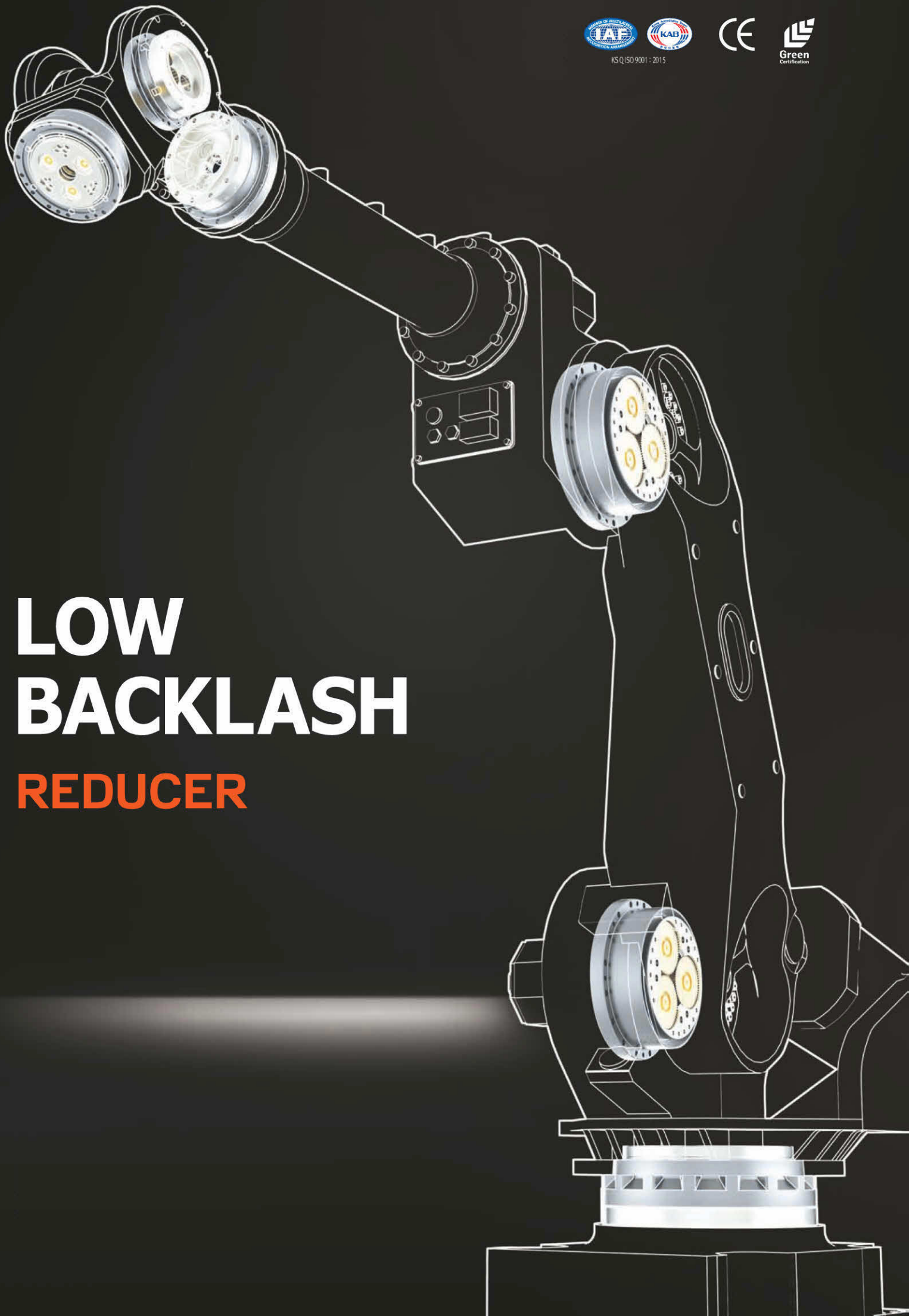


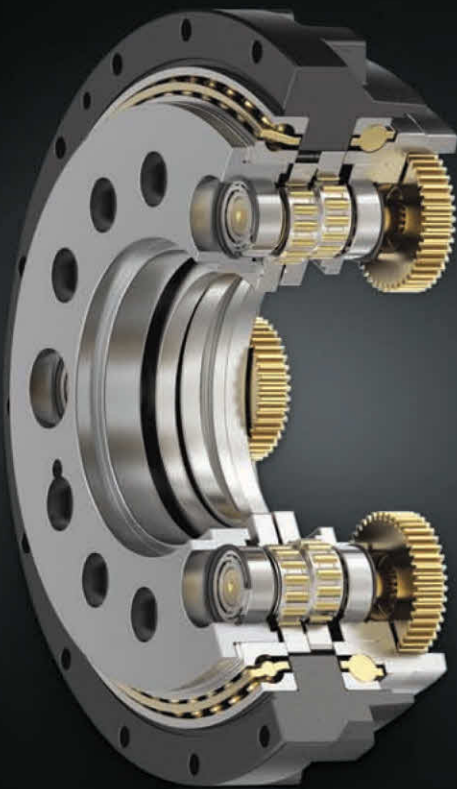


KS Q ISO 9001 : 2015

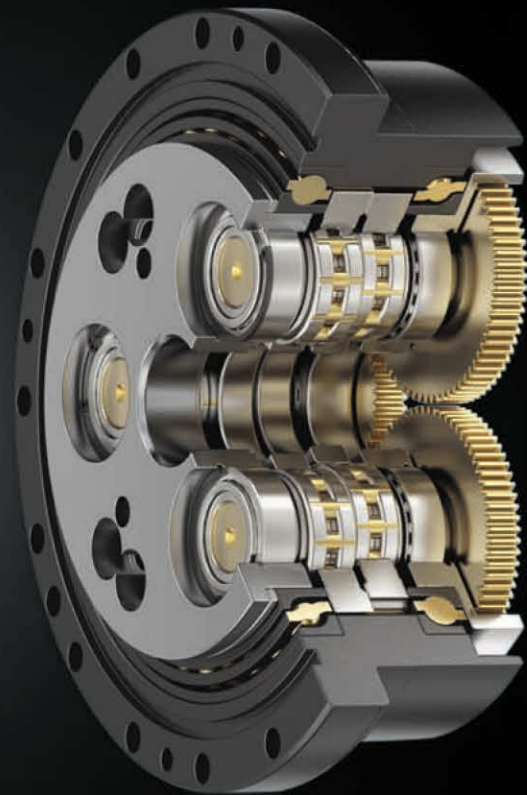


# LOW BACKLASH REDUCER

# LOW BACKLASH REDUCER

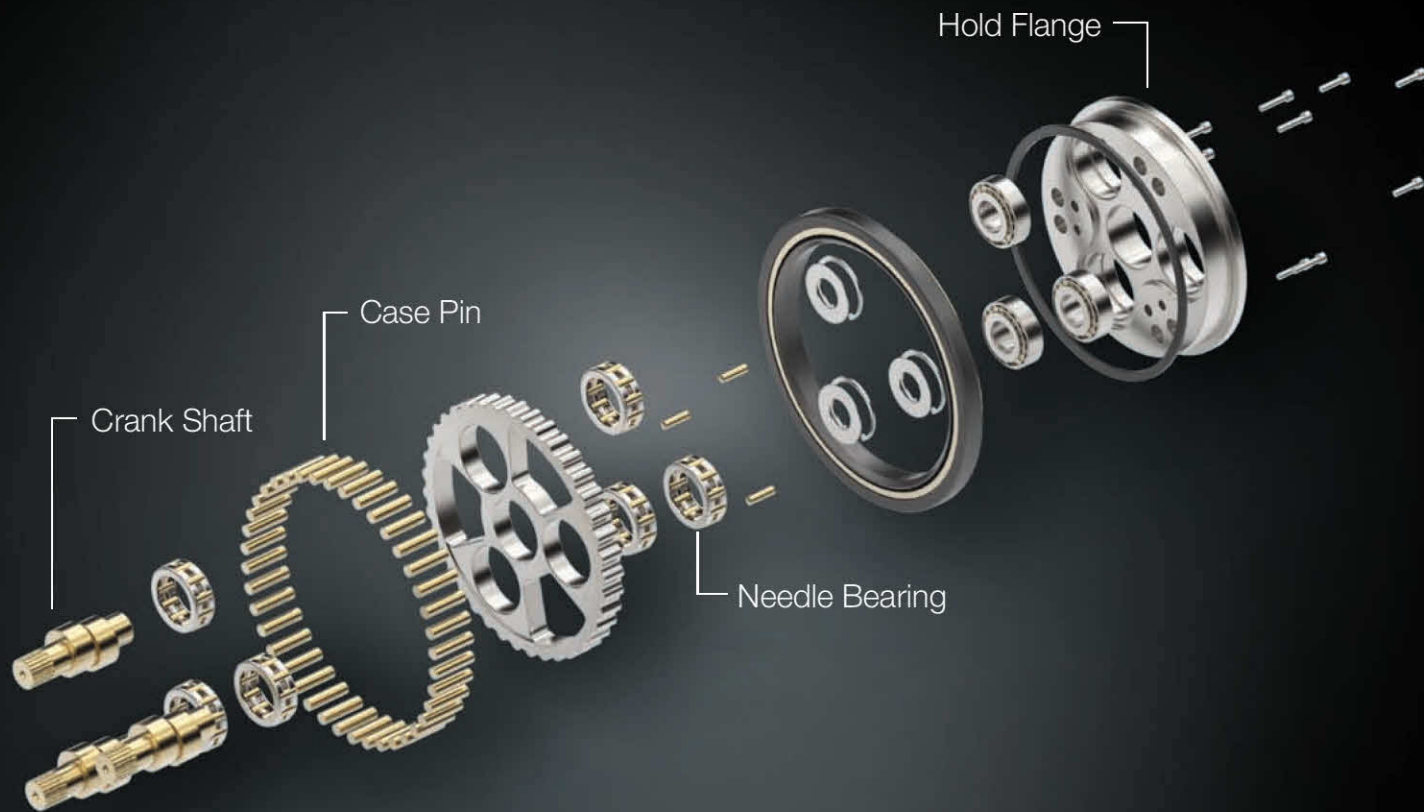


C-Type



E-Type





## Features & Benefits

### Low backlash

Assembled with its optimum load and without clearance.

### Compact Design

Two Cycloid gears provide optimum load distribution and compactness.

### High Speed Bearing Support

Easy to apply overload capacity without added parts. Shaft on reduction parts has designed in both ends support bearing.

### Low Vibration

Two Cycloid gears provide optimum load balance and its soft running guaranteed safety.

### High Rigidity

Improved by load distribution, increased output.

### High Efficiency

Its unique rolling action with assembled high accuracy of manufacture and optimum load balances.

### Long life period

Cycloid(teeth) has many simultaneous contact points to ensure shock load, Use high chrome type of bearing to ensure fatigue resistance, durability.

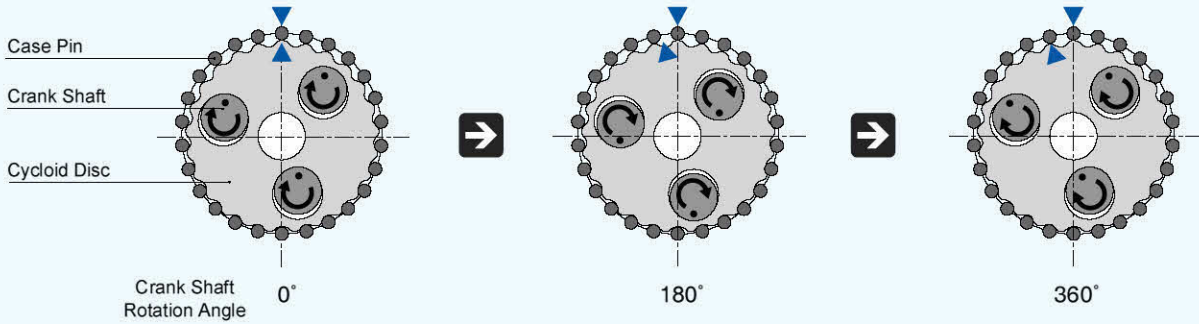
### Easy Maintenance

Requires minimum maintenance, flange on output shaft and reducing part can be separated.

### Easy Mounting

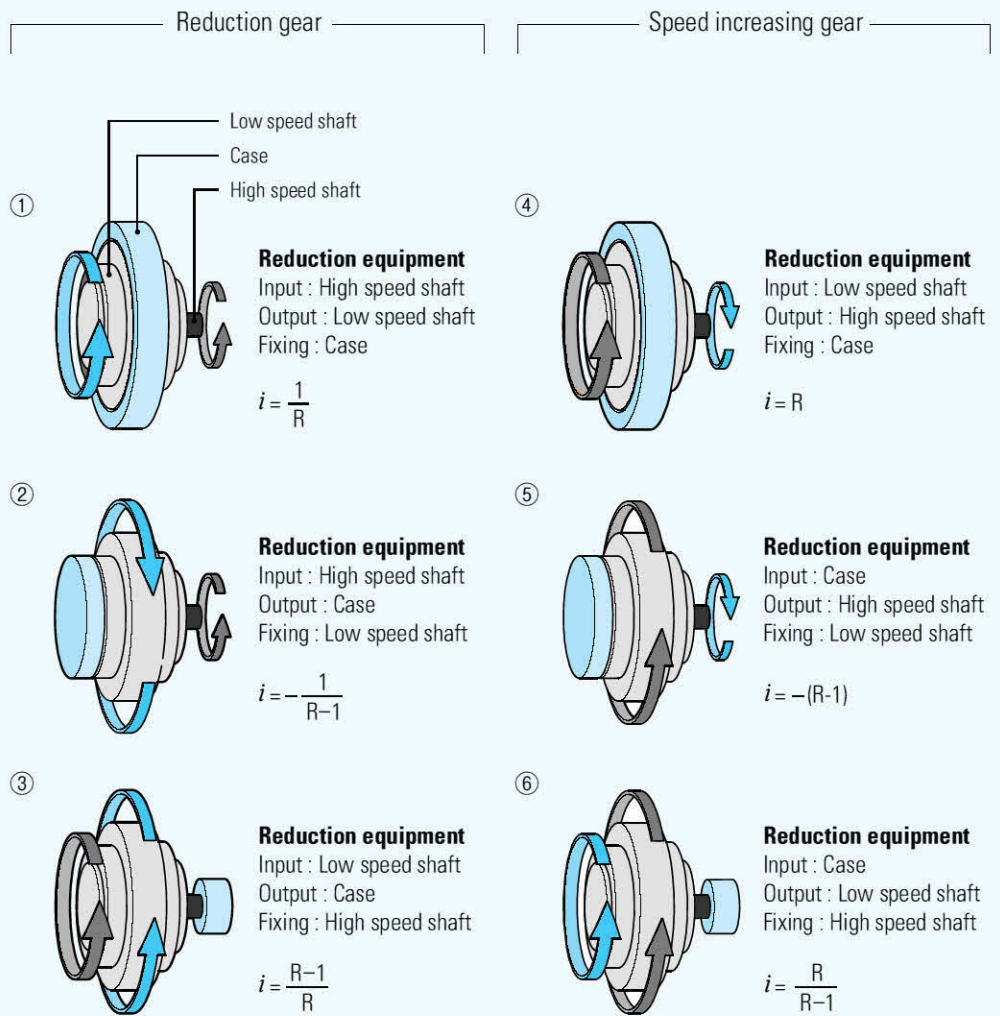
Simple assembly and grease lubricated for life.

## Cycloid Operation Principle Principle (Secondary Reduction)



Secondary Reduction is proceed by eccentric motion of Cycloid Disc, it is reduced by gap between Case pin number and tooth number of Cycloid Disc

## Rotation Direction & Ratio



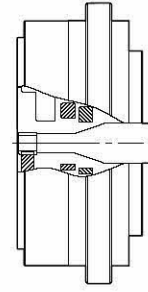
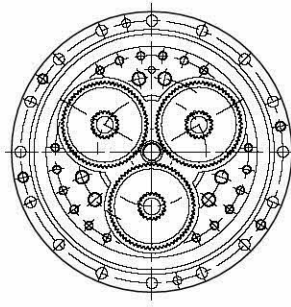
$R$  = Speed ratio  
 $i$  = Reduction ratio

## Ordering information

### E Type

Frame No. \_\_\_\_\_ **40** **E** — **81**  
 Type Speed ratio  
 (Reduction ratio) =  $\frac{1}{R}$

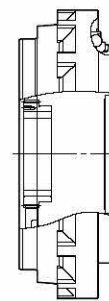
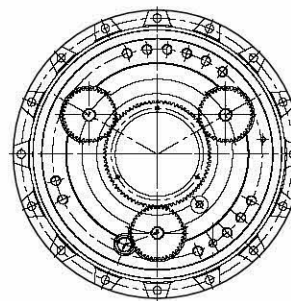
Frame No.	Torque kgf-m(Nm)	Frame No.	Torque kgf-m(Nm)
6	6 (58)	160	160 (1,568)
20	17 (167)	320	320 (3,136)
40	42 (412)	450	450 (4,410)
80	80 (784)	550	550 (5,390)
110	110 (1,078)		



### C Type

Frame No. \_\_\_\_\_ **100** **C** — **36.75**  
 Type Speed ratio  
 (Reduction ratio) =  $\frac{1}{R}$

Frame No.	Torque kgf-m(Nm)	Frame No.	Torque kgf-m(Nm)
10	10 (98)	200	200 (1,960)
27	27 (265)	320	320 (3,136)
50	50 (490)	400	400 (3,920)
100	100 (980)	500	500 (4,900)
120	120 (1,176)		


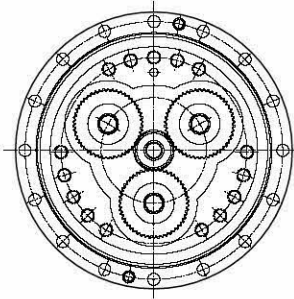
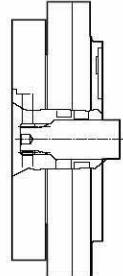


## Ordering information

**F Type**

Frame No. \_\_\_\_\_ **320** **F** — **201**  
 Type Speed ratio (Reduction ratio) =  $\frac{1}{R}$


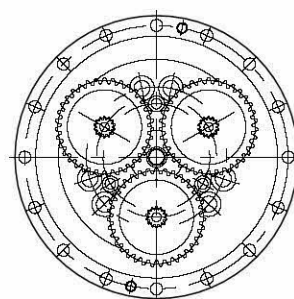
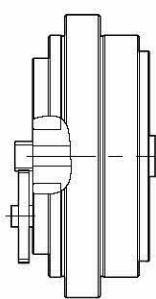
Frame No.	Torque kgf-m(Nm)	Frame No.	Torque kgf-m(Nm)
15	14 (137)	320	320 (3,136)
30	34 (333)	450	450 (4,410)
60	65 (637)	550	550 (5,390)
160	160 (1,568)		

**H Type**

Frame No. \_\_\_\_\_ **42** **H** — **81**  
 Type Speed ratio (Reduction ratio) =  $\frac{1}{R}$

Frame No.	Torque kgf-m(Nm)	Frame No.	Torque kgf-m(Nm)
25	25 (245)	125	125 (1,225)
42	42 (412)	160	163 (1,600)
60	61 (600)	380	380 (3,724)
80	80 (784)	500	500 (4,900)
100	102 (1,000)	700	714 (7,000)

## E




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Solid shaft standard type

Coaxial input and output shaft

High stiffness, high torque

2-stage reduction structure

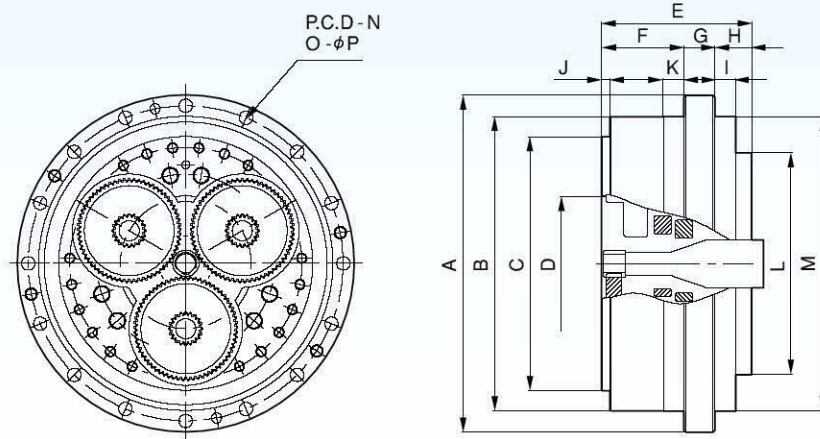
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## SPECIFICATION

Type		6E	20E	40E	80E	110E	160E	320E	450E	550E
Rated output Torque	kgf-m (Nm)	6 (58)	17 (167)	42 (412)	80 (784)	110 (1,078)	160 (1,568)	320 (3,136)	450 (4,410)	550 (5,390)
Rated output speed	rpm	30	15	15	15	15	15	15	15	15
Allowable acceleration / deceleration torque	kgf-m (Nm)	12 (117)	42 (412)	105 (1,029)	200 (1,960)	275 (2,695)	400 (3,920)	800 (7,840)	1,125 (11,025)	1,375 (13,475)
Momentary max. allowable torque	kgf-m (Nm)	30 (294)	85 (833)	210 (2,058)	400 (3,920)	550 (5,390)	800 (7,840)	1,600 (15,680)	2,250 (22,050)	2,750 (26,950)
Allowable moment	kgf-m (Nm)	20 (196)	90 (882)	170 (1,666)	220 (2,156)	300 (2,940)	400 (3,920)	720 (7,056)	900 (8,820)	1,100 (10,780)
Stiffness	kgf-m/arc.min (Nm/arc.min)	2 (20)	5 (49)	11 (108)	20 (196)	30 (294)	40 (392)	100 (980)	120 (1,176)	160 (1,568)
Backlash max.	arc.min	1.5	1	1	1	1	1	1	1	1
Lost motion max.	arc.min	1.5	1	1	1	1	1	1	1	1
Ratio	1 / i	31~103	57~161	57~153	57~153	81~175.3	81~171	81~185	81~192.4	123~192.4
Allowable max. output speed	rpm	100	75	70	70	50	45	35	25	20
Weight	kg	2.5	5	9.5	13	18	27	45	68	95

Specification & dimensions can be changed without prior notice for product improvement.

## E



## DIMENSION

mm

Type	6E	20E	40E	80E	110E	160E	320E	450E	550E
$\phi A$	122	145	190	222	244	280	325	370	395
$\phi B h7$	103	124	160	190	208	240	284	328	351
$\phi C h7$	86	105	135	160	182	204	245	275	317
$\phi D h7$	26	32	50	62	80	110	130	154	175
E	53	65	76	84	92.5	104	125	140	159
F	24	30	31	48	67	68.5	79.5	84	95.5
G	12	20	24	15	19	25	30	38	45
H	17	15	21	21	6.5	10.5	15.5	18	48.5
I	8	8	13	12	-	-	-	-	7
J	4	5.5	7	11	14	8	8	8	7.5
K	8	10	10	10	15	15	20	20	14
$\phi L$	78	92	123.5	140	154	178	214	248	275
$\phi M h7$	103	123	160	190	-	-	-	-	325
$\phi N$	113	135	175	206	226	260	304	348	374
O	8	16	16	16	12	12	16	24	30
P	5.8	6.8	9	9	11	13	13	13	13

Specification & dimensions can be changed without prior notice for product improvement.



C



Hollow shaft standard type

Coaxial input and output shaft

High stiffness, high torque

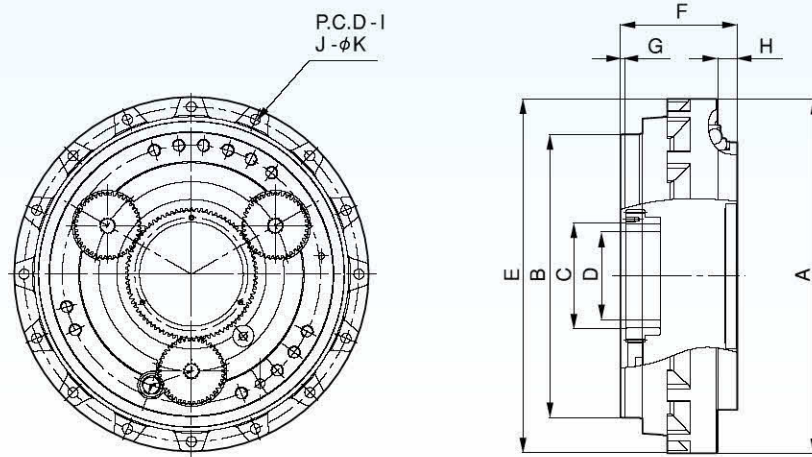
2-stage reduction structure

## SPECIFICATION

Type		10C	27C	50C	100C	120C	200C	320C	400C	500C
Rated output torque	kgf-m (Nm)	10 (98)	27 (265)	50 (490)	100 (980)	120 (1,176)	200 (1,960)	320 (3,136)	400 (3,920)	500 (4,900)
Rated output speed	rpm	15	15	15	15	15	15	15	15	15
Allowable acceleration / deceleration torque	kgf-m (Nm)	25 (245)	67.5 (662)	125 (1,225)	250 (2,450)	300 (2,940)	500 (4,900)	800 (7,840)	1,000 (9,800)	1,250 (12,250)
Momentary max. allowable torque	kgf-m (Nm)	50 (490)	135 (1,323)	250 (2,450)	500 (4,900)	600 (5,880)	1,000 (9,800)	1,600 (15,680)	2,000 (19,600)	2,500 (24,500)
Allowable moment	kgf-m (Nm)	70 (686)	100 (980)	180 (1,764)	250 (2,450)	400 (3,920)	900 (8,820)	2,100 (20,580)	2,500 (24,500)	3,500 (34,300)
Stiffness	kgf-m/arc.min (Nm/arc.min)	4.8 (47)	15 (147)	26 (255)	52 (510)	60 (588)	100 (980)	200 (1,960)	300 (2,940)	350 (3,430)
Backlash max.	arc.min	1	1	1	1	1	1	1	1	1
Lost motion max.	arc.min	1	1	1	1	1	1	1	1	1
Ratio	1 / i	27	36.57	32.54	36.75	36.75	34.86	35.61	35.61	37.34
Allowable max. output speed	rpm	80	60	50	40	38.5	30	25	20	20
Weight	kg	4.6	8.5	15	20	22	57	80	110	160

Specification &amp; dimensions can be changed without prior notice for product improvement.

C



## DIMENSION

mm

Type	10C	27C	50C	100C	120C	200C	320C	400C	500C
$\phi A$	147	182	222.5	250.5	250.5	347	440	485	520
$\phi B h7$	110	140	176	199	199	260	340	350	390
$\phi C h7$	34	47	66	73	73	100	140	140	150
$\phi D$	31	43	57	71	71	90	138	-	-
$\phi E h7$	146	181	222	250	250	346	438	432	475
F	49.5	57.5	68	72.6	82.5	102	126	138	162.5
G	4	5	5	5	5	7	5.5	6	7.5
H	10	10	12	12	10	10	-	27	32
$\phi I$	134	169	208	233	233	324	415	458	495
J	8	12	8	14	14	8	8	14	24
K	6.6	6.6	9	11	11	13	13	M16	M12

Specification & dimensions can be changed without prior notice for product improvement.

## F




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Solid shaft flange type

Coaxial input and output shaft

High stiffness, high torque

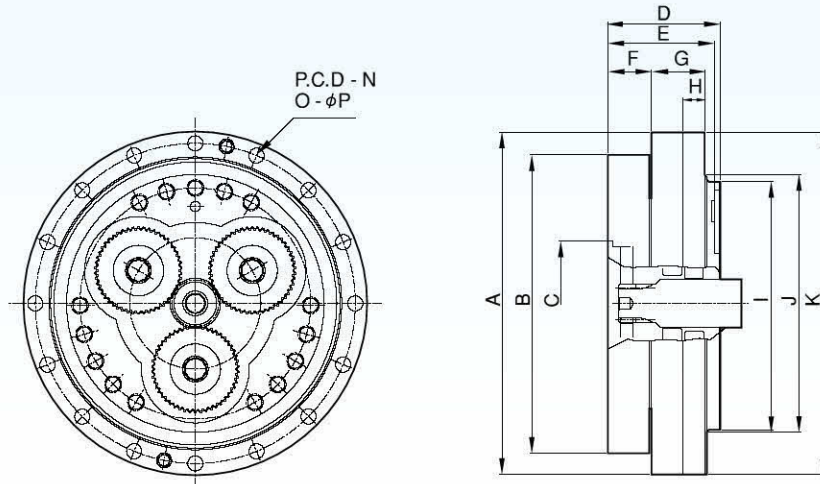
2-stage reduction structure

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## SPECIFICATION

Type		15F	30F	60F	160F	320F	450F	550F
Rated output torque	kgf-m (Nm)	14 (137)	34 (333)	65 (637)	160 (1,568)	320 (3,136)	450 (4,410)	550 (5,390)
Rated output speed	rpm	15	15	15	15	15	15	15
Allowable acceleration / deceleration torque	kgf-m (Nm)	28 (274)	85 (833)	162.5 (1,592)	400 (3,920)	800 (7,840)	1,125 (11,025)	1,375 (13,475)
Momentary max. allowable torque	kgf-m (Nm)	70 (686)	170 (1,666)	325 (3,185)	675 (6,615)	1,250 (12,250)	1,900 (18,620)	2,750 (26,950)
Stiffness	kgf-m/arc.min (Nm/arc.min)	4 (39)	10 (98)	20 (196)	40 (392)	100 (980)	120 (1,176)	160 (1,568)
Backlash max.	arc.min	1	1	1	1	1	1	1
Lost motion max.	arc.min	1	1	1	1	1	1	1
Ratio	1 / i	57~141	57~153	57~153	66~171	66~185	66~192.4	123~192.4
Allowable max. output speed	rpm	60	50	40	45	35	25	20
Weight	kg	3.5	6.5	10	20	36.5	50	71

## F



## DIMENSION

mm

Type	CR-15F	CR-30F	CR-60F	CR-160F	CR-320F	CR-450F	CR-550F
$\phi A$	129.9	159.5	199.5	239.5	289.5	324.5	369.5
$\phi B h7$	105	135	160	204	245	275	316
$\phi C h7$	32	50	62	110	130	154	180
D	65	71.5	71.5	96	117.6	128.5	147
E	55	60	64	82	102	109.5	128
F	16	22	19	27	33	35	41
G	32	34	42	52	63	72.5	82
H	12	15	15	30	25	30	30
$\phi I$	90	120	142	175	208	232	260
$\phi J$	100	129	152.6	190	224	252	294
$\phi K h7$	130	160	200	239.9	290	325	370
$\phi N$	118	148	185	222	270	304	346
O	6	12	8	12	8	12	24
P	6.8	6.8	9	10.5	13	13	15

## H




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Solid shaft compact type

Coaxial input and output shaft

High stiffness, high torque

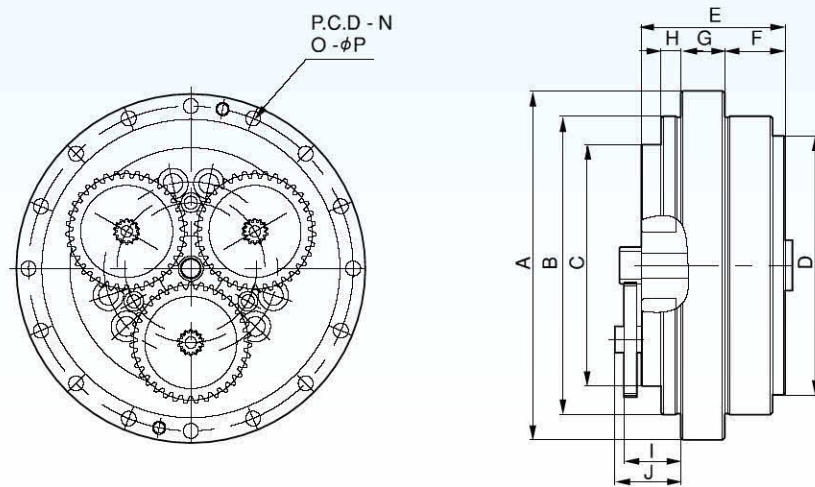
2-stage reduction structure

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## SPECIFICATION

Type		25H	42H	60H	80H	100H	125H	160H	380H	500H	700H
Rated output torque	kgf-m (Nm)	25 (245)	42 (412)	61 (600)	80 (784)	102 (1,000)	125 (1,225)	163 (1,600)	380 (3,724)	500 (4,900)	714 (7,000)
Rated output speed	rpm	15	15	15	15	15	15	15	15	15	15
Allowable acceleration / deceleration torque	kgf-m (Nm)	62 (612)	105 (1,029)	153 (1,500)	200 (1,960)	255 (2,500)	312 (3,062)	408 (4,000)	950 (9,310)	1,250 (12,250)	1,785 (17,500)
Momentary max. allowable torque	kgf-m (Nm)	125 (1,225)	210 (2,058)	306 (3,000)	400 (3,920)	510 (5,000)	625 (6,125)	816 (8,000)	1,900 (18,620)	2,500 (24,500)	3,571 (35,000)
Allowable moment	kgf-m (Nm)	80 (784)	169 (1,660)	204 (2,000)	219 (2,150)	275 (2,700)	350 (3,430)	408 (4,000)	719 (7,050)	1,122 (11,000)	1,530 (15,000)
Stiffness	kgf-m/arc.min (Nm/arc.min)	6.2 (61)	11.5 (113)	20.4 (200)	21.6 (212)	31.8 (312)	34 (334)	50 (490)	96.7 (948)	165 (1,620)	265 (2,600)
Backlash max.	arc.min	1	1	1	1	1	1	1	1	1	1
Lost motion max.	arc.min	1	1	1	1	1	1	1	1	1	1
Ratio	1 / i	41~164:1	41~164:1	41~161	41~171	41~161	41~161	41~201	75~185	81~192.8	105~203.5
Allowable max. output speed	rpm	110	100	94	88	83	79	48	27	25	19
Weight	kg	4	6.5	9	9.5	13	14	22	44	60	105

# H



## DIMENSION

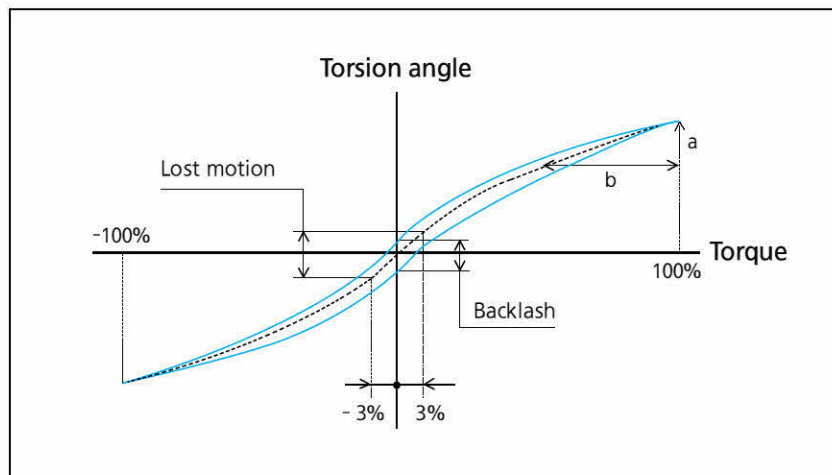
mm

Type	25H	42H	60H	80H	100H	125H	160H	380H	500H	700H
$\phi A$	133	159	183	189	208	221	238	295	325	395
$\phi B h7$	113	136	160	160	179	186	202	252	284	350
$\phi C h7$	90	110	129	131	146	152	166	208	230	275
$\phi D h7$	94	118	140	140	160	160	179	222	253	315
E	62	65.5	69.5	74	80	80	104	131	137.5	170
F	30.5	27.5	26	33	31	32.9	43.5	52	53	72
G	12	20	25	20	30	25	37	47	53	58
H	10	14.5	15.5	19	18.2	15.5	20.6	23.5	20	20
I	32.2	32.5	31.9	37.6	36.9	40.7	40.1	54.2	53.4	58.9
J	30.5	27.5	32.3	36	34.6	38.2	39.9	54.2	51	62.2
$\phi N$	123.5	148	172	175	194	204	220	276	305	374
O	16	16	20	16	18	16	16	24	28	32
P	5.8	6.8	6.8	9	9	11	11	13	13	13

Specification & dimensions can be changed without prior notice for product improvement.

### Hysteresis curve

When a torque is applied to the output shaft while the input shaft is fixed, torsion is generated according to the torque value.



The torsion angle when the torque indicated by the hysteresis curve is equal to zero is referred to as “backlash”.

The torsion angle at the mid point of the hysteresis curve width within  $\pm 3\%$  of the rated torque is referred to as “lost motion”.

### Rated service life

The lifetime resulting from the operation with the rated torque and the rated output speed is referred to as the “rated service life”.

### Allowable acceleration/deceleration torque

When the machine starts or stops, the load torque to be applied to the reduction gear is larger than the constant-speed load torque due to the effect of the inertia torque of the rotating part. In such a situation, the allowable torque during acceleration/deceleration is referred to as “allowable acceleration/deceleration torque”.

### Momentary maximum allowable torque

A large torque may be applied to the reduction gear due to execution of emergency stop or by an external shock. In such a situation, the allowable value of the momentary applied torque is referred to as “momentary maximum allowable torque”.

### Allowable Moment

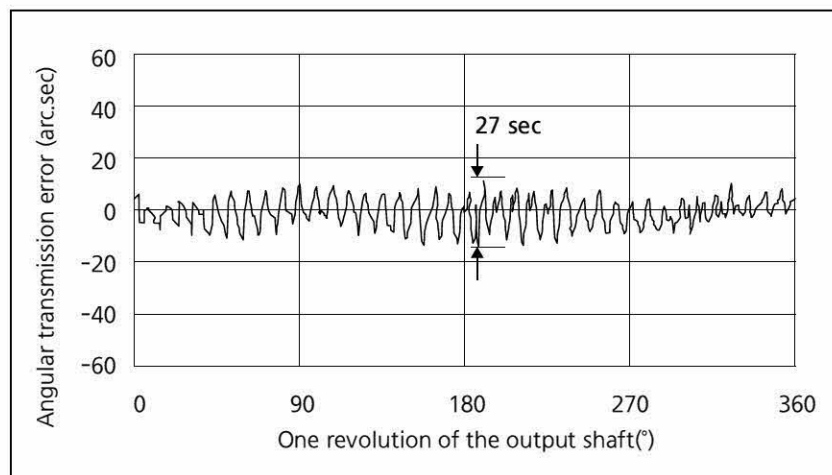
The external load moment may be applied to the reduction gear during normal operation. The allowable value of the external moment at this time are referred to as “allowable moment”.

### No-load running torque

The torque for the input shaft that is required to run the reduction gear without load is referred to as “no-load running torque”.

### Angular transmission error

The angular transmission error is defined as the difference between the theoretical output angle of rotation (when there are input instructions for an arbitrary rotation angle) and the actual output angle of rotation.





## Lubricant

The standard lubricant for CR precision reduction gears is grease.

This reducer model is shipped without the grease enclosed. Please fill with the required amount during installation

During proper operation of the reduction gear, the standard grease replacement time due to lubricant degradation is 20,000 hours. However, when operation involves a reduction gear surface temperature above 40°C, the state of the lubricant should be checked in advance and the grease replaced earlier as necessary.

Leave a space about 10% of the total volume of the internal capacity of the reduction gear and the space on the motor mounting side.

## Operating environment

Use the reduction gear under the following environment

Location where the ambient temperature is between -10°C to 40°C.

Location where the humidity is less than 85% and no condensation occurs.

Location where the altitude is less than 1000m.

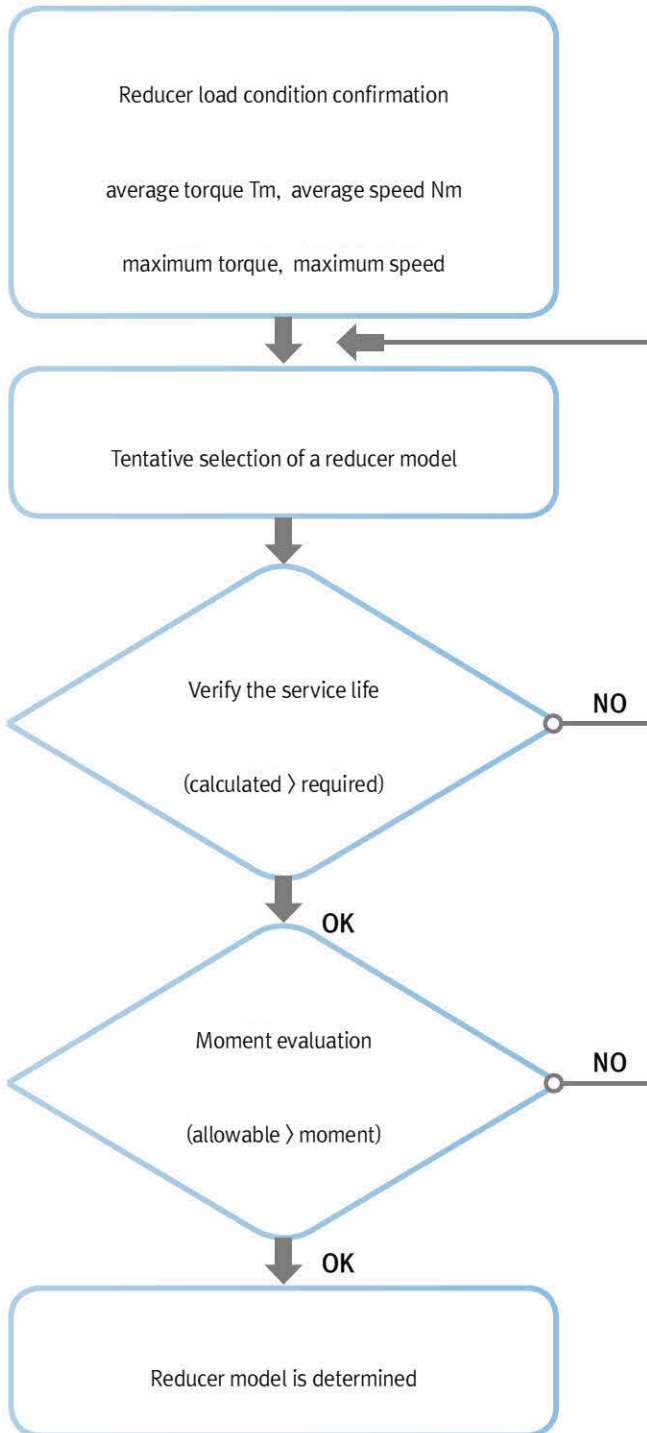
Well-ventilated location.

Indoors that can not be directly affected by wind and rain

Location near the environment that contains combustible, explosive, or corrosive gases and flammable materials.

Location that is heated due to heat transfer and radiation from peripherals and direct sun.

Product selection



$$T_m = \sqrt[10]{\frac{t_1 \cdot N_1 \cdot T_1^{10} + t_2 \cdot N_2 \cdot T_2^{10} + \dots + t_n \cdot N_n \cdot T_n^{10}}{t_1 \cdot N_1 + t_2 \cdot N_2 + \dots + t_n \cdot N_n}}$$

$$N_m = \frac{t_1 \cdot N_1 + t_2 \cdot N_2 + \dots + t_n \cdot N_n}{t_1 + t_2 + \dots + t_n}$$

	Startup	Normal	Stop	Emergency Stop
Torque (Nm)	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>em</sub>
Speed (rpm)	N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>	N <sub>em</sub>
Time (sec.)	t <sub>1</sub>	t <sub>2</sub>	t <sub>3</sub>	t <sub>em</sub>

$$L_h = 6,000 \times \frac{N_o}{N_m} \times \left(\frac{T_o}{T_m}\right)^{\frac{10}{3}}$$

- L<sub>h</sub> : Verify the service life
- N<sub>m</sub> : Average output speed
- T<sub>m</sub> : Average torque
- N<sub>o</sub> : Rated output speed
- T<sub>o</sub> : Rated torque

Type	Rated torque	Rated output speed
CR - 6E	58Nm	30 rpm
CR - 20E	167Nm	15 rpm
CR - 40E	412Nm	
CR - 80E	784Nm	
CR - 110E	1,078Nm	
CR - 160E	1,568Nm	
CR - 320E	3,136Nm	
CR - 450E	4,410Nm	

## ■ Precautions

Be aware of conditions so that the surface temperature of the reduction gear does not exceed 60°C while it is in operation.

There is a possibility of damage to the product if the surface temperature exceeds 60°C.

When the range of the rotation angle is small (10 degrees or less), the service life of the reduction gear may be reduced due to poor lubrication or the internal parts being subject to a concentrated load.

Please watch for overloading situation.

Please make sure the rotation speed is within the specification

Please do not attempt to disassemble and reassemble

## ■ Check

Over-heating of the reducer surface

Abnormal noise from bearing and gear

Abnormal vibration from the reducer

Lubricant leakage

Overloading situation. Irregular rotation.

Reducer mounting bolt tightness

Abnormality in electric system

Lubricant problem

◆ If any abnormality is observed, please stop the operation immediately and contact us.

## ■ Warranty

### Warranty period

Warranty is up to one year after the delivery or 2,000 hours of operation, whichever is sooner.

### Warranty coverage

When the product malfunctions for the reasons attributed to our company, we will repair or replace it free of charge during the warranty period.

Scope of warranty is for the delivered product only.

Following expense and damage are outside this warranty

Any expense associated with the removal of reducer from attached devices and mounting fixtures. Any expense associated with assembly and its related work and the freight, etc.

Indirect cost incurred at the user, such as lost opportunities and operation intermission.

All other secondary and contingent damage.

### Warranty exemption

Following cases are not covered by the warranty.

Parts are used in inadequate condition and environment.

Parts are handled or used in inadequate manner by the user.

Parts installation or the connection with other devices are not done correctly.

The root cause of the problem is not the part delivered.

There is a history of modification or repair done by somebody other than us.

The problem is due to extraneous accidents such as natural disaster, fire, etc.

The scheduled replacement of consumable components such as bearing, oil sealing, etc.

All other circumstances where we are not at fault.