



ISO 9001
JQA-1190

VIGO DRIVE™

RA SERIES

High Precision Gearheads for Machine Tools



Nabtesco

*The **RA** SERIES
includes gearheads
for high precision dividing
of ATC magazines, ATC arms, APC,
or turret tool posts of a lathe
at machining centers.*

RA-EA Series



RA-EC Series

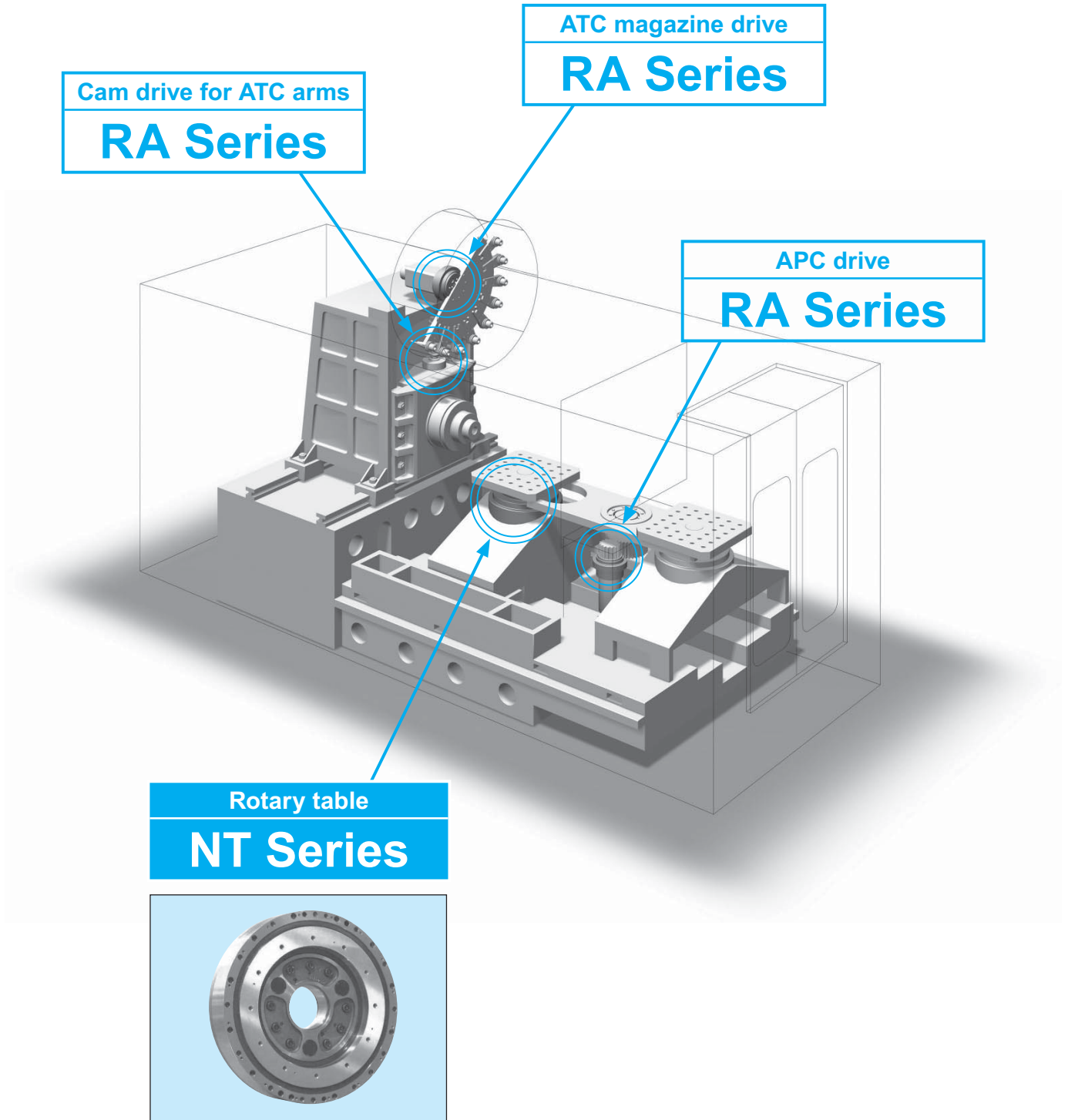


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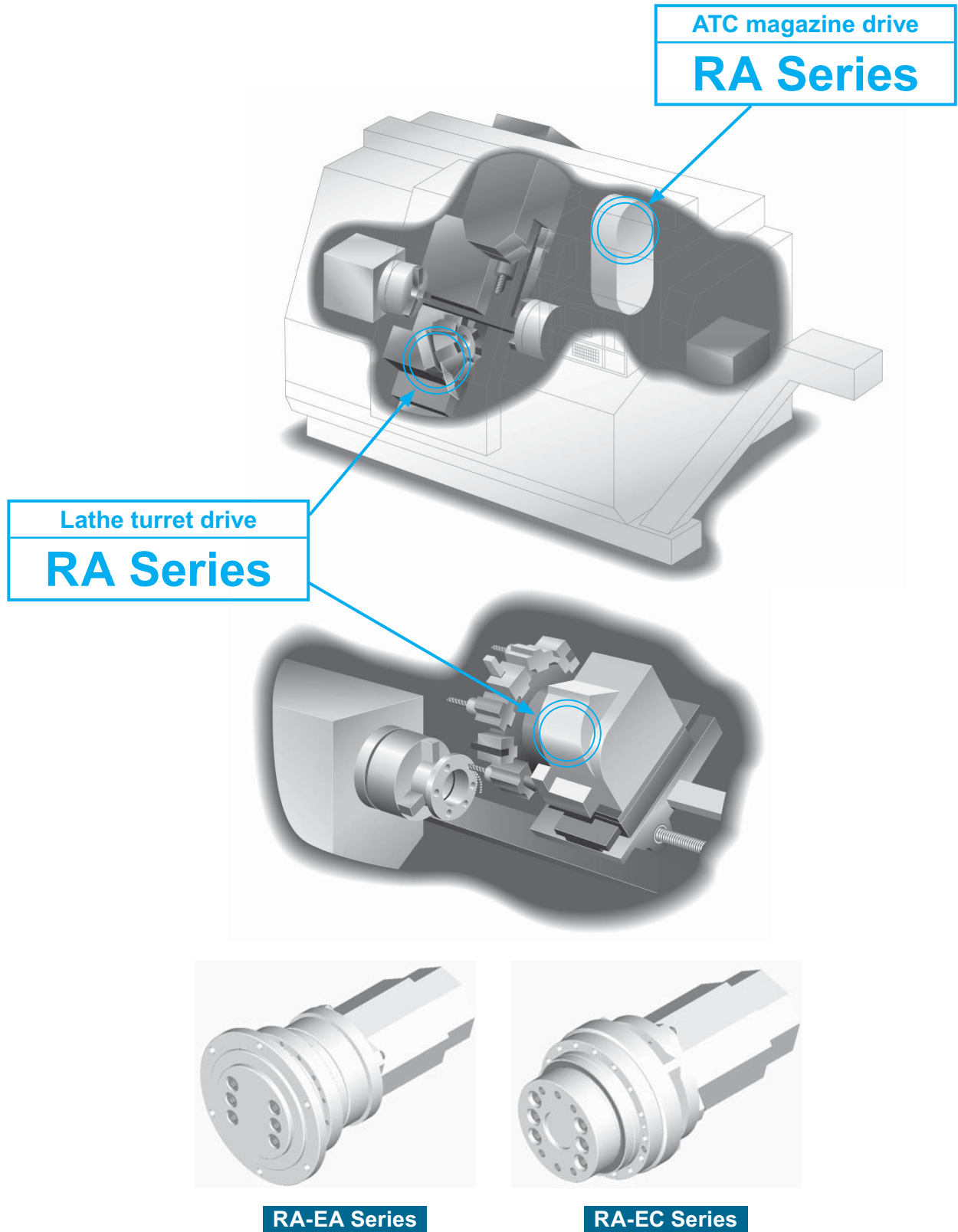
Examples of Use

For Machining Center



Contact us for NT Series rotary tables.

For NC lathe or combined lathe





Features and Configurations

High shock load capability
High rigidity
High precision
High torque

The double-end support design and unique pin gear mechanism provide the following advantages

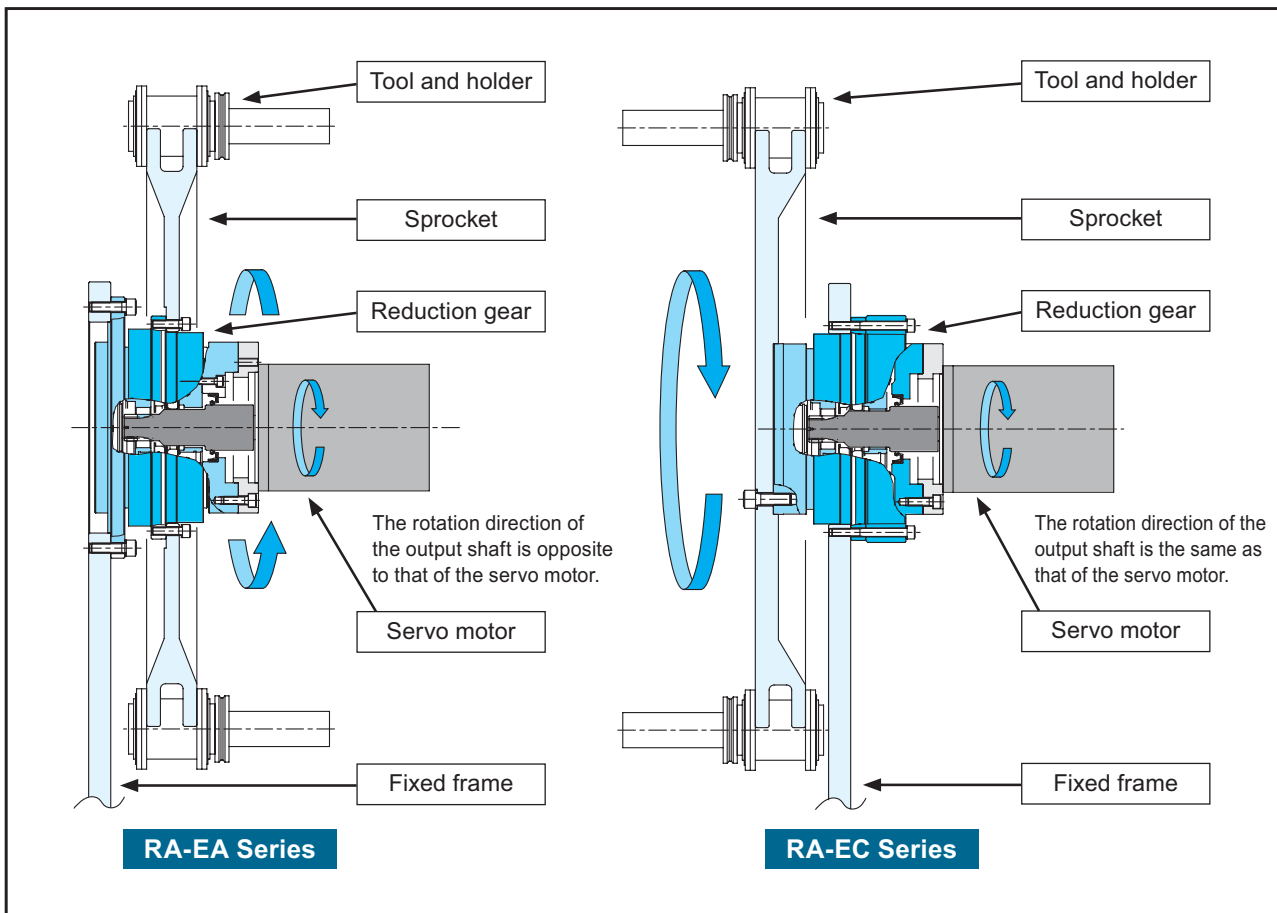
- (1) Capable of high shock load 5 times the rated torque
- (2) High torsional rigidity
- (3) Small backlash [1 arc.min]
- (4) High torque density (capable of high torque with downsized gear)

Heavy load support

A set of internal main bearings (large angular ball bearings) enables complete support of heavy external loads.

Three benefits due to the features above

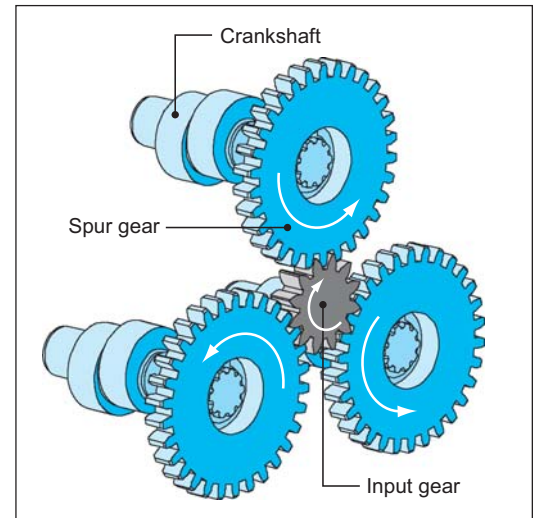
- 1. Maintenance free (Trouble free)
- 2. Compact design with a reduced number of parts
- 3. Reduced man-hours (for design, assembly, and adjustment)



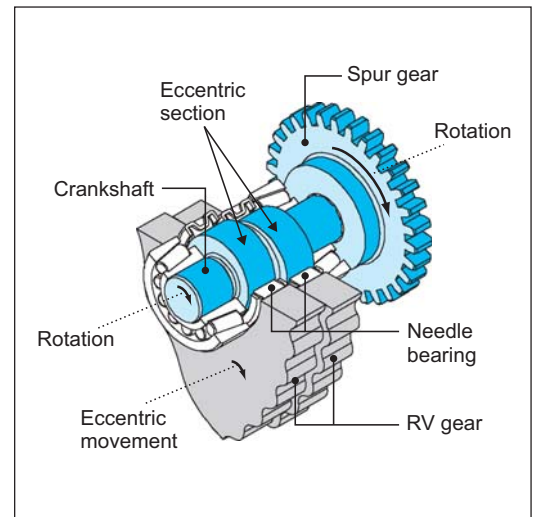
Principle of Operation

1. Rotation of the servo motor is transmitted through the input gear to the spur gears, and the speed is reduced according to the gear ratio between the input gear and the spur gears. <Fig. 1>
2. Since the crankshafts are directly connected to the spur gears, they have the same rotational speed as the spur gears. <Fig. 1>
3. Two RV gears are mounted around the needle bearings on the eccentric section of the crankshaft. (In order to balance the equal amount of force, two RV gears are mounted.) <Fig. 2>
4. When the crankshafts rotate, the two RV gears mounted on the eccentric sections also revolve eccentrically around the input axis (crank movement). <Fig. 2>
5. Pins are arrayed in a constant pitch in the grooves inside the case. The number of pins is just one larger than the number of RV gear teeth. <Fig. 3>
6. As the crankshafts revolve one complete rotation, the RV gears revolve eccentrically one pitch of a pin (crank movement), with all the RV teeth in contact with all of the pins. As a result, 1 RV gear tooth moves in the opposite direction of the crankshaft rotation. <Fig. 3>
7. The rotation is then output to the shaft (output shaft) via the crankshaft so that the crankshaft rotation speed can be reduced in proportion to the number of pins. <Fig. 3>
8. The total reduction ratio is the product to the first reduction ratio multiplied by the second reduction ratio.

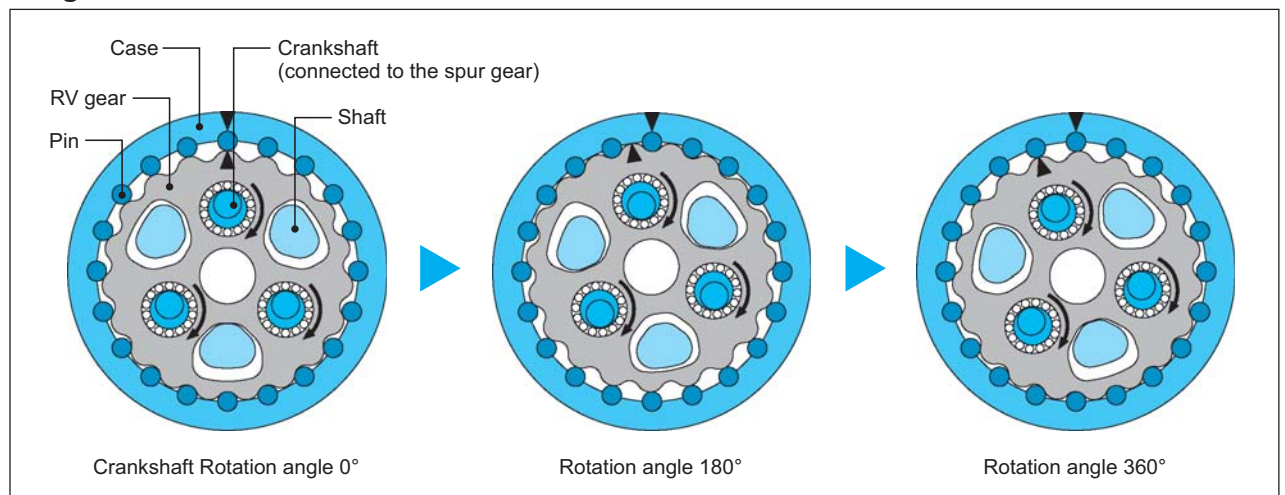
■ Fig. 1. First reduction section



■ Fig. 2. Crankshaft section



■ Fig. 3. Second reduction section





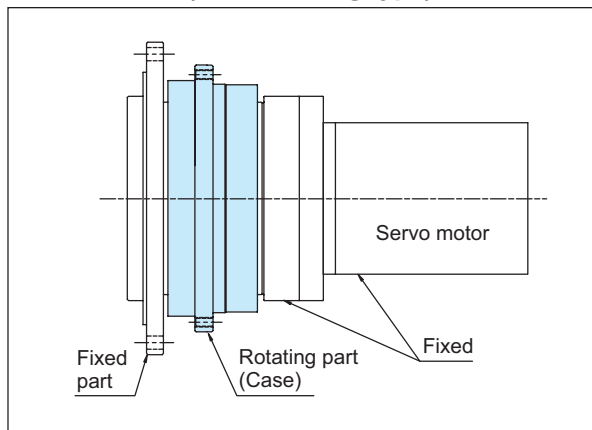
Rating Table

Models	Speed Ratio					To Rated Torque	No Rated Output Speed	K Rated Life	Ts1 Allowable Acceleration/ Deceleration Torque	Ts2 Momentary Maximum Allowable Torque
						N-m (kgf-m)	rpm	Hr	N-m (kgf-m)	N-m (kgf-m)
RA-EA Series										
RA-20EA	80	104	120	140	160	167 (17)	15	6000	412 (42)	833 (85)
RA-40EA	80	104	120	152		412 (42)	15	6000	1029 (105)	2058 (210)
RA-80EA	80	100	120	152		784 (80)	15	6000	1960 (200)	3920 (400)
RA-160EA	80	100	128	144	170	1568 (160)	15	6000	3920 (400)	7840 (800)
RA-EC Series										
RA-20EC	81	105	121	141	161	167 (17)	15	6000	412 (42)	833 (85)
RA-40EC	81	105	121	153		412 (42)	15	6000	1029 (105)	2058 (210)
RA-80EC	81	101	121	153		784 (80)	15	6000	1960 (200)	3920 (400)
RA-160EC	81	101	129	145	171	1568 (160)	15	6000	3920 (400)	7840 (800)

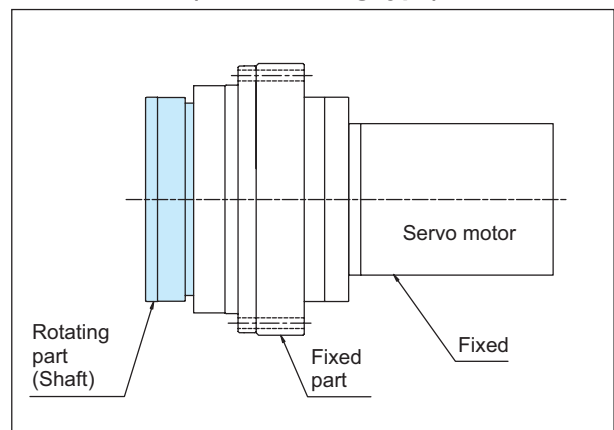
- Note: 1. The Rating Table shows the specification values of each individual reduction gear.
 2. The allowable output speed may be limited by heat depending on the operating rate.
 3. For the inertia moment of the reduction gears, refer to the Product Summary Sheet.
 4. For dimensions α and L, refer to "Allowable Moment and Maximum Thrust Load".

Ns1 Allowable Output Speed [Continuous]	Ns2 Allowable Output Speed [Intermittent]	Backlash	Lost motion	Torsional Rigidity (Spring Constant)	Capacity of main bearing					Mass
					Mo Allowable Moment	Ms1 Momentary Maximum Allowable Moment	Fo Maximum Thrust Load	α Dimension α	L Dimension L	
Note 2 rpm	Note 2 rpm	arc.min.	arc.min.	N-m/ arc.min. (kgf-m/ arc.min.)	N-m (kgf-m)	N-m (kgf-m)	N (kgf)	Note 4 mm	Note 4 mm	kg
45	75	1.0	1.0	49 (5)	882 (90)	1764 (180)	3920 (400)	63.1	113.3	10
42	70	1.0	1.0	108 (11)	1666 (170)	3332 (340)	5194 (530)	83.1	143.7	18.5
42	70	1.0	1.0	196 (20)	2156 (220)	4312 (440)	7840 (800)	81.5	166	28
27	45	1.0	1.0	392 (40)	3920 (400)	7840 (800)	14700 (1500)	93.8	210.9	58
45	75	1.0	1.0	49 (5)	882 (90)	1764 (180)	3920 (400)	122.2	113.3	9.5
42	70	1.0	1.0	108 (11)	1666 (170)	3332 (340)	5194 (530)	148.1	143.7	20
42	70	1.0	1.0	196 (20)	2156 (220)	4312 (440)	7840 (800)	158.4	166	27
27	45	1.0	1.0	392 (40)	3920 (400)	7840 (800)	14700 (1500)	201.8	210.9	59

RA-EA Series (Case rotating type)



RA-EC Series (Shaft rotating type)



Life Rating

The life time when driven at the rated torque and rated output speed is called the “life rating”.

Allowable Acceleration/Deceleration Torque

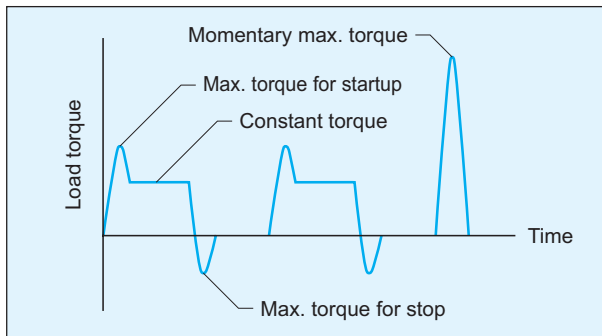
When the machine starts or stops, the load torque to be applied to the reduction gear is larger than the constant-speed load torque due to the effect of the inertia torque of the rotating part. In such a situation, the allowable torque during acceleration/deceleration is referred to as “allowable acceleration/deceleration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

Note: Be careful so that the load torque, which is applied during normal operation, does not exceed the allowable acceleration/deceleration torque.

Momentary Maximum Allowable Torque

A large torque may be applied to the reduction gear due to an emergency stop or an external shock. The allowable value of the momentary applied torque at this time is referred to as “momentary maximum allowable torque”.

Note: Be careful so that the momentary excessive torque does not exceed the momentary maximum allowable torque.



Allowable Output Speed [Continuous]

The allowable output speed when the machine starts and stops repeatedly is referred to as “allowable output speed [Continuous]”.

Note: Maintain the environment and operation conditions so that the temperature of the reduction gear case is 60°C or lower.

Allowable Output Speed [Intermittent]

The allowable output speed during the operation in which the reduction gear is not activated frequently is referred to as “allowable output speed [Intermittent]”.

Note: Maintain the environment and operation conditions so that the temperature of the reduction gear case is 60°C or lower.

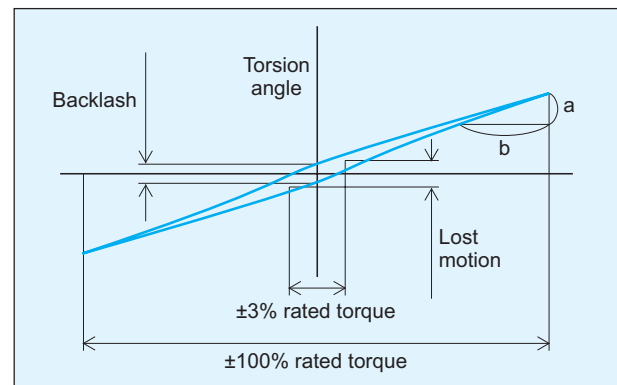
Torsional Rigidity, Lost Motion, Backlash

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 can be shown in the hysteresis curves.

The value of b/a is referred to as “torsional rigidity”. 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”.

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

■ Hysteresis curve



Calculation of torsion angle

Taking RA-160E as an example, the torsion angle will be calculated when torque is added in one direction.

1) When the load torque is 30 N-m Torsion angle (ST1)

- When the load torque is within the lost motion area

$$ST1 = \frac{30}{47} \times \frac{1 \text{ (arc.min.)}}{2} = 0.32 \text{ arc.min or less}$$

2) When the load torque is 1,300 N-m Torsion angle (ST2)

- When the load torque is within the rated torque area

$$ST2 = \frac{1}{2} + \frac{1300-47.0}{392} = 3.70 \text{ arc.min.}$$

Note: 1. The torsion angles that are calculated above are for a single reduction gear.

2. For the customized specifications of the lost motion, contact us.

Models	Torsional rigidity (Spring Constant) N-m/arc.min.	Lost motion		Backlash arc.min.
		Lost motion arc.min.	Measured torque N-m	
RA-20E	49	1.0	± 5.0	1.0
RA-40E	108		± 12.3	
RA-80E	196		± 23.5	
RA-160E	392		± 47.0	

Allowable Moment and Maximum Thrust Load

The external load moment may be applied to the reduction gear during normal operation. The allowable values of the external moment and the external axial load at this time are each referred to as “allowable moment” and “maximum thrust load”.

M_c : Load moment (N-m)

W_1, W_2 : Load (N)

L_1, L_2 : Distance to the point of load application (mm)

α : Designated dimension (mm)
(Refer to the Rating Table.)

L : Designated dimension (mm)
(Refer to the Rating Table.)

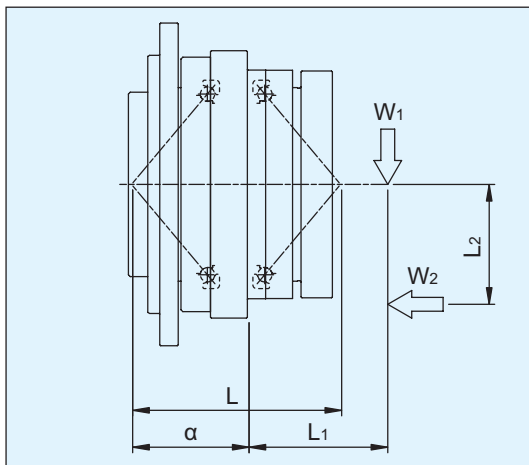
$$M_c = \frac{W_1 \times (L_1 + \alpha) + W_2 \times L_2}{1000}$$

$M_c \leq$ Allowable moment

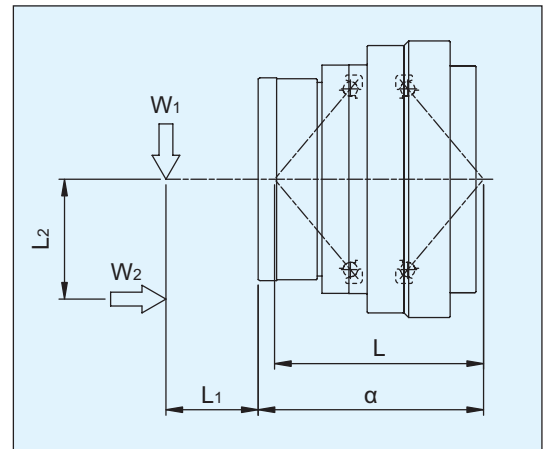
- Note: 1. When the load moment and the thrust load are applied concurrently, ensure that the reduction gear is used within the corresponding allowable moment range, which is indicated in the allowable moment diagram.**
- 2. When W_1 load is applied in the area of the dimension L , use it within the allowable radial load, calculated using the formula below.**

$$\text{Allowable radial load} = \frac{\text{Allowable moment}}{L} : (\text{N})$$

RA-EA



RA-EC

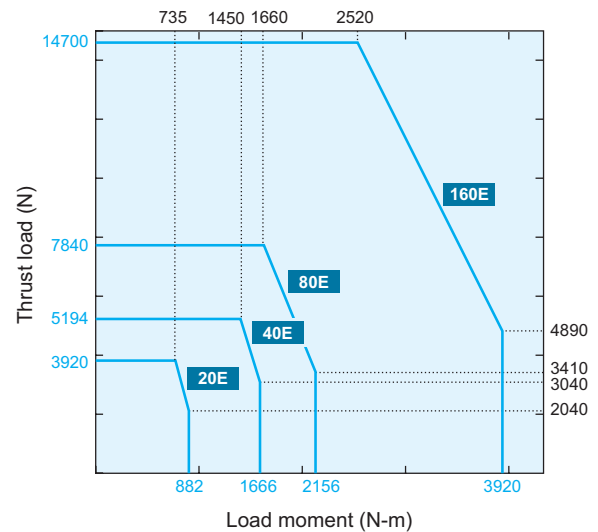


Momentary Maximum Allowable Moment

A large moment may be applied to the reduction gear due to an emergency stop or external shock. The allowable value of the momentary applied moment at this time is referred to as “momentary maximum allowable moment”.

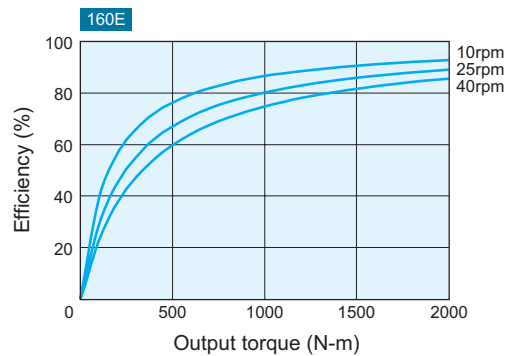
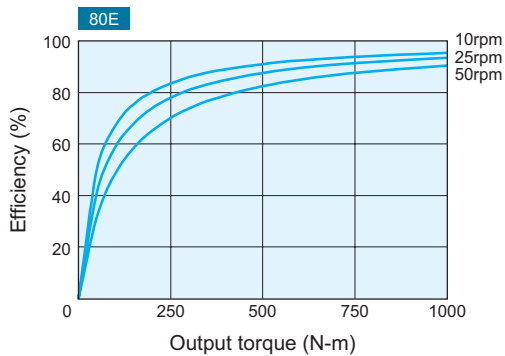
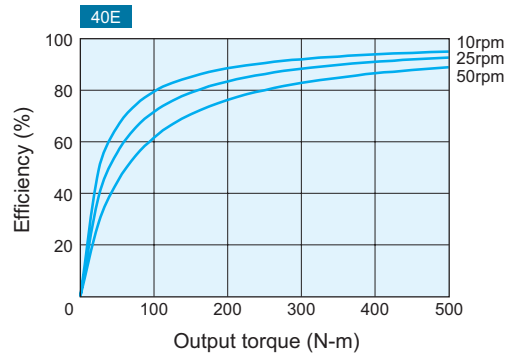
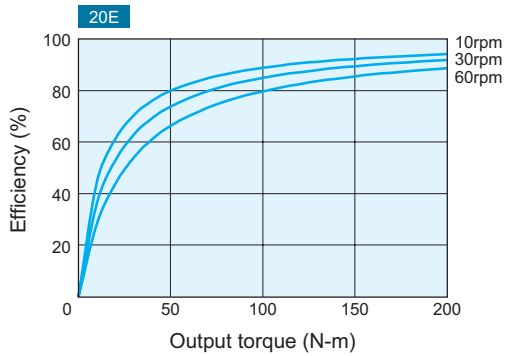
Note: Be careful so that the momentary excessive moment does not exceed the momentary maximum allowable moment.

Allowable Moment Diagram



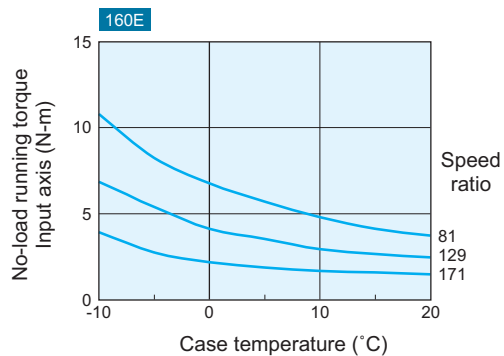
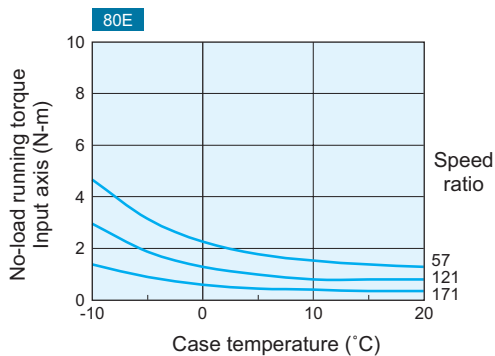
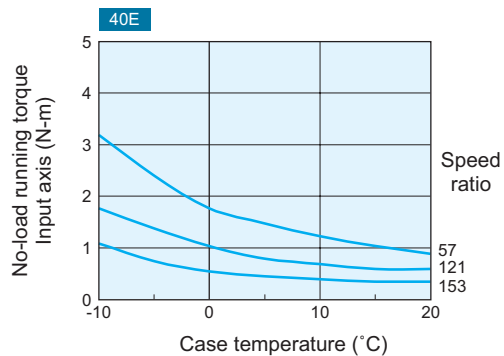
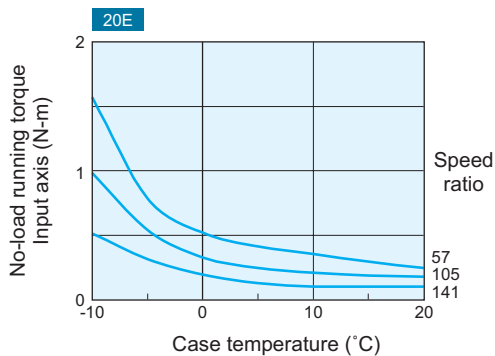
Efficiency

RA Sries Case temperature: 30°C
Lubricant: Grease (VIGO GREASE RE0)



Low-temperature characteristics (No-load running torque for low-temperature range)

RA Series RA Series: Input speed
Lubricant: Grease (VIGO GREASE RE0)

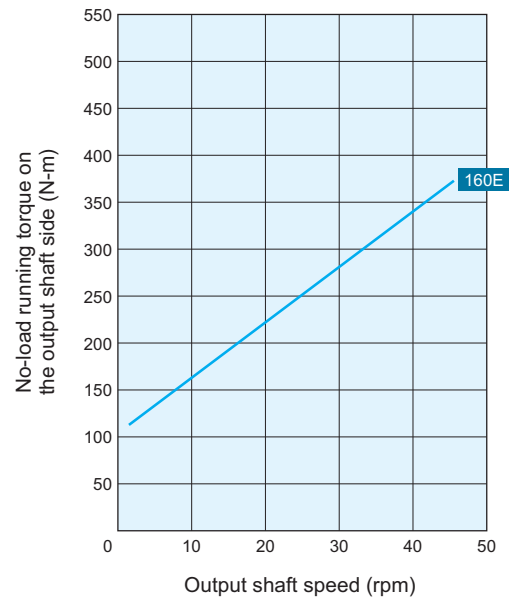
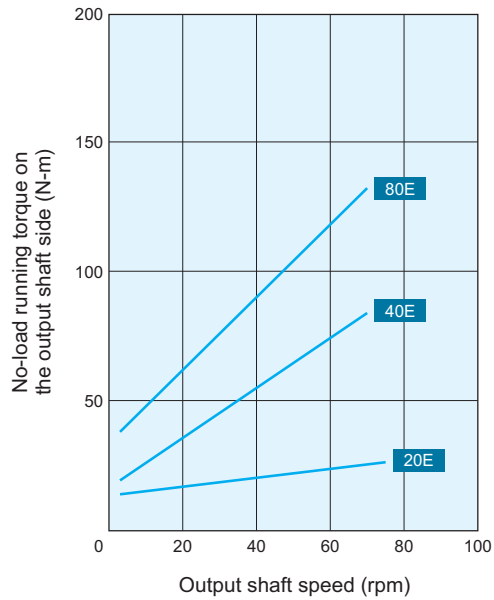


No-load running torque

RA Series

Case temperature: 30°C

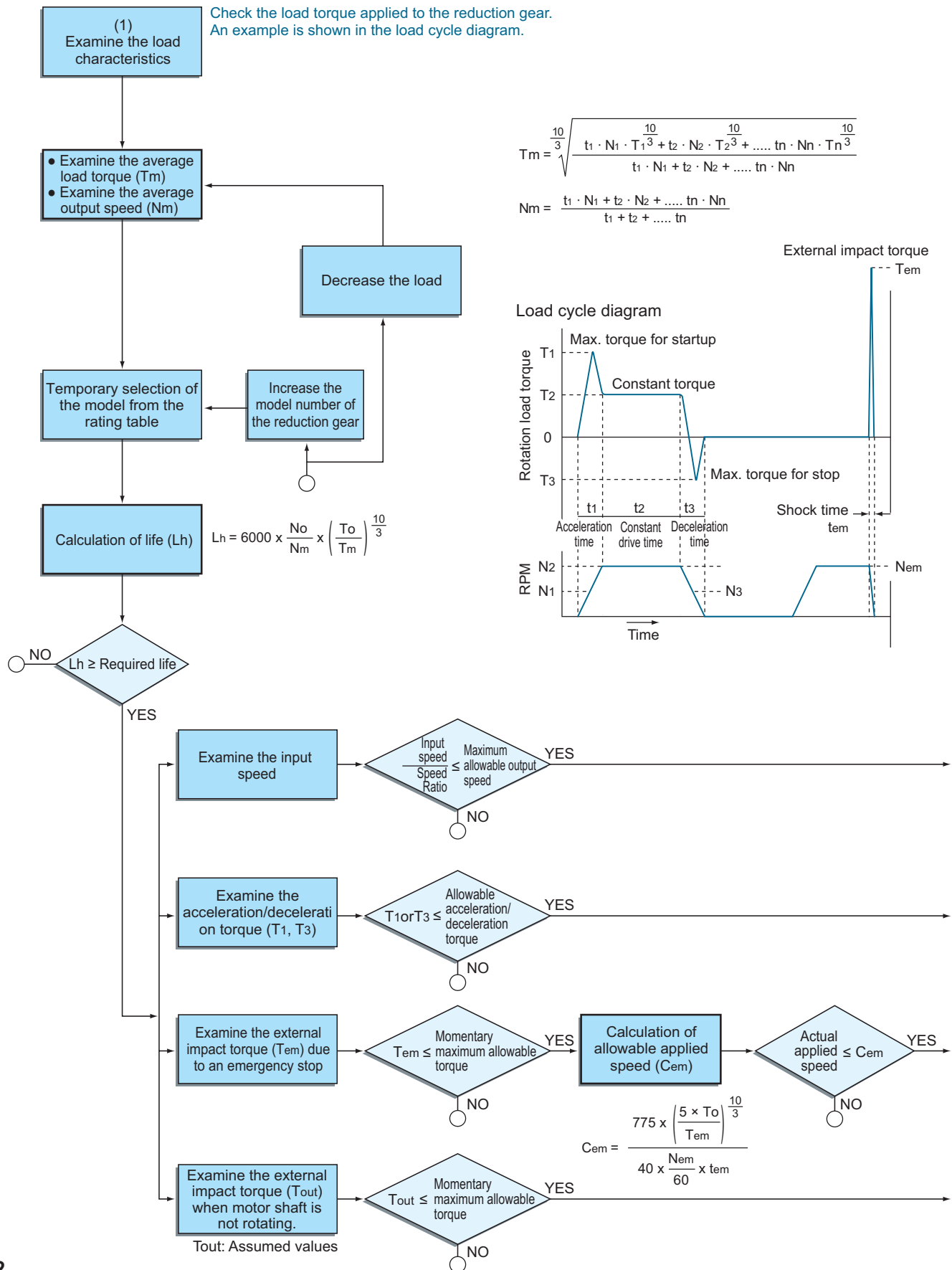
Lubricant: Grease (VIGO GREASE RE0)

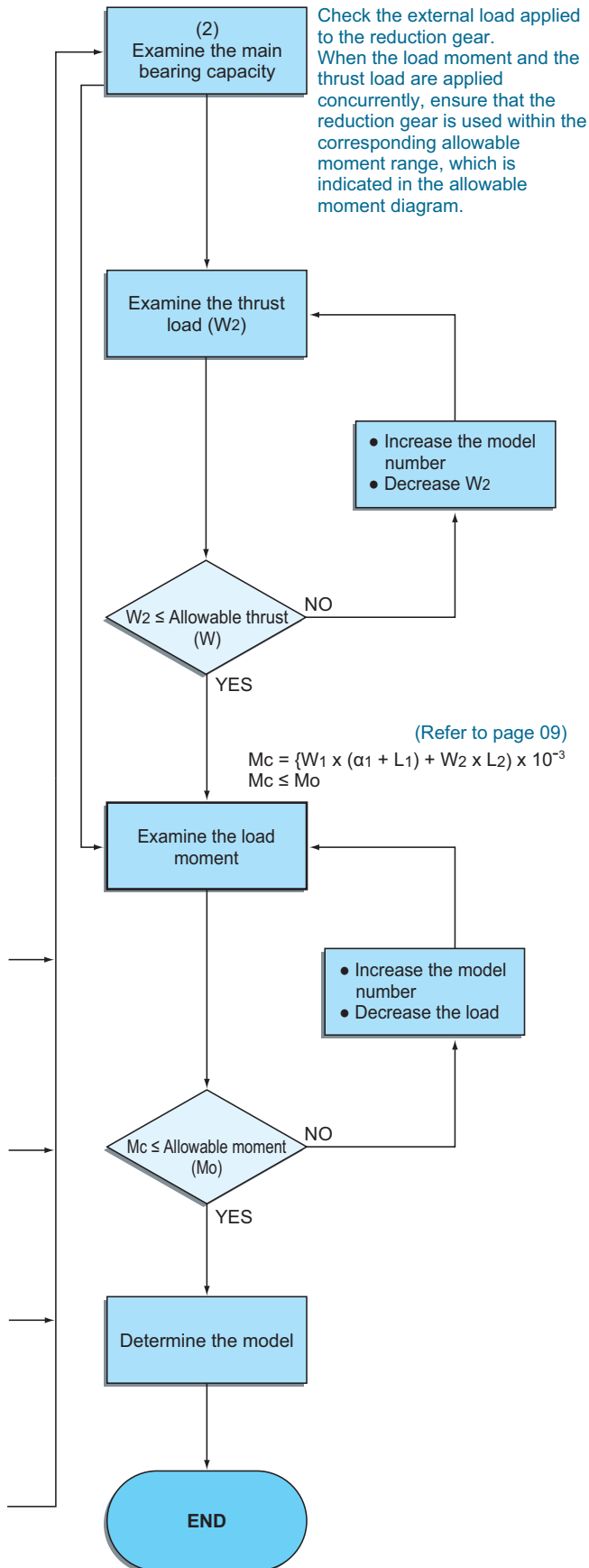


The no-load running torque that is converted to the input shaft side value should be figured out according to the following equation.

$$\text{No-load running torque on the input shaft side (N-m)} = \frac{\text{No-load running torque on the output shaft side (N-m)}}{\text{Speed ratio}}$$

Selection Flowchart





Selection examples

(1) Examine the load characteristics

● Usage conditions

$T_1 = 2,500\text{N}\cdot\text{m}$ $T_2 = 500\text{N}\cdot\text{m}$ $T_3 = 1,500\text{N}\cdot\text{m}$ $T_{em} = 7,000\text{N}\cdot\text{m}$
 $t_1 = 0.2\text{sec}$ $t_2 = 0.5\text{sec}$ $t_3 = 0.2\text{sec}$ $t_{em} = 0.05\text{sec}$
 $N_1 = N_3 = 10\text{r.p.m.}$ $N_2 = 20\text{r.p.m.}$ $N_{em} = 20\text{r.p.m.}$

● Calculation of average load torque

$$T_m = \frac{0.2 \times 10 \times 2,500^{\frac{10}{3}} + 0.5 \times 20 \times 500^{\frac{10}{3}} + 0.2 \times 10 \times 1,500^{\frac{10}{3}}}{0.2 \times 10 + 0.5 \times 20 + 0.2 \times 10}$$

$$= 1,475\text{N}\cdot\text{m}$$

● Calculation of average output speed

$$N_m = \frac{0.2 \times 10 + 0.5 \times 20 + 0.2 \times 10}{0.2 + 0.5 + 0.2} = 15.6\text{r.p.m.}$$

● Tentative selection of frame number

Temporarily select RA-160EC from the T_m and N_m values.
 $1,475\text{N}\cdot\text{m} < 1,568\text{N}\cdot\text{m}$, $15.6\text{r.p.m.} < 27\text{r.p.m.}$

Rated torque of RA-160EC

Maximum allowable output speed of RA-160EC

● Calculation of life

$$L_h = 6000 \times \frac{15}{15.6} \times \left(\frac{1,568}{1,475}\right)^{\frac{10}{3}} = 7,073\text{Hr}$$

$$7,073 > 5,000$$

Required life

● Examine the maximum output speed

$20\text{r.p.m.} < 27\text{r.p.m.}$

Maximum allowable output speed of RA-160EC [Continuous]

● Examine the acceleration/deceleration torque

$T_{max} = T_1 = 2,500\text{N}\cdot\text{m} < 3,920\text{N}\cdot\text{m}$

Allowable acceleration/deceleration torque of RA-160EC

● Examine the emergency stop and external impact torque

$T_{em} = 7,000\text{N}\cdot\text{m} < 7,840\text{N}\cdot\text{m}$

Momentary maximum allowable torque of RA-160EC

$$C_{em} = \frac{775 \times \left(\frac{5 \times 1,568}{7,000}\right)^{\frac{10}{3}}}{40 \times \frac{20}{60} \times 0.05} = 1696 \text{ times}$$

150 times < 1696 times

Actual applied speed

(2) Examine the main bearing capacity

● External load conditions

$W_1 = 3,000\text{N}$ $L_1 = 500\text{mm}$
 $W_2 = 1,500\text{N}$ $L_2 = 200\text{mm}$

● Examine the thrust load

$1,500\text{N} < 14,700\text{N}$

Maximum thrust load of RA-160EC

● Examine the load moment (RA-160EC)

$$M_c = 3,000 \times \frac{(201.8 + 500)}{1,000} + 1,500 \times \frac{200}{1,000}$$

$$= 2,405.4\text{N}\cdot\text{m}$$

$2,405.4\text{N}\cdot\text{m} < 3,920\text{N}\cdot\text{m}$

Allowable moment of RA-160EC

● RA-160EC is selected (All conditions are met)

1. Installation of the reduction gear and mounting it to the output shaft

- When installing the reduction gear and mounting it to the output shaft, use hexagon socket head cap screws and tighten them with the torque as specified below, in order to satisfy the momentary maximum allowable torque, which is noted in the rating table.

Employment of the Belleville spring washer is recommended to prevent the hexagon socket head cap screws and protect their seat surface from flaws.

(1) Bolt tightening torque and tightening force

Hexagon socket head cap screw Nominal size x pitch	Tightening torque (N-m)	Tightening force F (N)	Bolt specifications
M5 x 0.8	9.01 ± 0.49	9310	<ul style="list-style-type: none"> ◆ Hexagon socket head cap screw JIS B 1176 ◆ Strength class JIS B 1051 12.9 ◆ Thread JIS B 0205 6g or class 2
M6 x 1.0	15.6 ± 0.78	13180	
M8 x 1.25	37.2 ± 1.86	23960	
M10 x 1.5	73.5 ± 3.43	38080	
M12 x 1.75	128.4 ± 6.37	55100	
M14 x 2.0	204.8 ± 10.2	75860	
M16 x 2.0	318.5 ± 15.9	103410	

Note: 1. The tightening torque values listed are for steel or cast iron material.

2. If softer material, such as aluminum or stainless steel, is used, limit the tightening torque.

Also, pay attention to the system requirements of the transmission torque.

(2) Calculation of allowable transmission torque of bolts.

$T = F \times \frac{D \times 10^{-3}}{2} \times \mu \times n$	T	Allowable transmission torque by tightening bolt (N-m)
	F	Bolt tightening force (N)
	D	Bolt mounting P.C.D (mm)
	μ	Friction factor μ=0.15... When grease remains of the mating face μ=0.20.. When grease has been removed from the mating face
	n	Number of bolts (pcs)

(3) Serrated lock washer for hexagon socket head cap screw

Name : Belleville spring washer (made by Heiwa Hatsujo Industry Co., Ltd.)

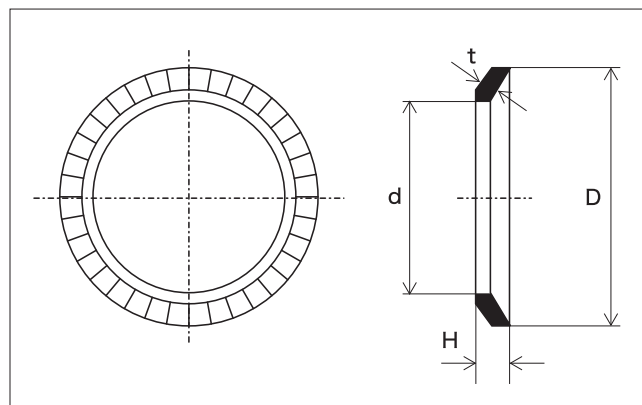
Corporation symbol : Bell SW-2H (nominal size)

Material : S50CM to S65CM

Hardness : HRC40 to 48

(Unit: mm)

Normal size	ID and OD of Belleville spring washer		t	H
	d Basic size	D		
5	5.25	8.5	0.6	0.85
6	6.4	10	1.0	1.25
8	8.4	13	1.2	1.55
10	10.6	16	1.5	1.9
12	12.6	18	1.8	2.2
14	14.6	21	2.0	2.5
16	16.9	24	2.3	2.8

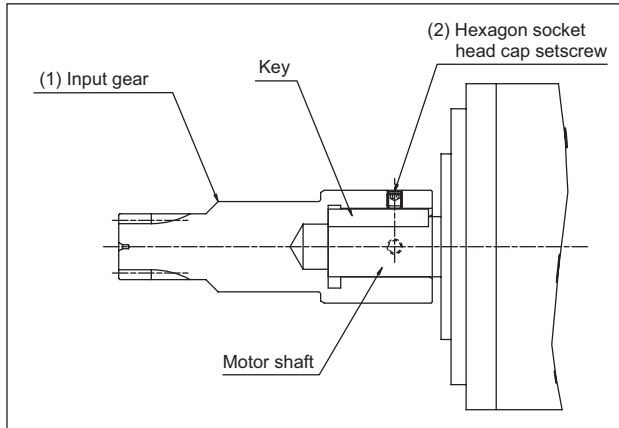


Note: When using any equivalent washer, select it with special care given to its outer diameter.

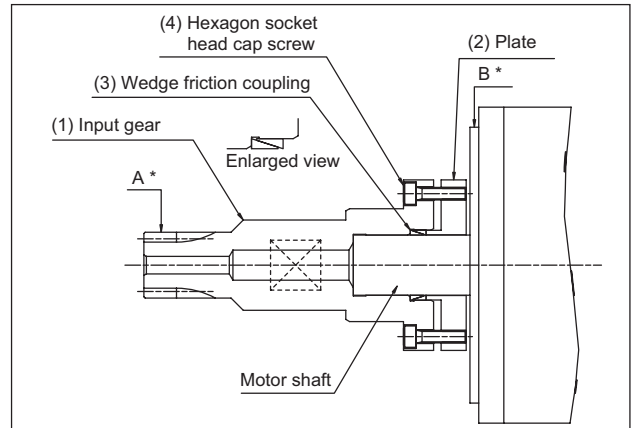
2. Mounting the input gear

- The following is a representative case for connecting an input gear to a servo motor shaft.

(1) For straight shaft (with key)

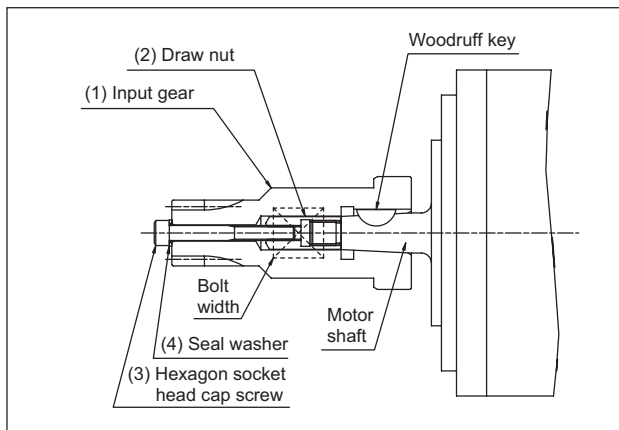


(2) For straight shaft (without key)



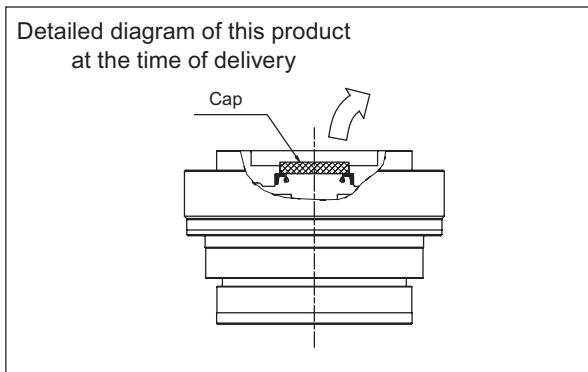
* Adjust the deviation of "A" at the edge of the input gear to 70 μ m or less against "B" on the motor mounting pilot diameter.

(3) For 1/10 tapered shaft



3. Notes when assembling an input gear

- (1) Remove the cap when assembling an input gear.

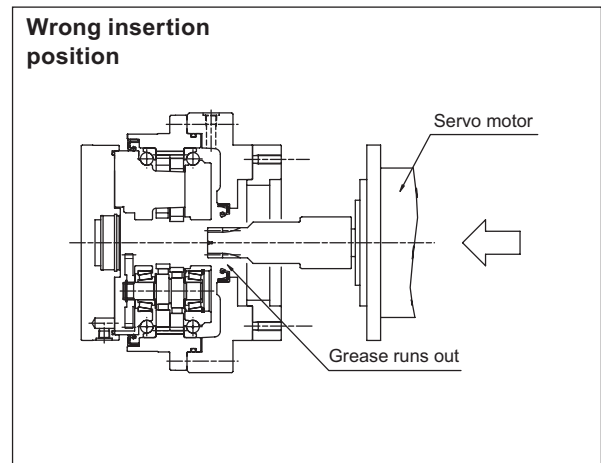
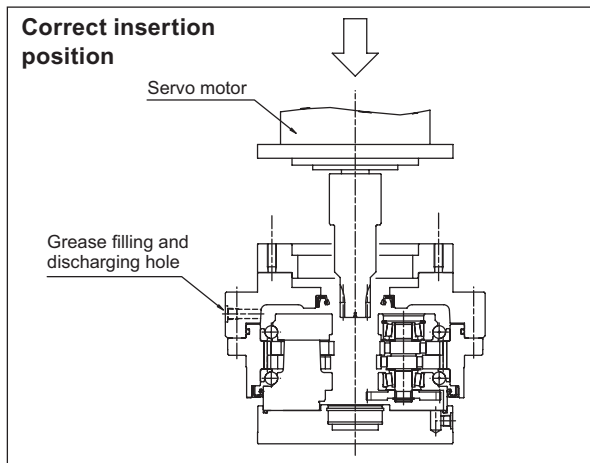


(2) Insert the input gear directly downward with the reduction gear held vertical.

If the reduction gear is in a horizontal state, grease will run out from the input gear insertion part.

After inserting the input gear, remove one of the hexagon plugs (one of two) from the grease filling and discharging hole once to release the increased pressure inside the reduction gear, and then re-wrap the sealing tape to re-install the gear.

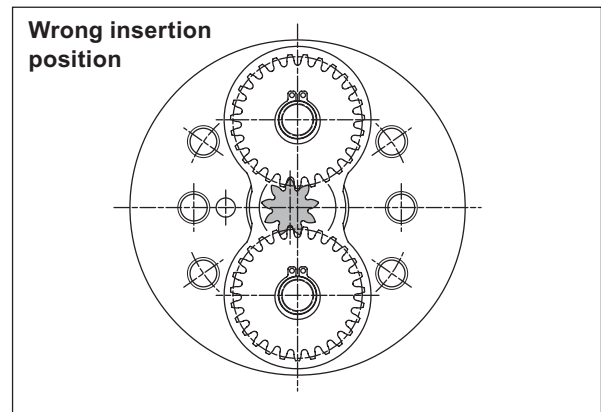
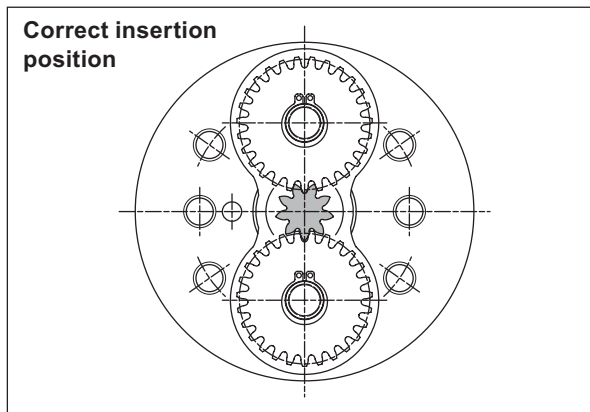
At that time, tighten the hexagon plug (PT1/8) with a tightening torque of 12.3 N-m.



(3) RA-20E and 40E have two spur gears. Please remember this particularly when assembling the input gear.

If the input gear does not align with the spur gears, insert the input gear while changing the angle a little toward the circumference. Then, check that the motor flange surface is closely attached without tilting. At this time, do not tighten the input gear with bolts or the like.

If the flange surface is tilted, it may be in the state shown in the figure below.



4. Lubrication

- The standard lubrication method for the RA reduction gears is greasing. Before the reduction gear is shipped, it is filled with our recommended grease (VIGO GREASE RE0). When operating a reduction gear filled with the appropriate amount of grease, the standard replacement time due to deterioration of grease is 20,000 hours. When using the gear with deteriorated grease or under an inappropriate ambient temperature condition (40°C or more), check the deterioration condition of the grease and determine the appropriate replacement cycle.
- Specified grease name

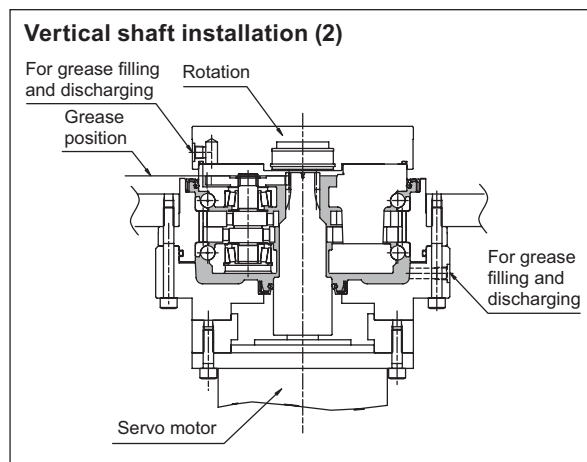
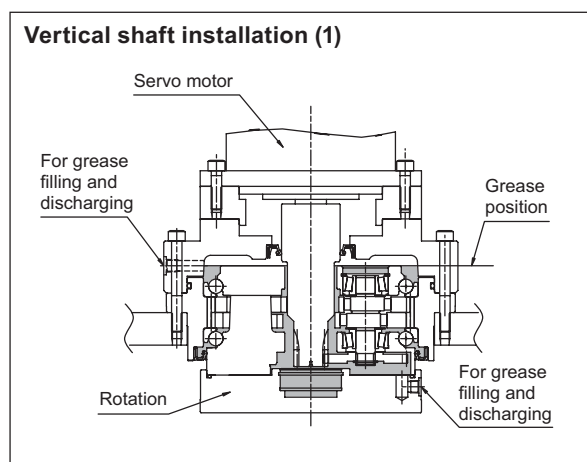
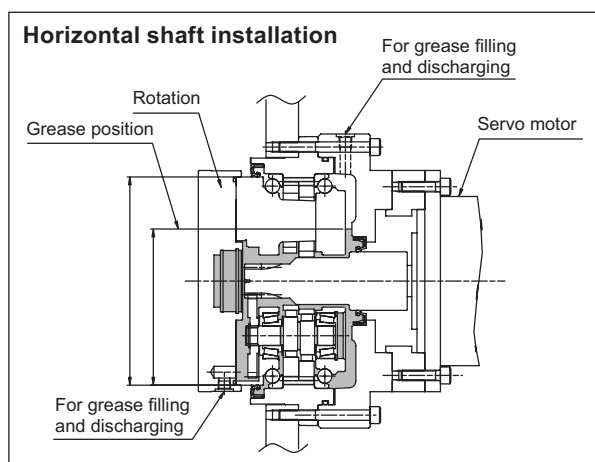
Grease name	VIGOGREASE RE0
Manufacturer	Nabtesco Corporation
Ambient temperature	-10 to 40°C

● Amount of grease in the reduction gear

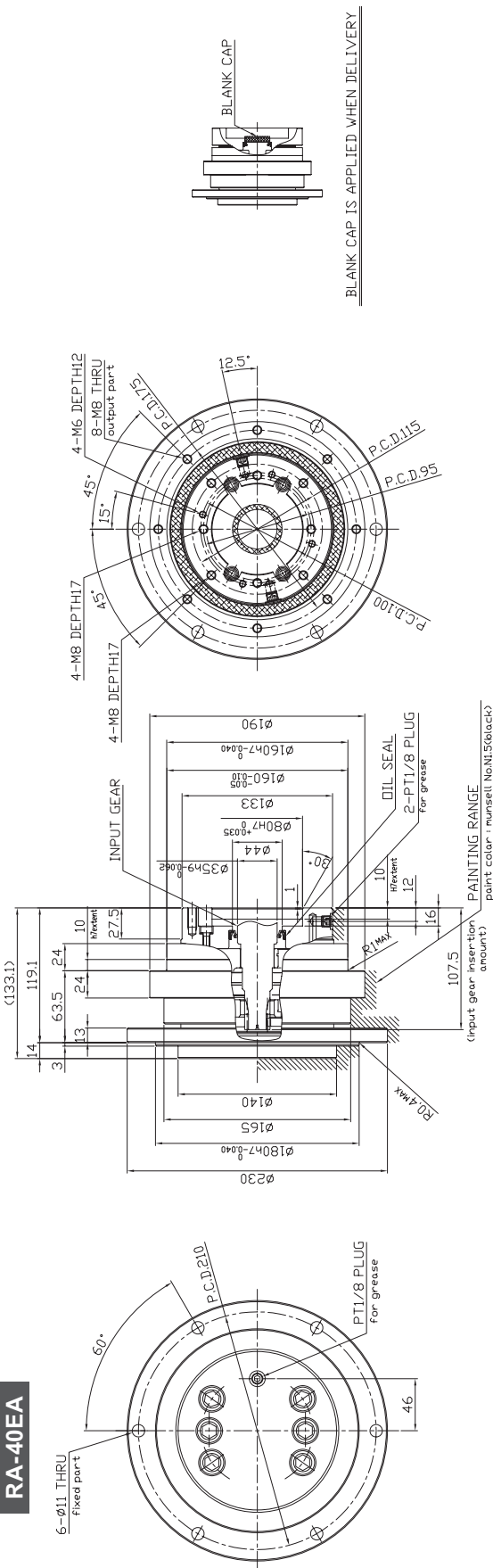
Models	Required input amount					
	Horizontal shaft installation		Vertical shaft installation (1)		Vertical shaft installation (2)	
	cc	(g)	cc	(g)	cc	(g)
RA-EA Series						
RA-20EA	86	(75)	85	(74)	71	(62)
RA-40EA	169	(147)	167	(145)	148	(128)
RA-80EA	381	(331)	383	(333)	324	(281)
RA-160EA	655	(570)	656	(571)	647	(563)
RA-EC Series						
RA-20EC	169	(147)	163	(142)	176	(153)
RA-40EC	299	(260)	264	(230)	309	(269)
RA-80EC	473	(412)	427	(371)	439	(382)
RA-160EC	689	(599)	546	(474)	690	(600)

Note: After replacement, fill the reduction gear with the required amount of our recommended lubricant.
If it is filled excessively, however, the internal pressure increases and the oil seal may be damaged.

● Greasing position

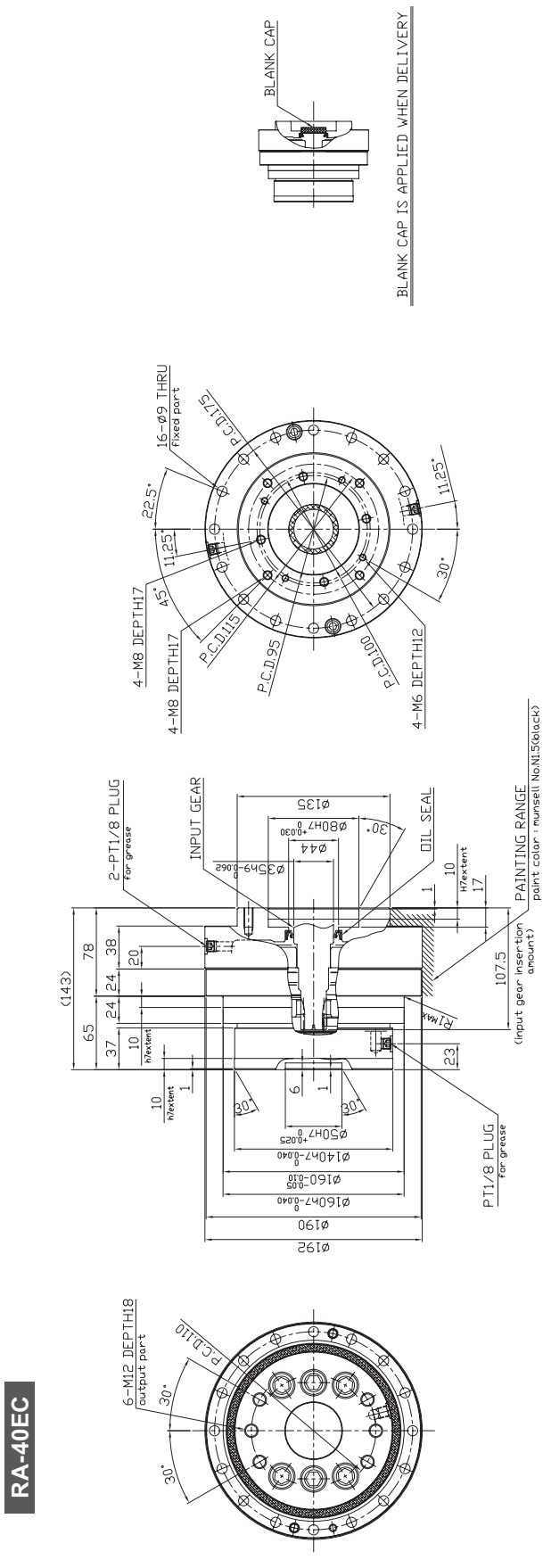


RA-40EA

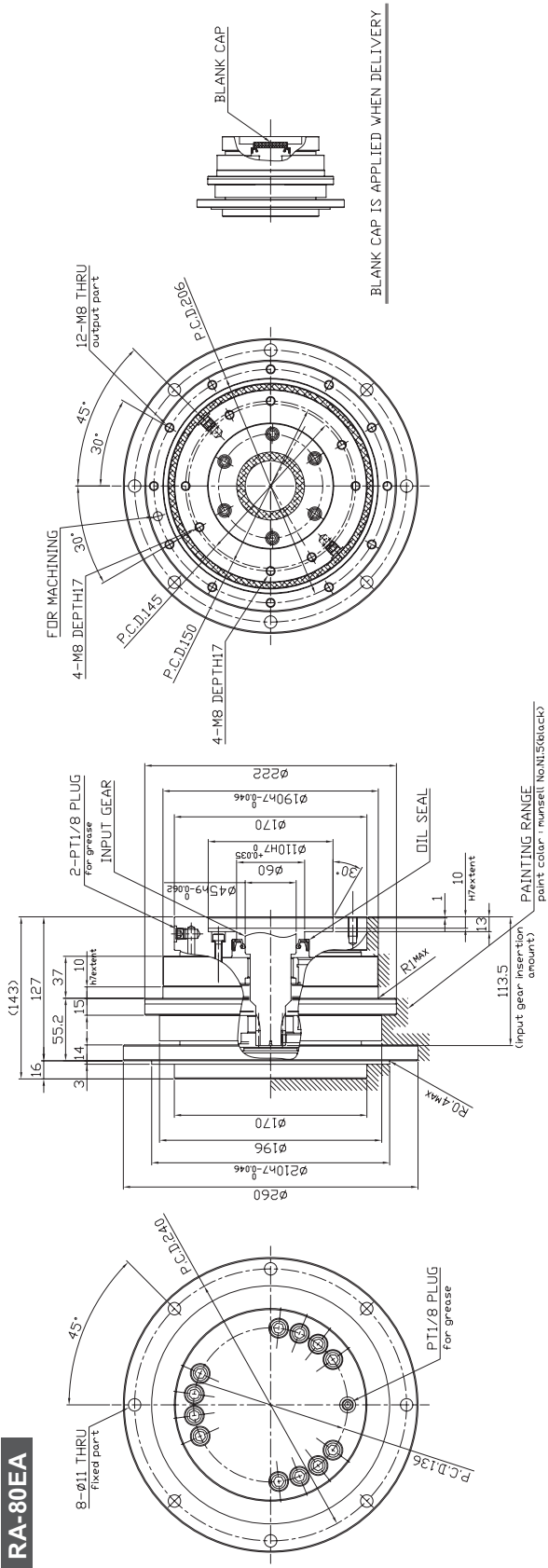


Note: Install the RA-EA series using the alignment indicated in the above figure, as their cases rotate. If this is not done, there may be insufficient lubrication in the crankshaft.

RA-40EC

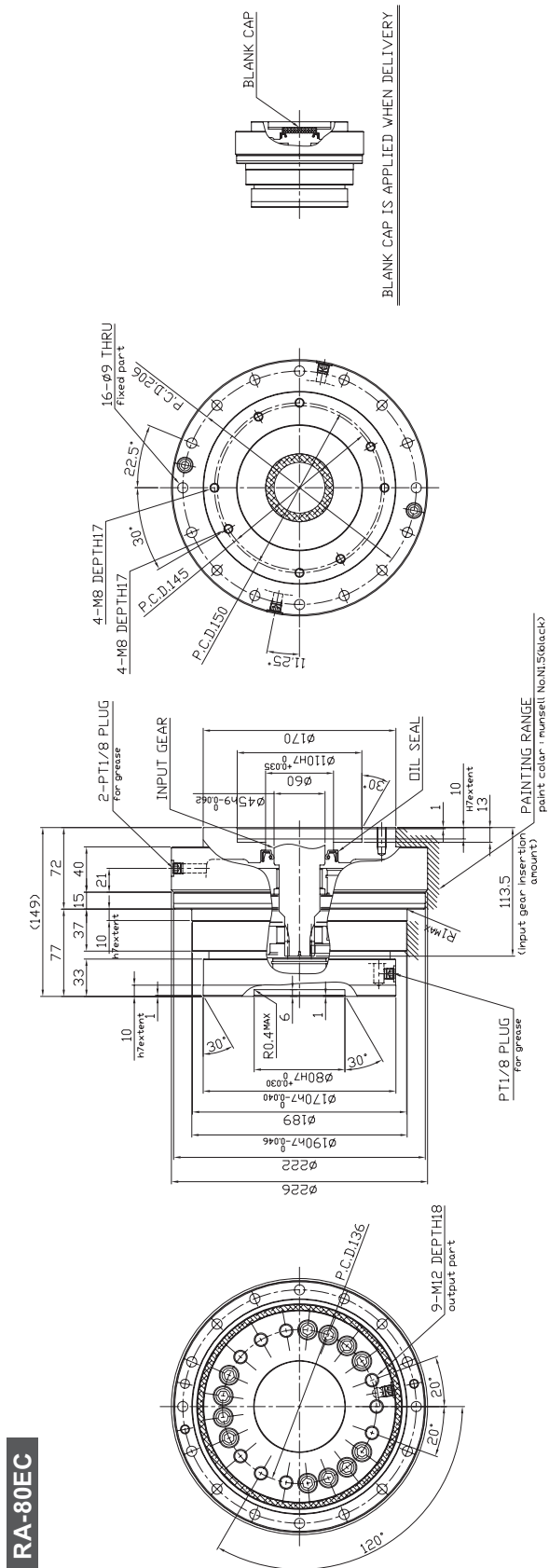


RA-80EA



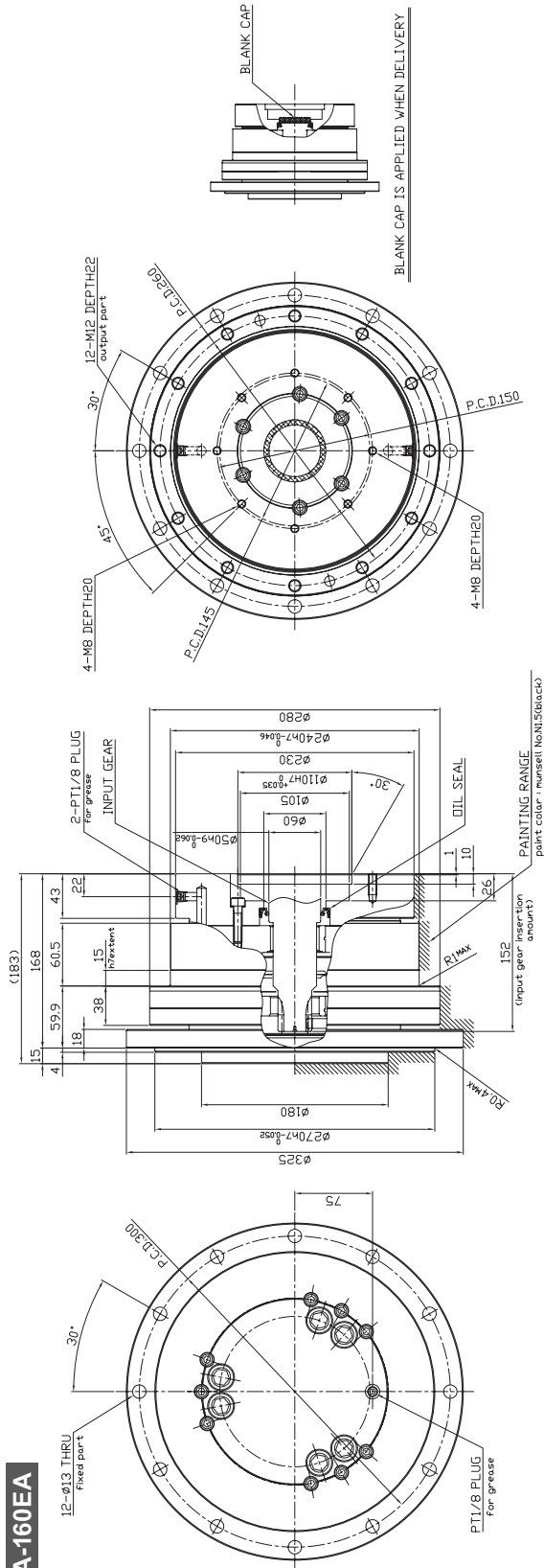
Note: Install the RA-EA series using the alignment indicated in the above figure, as their cases rotate. If this is not done, there may be insufficient lubrication in the crankshaft.

RA-80EC



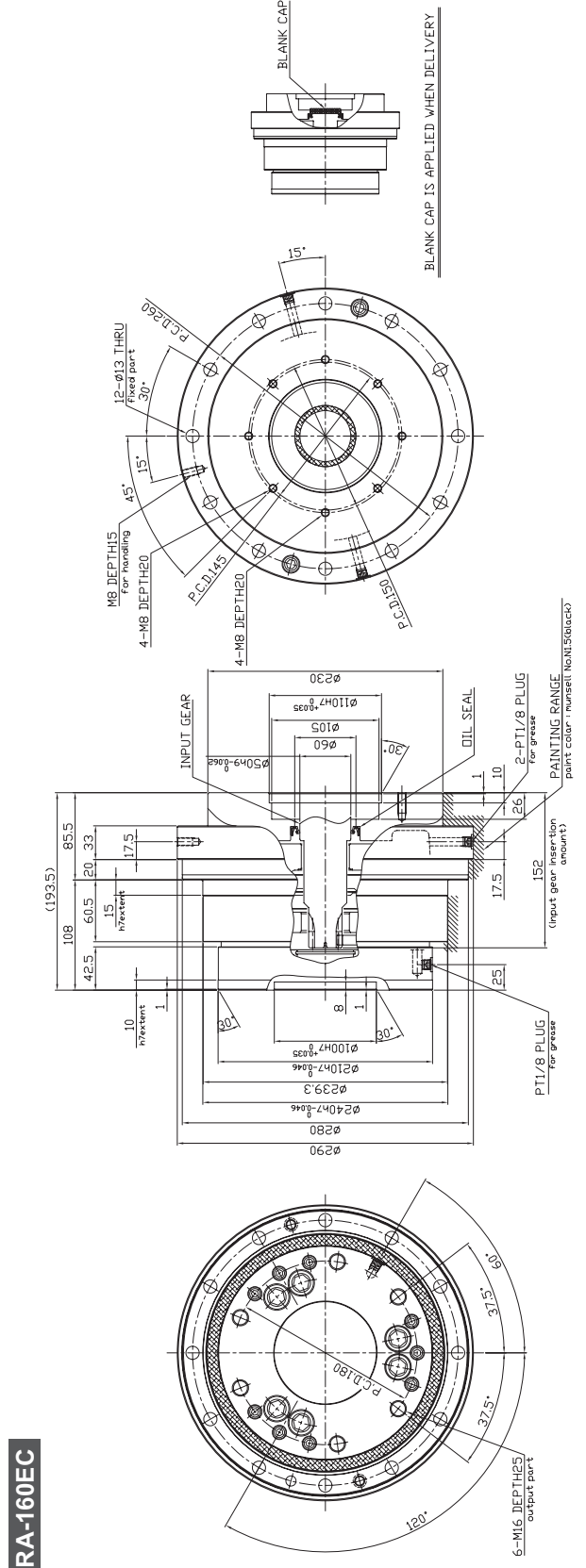
The total length does not include the length of the motor flange.

RA-160EA



Note: Install the RA-EA series using the alignment indicated in the above figure, as their cases rotate. If this is not done, there may be insufficient lubrication in the crankshaft.

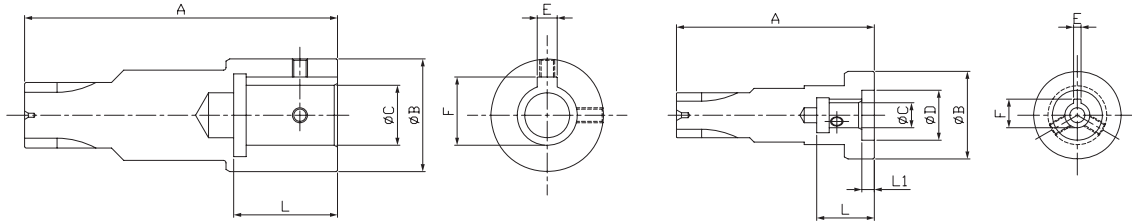
RA-160EC





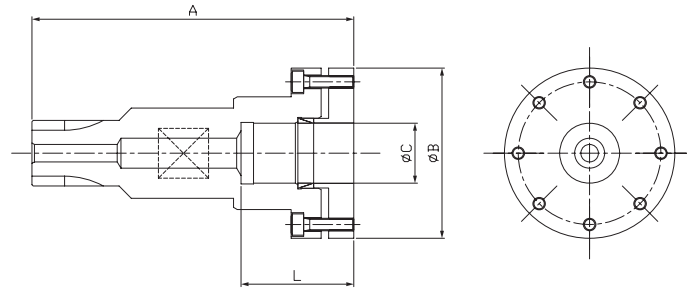
Outside Dimension Drawing Input gear

For straight shaft (without key)



Models	Speed ratio		Part number	Input gear dimensions (mm)										
	EA	EC		A	ØB	ØC	ØD	L	L1	E	F			
RA-20E	80	81	21RA107-*	79	35	10H7	+0.015 0	20	23	5	3	±0.0125	11.4	+0.2 0
	104	105	21RA107A*											
	120	121	21RA107B*											
	140	141	21RA107C*											
	160	161	21RA107D*	94.5	35	14	+0.030 +0.012	-	21.5	-	5	±0.015	16.3	+0.2 0
	80	81	21RA107BL*											
	104	105	21RA107BM*											
	120	121	21RA107BN*											
	140	141	21RA107BP*	135.5	42	24H7	+0.021 0	-	47.5	-	8	±0.018	27.3	+0.2 0
	160	161	21RA107BQ*											
	80	81	21RA107K*											
	104	105	21RA107L*											
	120	121	21RA107M*	113	35	19	+0.036 +0.015	-	35	-	6	±0.015	21.8	+0.2 0
	140	141	21RA107N*											
	160	161	21RA107P*											
	80	81	21RA107Q*											
	104	105	21RA107R*	138	42	24	+0.036 +0.015	-	45	-	8	±0.018	27.3	+0.2 0
	120	121	21RA107T*											
	140	141	21RA107U*											
	160	161	21RA107W*											
80	81	21RA107X*	120	35	19H7	+0.021 0	-	37.5	-	6	±0.015	21.8	+0.2 0	
104	105	21RA107Y*												
120	121	21RA107Z*												
140	141	21RA107AA*												
160	161	21RA107AB*	99	35	14	+0.030 +0.012	-	21.5	-	5	±0.015	16.3	+0.2 0	
80	81	31RA107-*												
104	105	31RA107A*												
120	121	31RA107B*												
152	153	31RA107C*	150	42	24H7	+0.021 0	-	47.5	-	8	±0.018	27.3	+0.2 0	
80	81	31RA107D*												
104	105	31RA107E*												
120	121	31RA107F*												
152	153	31RA107G*	142.5	42	24	+0.036 +0.015	-	45	-	8	±0.018	27.3	+0.2 0	
80	81	31RA107H*												
104	105	31RA107J*												
120	121	31RA107K*												
152	153	31RA107L*	150	50	32	+0.043 +0.018	-	50.5	-	10	±0.018	35.3	+0.2 0	
80	81	31RA107M*												
104	105	31RA107N*												
120	121	31RA107P*												
152	153	31RA107Q*	96	45	19H7	+0.021 0	-	37.5	-	6	±0.015	21.8	+0.2 0	
80	81	31RA107R*												
104	105	31RA107T*												
120	121	31RA107U*												
152	153	31RA107W*	177	55	35	+0.035 +0.010	-	72.5	-	10	±0.018	38.3	+0.2 0	
80	81	41RA107-*												
100	101	41RA107A*												
120	121	41RA107B*												
152	153	41RA107C*	125	45	24H7	+0.021 0	-	41.5	-	8	±0.018	27.3	+0.2 0	
80	81	41RA107BD*												
100	101	41RA107BE*												
120	121	41RA107BF*												
152	153	41RA107BG*	128.5	45	24	+0.036 +0.015	-	45	-	8	±0.018	27.3	+0.2 0	
80	81	41RA107H*												
100	101	41RA107J*												
120	121	41RA107K*												
152	153	41RA107L*	156	50	32	+0.043 +0.018	-	50.5	-	10	±0.018	35.3	+0.2 0	
80	81	41RA107M*												
100	101	41RA107N*												
120	121	41RA107P*												
152	153	41RA107Q*	205	58	35	+0.035 +0.010	-	72	-	10	±0.018	38.3	+0.2 0	
80	81	41RA107R*												
100	101	41RA107T*												
120	121	41RA107U*												
152	153	41RA107W*	140	50	24H7	+0.021 0	-	43	-	8	±0.018	27.3	+0.2 0	
80	81	51RA107-*												
100	101	51RA107A*												
128	129	51RA107B*												
144	145	51RA107C*	164	58	32	+0.043 +0.018	-	50	-	10	±0.018	35.3	+0.2 0	
170	171	51RA107D*												
80	81	51RA107E*												
100	101	51RA107F*												
128	129	51RA107G*												
144	145	51RA107H*												
170	171	51RA107J*												
80	81	51RA107K*												
100	101	51RA107L*												
128	129	51RA107M*												
144	145	51RA107N*												
170	171	51RA107P*												

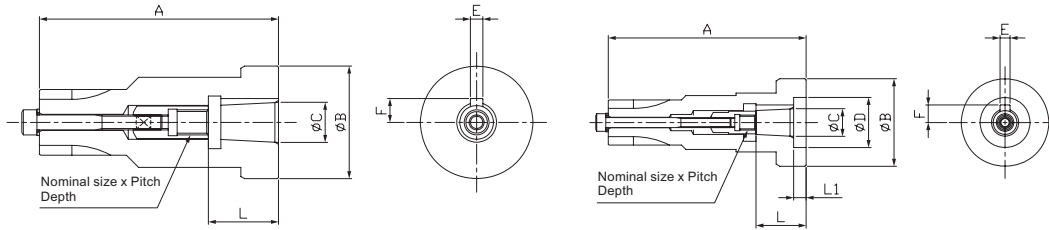
For straight shaft (without key)



Models	Speed ratio		Part number	Input gear dimensions (mm)				Transmission torque N·m	
	EA	EC		A	ΦB	ΦC	L		
RA-20E	80	81	21RA405AC*	113	63	19	+0.036 +0.015	35	52.4
	104	105	21RA405AD*						
	120	121	21RA405AE*						
	140	141	21RA405AF*						
	160	161	21RA405AG*	123	63	24	+0.036 +0.015	45	
	80	81	21RA405AH*						
	104	105	21RA405AJ*						
	120	121	21RA405AK*						
	140	141	21RA405AL*	120.5	63	24H7	+0.021 0	47.5	
	160	161	21RA405AM*						
	80	81	21RA405AN*						
	104	105	21RA405AP*						
120	121	21RA405AQ*	132.5	63	24	+0.036 +0.015	45		
140	141	21RA405AR*							
160	161	21RA405AT*							
80	81	31RA405AZ*						150	68
104	105	31RA405BA*							
120	121	31RA405BB*							
152	153	31RA405BC*							
80	81	31RA405AB*	120	63	19H7	+0.021 0	37.5		
104	105	31RA405AC*							
120	121	31RA405AD*							
152	153	31RA405AE*							
80	81	31RA405AF*	127.5	63	24H7	+0.021 0	45		
104	105	31RA405AG*							
120	121	31RA405AH*							
152	153	31RA405AJ*							
80	81	31RA405AK*	128.5	68	24	+0.036 +0.015	45		
104	105	31RA405AL*							
120	121	31RA405AM*							
152	153	31RA405AN*							
80	81	41RA405X*	136	68	32	+0.043 +0.018	50.5		
100	101	41RA405Y*							
120	121	41RA405Z*							
152	153	41RA405AA*							
80	81	41RA405AB*	131	68	19H7	+0.021 0	37.5		
100	101	41RA405AC*							
120	121	41RA405AD*							
152	153	41RA405AE*							
80	81	41RA405AF*	157	68	35	+0.035 +0.010	72.5		
100	101	41RA405AG*							
120	121	41RA405AH*							
152	153	41RA405AJ*							
80	81	41RA405AK*	135	68	24H7	+0.021 0	41.5		
100	101	41RA405AL*							
120	121	41RA405AM*							
152	153	41RA405AN*							
80	81	41RA405AP*	164	84	32	+0.043 +0.018	50		
100	101	41RA405AQ*							
120	121	41RA405AR*							
152	153	41RA405AS*							
80	81	51RA405Q*	180	84	35	+0.035 +0.010	67		
100	101	51RA405R*							
128	129	51RA405T*							
144	145	51RA405U*							
170	171	51RA405W*	160	84	24H7	+0.021 0	43		
80	81	51RA405X*							
100	101	51RA405Y*							
128	129	51RA405Z*							
144	145	51RA405AA*	170	84	24H7	+0.021 0	43		
170	171	51RA405AB*							
80	81	51RA405AC*							
100	101	51RA405AD*							
128	129	51RA405AE*	170	84	24H7	+0.021 0	43		
144	145	51RA405AF*							
170	171	51RA405AG*							
170	171	51RA405AG*							

- The part numbers attached with * at the end are our revised numbers. These are subject to change without advance notice.
- The shapes used in this figure are representative examples only. For this reason, the shapes of actual parts may differ from those in the drawing.

For 1/10 tapered shaft

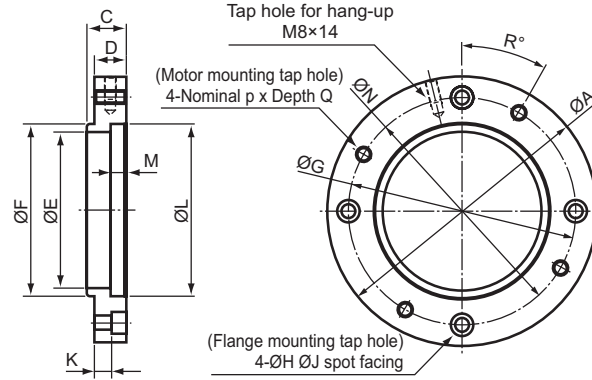


Models	Speed ratio		Part number	Input gear dimensions (mm)										Screw part			
	EA	EC		A	ΦB	ΦC	ΦD	L	L1	E	F	Nomi-nal size	Pitch	Depth			
RA-20E	80	81	21RA406BA*	79	35	11	+0.1 0	20	20	5	4	+0.040 +0.010	7	+0.2 0	M6	P1.0	8.5
	104	105	21RA406BB*														
	120	121	21RA406BC*														
	140	141	21RA406BD*														
	160	161	21RA406BE*														
	80	81	21RA406BF*														
RA-20E	104	105	21RA406BG*	89	35	14	+0.1 0	-	18	-	4	+0.040 +0.010	8.5	+0.2 0	M8	P1.0	14
	120	121	21RA406BH*														
	140	141	21RA406BJ*														
	160	161	21RA406BK*														
	80	81	31RA406AP*														
	104	105	31RA406AQ*														
RA-40E	120	121	31RA406AR*	119.5	35	16	+0.1 0	-	28	-	5	+0.040 +0.010	9.5	+0.2 0	M10	P1.25	16
	152	153	31RA406AT*														
	80	81	31RA406AU*														
	104	105	31RA406AW*														
	120	121	31RA406AX*														
	152	153	31RA406AY*														
RA-80E	80	81	41RA406AU*	95.5	45	16	+0.1 0	-	28	-	5	+0.040 +0.010	9.5	+0.2 0	M10	P1.25	16
	100	101	41RA406AW*														
	120	121	41RA406AX*														
	152	153	41RA406AY*														
	80	81	41RA406AZ*														
	100	101	41RA406BA*														
RA-160E	120	121	41RA406BB*	141.5	50	32	+0.1 0	-	58	-	7	+0.080 +0.043	17.75	+0.2 0	M20	P1.5	23
	152	153	41RA406BC*														
	80	81	51RA406AH*														
	100	101	51RA406AJ*														
	128	129	51RA406AK*														
	144	145	51RA406AL*														
	170	171	51RA406AM*														
	80	81	51RA406AN*														
	100	101	51RA406AP*														
	128	129	51RA406AQ*														
RA-160E	144	145	51RA406AR*	170	50	32	+0.1 0	-	58	-	7	+0.080 +0.043	17.75	+0.2 0	M20	P1.5	23
	170	171	51RA406AT*														
	100	101	51RA406AP*														
	128	129	51RA406AQ*														
RA-160E	144	145	51RA406AR*	134	50	16	+0.1 0	-	28	-	5	+0.040 +0.010	9.5	+0.2 0	M10	P1.25	16
	170	171	51RA406AT*														



Outside Dimension Drawing Motor flange

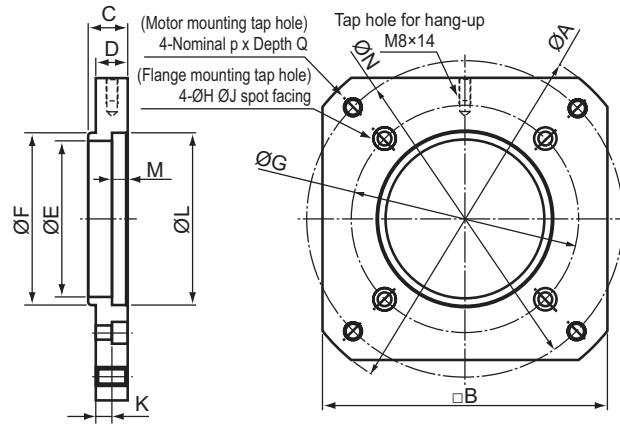
Round type



Models	Part number	Flange outer dimensions (mm)				Reduction gear mounting dimensions (mm)						Motor mounting dimensions (mm)						
		ΦA	C	D	ΦE	ΦF	ΦG	ΦH	ΦJ	K	ΦL	M	ϕN	P	Q	R°		
RA-20E	21RA203B*	123	19	15	70	80h7	0 -0.030	100	6.6	11	7	80H7	+0.030 0	6	100	M6	15	45
	21RA203D*	123	34	30	70	80h7	0 -0.030	100	6.6	11	7	80	+0.037 +0.012	10	100	M6	15	45
RA-80E	20S203R*	170	30	25	100	110h7	0 -0.035	145	9	14	10	110H7	+0.035 0	10	145	M8	20	30
	20S203T*	170	25	20	100	110h7	0 -0.035	145	9	14	10	110	+0.038 +0.013	10	130	M8	20	30
	20S203U*	170	40	35	100	110h7	0 -0.035	145	9	14	10	110H7	+0.035 0	10	145	M8	20	30
	20S203AA*	190	55	50	100	110h7	0 -0.035	150	9	14	10	130	+0.039 +0.014	10	165	M10	20	45
	20S203AB*	190	35	30	100	110h7	0 -0.035	150	9	14	10	130	+0.039 +0.014	10	165	M10	20	45
RA-160E	20S203-*	170	25	20	100	110h7	0 -0.035	145	9	14	10	110H7	+0.035 0	10	145	M8	20	30
	20S203Y*	190	25	20	100	110h7	0 -0.035	150	9	14	10	130	+0.039 +0.014	10	165	M10	20	45

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Square type



Models	Part number	Flange outer dimensions (mm)					Reduction gear mounting dimensions (mm)						Motor mounting dimensions (mm)				
		ΦA	ΦB	C	D	ΦE	ΦF	ΦG	ΦH	ΦJ	K	ΦL	M	ΦN	P	Q	
RA-20E	21RA203C*	165	130	59	55	70	80h7 0 -0.030	95	6.6	11	7	110H7	+0.035 0	10	145	M8	20
	21RA203E*	165	130	59	55	70	80h7 0 -0.030	95	6.6	11	7	110	+0.038 +0.013	10	130	M8	20
	21RA203F*	165	130	44	40	70	80h7 0 -0.030	95	6.6	11	7	110	+0.038 +0.013	10	130	M8	20
	21RA203G*	165	130	44	40	70	80h7 0 -0.030	95	6.6	11	7	110H7	+0.035 0	10	145	M8	20
RA-40E	10S203A*	165	130	35	30	72	80h7 0 -0.030	95	9	14	10	110H7	+0.035 0	11	145	M8	20
	10S203F*	165	130	55	50	72	80h7 0 -0.030	95	9	14	10	110H7	+0.035 0	11	145	M8	20
	10S203AG*	165	130	45	40	72	80h7 0 -0.030	95	9	14	10	110	+0.038 +0.013	10	130	M8	20
	10S203AH*	190	150	55	50	72	80h7 0 -0.030	95	9	14	10	130	0.039 +0.014	12	165	M10	20
	10S203AJ*	165	130	35	30	72	80h7 0 -0.030	95	9	14	10	110	+0.038 +0.013	10	130	M8	20
RA-80E	20S203Q*	230	180	75	70	100	110h7 0 -0.035	145	9	14	10	114.3H7	+0.035 0	10	200	M12	20
	20S203AC*	230	180	55	50	100	110h7 0 -0.035	145	9	14	10	114.3H7	+0.035 0	10	200	M12	20
RA-160E	20S203D*	230	180	65	60	100	110h7 0 -0.035	145	9	14	10	114.3H7	+0.035 0	10	200	M12	20
	20S203Z*	230	180	45	40	100	110h7 0 -0.035	145	9	14	10	114.3H7	+0.035 0	10	200	M12	20

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Cautions for use of RA Series

- If the end user of this product is a military interest or the product is to be used in the manufacture of weapons, the product may be subject to export regulations prescribed in the Foreign Exchange and Foreign Trade Control Law. Confirm these conditions before exporting the product and take the necessary steps.
 - When using this product with devices (nuclear facilities, aerospace equipment, transportation equipment, medical equipment, safety devices, etc.) that may directly affect the human body or endanger human life due to an operational malfunction or failure, examination of individual situations is required. Contact our agent or your nearest business office in such a case.
 - Although this product has been manufactured under strict quality control, if it is to be used in equipment that could cause serious injury or damage to facilities as a result of failure of the product, all appropriate safety measures must be taken.
 - When this product is used in a special environment (clean room, food handling facilities, etc.), please contact our agent or your nearest business office.
-

Guarantee

- Nabtesco Corporation guarantees that the RA Gearheads are free from defects in materials and workmanship.
 - The term of guarantee shall be one year after delivery or 2,000 hours of operation after the installation on an actual machine, whichever is earlier, on condition that the product is operated under the rated operation conditions specified by us, under normal assembly and lubrication conditions.
 - If any defect in the materials or workmanship is detected during the above guarantee term, the product will be repaired or replaced at our expense, provided that the number of man-hours required for demounting and remounting the product from the machine, transportation expenses for re-delivery, warehousing and other incidental expenses shall be excluded from our obligation.
 - No compensation will be provided for the lost opportunities or any other type of loss due to a shutdown of operation that was caused by a defect in the product.
 - If compensation under the guarantee is discharged monetarily, the upper limit of the amount shall not exceed the selling price of the product which is the subject of the claim.
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Rev. 000

Nabtesco
Nabtesco Corporation



CAT. 060714

