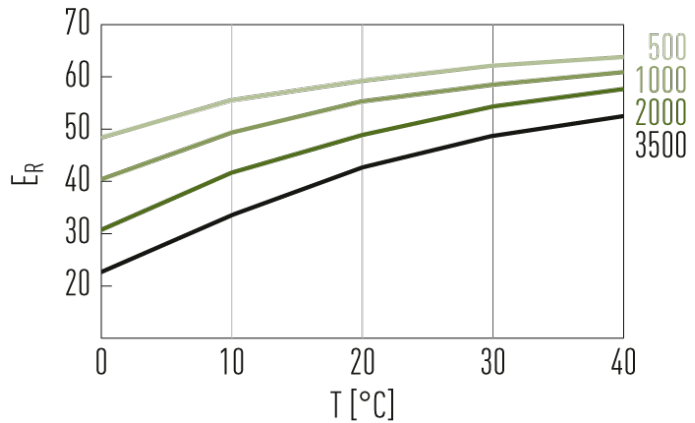
1. Nominal torque E_R

The efficiency of DATORKER® strain wave gears changes depending on the specification, ratio, operating conditions (speed/load) and lubrication (lubricant type/amount).

Model: 14-32, ratio: 50, 80, 100, 120

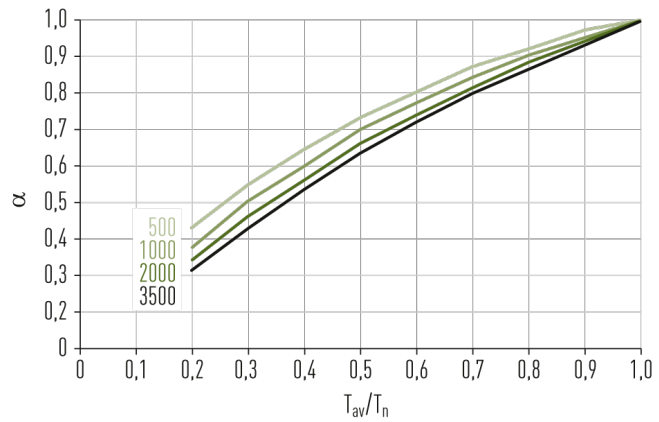


Model: 20-32, ratio: 160



2. Correction coefficient α

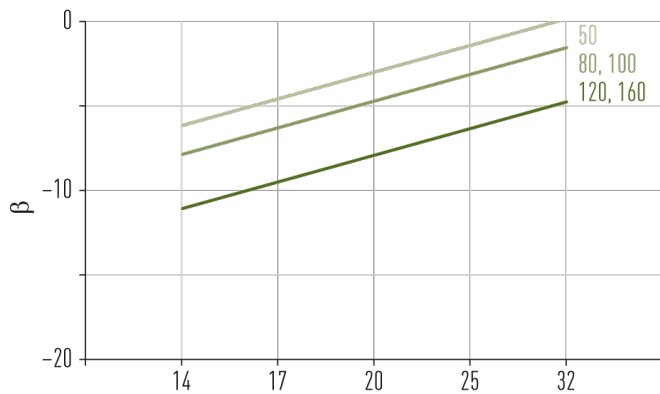
Coefficient for correcting efficiency α according to load torque



3. Correction coefficient β

Coefficient for correcting efficiency β according to specification

Efficiency = $\alpha \cdot X_{ER}$



4.13.3 Idling operating torque

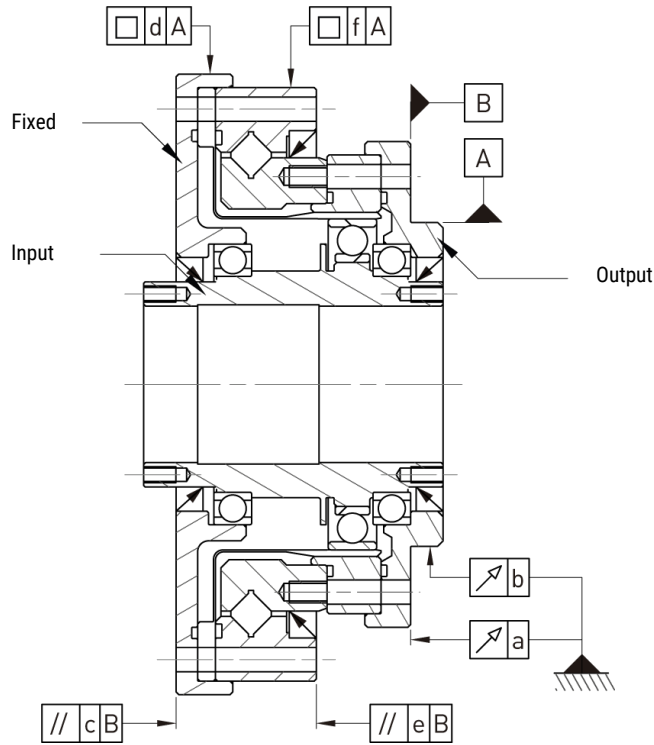
The idling operating torque is the torque required to drive the DATORKER® strain wave gear input (high speed end) after more than 2 hours at an input speed of 2,000 rpm at an average ambient temperature of 25 °C without load.

Unit: cNm

Reduction ratio	Input speed	Model				
		14	17	20	25	32
50	500 rpm	6.3	17.8	23.6	37.2	58.0
	1,000 rpm	7.8	21.8	28.6	49.2	76.0
	2,000 rpm	10.1	27.8	37.6	62.2	98.0
	3,500 rpm	14.1	36.8	48.6	89.2	138.0
80	500 rpm	5.4	16.4	21.5	33.8	51.5
	1,000 rpm	6.9	20.4	26.5	45.8	69.5
	2,000 rpm	9.2	26.4	35.5	58.8	91.5
	3,500 rpm	13.2	35.4	46.5	85.8	131.5
100	500 rpm	5.2	16.0	21.0	33.0	50.0
	1,000 rpm	6.7	20.0	26.0	45.0	68.0
	2,000 rpm	9.0	26.0	35.0	58.0	90.0
	3,500 rpm	13.0	35.0	46.0	85.0	130.0
120	500 rpm	-	15.8	20.6	32.4	48.9
	1,000 rpm	-	19.8	25.6	44.4	66.9
	2,000 rpm	-	25.8	34.6	57.4	88.9
	3,500 rpm	-	34.8	45.6	84.4	128.9
160	500 rpm	-	-	20.2	31.7	47.5
	1,000 rpm	-	-	25.2	43.7	65.5
	2,000 rpm	-	-	34.2	56.7	87.5
	3,500 rpm	-	-	45.2	83.7	127.5

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

4.13.4 Installation accuracy



Unit: mm

	Model	14	17	20	25	32
Labelling						
a		0.033	0.038	0.040	0.046	0.054
b		0.035	0.035	0.039	0.041	0.047
c		0.064	0.071	0.079	0.085	0.104
d		0.053	0.050	0.059	0.061	0.072
e		0.040	0.045	0.051	0.057	0.065
f		0.038	0.038	0.047	0.049	0.054

4.13.5 Tightening torque for mounting screw

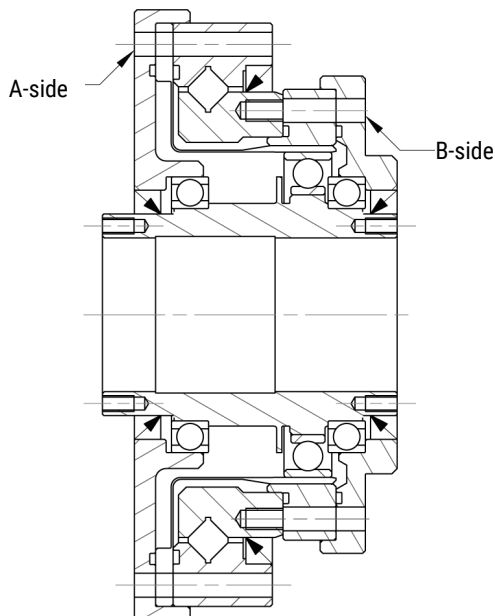


Table 4.124: Mounting screw tightening torque on the A-side

Element		Model 14	17	20	25	32
Number of screws		8	12	12	12	12
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	64	74	84	102	132
Tightening torque for screws	Nm	2.4	2.4	2.4	5.4	10.8

Table 4.125: Mounting screw tightening torque on the B-side

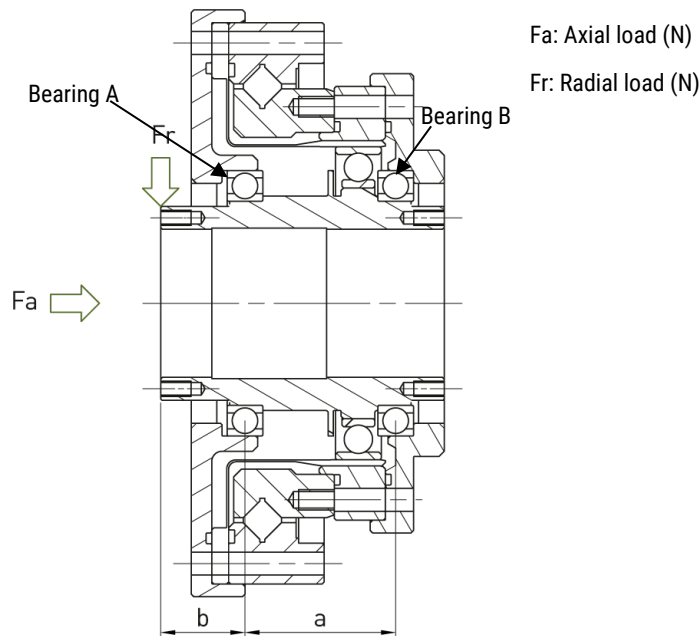
Element		Model 14	17	20	25	32
Number of screws		8	16	16	16	16
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	44	54	62	77	100
Tightening torque for screws	Nm	2.4	2.4	2.4	5.4	10.8

Note:

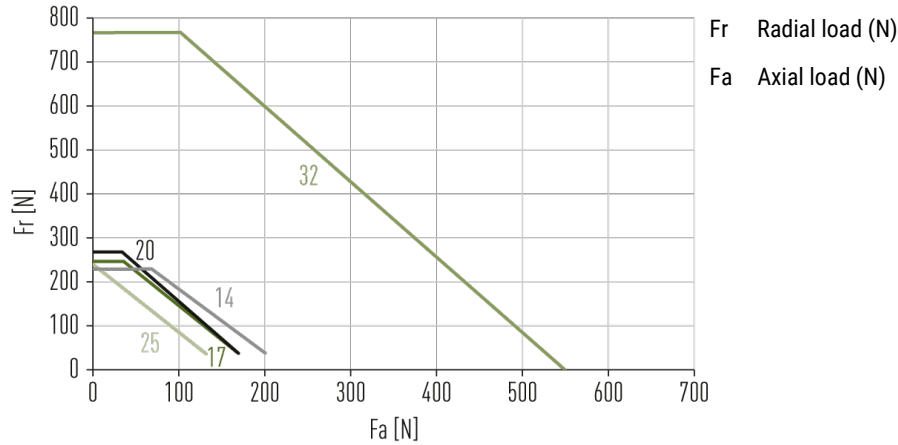
1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.13.6 Permissible input load

The hollow shaft is supported by two deep groove ball bearings. To ensure proper performance of the gearbox, confirm the load on the hollow shaft. As shown below:

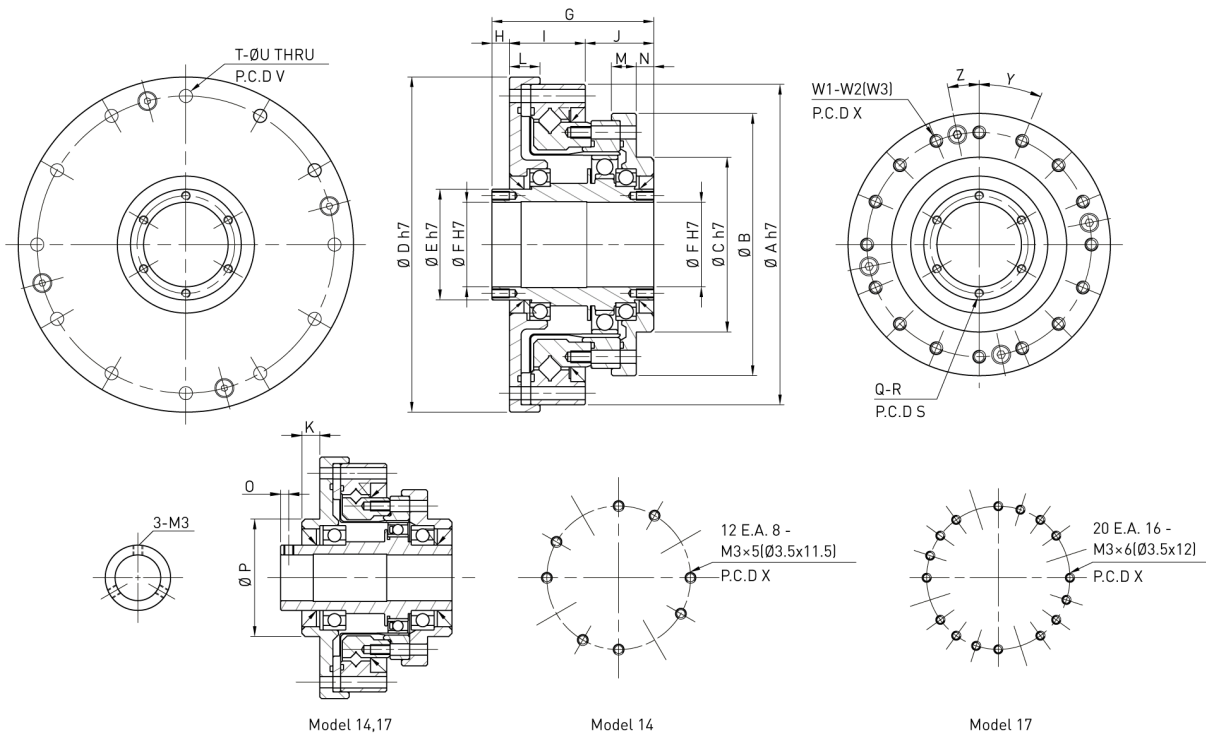


The following figure shows the average input speed of 2,000 rpm and the basic nominal service life $L_{10} = 10,000$ hours.



Element	Bearing A		Bearing B		a (mm)	b (mm)	Maximum radial load Fr(N)
	Dynamic load C_{dyn} (kN)	Static load C_0 (kN)	Dynamic load C_{dyn} (kN)	Static load C_0 (kN)			
Model							
14	4.0	2.47	4.00	2.47	27.0	16.5	230
17	4.3	2.95	4.30	2.95	29.0	17.5	250
20	4.5	3.45	4.50	3.45	27.0	15.5	275
25	4.9	4.35	4.90	4.35	29.5	16.5	250
32	14.1	10.90	5.35	5.25	33.0	23.0	770

4.13.7 DGH-AH type, size chart



	Model 14	17	20	25	32
Labelling					
ØA h7	70	80	90	110	142
ØB	54	64	75	90	115

Modell	14	17	20	25	32
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	2 x 6	2 x 6	2 x 6
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 (degrees)	30°	18°	22.5°	22.5°	22.5°
Z (degrees)	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

Dimensions without unit in mm

4.14 DGH-AJ type

4.14.1 Technical data

Table 4.126: Valuation table

Model	Reduction	Nominal torque at 2000 rpm ¹⁾	Peak torque at start/stop ²⁾	Maximum average torque ³⁾	Collision torque ⁴⁾	Maximum input speed	Max. average speed
		Nm	Nm	Nm	Nm	Revolutions per minute	Revolutions per minute
14	50	7.0	23.0	9.0	46.0	8,500	3,500
	80	10.0	30.0	14.0	61.0		
	100	10.0	36.0	14.0	70.0		
17	50	21.0	44.0	34.0	91.0	7,300	3,500
	80	29.0	56.0	35.0	113.0		
	100	31.0	70.0	51.0	143.0		
	120	31.0	70.0	51.0	112.0		
20	50	33.0	73.0	44.0	127.0	6,500	3,500
	80	44.0	96.0	61.0	165.0		
	100	52.0	107.0	64.0	191.0		
	120	52.0	113.0	64.0	191.0		
	160	52.0	120.0	64.0	191.0		
25	50	51.0	127.0	72.0	242.0	5,600	3,500
	80	82.0	178.0	113.0	332.0		
	100	87.0	204.0	140.0	369.0		
	120	87.0	217.0	140.0	395.0		
	160	87.0	229.0	140.0	408.0		
32	50	99.0	281.0	140.0	497.0	4,800	3,500
	80	153.0	395.0	217.0	738.0		
	100	178.0	433.0	281.0	841.0		
	120	178.0	459.0	281.0	892.0		
	160	178.0	484.0	281.0	892.0		

¹⁾ Permissible nominal torque

²⁾ Maximum permissible torque

³⁾ Permissible average torque

⁴⁾ Maximum permissible value of impact

Table 4.127: Crossed roller bearing specifications

Model	Hole circle diameter of the roller	Offset amount	Basic load ratings		Permissible torque load	Torque stiffness
	Dpw	R	Dynamic load C	Normal load Co		
	m	m	kN	kN	Nm	×10 ⁴ Nm/rad
14	0.050	0.0217	5.8	8.6	74	8.5
17	0.060	0.0239	10.4	16.3	124	15.4
20	0.070	0.0255	14.6	22.0	187	25.2
25	0.085	0.0296	21.8	35.8	258	39.2
32	0.111	0.0364	38.2	65.4	580	100

Table 4.128: Accuracy of angular transmission

Reduction ratio		Model	14	17	20	25	32
50 - 160	$\times 10^{-4}$ rad		4.4	4.4	2.9	2.9	2.9

Table 4.129: 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
80 - 160	$\times 10^{-4}$ rad		2.9	2.9	2.9	2.9	2.9

Table 4.130: Starting torque (unit cNm)

Reduction ratio		Model	14	17	20	25	32
50			5.7	9.7	14	22	41
80			4.4	7.2	11	15	29
100			3.7	6.5	9.9	14	27
120			-	6.2	9.3	13	24
160			-	-	8.6	12	23

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

Table 4.131: Reverse starting torque (unit Nm)

Reduction ratio		Model	14	17	20	25	32
50			3.4	5.8	8.4	13	25
80			4.2	6.9	10	15	28
100			4.5	7.8	12	17	33
120			-	8.9	13	19	34
160			-	-	17	23	43

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

Table 4.132: Torsional rigidity

Reduction ratio			Model	14	17	20	25	32
T ₁		Nm		2.0	3.9	7.0	14	29
T ₂		Nm		6.9	12	25	48	108
50	K ₁	×10 ⁴ Nm/rad		0.34	0.81	1.3	2.5	5.4
	K ₂	×10 ⁴ Nm/rad		0.47	1.1	1.8	3.4	7.8
	K ₃	×10 ⁴ Nm/rad		0.57	1.3	2.3	4.4	9.8
	θ ₁	×10 ⁻⁴ rad		5.8	4.9	5.2	5.5	5.5
	θ ₂	×10 ⁻⁴ rad		16	12	15.4	15.7	15.7
80 - 160	K ₁	×10 ⁴ Nm/rad		0.47	1	1.6	3.1	6.7
	K ₂	×10 ⁴ Nm/rad		0.61	1.4	2.5	5.0	11
	K ₃	×10 ⁴ Nm/rad		0.71	1.6	2.9	5.7	12
	θ ₁	×10 ⁻⁴ rad		4.1	3.9	4.4	4.4	4.4
	θ ₂	×10 ⁻⁴ rad		12	9.7	11.3	11.1	11.6

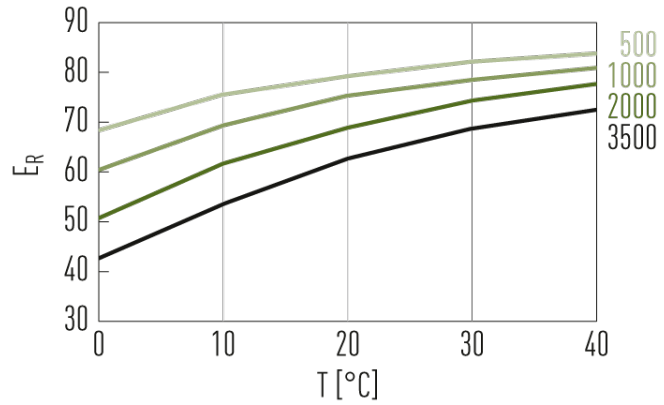
Note: The values are for reference purposes only. The lower limit is 20 % below the value in this table.

4.14.2 Efficiency E_R

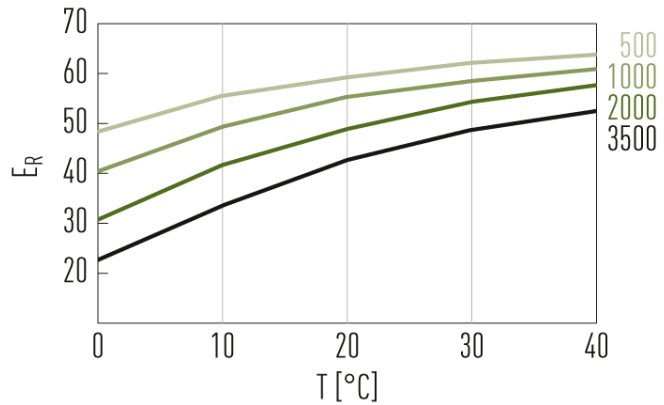
1. Nominal torque E_R

The efficiency of DATORKER® strain wave gears changes depending on the specification, ratio, operating conditions (speed/load) and lubrication (lubricant type/amount).

Model: 14-32, ratio: 50, 80, 100, 120

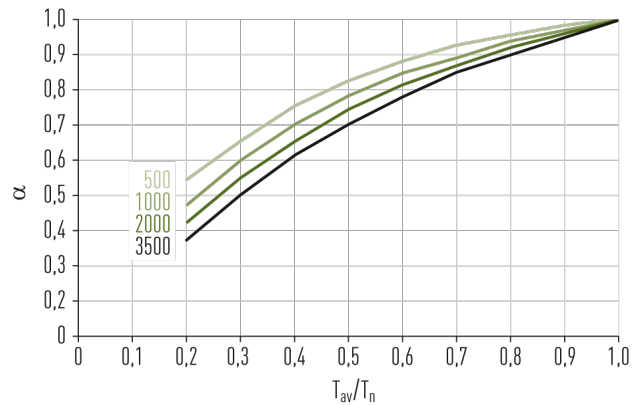


Model: 20-32, ratio: 160



2. Correction coefficient α

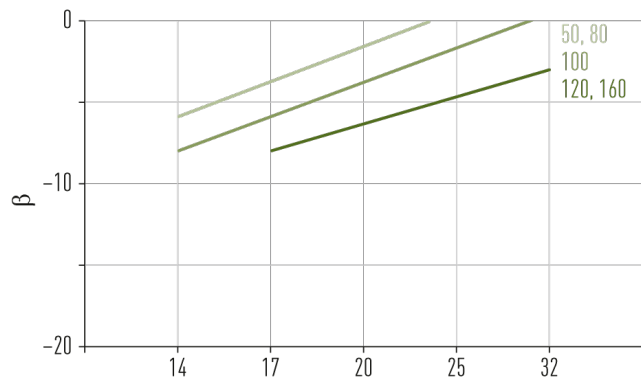
Coefficient for correcting efficiency α according to load torque



3. Correction coefficient β

Coefficient for correcting efficiency β according to specification

Efficiency = $\alpha \cdot E_R$



4.14.3 Idling operating torque

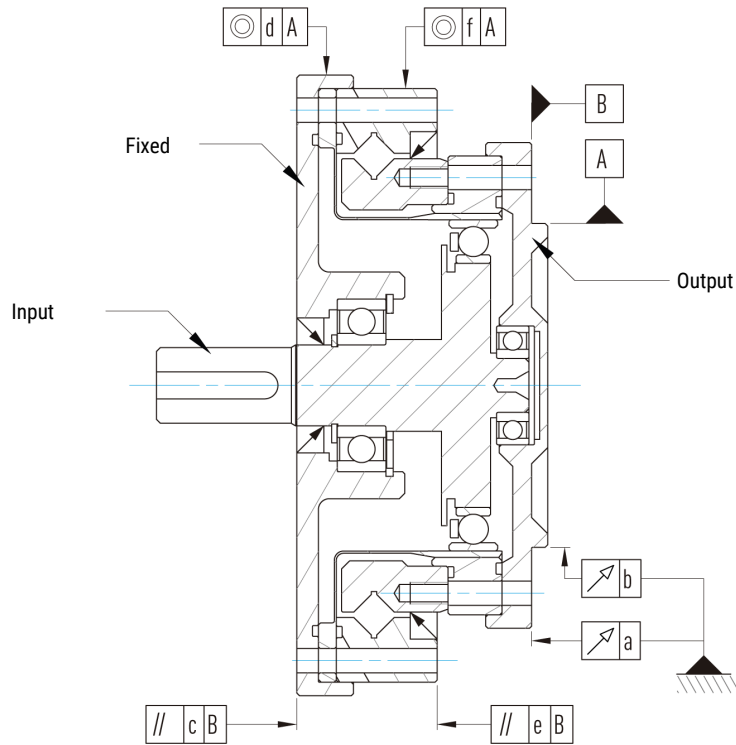
The idling operating torque is the torque required to drive the DATORKER® strain wave gear input (high speed end) after more than 2 hours at an input speed of 2,000 rpm at an average ambient temperature of 25 °C without load.

Unit: cNm

Reduction ratio	Input speed	Model				
		14	17	20	25	32
50	500 rpm	3.9	8	11.6	18.2	31
	1,000 rpm	4.7	9.8	14.6	22.2	38
	2,000 rpm	5.8	12.8	19.6	28.2	53
	3,500 rpm	7	14.8	22.6	35.2	68
80	500 rpm	3	6.6	9.5	14.8	24.5
	1,000 rpm	3.8	8.4	12.5	18.8	31.5
	2,000 rpm	4.9	11.4	17.5	24.8	46.5
	3,500 rpm	6.1	13.4	20.5	31.8	61.5
100	500 rpm	2.8	6.2	9	14	23
	1,000 rpm	3.6	8	12	18	30
	2,000 rpm	4.7	11	17	24	45
	3,500 rpm	5.9	13	20	31	60
120	500 rpm	-	6	8.6	13.4	21.9
	1,000 rpm	-	7.8	11.6	17.4	28.9
	2,000 rpm	-	10.8	16.6	23.4	43.9
	3,500 rpm	-	12.8	19.6	30.4	58.9
160	500 rpm	-	-	8.2	12.7	20.5
	1,000 rpm	-	-	11.2	16.7	27.5
	2,000 rpm	-	-	16.2	22.7	42.5
	3,500 rpm	-	-	19.2	29.7	57.5

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

4.14.4 Installation accuracy



Unit: mm

Labelling	Model 14	17	20	25	32
a	0.033	0.038	0.040	0.046	0.054
b	0.035	0.035	0.039	0.041	0.047
c	0.064	0.071	0.079	0.085	0.104
d	0.053	0.050	0.059	0.061	0.072
e	0.040	0.045	0.051	0.057	0.065
f	0.038	0.038	0.047	0.049	0.054

4.14.5 Tightening torque for mounting screw

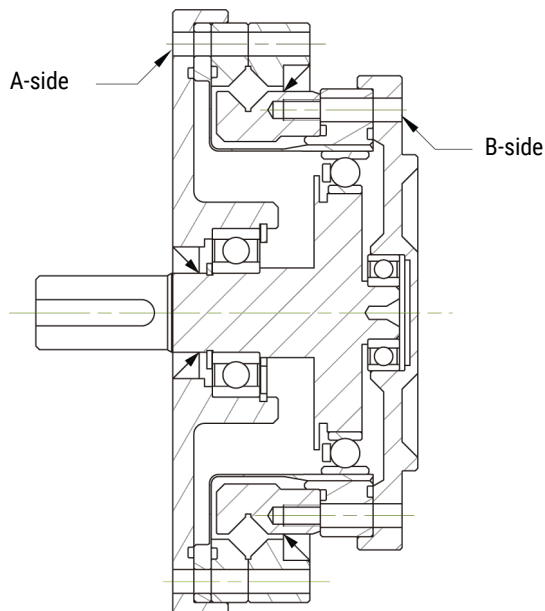


Table 4.133: Mounting screw tightening torque on the A-side

Element		Model 14	17	20	25	32
Number of screws		8	12	12	12	12
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	64	74	84	102	132
Tightening torque for screws	Nm	2.4	2.4	2.4	5.4	10.8

Table 4.134: Mounting screw tightening torque on the B-side

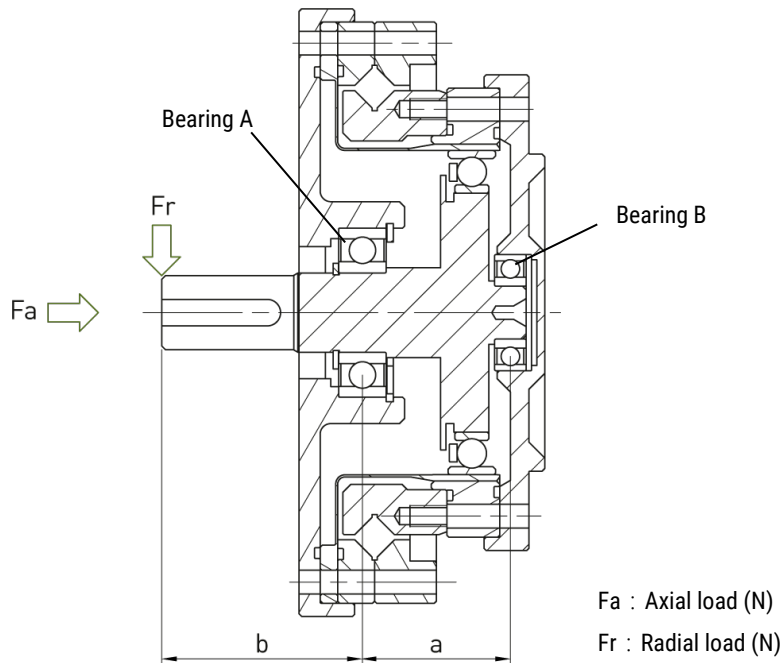
Element		Model 14	17	20	25	32
Number of screws		8	16	16	16	16
Screw size		M3	M3	M3	M4	M5
Installation of PCD screws	mm	44	54	62	77	100
Tightening torque for screws	Nm	2.4	2.4	2.4	5.4	10.8

Note:

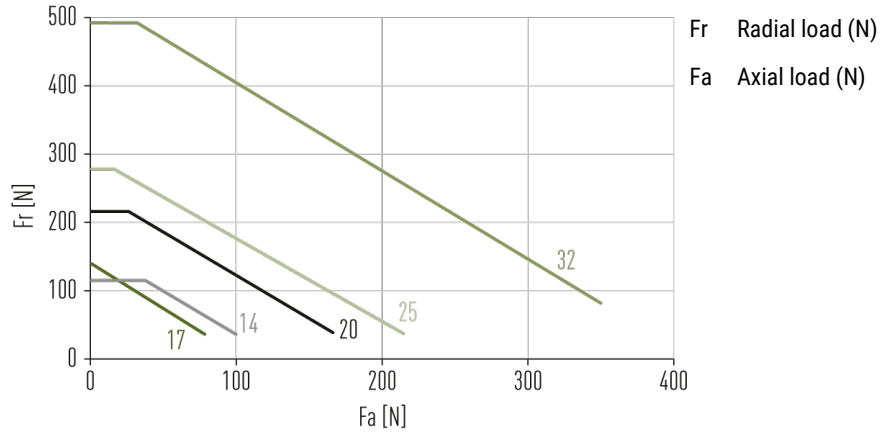
1. Recommended tightening torques for 12.9 DIN EN ISO 4762 mounting bolts DIN912 according to VDI 2230 for $\mu K = \mu G = 0.125$
2. Screw-in depth at least 2 x thread diameter

4.14.6 Permissible input load

The hollow shaft is supported by two deep groove ball bearings. To ensure proper performance of the gearbox, confirm the load on the hollow shaft. As shown below:

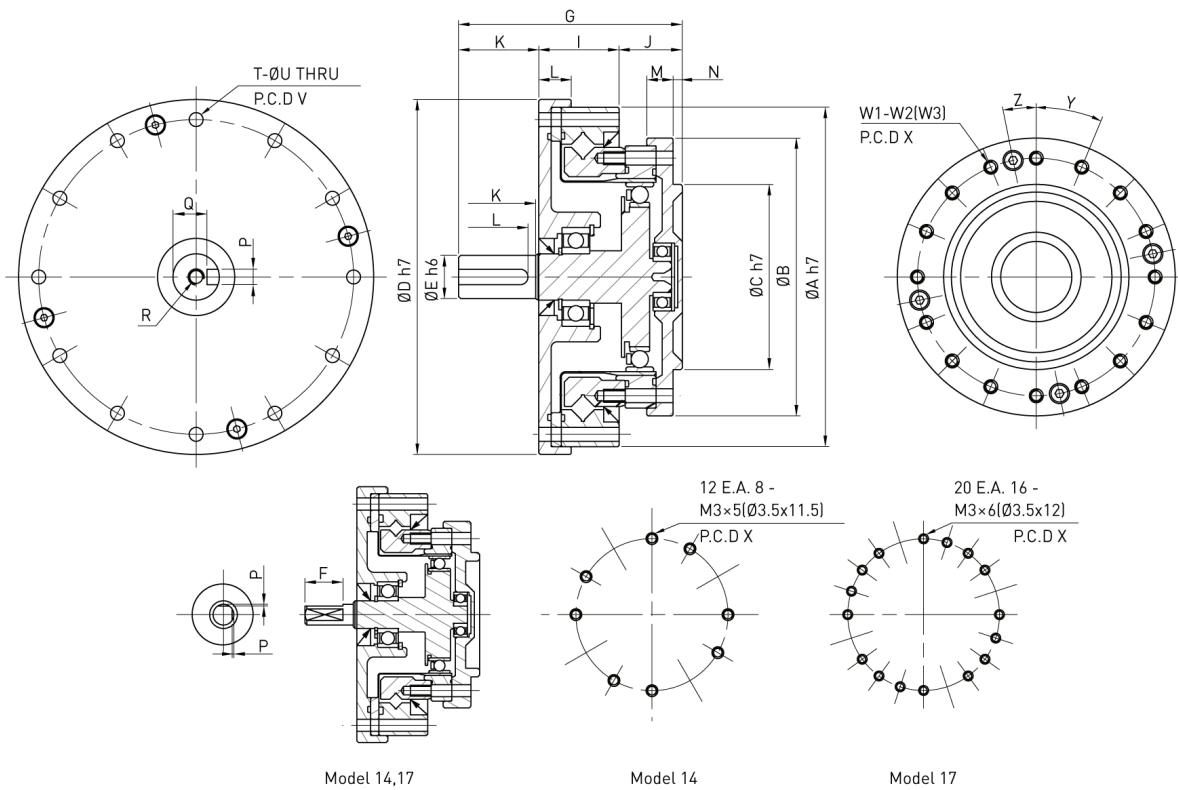


The following figure shows the average input speed of 2,000 rpm and the basic nominal service life $L_{10} = 10,000$ hours.



Model	Bearing A		Bearing B		a (mm)	b (mm)	Maximum radial load Fr(N)
	Dynamic load C_{dyn} (kN)	Static load C_0 (kN)	Dynamic load C_{dyn} (kN)	Static load C_0 (kN)			
14	2.24	0.91	1.08	0.43	20	14	110
17	2.7	1.27	1.61	0.71	23.5	21	135
20	4.35	2.26	2.24	0.91	26.5	23.3	210
25	5.6	2.83	2.7	1.27	28	28	270
32	9.4	5	4.35	2.26	36	27	490

4.14.7 DGH-AJ type, size chart



Unit: mm

Modell	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 h6	6	8	10	14	14
ØF	11	12	16.5	22.5	22.5
G	50.5	56	63.5	72.5	84.5
H	15	17	21	26	26
I	20.5	23	25	26	32
J	15	16	17.5	20.5	26.5
K	14	16	20	25	25
L	9	10	10.5	10.5	12
M	8	8.5	9	8.5	9.5
N	2.5	3	3	3	5
P	0.5	0.5	$3 \begin{smallmatrix} -0,004 \\ -0,029 \end{smallmatrix}$	$5 \begin{smallmatrix} 0 \\ -0,03 \end{smallmatrix}$	$5 \begin{smallmatrix} 0 \\ -0,03 \end{smallmatrix}$
Q	-	-	$8,2 \begin{smallmatrix} 0 \\ -0,1 \end{smallmatrix}$	$11 \begin{smallmatrix} 0 \\ -0,1 \end{smallmatrix}$	$11 \begin{smallmatrix} 0 \\ -0,1 \end{smallmatrix}$
R	-	-	M3 x 6DP	M5 x 10DP	M5 x 10DP
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 (degrees)	30°	18°	22.5°	22.5°	22.5°
Z (degrees)	30°	18°	11.25°	11.25°	11.25°
Moment of inertia (×10 ⁻⁴ kgm ²)	0.025	0.059	0.137	0.32	1.2
Weight (kg)	0.66	0.94	1.38	2.1	4.4

5 Installation notes

5.1 Precautions for installing the gearbox

- Check the evenness of the installation level and make sure it is not tilted.
- Check the housing mounting part and make sure that it cannot interfere with the gearbox.
- When locking the bolt, tighten it temporarily to half the value of the specified torque in diagonal order before reaching the specified torque. Do not tighten the screws directly to the specified torque.
- The surface of the product is not treated with rust protection. If rust protection is required, apply it to the surface.

5.2 Precautions for installing the shaft generator

- To avoid excessive force on the shaft generator bearing during installation, rotate the shaft generator and insert it carefully.
- If you choose a shaft generator without the Oldham mechanism, please make sure that the concentricity and verticality are within the recommended range (see "Mounting accuracy" of the individual series).

5.3 Other

- Make sure you use the specified grease in the product. (See chapter [6 Lubricant](#)).
- Avoid overload operation.
- Note that the input speed should be within the specified range.
- Use a thread locker in the threaded hole (Loctite242 is recommended) and prevent the thread locker from leaking.

5.4 Causes of problems

- Caster
- Insufficient lubricant
- Damaged bearing/gearbox components
- Poor connection with other interface components

5.5 If the following problems occur, stop operation immediately and check the gearbox

- The internal temperature rises above 80 °C or the ambient temperature above 40 °C
- Abnormal noises or vibrations

6 Lubricant

HIWIN G11 special lubricating oil for the gearbox

- Terms of use and properties

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

- Basic properties

Colour	Yellow
Base oil	Mineral oil
Texture enhancer	Lithium soap
Maintenance temp. (°C)	-20 - 130
Ambient operating temperature (°C)	0 – 40
NLGI class (0.1 mm)	265 – 295
Drip point (°C)	196

- Packaging specifications: 400 g hard tube packed

- Other

1. The DATORKER® strain wave gear is pre-lubricated with HIWIN G11 grease and can be installed directly. With the exception of the DSC-CO type, due to the high speed and high torque, applying additional grease to each part according to the lubrication instructions in these assembly instructions is recommended.
2. Do not mix or use with other types of lubricants.
3. For use under special conditions with high vibrations, in clean rooms, vacuums, at high or low temperatures, please contact us for a more detailed assessment.

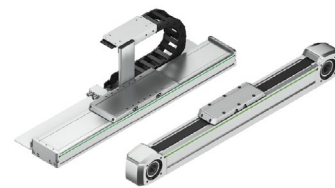
We live motion.



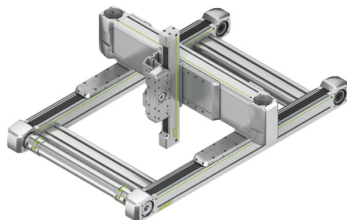
Linear guideway



Ballscrews



Linear axes



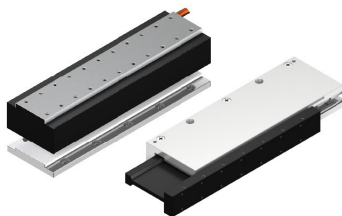
Linear axis systems



Torque motors



Robot



Linear motors



Rotary tables



Servo drives and servo motors

Germany

HIWIN GmbH
Brücklesbünd 1
77654 Offenburg, Germany
Germany
Phone +49 781 93278-0
info@hiwin.de
hiwin.de

Taiwan

Headquarter
HIWIN Technologies Corp.
Nr. 7, Jingke Road
Precision Machinery Park
Taichung 40852
Taiwan
Phone +886 4 2359-4510
business@hiwin.tw
hiwin.tw

Taiwan

Headquarter
HIWIN Corp.
No. 6, Jingke Central Road
Precision Machinery Park
Taichung 40852
Taiwan
Phone +886 4 2355-0110
business@hiwinmikro.tw
hiwinmikro.tw

France

HIWIN SAS
4 Impasse Joffre
67202 Wolfisheim
France
Phone +33 3 882884-80
contact@hiwin.fr
hiwin.fr

Poland

HIWIN GmbH Biuro Warszawa
ul. Puławska 405a
02-801 Warszawa
Poland
Phone +48 22 46280-00
info@hiwin.pl
hiwin.pl

Switzerland

HIWIN (Switzerland) GmbH
Eichwiesstraße 20
8645 Jona
Switzerland
Phone +41 55 22500-25
sales@hiwin.ch
hiwin.ch

Italy

HIWIN Srl
Strada Pitagora 4
20861 Brugherio (MB)
Italy
Phone +39 039 28761-68
info@hiwin.it
hiwin.it

Slovakia

HIWIN s.r.o., o.z.z.o.
Mládežnícka 2101
01701 Považská Bystrica
Slovenia
Phone +421 424 4347-77
info@hiwin.sk
hiwin.sk

Czech Republic

HIWIN s.r.o.
Medkova 888/11
62700 Brno
Czech Republic
Phone +42 05 48528-238
info@hiwin.cz
hiwin.cz

Denmark

HIWIN GmbH
info@hiwin.dk
hiwin.dk

The Netherlands

HIWIN GmbH
info@hiwin.nl
hiwin.nl

Austria

HIWIN GmbH
info@hiwin.at
hiwin.at

Hungary

HIWIN GmbH
info@hiwin.hu
hiwin.hu

Romania

HIWIN GmbH
info@hiwin.ro
hiwin.ro

Slovenia

HIWIN GmbH
info@hiwin.si
hiwin.si

China

HIWIN Corp.
hiwin.cn

Japan

HIWIN Corp.
info@hiwin.co.jp
hiwin.co.jp

USA

HIWIN Corp.
info@hiwin.com
hiwin.us

Korea

HIWIN Corp.
hiwin.kr

Singapore

HIWIN Corp.
hiwin.sg