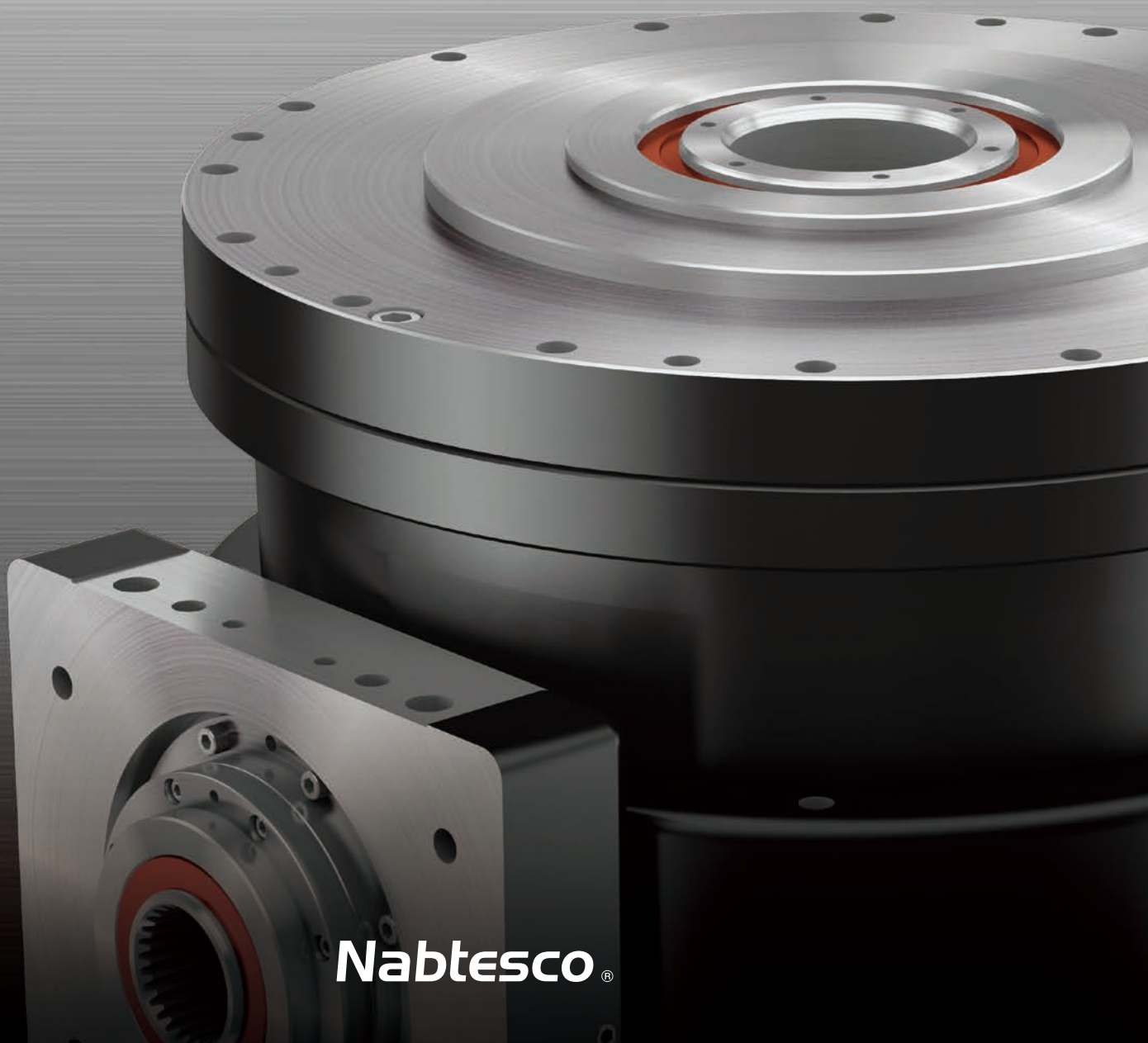




**Precision Reduction Gear RV™**  
**Turntable Gearhead**

**RS**

RS Series

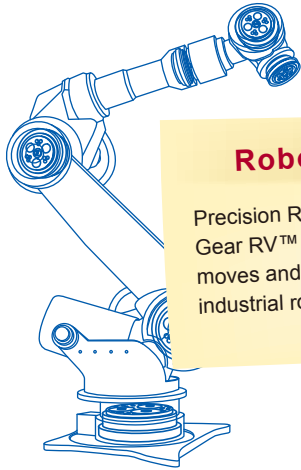


**Nabtesco®**



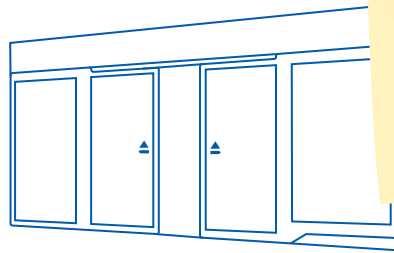
## Contributing to society with our 'Moving it. Stopping it.' technologies

Nabtesco manufactures products which are used in everyday life. Our high-accuracy components are essential for moving objects; they may be rarely visible, but are the foundation of everyday objects that you see moving and wonder how. Nabtesco's technologies are found throughout objects that move and stop people's lives.



### Robots

Precision Reduction Gear RV™ precisely moves and stops industrial robots.

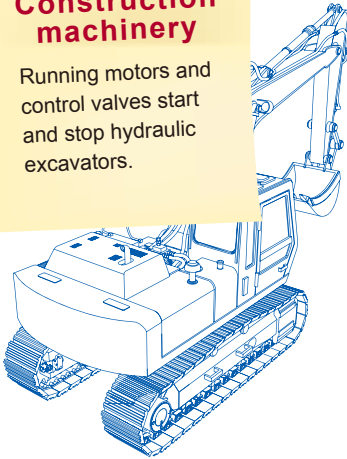


### Doors

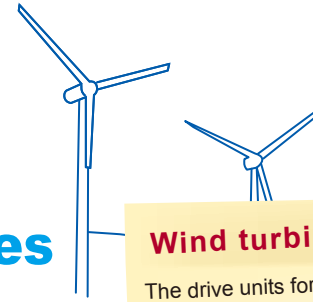
Nabtesco technology opens and closes automatic doors in buildings and platform doors at train stations.

### Construction machinery

Running motors and control valves start and stop hydraulic excavators.

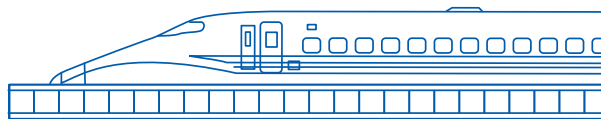


## Nabtesco technologies are at work in many areas of our daily lives.



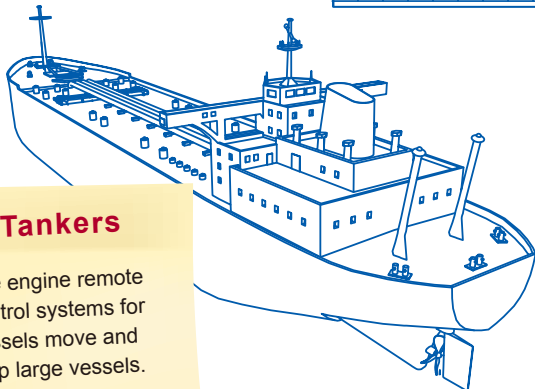
### Wind turbines

The drive units for wind turbine generators control the orientation of the wind turbine and the angle of the blades.



### Bullet trains

Brakes and doors ensure safety and comfort for the world-famous Shinkansen bullet trains.



### Tankers

The engine remote control systems for vessels move and stop large vessels.



### Airplanes

The flight control systems are crucial for the flight safety of aircraft.

# CONTENTS

## Who is Nabtesco?

The key words for Nabtesco are 'motion control'. We use our strengths in the fields of component and systems technologies to develop highly creative products. Through the Nabtesco Group as a whole, we can also utilize our advantage of expertise to maximum effect in order to further enhance these strengths.

In the air, on land and at sea, we have a leading share in various fields of both international and domestic markets. Nabtesco will continue to evolve by utilizing its strengths in many fields and by exploring the possibilities of the future.



# Nabtesco®

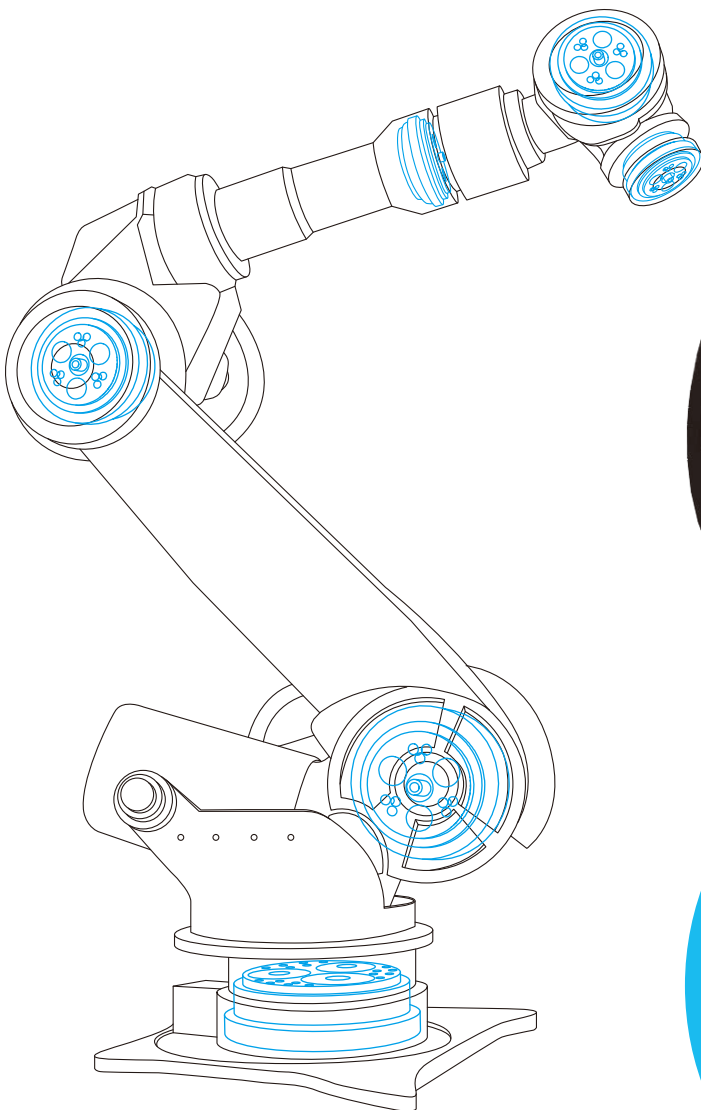
April 2002 Initiation of hydraulic equipment business alliance  
October 2003 Business merger

The business alliance between Teijin Seiki and NABCO on hydraulic equipment projects was the beginning of a mutual confirmation by the companies of the other's product configuration, core technologies, corporate strategies and corporate culture. This led to a common recognition that a business merger would be an extremely effective means of increasing corporate value and achieving long-term development. Based on this mutual judgment, in 2003 an equity transfer was conducted to establish Nabtesco as a pure holding company, with both firms as wholly owned subsidiaries. After a year of preparation, both companies were absorbed and amalgamated by means of a short form merger, and Nabtesco was transitioned to an operating holding company.

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## What is the RS series?

# RS Series Eliminates Turntable Problems!



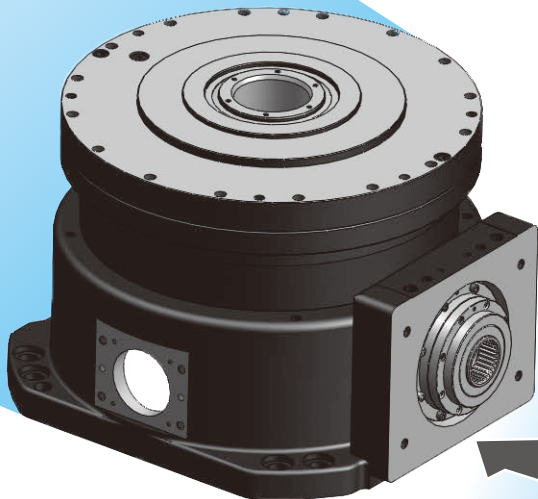
**Industrial robot**

### **Precision Reduction Gear RV™**

Precision Reduction Gear RV™ enables the precision movements of industrial robots and also ensures their strength. Precision Reduction Gear RV™ has been praised for being compact and lightweight while offering high precision and rigidity. Since its debut in 1985, Precision Reduction Gear RV™ has been selected for use by most major industrial robot manufacturers around the world.

## Precision Gearhead RS Series

The RS series continues the success of Nabtesco's world-leading Precision Reduction Gear RV™ series. These low profile gearheads are pre-lubricated with a sealed structure and are available in five types to suit different load capacities. Each type comes with dedicated fasteners that allow it to be mounted on all major motors for immediate use. As well as reducing the time needed for adjustment, the RS series significantly decreases both design and component requirements.



Motor flange

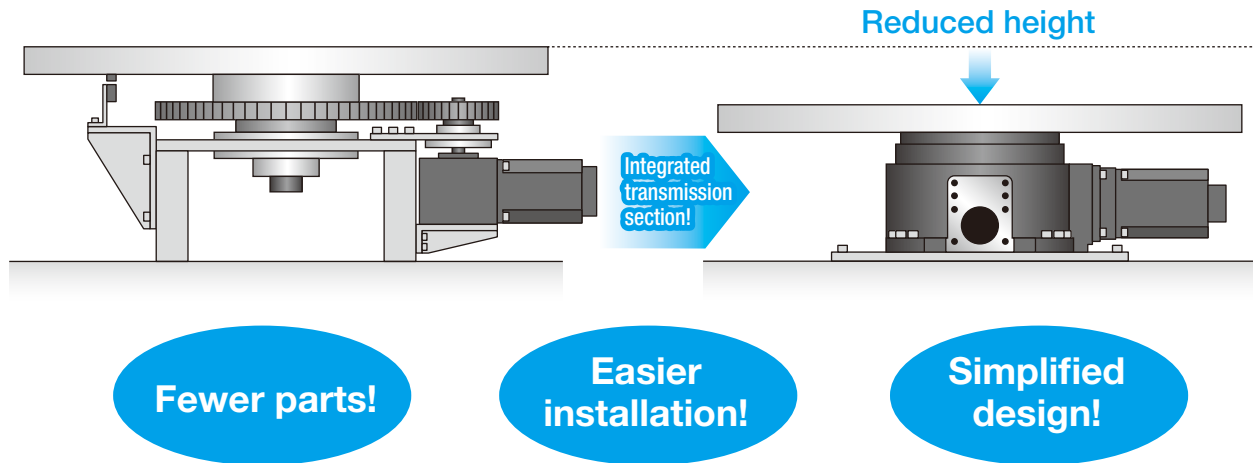
Input spline

Motor fastener components

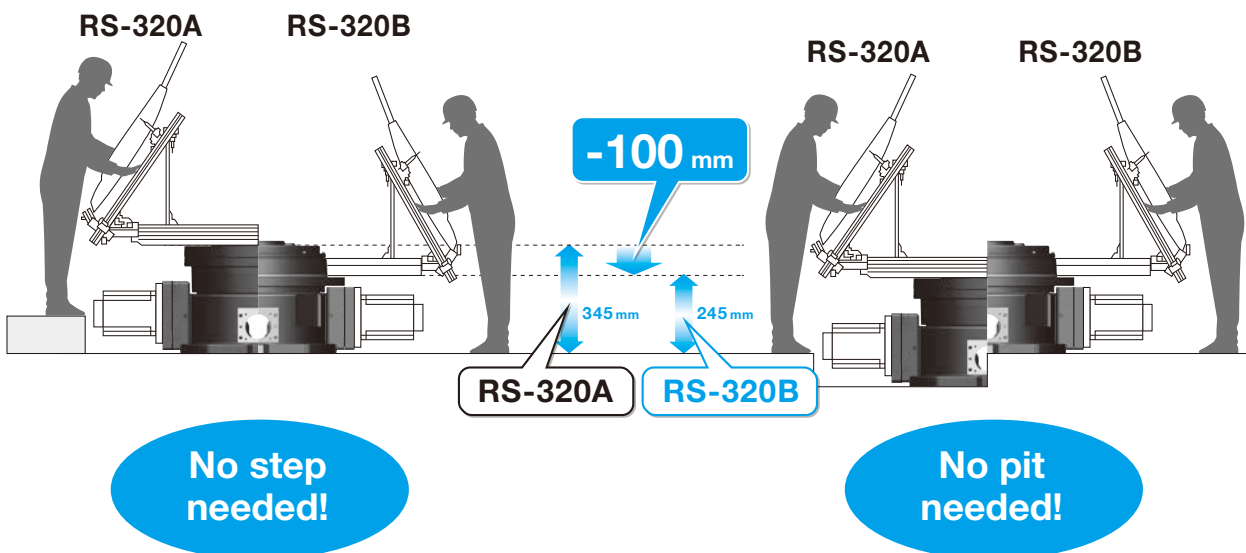
Simple mounting

# Advantages of RS series

More components increase assembly and adjustment times...



Want lower equipment even further...



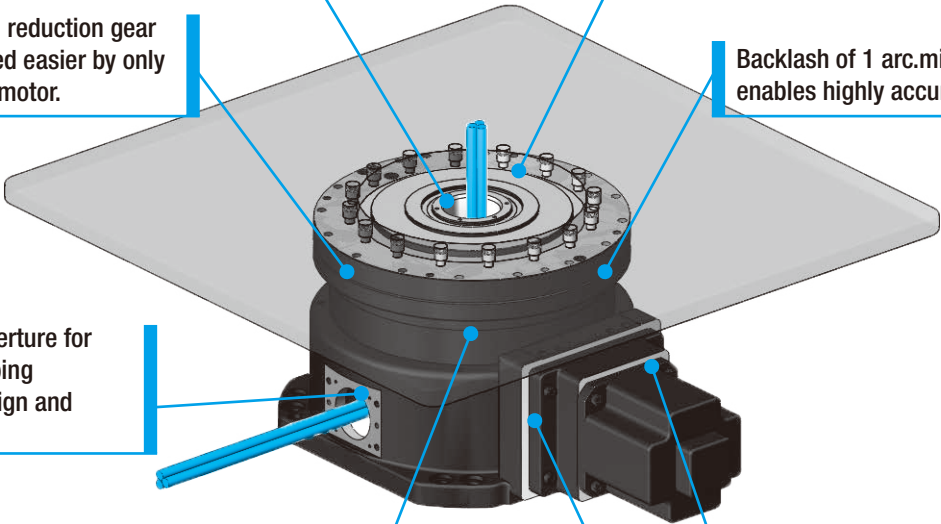
# Individual features of RS series

Wiring and piping can be easily accomplished thanks to the center section and through hole.

Use of a large, built-in main bearing makes it possible to support heavy loads.

Pre-lubricated reduction gear can be installed easier by only mounting the motor.

Backlash of 1 arc.min or less enables highly accurate positioning.



Three-way aperture for wiring and piping simplifies design and installation.

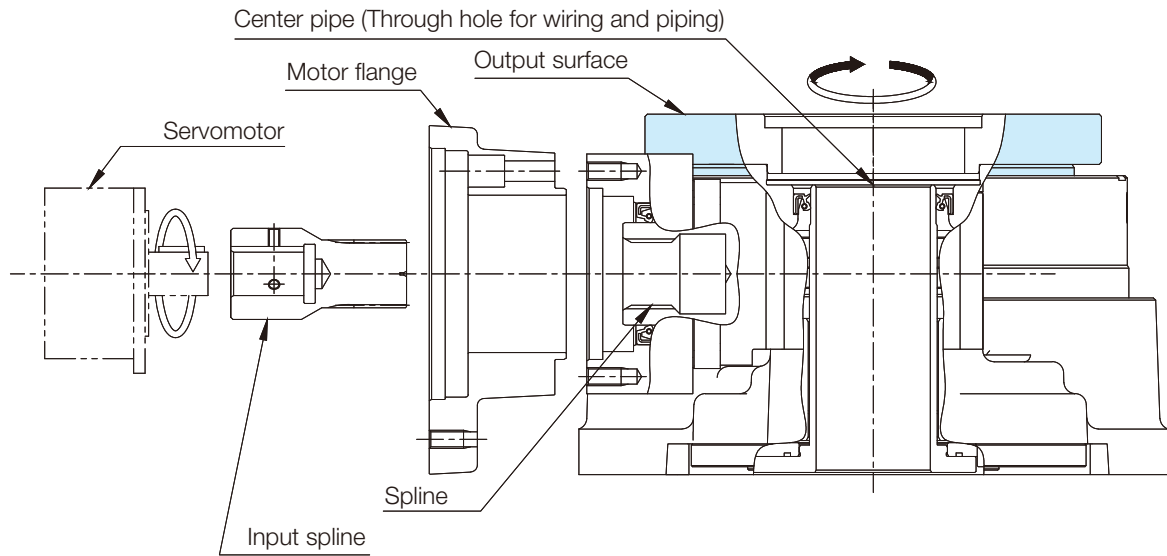
Integrated input spline and motor flange supports many motor types.

Use of Precision Reduction Gear RV™ designed for industrial robots creates a highly accurate and rigid device.

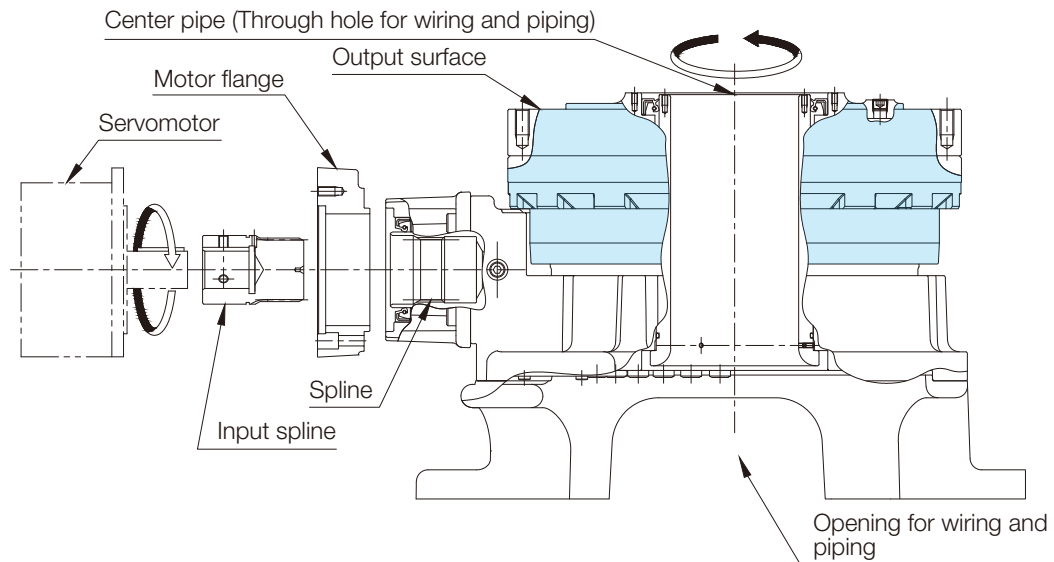
Installation of a right angle input shaft makes the device more compact.

## Structure and rotation directions

### RS-50A/RS-50B

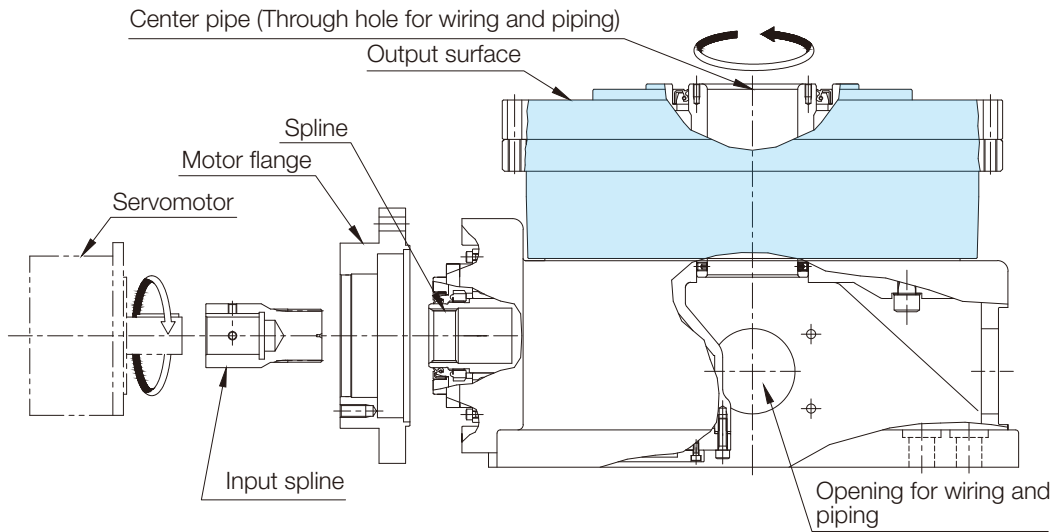


### RS-260A/RS-260B

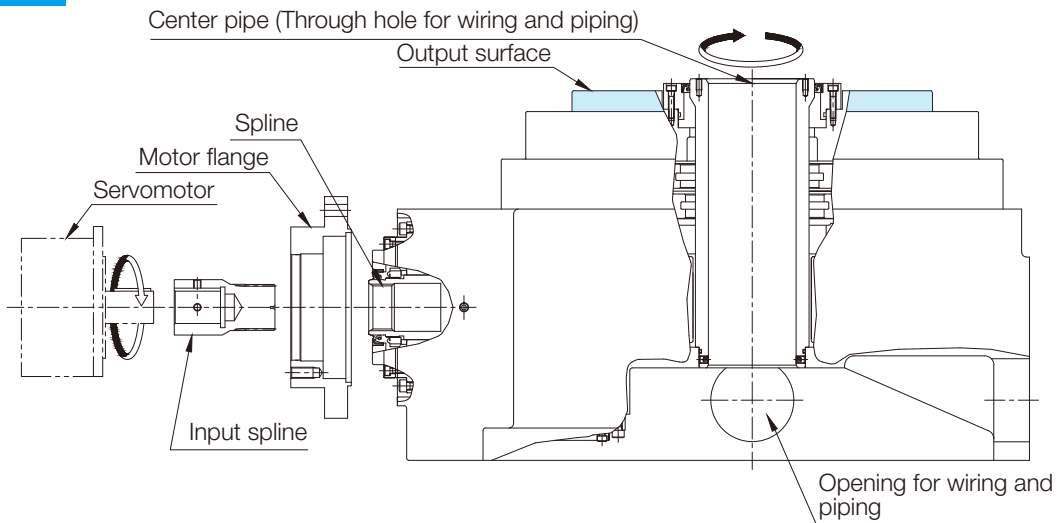




RS-320A/RS-320B/RS-400A



RS-900A

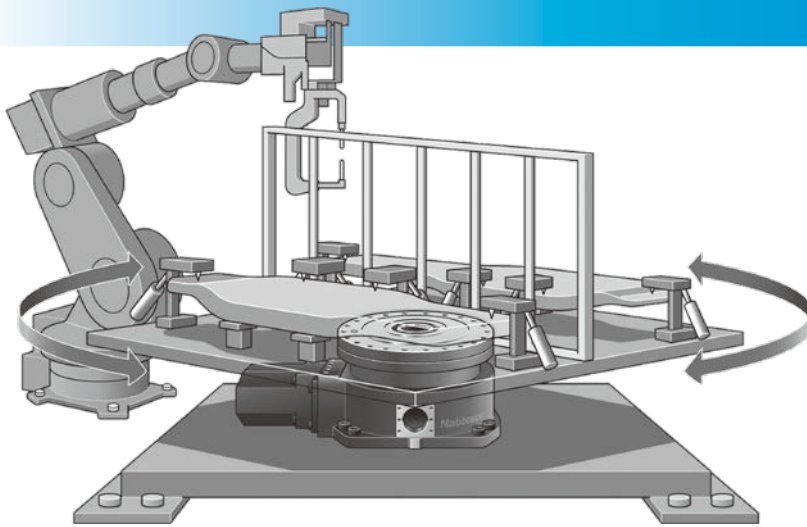


With the RS-260A/260B, RS-320A/320B/400A and RS-50A/50B, RS-900A, the rotation direction of the output shaft and servo motor differs.

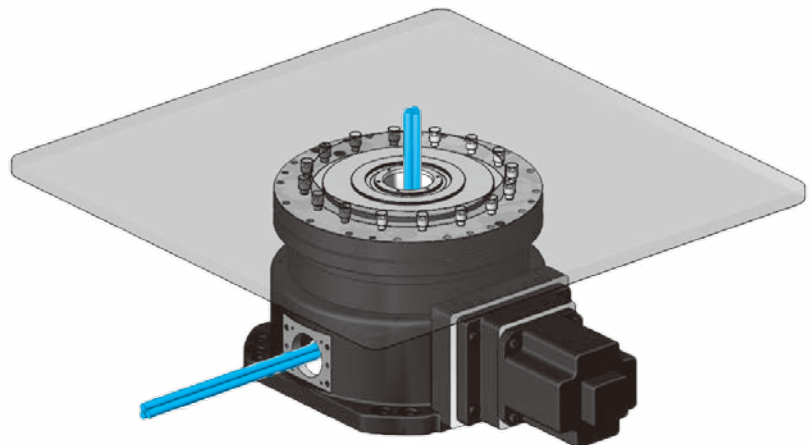
Note: The  areas indicate output rotation sections.

# Main RS series applications

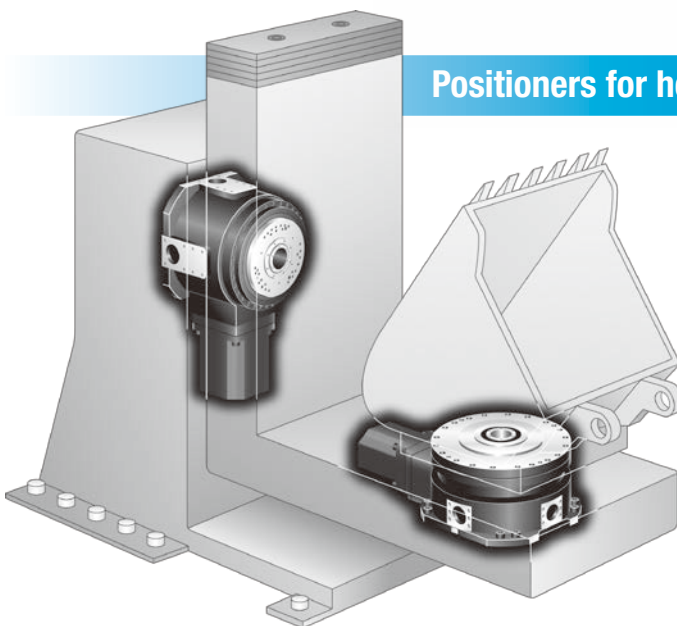
Welding turntables



Index tables



Positioners for heavy welding (rotary axis, tilting axis)



# RS series model code

## Product code

**RS - 260 A - 120 - SXA - XB - LB**

Model code	Frame number	Ratio code	Input spline code	Motor flange code	Lubricant code
<b>RS</b>	50A	65, 131, 164	Standard component: 3 alphabetic characters. Third character may be numerical. (Code will differ depending on motor to be attached.) None: ZZZ	Standard component: 2-letter code (code will differ depending on motor to be attached) None: ZZ	SB, LB
	50B	65, 131, 164			SB, LB
	260A	120			LB
	260B	120			LB
	320A	170			MW
	320B	170			MW
	400A	170			LB
	900A	194, 240			MW

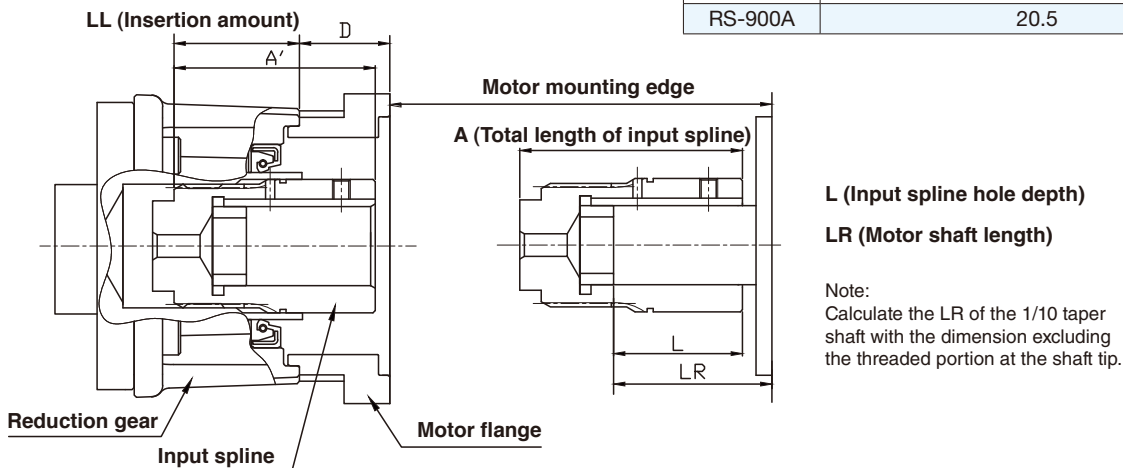
The lubricant code varies with the frame number. For the lubricants, refer to page 41.

## How to select model code

- Check the thickness of the motor flange according to the following equation:

Thickness of motor flange  $D = (A' + LR - L) - LL$

Model Code	LL Input Spline Insertion Amount (mm)
RS-50A	40
RS-50B	
RS-260A	57
RS-260B	
RS-320A	20.5
RS-320B	
RS-400A	20.5
RS-900A	



Note: Refer to page 19 to 21 regarding length A' and select a spline within the numerical range.

## Combination of reduction gear and servomotor

1. The combinations that satisfy the following equation are recommended.  
(Rated torque of motor x 0.5) < {Rated torque of reduction gear/(Speed ratio x 0.8)} < (Rated torque of motor x 1.5)
2. Select the combinations that satisfy the following equation.  
(Maximum torque of motor) < {Momentary maximum torque of reduction gear/(Speed ratio x 0.8)}
3. Limitation must be imposed to the motor torque when the condition indicated in 1 and 2 above cannot be satisfied.
4. For more precise motor selection, the effective torque, load inertia moment, brake torque, regenerative ability, and so forth, must also be considered.

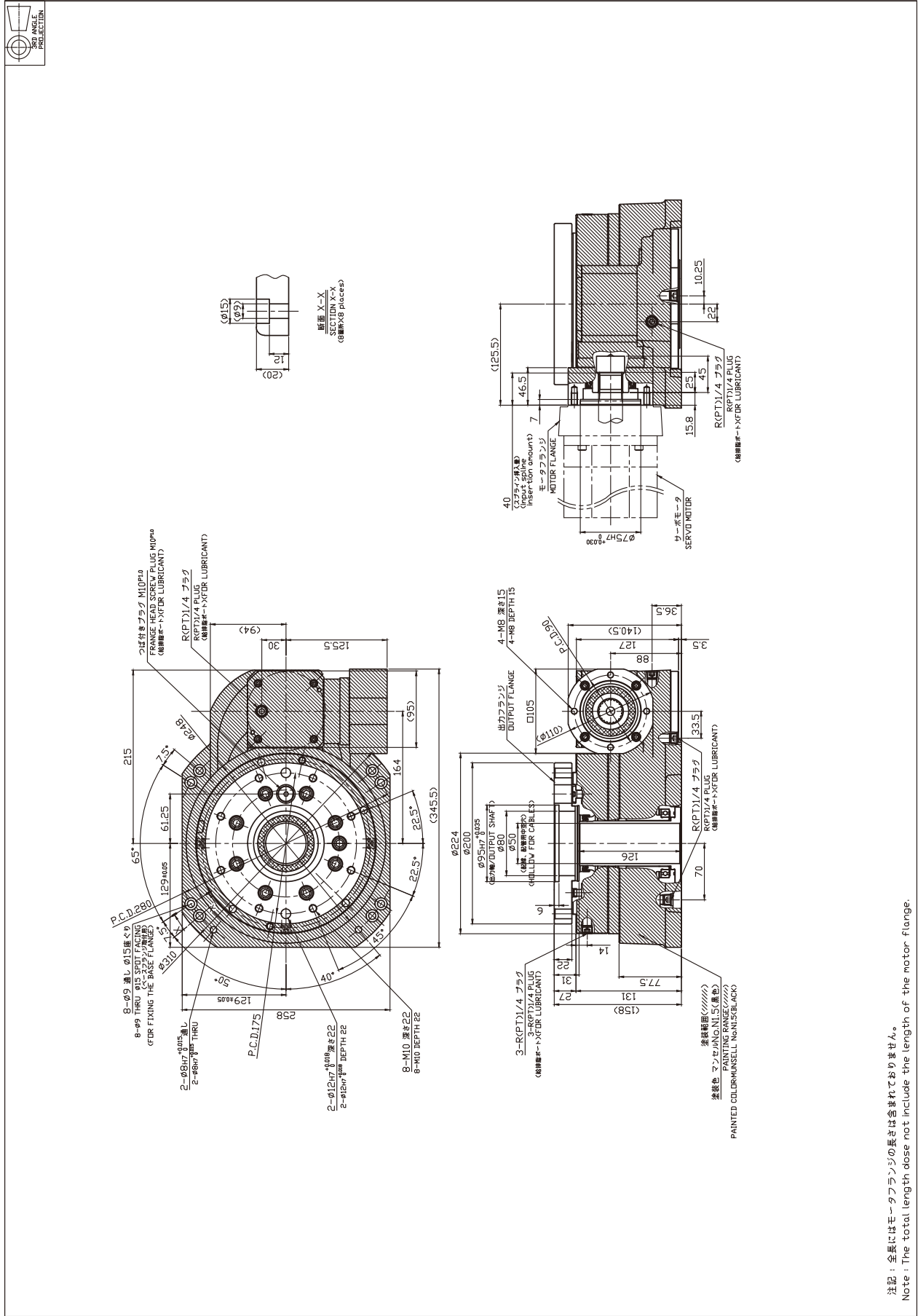
# Rating table

Model			RS-50A/RS-50B			RS-260A/ RS-260B	RS-320A/ RS-320B	RS-400A	RS-900A	
Speed ratio	R		65.4	130.8	163.5	120	170	170	193.6	240
Ratio code			65	131	164	120	170	170	194	240
Rated torque	T <sub>0</sub>	Nm	490			2,548	3,136	3,920	8,820	
Rated output speed	N <sub>0</sub>	rpm	15			15	15	15	15	
Rated life	K	h	6,000			6,000	6,000	6,000	6,000	
Allowable acceleration/deceleration torque	Ts1	Nm	1,225			6,370	7,840	9,800	17,640	
Momentary maximum allowable torque	Ts2	Nm	2,450			12,740	15,680	19,600	35,280	
Allowable output speed [Duty ratio: 100%] <sup>Note 2</sup>	Ns <sub>0</sub>	rpm	60			21.5	20	20	10	
Backlash		arc.min.	1.5			1.0	1.0	1.0	1.0	
Lost motion		arc.min.	1.5			1.0	1.0	1.0	1.0	
Startup efficiency (Reference Value)		%	65			75	75	70	70	
Capacity of main bearing	Allowable moment <sup>Note 4</sup>	M <sub>01</sub>	1,764			12,740	20,580	24,500	44,100	
	Momentary maximum allowable moment	M <sub>02</sub>	3,528			25,480	39,200	58,800	88,200	
	Maximum thrust load	F <sub>0</sub>	14,700			24,500	49,000	72,000	88,200	
	Allowable radial load	W <sub>r</sub>	9,428			39,900	54,676	66,252	101,754	
Moment of inertia (I=GD <sup>2</sup> /4) Input shaft conversion value <sup>Note 3</sup>		kgm <sup>2</sup>	8.98x10 <sup>-4</sup> / 8.92x10 <sup>-4</sup>	4.61x10 <sup>-4</sup> / 4.60x10 <sup>-4</sup>	4.02x10 <sup>-4</sup> / 4.01x10 <sup>-4</sup>	5.76x10 <sup>-3</sup>	3.40x10 <sup>-3</sup>	4.05x10 <sup>-3</sup>	1.16x10 <sup>-2</sup>	1.14x10 <sup>-2</sup>
Repeated positioning accuracy (ref. value)		arc.sec	±5	±5	±5	±5	±5	±5	ASK	ASK
Mass		kg	45 / 40			165 / 129	290 / 315	290	480	

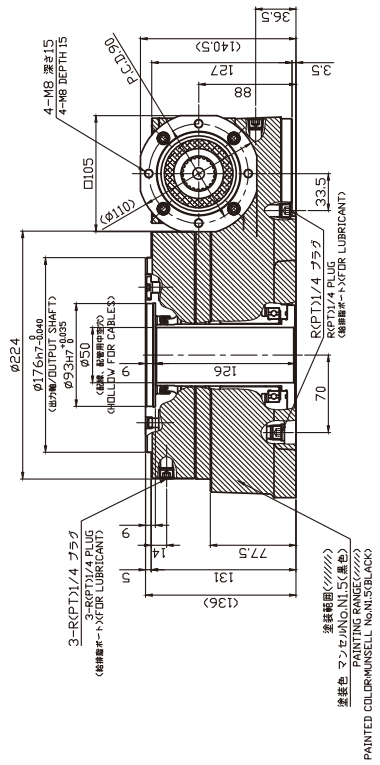
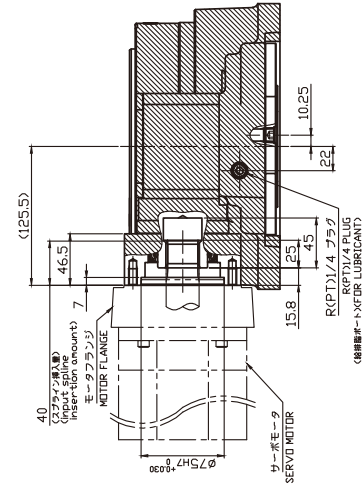
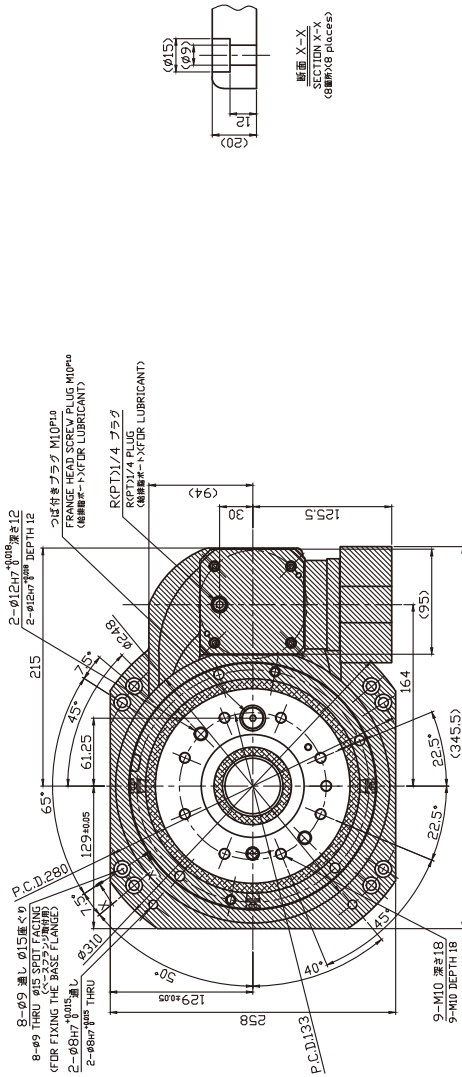
- Note:
1. The Rating Table shows the specification values of each individual reduction gear.
  2. The allowable output speed may be limited by heat depending on the operating rate. Make sure that the surface temperature of the reduction gear does not exceed 60°C during use.
  3. The inertia moment value is for the reduction gear. It does not include the inertia moment for the input gear.
  4. The allowable moment will differ depending on the thrust load. Check the allowable moment diagram (p. 37).
  5. For the moment rigidity and torsional rigidity, refer to the calculation of tilt angle and the torsion angle (p. 39).
  6. The rated torque is the value that produces the rated service life based on operation at the rated output speed; it does not indicate the maximum load. Refer to "Glossary" (p. 27) and "Product selection flowchart" (p. 28).
  7. The specifications above are based on Nabtesco evaluation methods; this product should only be used after confirming that it is appropriate for the operating conditions of your system.

# External dimensions Reduction gear main unit

RS-50A



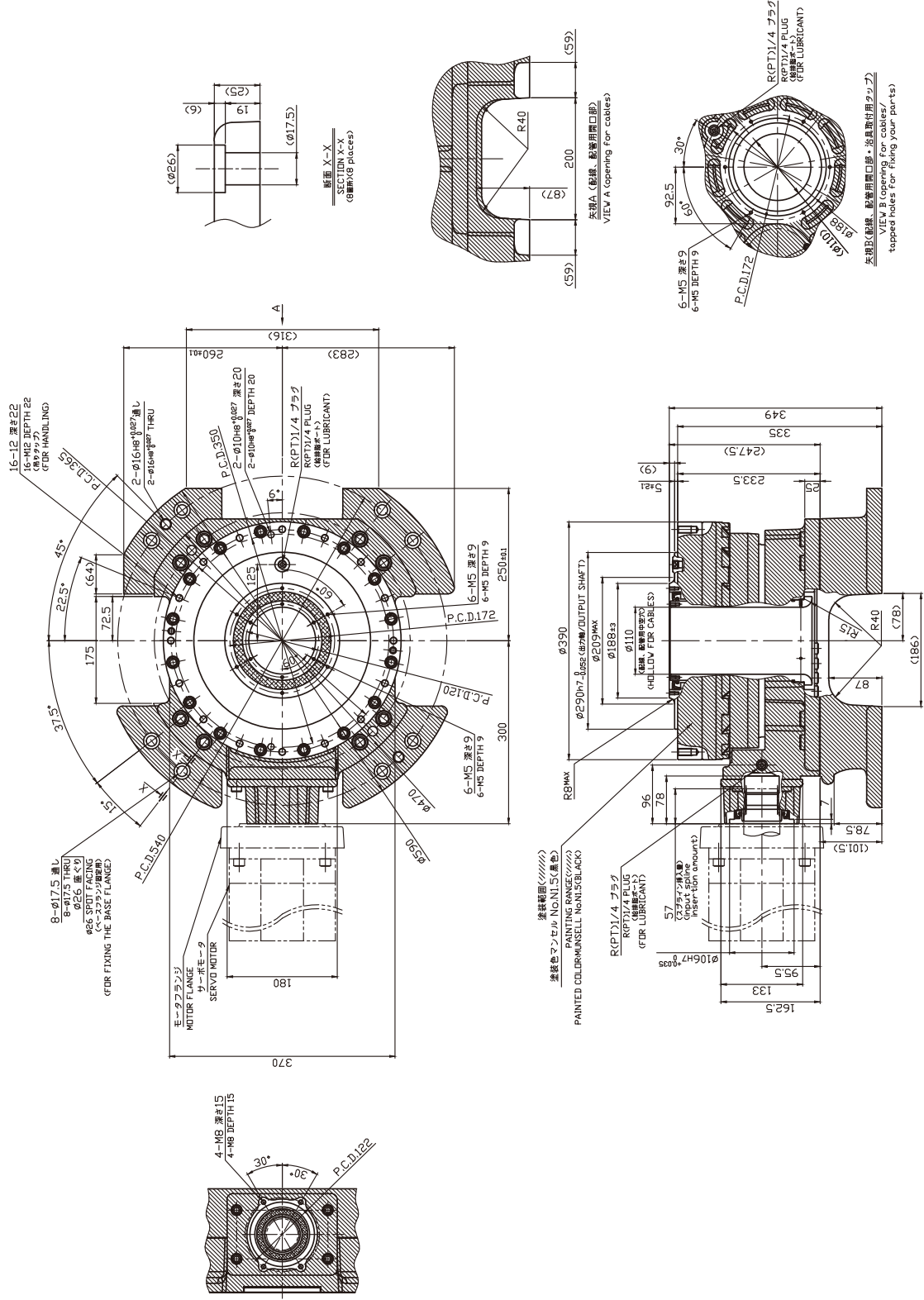
# RS-50B



注記：全長にはモーターフランジの長さも含まれておりません。  
 Note: The total length does not include the length of the motor flange.

Specifications and dimensions are subject to change without notice.

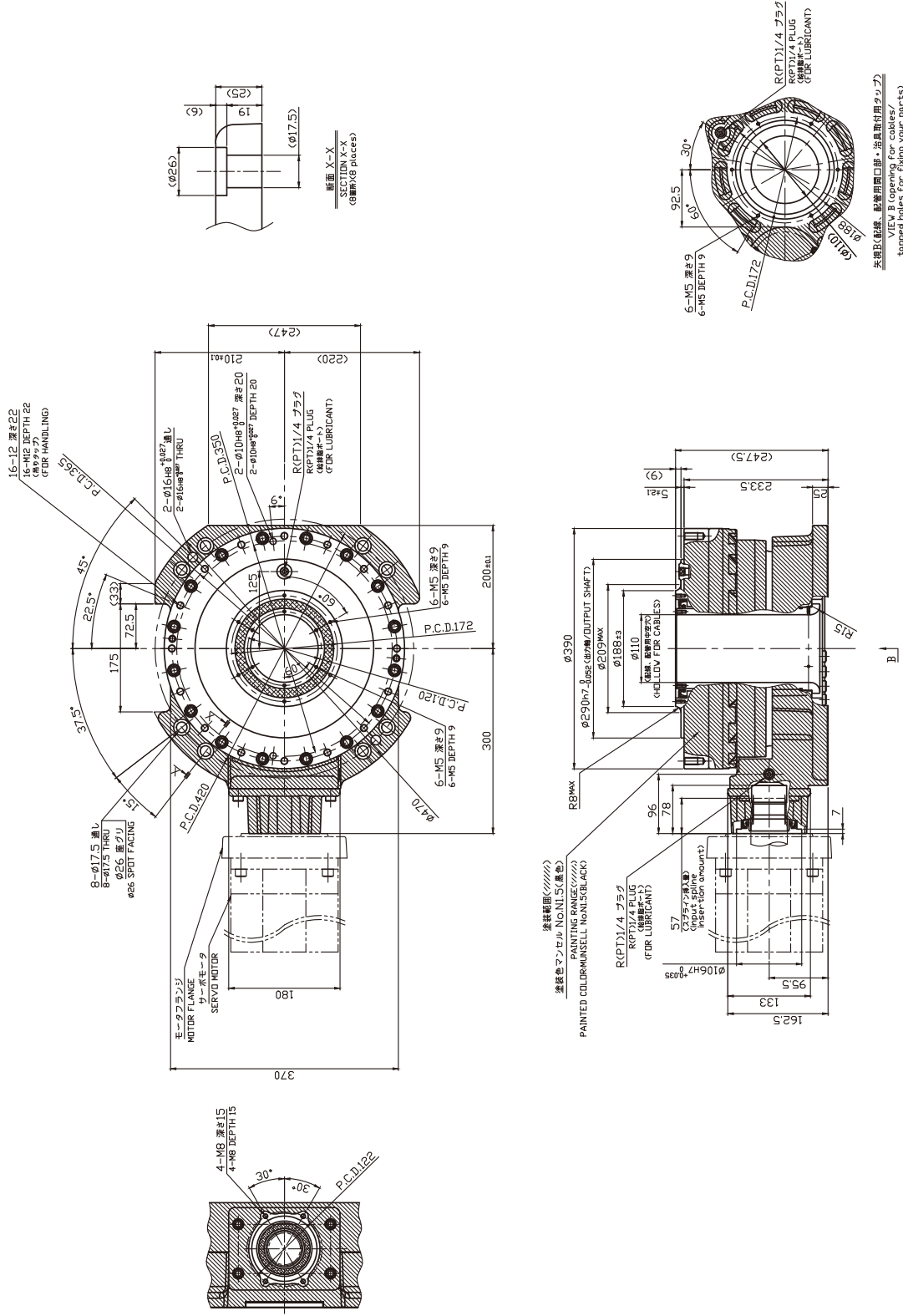
# RS-260A



注記：全長にはモータフランジの長さが必要でありません。  
Note: The total length does not include the length of the motor flange.

Specifications and dimensions are subject to change without notice.

# RS-260B

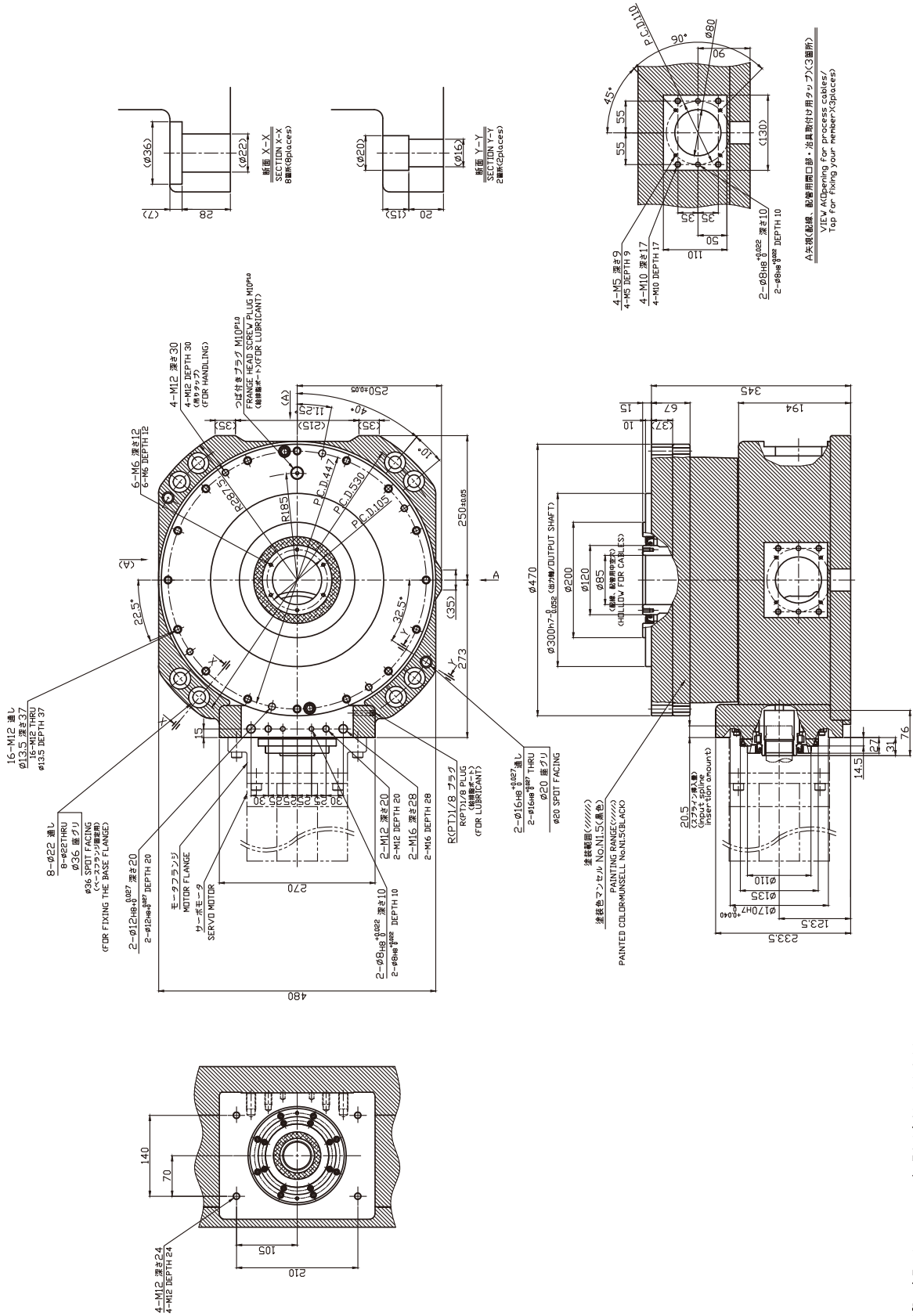


注記：全長にはモータフランジの長さも含まれておりません。  
 Note: The total length does not include the length of the motor flange.

Specifications and dimensions are subject to change without notice.



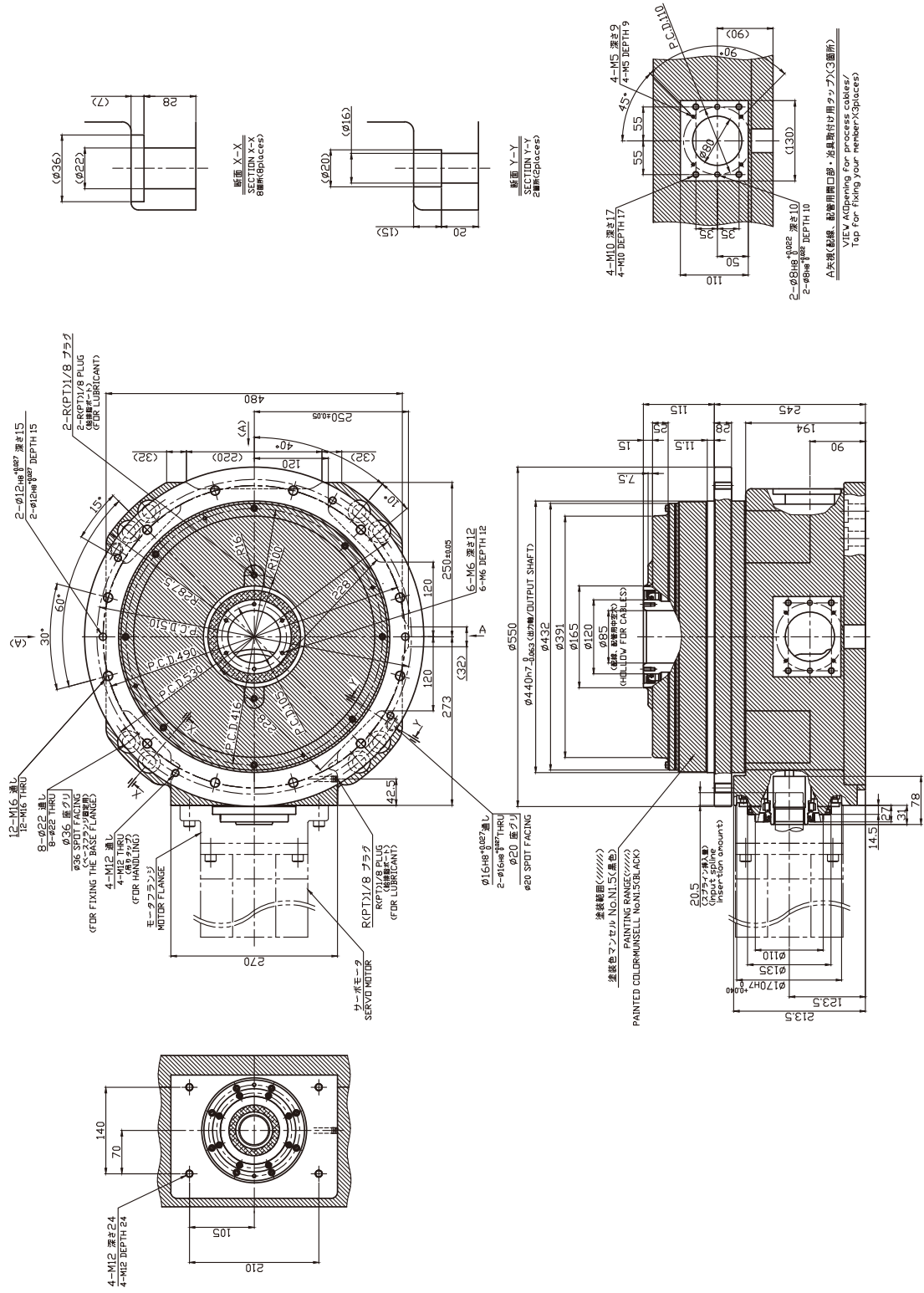
# RS-320A



注記：全長にはモーターフランジの長さを含まれておりません。  
 Note: The total length does not include the length of the motor flange.

Specifications and dimensions are subject to change without notice.

# RS-320B



注記：塗装にはモータフランジの長さは含まれておりません。  
Note: The total length does not include the length of the motor flange.

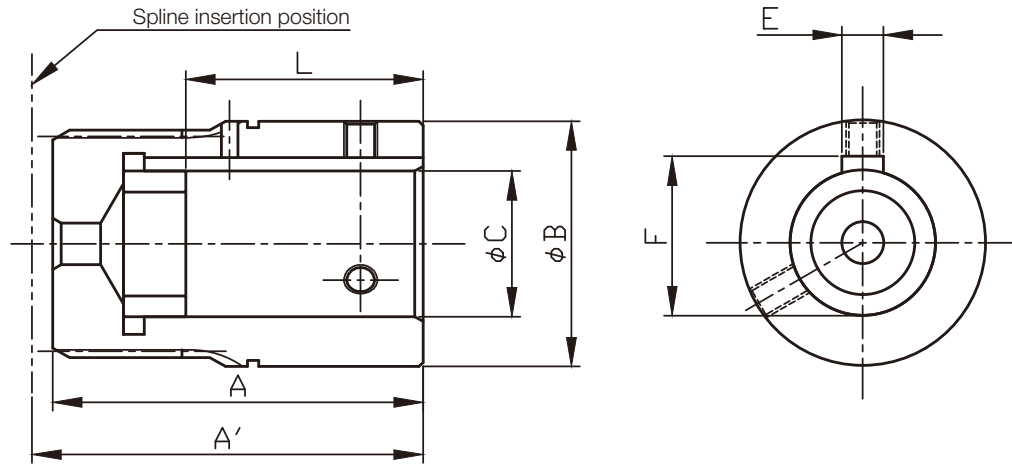
Specifications and dimensions are subject to change without notice.





# External dimensions Input spline

## Straight shaft (with key)

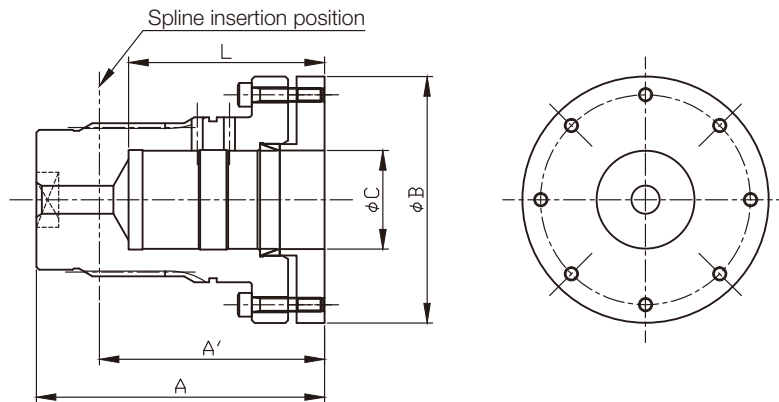


Model	Code	Order item number	Input spline dimensions (mm)								Inertia moment I (I=GD <sup>2</sup> /4) Input shaft equivalent (kgm <sup>2</sup> )	
			A	A*	øB	øC	L	E	F			
RS-50A RS-50B	VXD	30WA140D*	77	74.5 to 79.5	40	19H7	+0.021 0	37	6	±0.015	21.8	8.74×10 <sup>-5</sup>
	VXE	30WA140E*	77	72.5 to 79.5	40	22H7	+0.021 0	34	8	±0.018	25.3	8.77×10 <sup>-5</sup>
	VXF	30WA140F*	83	79.5 to 85.5	40	24H7	+0.021 0	43	8	±0.018	27.3	9.55×10 <sup>-5</sup>
	VXH	30WA140H*	70	65.5 to 72.5	30	14	+0.030 +0.012	22	5	±0.015	16.3	4.14×10 <sup>-5</sup>
	VXJ	30WA140J*	68	63.5 to 70.5	30	17H7	+0.018 0	28	5	±0.015	19.3	3.90×10 <sup>-5</sup>
	VXP	30WA140P*	72	67.5 to 74.5	30	16H7	+0.018 0	27	5	±0.015	18.3	4.19×10 <sup>-5</sup>
RS-260A RS-260B	WXS	60WA140-*	87	85.5 to 87.5	59	32H7	+0.025 0	45	10	±0.018	35.3	6.69×10 <sup>-4</sup>
	WXB	60WA140B*	89	87.5 to 90	59	35	+0.035 +0.010	72	10	±0.018	38.3	6.40×10 <sup>-4</sup>
	WB2	60WA423B*	89	87.5 to 90	59	35	+0.035 +0.010	57	10	±0.018	38.3	6.65×10 <sup>-4</sup>
	WXC	60WA140C*	83	81.5 to 83.5	59	28H7	+0.021 0	49	8	±0.018	31.3	6.48×10 <sup>-4</sup>
RS-320A RS-320B RS-400A RS-900A	YXA	67WA422A*	68	64 to 72	45	28H7	+0.021 0	52	8	±0.018	31.3	2.44×10 <sup>-4</sup>
	YXD	67WA422D*	68	64 to 72	45	28H7	+0.021 0	52	10	±0.018	31.3	2.44×10 <sup>-4</sup>
	YXF	67WA140F*	145	150 to 159	56	38H7	+0.025 0	66.5	10	±0.018	41.3	7.47×10 <sup>-4</sup>
	YXG	67WA140G*	95	113.5 to 120.5	55	32H7	+0.025 0	45	10	±0.018	35.3	5.01×10 <sup>-4</sup>
	YXK	67WA140K*	109	126.5 to 133.5	60	35H7	+0.025 0	55	10	±0.018	38.3	7.11×10 <sup>-4</sup>
	YXL	67WA140L*	81	98.5 to 105.5	55	32	+0.043 +0.018	31	10	±0.018	35.3	4.17×10 <sup>-4</sup>
	YXM	67WA140M*	57	74.5 to 81.5	45	24	+0.034 +0.013	23	8	±0.018	27.3	2.26×10 <sup>-4</sup>
	YXN	67WA140N*	109	126.5 to 133.5	60	35	+0.035 +0.010	55	10	±0.018	38.3	7.11×10 <sup>-4</sup>
	YXP	67WA140P*	89	106.5 to 113.5	45	24H7	+0.021 0	55	8	±0.018	27.3	3.18×10 <sup>-4</sup>
	YXQ	67WA140Q*	144.5	162 to 169	60	35H7	+0.025 0	55	10	±0.018	38.3	9.38×10 <sup>-4</sup>
	YXR	67WA140R*	125	142.5 to 149.5	60	35	+0.035 +0.010	70	10	±0.018	38.3	8.43×10 <sup>-4</sup>
YS2	67WA140S*	142	159.5 to 166.5	60	42H7	+0.025 0	80	12	±0.0215	45.3	8.89×10 <sup>-4</sup>	

\* Ensure that length A' of the spline insertion position is within the range indicated in the table above.

# External dimensions Input spline

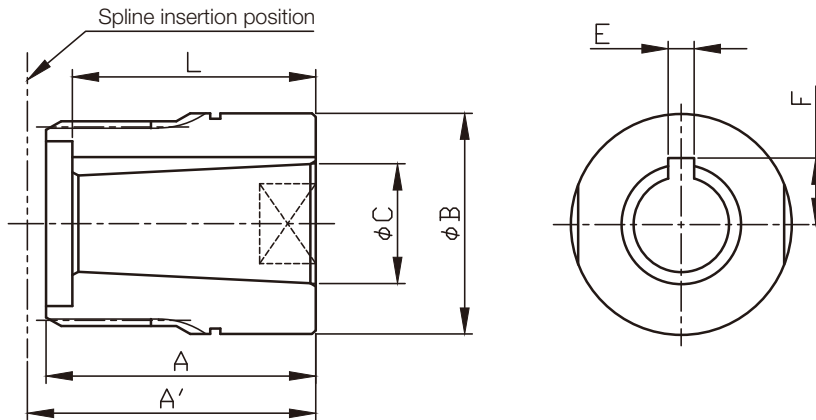
## Straight shaft (without key)



Model	Code	Order item number	Input spline dimensions (mm)					Inertia moment I ( $I=GD^2/4$ ) Input shaft equivalent (kgm <sup>2</sup> )	Transmission torque Nm	
			A	A*	φB	φC	L			
RS-50A RS-50B	VXA	30WA421A*	79	72.5 to 81.5	68	24	+0.021 0	39	$4.11 \times 10^{-4}$	77.8
	VXB	30WA421B*	68	63.5 to 70.5	63	19	+0.021 0	45	$2.40 \times 10^{-4}$	52.4
	VXC	30WA421C*	77	72.5 to 79.5	68	22	+0.021 0	45	$4.09 \times 10^{-4}$	68.7
	VXK	30WA421K*	77	70.5 to 79.5	63	24	+0.021 0	37	$2.40 \times 10^{-4}$	77.8
	VXQ	30WA421Q*	73	66.5 to 75.5	63	19	+0.021 0	36	$2.48 \times 10^{-4}$	52.4
	VQ2	30WA431Q*	73	66.5 to 75.5	63	19	+0.021 0	30	$2.48 \times 10^{-4}$	52.4
RS-260A RS-260B	WXD	60WA421D*	103	86.5 to 88.5	88	35	+0.035 +0.010	70	$1.52 \times 10^{-3}$	106.5
	WD2	60WA431D*	103	86.5 to 88.5	88	35	+0.035 +0.010	55	$1.53 \times 10^{-3}$	106.5
RS-320A RS-320B RS-400A RS-900A	YXB	67WA421B*	86	86 to 92	75	35	+0.035 +0.010	73	$7.34 \times 10^{-4}$	106.5
	YXC	67WA421C*	82	84.5 to 87	75	32H7	+0.025 0	33	$7.55 \times 10^{-4}$	170.8
	YE2	67WA421E*	86	86 to 92	75	35	+0.035 +0.010	58	$7.48 \times 10^{-4}$	106.5
	YXH	67WA421H*	144	140.5 to 149.5	77	42H7	+0.025 0	62	$9.73 \times 10^{-4}$	277.3
RS-900A	ZS2	96WA421-*	149	143.5 to 152.5	110	55H7	+0.030 0	53	$3.83 \times 10^{-3}$	657

\* Ensure that length A' of the spline insertion position is within the range indicated in the table above.

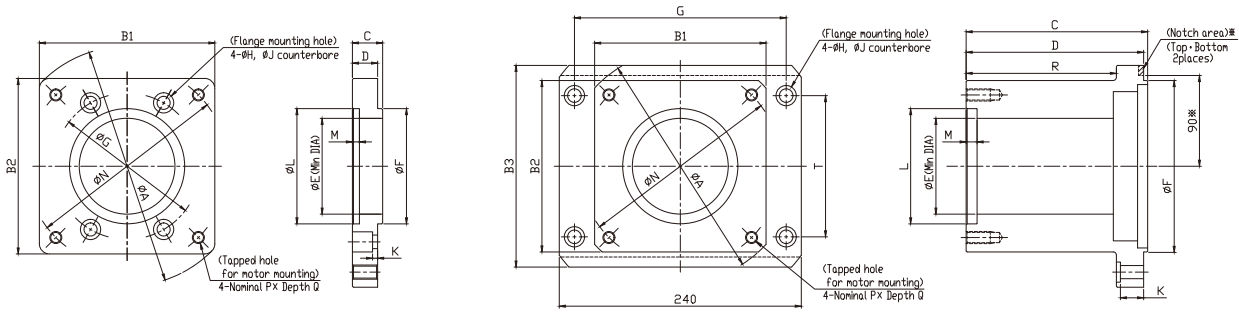
## 1/10 tapered shaft



Model	Code	Order item number	Input spline dimensions (mm)								Inertia moment I ( $I=GD^2/4$ ) Input shaft equivalent ( $\text{kgm}^2$ )	
			A	A*	$\phi B$	$\phi C$	L	E	F			
RS-50A RS-50B	VXL	30WA422L*	64	59.5 to 66.5	30	14	$\begin{matrix} +0.10 \\ 0 \end{matrix}$	18	4	$\begin{matrix} +0.040 \\ +0.010 \end{matrix}$	8.75	$3.75 \times 10^{-5}$
	VXM	30WA422M*	62	57.5 to 64.5	30	16	$\begin{matrix} +0.10 \\ 0 \end{matrix}$	28	5	$\begin{matrix} +0.040 \\ +0.010 \end{matrix}$	9.5	$3.57 \times 10^{-5}$
RS-260A RS-260B	WXA	60WA140A*	72	73.5 to 75.5	59	32	$\begin{matrix} +0.10 \\ 0 \end{matrix}$	65	7	$\begin{matrix} +0.049 \\ +0.013 \end{matrix}$	17.75	$5.08 \times 10^{-4}$
	WXE	60WA140E*	89	87.5 to 90	59	35	$\begin{matrix} +0.10 \\ 0 \end{matrix}$	57	6	$\begin{matrix} +0.2 \\ +0.1 \end{matrix}$	18.85	$6.53 \times 10^{-4}$
RS-320A RS-320B RS-400A RS-900A	YXS	67WA140-*	60	54 to 69.5	50	32	$\begin{matrix} +0.10 \\ 0 \end{matrix}$	60	7	$\begin{matrix} +0.08 \\ +0.043 \end{matrix}$	17.75	$2.06 \times 10^{-4}$
	YXE	67WA140E*	81	81.5 to 87.5	50	35	$\begin{matrix} +0.10 \\ 0 \end{matrix}$	55	6	$\begin{matrix} +0.040 \\ +0.010 \end{matrix}$	18.55	$2.74 \times 10^{-4}$

\* Ensure that length A' of the spline insertion position is within the range indicated in the table above.

# External dimensions Motor flange



For RS-50A, 50B, RS-260A, 260B

For RS-320A, 320B, 400A, RS-900A

Model	Code	Order item number	Flange outer dimensions (mm)									Reduction gear mounting dimensions (mm)						Motor mounting dimensions (mm)					
			øA	B1	B2	B3	R	C	D	øE	øF	G	T	øH	øJ	K	øL	M	øN	P	Q		
RS-50A RS-50B	CA	35PA203CA*	111.4	ø111.4				41	36	69							50	+0.036 +0.011	3.5	70	M5	9	
	CB	35PA203CB*	108	ø108				41	36	69							70	+0.037 +0.012	5.5	90	M5	9	
	CC	35PA203CC*	108	ø108				41	36	69							70	+0.037 +0.012	5.5	90	M6	11	
	CD	35PA203CD*	144	□129				43	38	69							80	+0.037 +0.012	6	100	M6	11	
	CE	35PA203CE*	144	□129				43	38	69							95	+0.038 +0.013	6	115	M6	11	
	CF	35PA203CF*	144	□129				43	38	69							95	+0.038 +0.013	6	115	M8	15	
	CG	35PA203CG*	176	□130				45	40	69							110	+0.038 +0.013	7	135	M8	15	
	CH	35PA203CH*	176	□130				45	40	69							110	+0.038 +0.013	11	145	M8	15	
	CJ	35PA203CJ*	176	□130				60	55	69							110	+0.038 +0.013	7	145	M8	15	
	CK	35PA203CK*	232	□176				45	40	69	75h7	0 -0.030	90	-	9	14	22	114.3	+0.038 +0.013	5	200	M12	22
	CL	35PA203CL*	232	□176				45	40	69								115	+0.038 +0.013	6	165	M8	15
	CM	35PA203CM*	232	□176				45	40	69								130	+0.039 +0.014	6	165	M10	18
	CN	35PA203CN*	295	□220				45	40	69								200	+0.040 +0.015	6	235	M12	22
	CP	35PA203CP*	176	□130				50	45	69								80	+0.037 +0.012	6	100	M6	11
	CQ	35PA203CQ*	144	□129				48	43	69								95	+0.038 +0.013	6	115	M8	15
	CR	35PA203CR*	170	□130				53	48	69								110	+0.038 +0.013	11	145	M8	15
	CT	35PA203CT*	176	□130				45	40	69								110	+0.038 +0.013	7	130	M8	15
	CU	35PA203CU*	111.4	ø111.4				41	36	67								60	+0.037 +0.012	3.5	75	M5	9
	RS-260A RS-260B	GA	35PA203GA*	144	□129				43	38	96							95	+0.038 +0.013	7	115	M8	15
		GB	35PA203GB*	176	□130				45	40	96							110	+0.038 +0.013	7	135	M8	15
GC		35PA203GC*	176	□130				45	40	96							110	+0.038 +0.013	7	145	M8	15	
GD		35PA203GD*	233	□176				45	40	96							114.3	+0.038 +0.013	5	200	M12	22	
GE		35PA203GE*	233	□176				45	40	96							130	+0.039 +0.014	6	165	M10	18	
GF		35PA203GF*	295	□220				45	40	96							200	+0.040 +0.015	6	235	M12	22	
GG		35PA203GG*	170	□130				55	50	96	106h7	0 -0.035	122	-	9	14	22	110	+0.038 +0.013	7	145	M8	15
GH		35PA203GH*	232	□176				55	50	96							114.3	+0.038 +0.013	5	200	M12	22	
GJ		35PA203GJ*	170	□130				50	45	96							110	+0.038 +0.013	7	145	M8	15	
GK		35PA203GK*	175	□130				45	40	96							110	+0.038 +0.013	7	130	M8	15	
GL		35PA203GL*	144	□129				43	38	80							80	+0.037 +0.012	6	100	M6	11	
GQ		35PA203GQ*	295	□220				45	40	96							180	+0.054 +0.014	6	215	M12	22	



Model	Code	Order item number	Flange outer dimensions (mm)							Reduction gear mounting dimensions (mm)					Motor mounting dimensions (mm)									
			øA	B1	B2	B3	R	C	D	øE	øF	G	T	øH	øJ	K	øL	M	øN	P	Q			
RS-320A RS-320B RS-400A	YS	67WA203-*	247	□174		174	36.5	65.5	61.5	170h7	0 -0.040	210	140	13	-	25	114.3H7	+0.035 0	10	200	M12	24		
	YA	67WA203A*	238	□174		174	44.5	75.5	71.5						114.3H7		+0.035 0	10	200	M12	24			
	YB	67WA203B*	318	240	220		-	75.5	71.5						148		25.5	200H7	+0.046 0	10	235	M12	24	
	YC	67WA203C*	318	240	220		-	85.5	81.5						148			200H7	+0.046 0	10	235	M12	24	
	YD	67WA203D*	245	□180		200	149	180	176						114.3		20	114.3H7	+0.035 0	10	200	M12	24	
	YE	67WA203E*	318	240	220		-	124	120						148			200H7	+0.046 0	10	235	M12	24	
	YG	67WA203G*	318	240	220		-	80	76						148			200H7	+0.046 0	10	235	M12	24	
	YH	67WA203H*	306	240	200		-	110	106						114.3			114.3H7	+0.035 0	10	200	M12	24	
	YJ	67WA203J*	310	□180		220	75	104	100						110			-	110H7	+0.035 0	10	145	M8	16
	YK	67WA203K*	306	240	200		-	139	135						114.3				114.3H7	+0.035 0	10	200	M12	24
	YL	67WA203L*	245	□180		200	134	165	161						114.3			20	114.3H7	+0.035 0	10	200	M12	24
	YM	67WA203M*	198	□145		200	5	79.5	75.5						130				130	+0.054 +0.014	10	165	M10	18
RS-900A	ZA	96WA203A*	238	□174		200	34.5	65.5	61.5	194h7	0 -0.046	210	140	13	25	114.3H7		+0.035 0	10	200	M12	24		
	ZB	96WA203B*	247	□180		200	134	165	161							114.3		114.3H7	+0.035 0	10	200	M12	24	
	ZC	96WA203C*	259	176	200		48.5	79.5	75.5							114.3		114.3H7	+0.035 0	10	200	M12	24	
	ZD	96WA203D*	313	240	213		-	80.5	76.5							180		25.5	200H7	+0.046 0	10	235	M12	24
	ZE	96WA203E*	238	□174		200	79.5	110.5	106.5							114.3	114.3H7		+0.035 0	10	200	M12	24	
	ZF	96WA203F*	318	240	220		-	85.5	81.5							175	25.5	200H7	+0.046 0	10	235	M12	24	
	ZH	96WA203H*	307	240	213		-	124.5	120.5							180		25	200H7	+0.046 0	10	235	M12	24
																	13.5							





## ***Technical Information***

# Considering the use of the RS series

This product features high precision and high rigidity, however, it is necessary to strictly comply with various restrictions and make considerations to maximize the product's features. Please read this technical document thoroughly and select and adopt an appropriate model based on the actual operating environment, method, and conditions at your facility.

## Export

- When this product is exported from Japan, it may be subject to the export regulations provided in the "Foreign Exchange Order and Export Trade Control Order". Be sure to take sufficient precautions and perform the required export procedures in advance if the final operating party is related to the military or the product is to be used in the manufacture of weapons, etc.

## Application

- If failure or malfunction of the product may directly endanger human life or if it is used in units which may injure the human body (atomic facilities, space equipment, medical equipment, safety units, etc.), examination of individual situations is required. Contact our agent or nearest business office in such a case.

## Safety measures

- Although this product has been manufactured under strict quality control, a mistake in operation or misuse can result in breakdown or damage, or an accident resulting in injury or death. Be sure to take all appropriate safety measures, such as the installation of independent safeguards.

## Product specifications indicated in this catalog

- The specifications indicated in this catalog are based on Nabtesco evaluation methods. This product should only be used after confirming that it is appropriate for the operating conditions of your system.

## Operating environment

Use the reduction gear under the following environment:

- Location where the ambient temperature is within the range from -10°C to 40°C.
- Location where the humidity is less than 85% and no condensation occurs.
- Location where the altitude is less than 1000 m.
- Well-ventilated location

Do not install the reduction gear at the following locations.

- Locations where a lot of dust is collected.
- Outdoor areas that are directly affected by wind and rain
- Locations near to areas that contains combustible, explosive, or corrosive gases and flammable materials.
- Locations that are heated due to heat transfer and radiation from peripherals and direct sun.
- Locations where the performance of the motor can be affected by magnetic fields or vibration.

**Note 1: If the required operating environment cannot be established/met, contact us in advance.**

- 2: When using the reduction gear under special conditions (clean room, equipment for food, concentrated alkali, high-pressure steam, etc.), contact our agent or nearest business office in advance.**

## Maintenance

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

## Reduction gear temperature

- When the reduction gear is used under high load and at a high duty ratio, it may overheat and the surface temperature may exceed the allowable temperature. 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.

## Reduction gear output rotation angle

- 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.

**Note: Contact us in case the rotation angle is 10 degrees or less.**

## Manuals

- Safety information and detail product instructions are indicated in the operation manual. The operation manual can be downloaded from the following website.

**<https://precision.nabtesco.com/>**

# Glossary

## 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

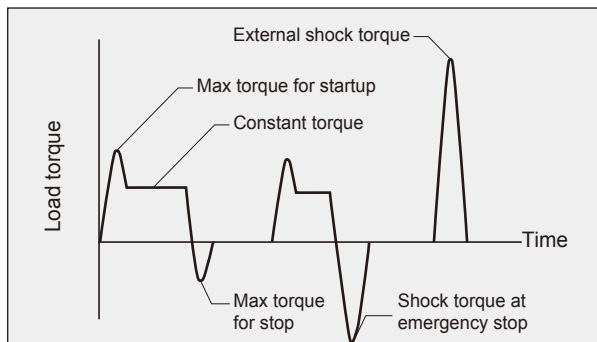
When the machine starts or stops, the load torque to be applied to the reduction gear is larger than the constant-speed load torque due to the effect of the inertia torque of the rotating part. In such a situation, the allowable torque during acceleration/deceleration is referred to as "allowable acceleration/deceleration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

**Note:** Be careful that the load torque, which is applied at startup and stop, does not exceed the 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".

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



## Allowable output speed

The allowable value for the reduction gear's output speed during operation without a load is referred to as the "allowable output speed".

**Notes:** Depending on the conditions of use (duty ratio, load, ambient temperature), the reduction gear temperature may exceed 60°C even when the speed is under the allowable output speed. In such a case, either take cooling measures or use the reduction gear at a speed that keeps the surface temperature at 60°C or lower.

## Duty ratio

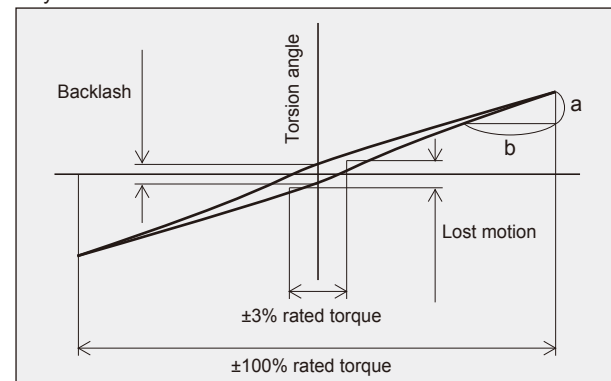
The duty ratio is defined as the ratio of the sum total time of acceleration, constant speed, and deceleration to the cycle time of the reduction gear.

## 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>



## Startup efficiency

The efficiency of the moment when the reduction gear starts up is referred to as "startup efficiency".

## No-load running torque (input shaft)

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

## Allowable moment and maximum thrust load

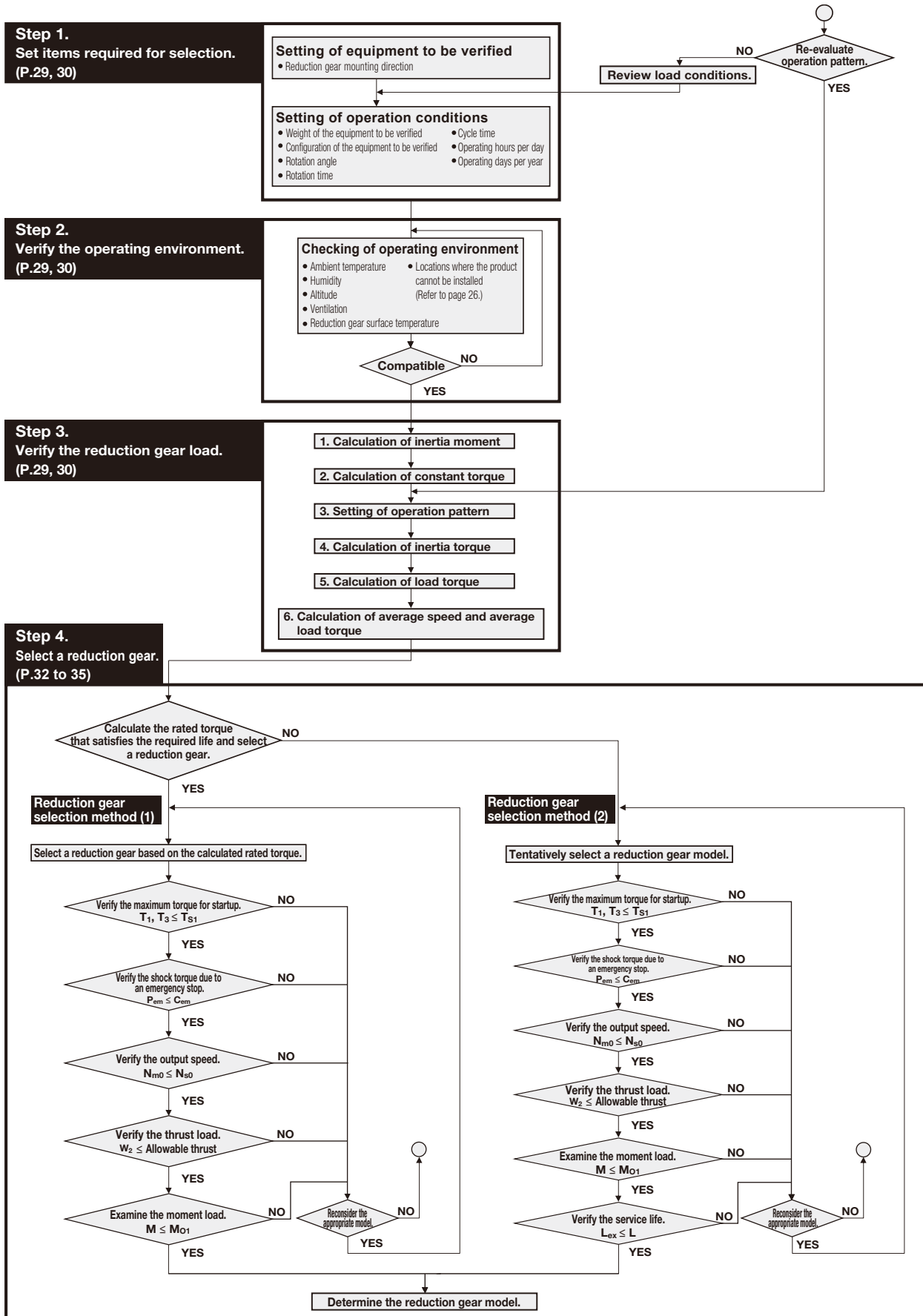
The external load moment may be applied to the reduction gear during normal operation. The allowable values of the external moment and the external axial load at this time are each referred to as "allowable moment" and "maximum thrust load".

## 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.

# Product selection flowchart



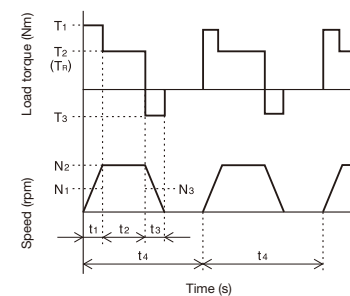
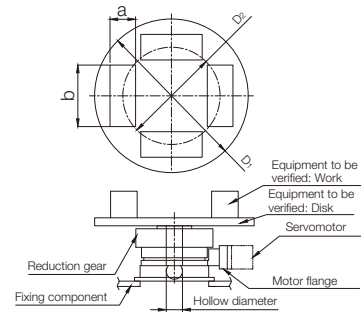
A limitation is imposed on the motor torque value according to the momentary maximum allowable torque of the selected reduction gear. (Refer to page 36.)

# Model code selection examples

## With horizontal rotational transfer

### Step 1. Set the items required for selection.

Setting item	Setting
Reduction gear mounting direction	Vertical shaft installation
<b>Equipment weight to be considered</b>	
W <sub>A</sub> ——— Disk weight (kg)	2,000
W <sub>B</sub> ——— Work weight (kg)	100×4 pieces
<b>Equipment configuration to be considered</b>	
D <sub>1</sub> ——— Disk: D dimension (mm)	1,200
a ——— Workpiece: a dimension (mm)	100
b ——— Workpiece: b dimension (mm)	300
D <sub>2</sub> ——— Workpiece: P.C.D. (mm)	1,000
<b>Operation conditions</b>	
θ ——— Rotation angle (°)*1	180
[t <sub>1</sub> +t <sub>2</sub> +t <sub>3</sub> ] ——— Rotation time (s)	2.5
[t <sub>4</sub> ] ——— Cycle time (s)	20
Q <sub>1</sub> ——— Equipment operation hours per day (hours/day)	12
Q <sub>2</sub> ——— Equipment operation days per year (days/year)	365

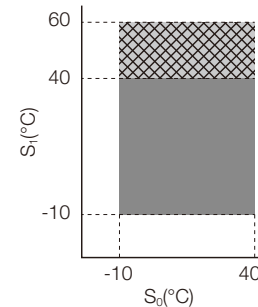


\*1. When the range of the rotation angle is small (10 degrees or less), the rating life of the reduction gear may be reduced due to poor lubrication or the internal parts being subject to a concentrated load.

### Step 2. Verify the operating environment.

Checkpoint	Standard value
S <sub>0</sub> ——— Ambient temperature (°C)	-10 to +40
S <sub>1</sub> ——— Reduction gear surface temperature (°C)	60 or less

Note: Refer to "Operating environment" on p. 26 for values other than those listed above.



### Step 3-1. Examine the reduction gear load

Setting item	Calculation formula	Selection examples
(1) Calculate the inertia moment based the calculation formula on page 42.		
I <sub>R</sub> Load inertia moment (kgm <sup>2</sup> )	$I_{R1} = \frac{W_A \times \left(\frac{D_1}{2 \times 1,000}\right)^2}{2}$ $I_{R2} = \left[ \frac{W_B}{12} \left\{ \left(\frac{a}{1,000}\right)^2 + \left(\frac{b}{1,000}\right)^2 \right\} + W_B \times \left(\frac{D_2}{2 \times 1,000}\right)^2 \right] \times n$ <p>I<sub>R1</sub> = Disk inertia moment I<sub>R2</sub> = Work inertia I<sub>R</sub> = I<sub>R1</sub> + I<sub>R2</sub> n = Number of Workpieces</p>	$I_{R1} = \frac{2,000 \times \left(\frac{1,200}{2 \times 1,000}\right)^2}{2}$ $= 360 \text{ (kgm}^2\text{)}$ $I_{R2} = \left[ \frac{100}{12} \left\{ \left(\frac{100}{1,000}\right)^2 + \left(\frac{300}{1,000}\right)^2 \right\} + 100 \times \left(\frac{1,000}{2 \times 1,000}\right)^2 \right] \times 4$ $= 103.3 \text{ (kgm}^2\text{)}$ $I_R = 360 + 103.3$ $= 463.3 \text{ (kgm}^2\text{)}$
(2) Examine the constant torque.		
T <sub>R</sub> Constant torque (Nm)	$T_R = (W_A + W_B) \times 9.8 \times \frac{D_{in}}{2 \times 1,000} \times \mu$ <p>μ = Friction factor Note: Use 0.015 for this example as the load is applied to the bearing of the Precision Reduction Gear RV™. D<sub>in</sub> = Rolling diameter: Use the pilot diameter which is almost equivalent to the rolling diameter in this selection calculation. Note: If the reduction gear model is not determined, select the following pilot diameter: Maximum pilot diameter: 490 (mm) (RS-900A)</p>	$T_R = (2,000 + 100 \times 4) \times 9.8 \times \frac{490}{2 \times 1,000} \times 0.015$ $= 86.4 \text{ (Nm)}$

### Step 3-2: Proceed to p. 31.

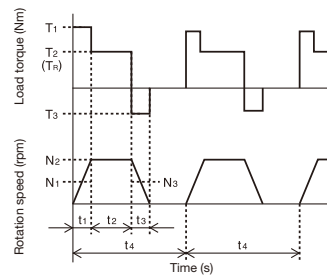
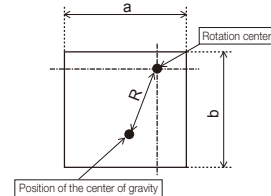
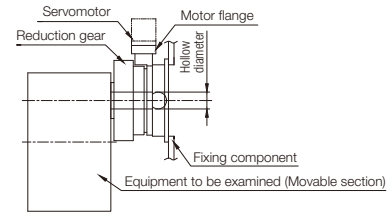
# Model code selection examples

## With vertical rotational transfer

### Step 1. Set the items required for selection.

Setting item	Setting
Reduction gear mounting direction	Horizontal shaft installation
<b>Equipment weight to be considered</b>	
$W_C$ — Mounted work weight (kg)	2,000
<b>Equipment configuration to be considered</b>	
$a$ — $a$ dimension (mm)	500
$b$ — $b$ dimension (mm)	500
$R$ — $R$ dimension (mm)	320
<b>Operation conditions</b>	
$\theta$ — Rotation angle ( $^\circ$ )*1	90
$[t_1+t_2+t_3]$ — Rotation time (s)	1.5
$[t_4]$ — Cycle time (s)	20
$Q_1$ — Equipment operation hours per day (hours/day)	24
$Q_2$ — Equipment operation days per year (days/year)	365

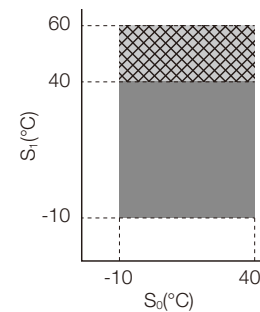
\*1. When the range of the rotation angle is small (10 degrees or less), the rating life of the reduction gear may be reduced due to poor lubrication or the internal parts being subject to a concentrated load.



### Step 2. Verify the operating environment.

Checkpoint	Standard value
$S_0$ — Ambient temperature ( $^\circ\text{C}$ )	-10 to +40
$S_1$ — Reduction gear surface temperature ( $^\circ\text{C}$ )	60 or less

Note: Refer to "Operating environment" on p. 26 for values other than those listed above.



### Step 3-1. Examine the reduction gear load.

Setting item	Calculation formula	Selection examples
<b>(1) Calculate the inertia moment.</b>		
$I_R$ Load inertia moment (kgm <sup>2</sup> )	$I_R = \frac{W_C}{12} \times \left\{ \left( \frac{a}{1,000} \right)^2 + \left( \frac{b}{1,000} \right)^2 \right\} + W_C \times \left( \frac{R}{1,000} \right)^2$	$I_R = \frac{2,000}{12} \times \left\{ \left( \frac{500}{1,000} \right)^2 + \left( \frac{500}{1,000} \right)^2 \right\} + 2,000 \times \left( \frac{320}{1,000} \right)^2 = 288.1 \text{ (kgm}^2\text{)}$
<b>(2) Examine the constant torque.</b>		
$T_R$ Constant torque (Nm)	$T_R = W_C \times 9.8 \times \frac{R}{1,000}$	$T_R = 2,000 \times 9.8 \times \frac{320}{1,000} = 6,272 \text{ (Nm)}$

### Step 3-2: Proceed to p. 31.

(Refer to "With horizontal rotational transfer" for selection examples.)



### Step 3-2. Set items required for selection.

Setting item	Calculation formula	Selection examples (With horizontal rotational transfer)
<b>(1) Set the acceleration/deceleration time, constant-speed operation time, and output speed.</b>		
t <sub>1</sub> — Acceleration time (s)	<ul style="list-style-type: none"> <li>The operation pattern does not need to be verified if it is already set.</li> <li>If the operation pattern has not been determined, use the following formula to calculate the reference operation pattern.</li> </ul> $t_1 = t_3 = \text{Rotation} [ t_1 + t_2 + t_3 ] - \frac{\theta}{\left(\frac{N_2}{60} \times 360\right)}$ $t_2 = \text{Rotation} [ t_1 + t_2 + t_3 ] - (t_1 + t_3)$ <p>Note: 1. Assume that t<sub>1</sub> and t<sub>3</sub> are the same.            Note: 2. N<sub>2</sub> = 15 rpm if the reduction gear output speed (N<sub>2</sub>) is not known.            Note: 3. If t<sub>1</sub> and t<sub>3</sub> is less than 0, increase the output speed or extend the rotation time.</p>	Examine the operation pattern using N <sub>2</sub> = 15 rpm as the reduction gear output speed is unknown. $t_1 = t_3 = 2.5 - \frac{180}{\left(\frac{15}{60} \times 360\right)} = 0.5 \text{ (s)}$ $t_2 = 2.5 - (0.5 + 0.5) = 1.5 \text{ (s)}$ $\therefore t_1 = t_3 = 0.5 \text{ (s)}$ $t_2 = 1.5 \text{ (s)}$ $N_2 = 15 \text{ (rpm)}$
t <sub>2</sub> — Constant-speed operation time (s)		
t <sub>3</sub> — Deceleration time (s)		
N <sub>2</sub> — Constant speed (rpm)		
N <sub>1</sub> — Average speed for startup (rpm)	$N_1 = \frac{N_2}{2}$	$N_1 = \frac{15}{2} = 7.5 \text{ (rpm)}$
N <sub>3</sub> — Average speed for stop (rpm)	$N_3 = \frac{N_2}{2}$	$N_3 = \frac{15}{2} = 7.5 \text{ (rpm)}$
<b>(2) Calculate the inertia torque for acceleration/deceleration.</b>		
T <sub>A</sub> — Inertia torque for acceleration (Nm)	$T_A = \left\{ \frac{I_R \times (N_2 - 0)}{t_1} \right\} \times \frac{2\pi}{60}$	$T_A = \left\{ \frac{463.3 \times (15 - 0)}{0.5} \right\} \times \frac{2\pi}{60}$ = 1,455 (Nm)
T <sub>D</sub> — Inertia torque for deceleration (Nm)	$T_D = \left\{ \frac{I_R \times (0 - N_2)}{t_3} \right\} \times \frac{2\pi}{60}$	$T_D = \left\{ \frac{463.3 \times (0 - 15)}{0.5} \right\} \times \frac{2\pi}{60}$ = -1,455 (Nm)
<b>(3) Calculate the load torque for acceleration/deceleration.</b>		
T <sub>1</sub> — Maximum torque for startup (Nm)	$T_1 =  T_A + T_R $ T <sub>R</sub> : Constant torque With horizontal rotational transfer Refer to page 29 With vertical rotational transfer Refer to page 30	$T_1 =  1,455 + 86.4 $ = 1,541.4 (Nm)
T <sub>2</sub> — Constant maximum torque (Nm)	$T_2 =  T_R $	$T_2 = 86.4 \text{ (Nm)}$
T <sub>3</sub> — Maximum torque for stop (Nm)	$T_3 =  T_D + T_R $ T <sub>R</sub> : Constant torque With horizontal rotational transfer Refer to page 29 With vertical rotational transfer Refer to page 30	$T_3 =  -1,455 + 86.4 $ = 1,368.6 (Nm)
<b>(4)-1 Calculate the average speed.</b>		
N <sub>m</sub> — Average speed (rpm)	$N_m = \frac{t_1 \times N_1 + t_2 \times N_2 + t_3 \times N_3}{t_1 + t_2 + t_3}$	$N_m = \frac{0.5 \times 7.5 + 1.5 \times 15 + 0.5 \times 7.5}{0.5 + 1.5 + 0.5}$ = 12 (rpm)
<b>(4)-2 Calculate the average load torque.</b>		
T <sub>m</sub> — Average load torque (Nm)	$T_m = \sqrt[3]{\frac{t_1 \times N_1 \times t_1^{\frac{10}{3}} + t_2 \times N_2 \times t_2^{\frac{10}{3}} + t_3 \times N_3 \times t_3^{\frac{10}{3}}}{t_1 \times N_1 + t_2 \times N_2 + t_3 \times N_3}}$	$T_m = \sqrt[3]{\frac{0.5 \times 7.5 \times 1,541.4^{\frac{10}{3}} + 1.5 \times 15 \times 86.4^{\frac{10}{3}} + 0.5 \times 7.5 \times 1,368.6^{\frac{10}{3}}}{0.5 \times 7.5 + 1.5 \times 15 + 0.5 \times 7.5}}$ = 963.9 (Nm)

Go to page 32 if the reduction gear model is verified based on the required life.

Go to page 34 if the service life is verified based on the reduction gear model.

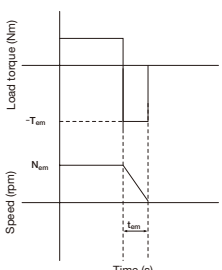
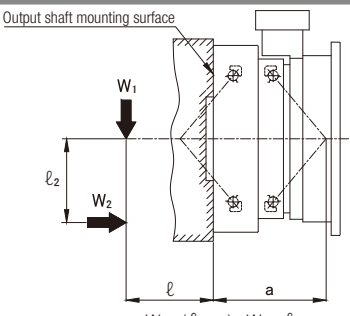
# Model code selection examples

## Step 4. Select a reduction gear.

Reduction gear selection method (1) Calculate the required torque based on the load conditions and required life and select a reduction gear.

Setting/verification item	Calculation formula	Selection examples (With horizontal rotational transfer)
<b>(1) Calculate the rated torque for the reduction gear that satisfies the required life.</b>		
$L_{ex}$ Required life (year)	Based on the operation conditions	20 years
$Q_{1cy}$ Number of cycles per day (times)	$Q_{1cy} = \frac{Q_1 \times 60 \times 60}{t_4}$	$Q_{1cy} = \frac{12 \times 60 \times 60}{20}$ = 2,160 (times)
$Q_3$ Operating hours of reduction gear per day (h)	$Q_3 = \frac{Q_{1cy} \times (t_1 + t_2 + t_3)}{60 \times 60}$	$Q_3 = \frac{2,160 \times (0.5 + 1.5 + 0.5)}{60 \times 60}$ = 1.5 (h)
$Q_4$ Operating hours of reduction gear per year (h)	$Q_4 = Q_3 \times Q_2$	$Q_4 = 1.5 \times 365$ = 548 (h)
$L_{hour}$ Reduction gear service life (h)	$L_{hour} = Q_4 \times L_{ex}$	$L_{hour} = 548 \times 20$ = 10,960 (h)
$T_0'$ Reduction gear rated torque that satisfies the required life (Nm)	$T_0' = T_m \times \sqrt[10]{\frac{L_{hour} \times N_m}{K \times N_0}}$ K : Reduction gear rated life (h) $N_0$ : Reduction gear rated output speed (rpm)	$T_0' = 963.9 \times \sqrt[10]{\frac{10,960 \times 12}{6,000 \times 15}}$ = 1.080 (Nm)
<b>(2) Tentatively select a reduction gear model based on the calculated rated torque.</b>		
Tentative selection of the reduction gear	Select a reduction gear for which the rated torque of the reduction gear $[T_0]^{*1}$ is equal to or greater than the rated torque of the reduction gear that satisfies the required life $[T_0']$ .  *1 $[T_0]$ : Refer to the rating table on page 10.	RS-260A that meets the following condition is tentatively selected: $[T_0] \geq 2,548 \text{ (Nm)} \geq [T_0'] \ 1.080 \text{ (Nm)}$
<b>(3) Verify the maximum torque for startup and stop.</b>		
Verification of maximum torque for startup and stop	Check the following conditions: The allowable acceleration/deceleration torque $[T_{s1}]^{*1}$ is equal to or greater than the maximum starting torque $[T_1]^{*2}$ and maximum stopping torque $[T_3]^{*2}$ .  If the tentatively selected reduction gear is outside of the specifications, change the reduction gear model.  *1 $[T_{s1}]$ : Refer to the rating table on page 10. *2 $[T_1]$ and $[T_3]$ : Refer to page 31.	$[T_{s1}] \ 6,370 \text{ (Nm)} \geq [T_1] \ 1,541.4 \text{ (Nm)}$ $[T_3] \ 1,368.6 \text{ (Nm)}$ According to the above conditions, the tentatively selected model should be no problem.
<b>(4) Verify the output speed.</b>		
$N_{m0}$ Average speed per cycle (rpm)	$N_{m0} = \frac{t_1 \times N_1 + t_2 \times N_2 + t_3 \times N_3}{t_4}$	$N_{m0} = \frac{0.5 \times 7.5 + 1.5 \times 15 + 0.5 \times 7.5}{20}$ = 1.5 (rpm)
Verification of output speed	Check the following condition: The allowable output speed $[N_{s0}]^{*1}$ is equal to or greater than the average speed per cycle $[N_{m0}]$ .  If the tentatively selected reduction gear is outside of the specifications, change the reduction gear model. Contact us regarding use of the model at a speed outside the allowable output speed $[N_{s0}]^{*1}$ .  Note: The value of $[N_{s0}]$ is the speed at which the case temperature is balanced at 60°C for 30 minutes.  *1 $[N_{s0}]$ and $[N_{s1}]$ : Refer to the rating table on page 10.	$[N_{s0}] \ 21.5 \text{ (rpm)} \geq [N_{m0}] \ 1.5 \text{ (rpm)}$ According to the above condition, the tentatively selected model should be no problem.

**Reduction gear selection method (1) Calculate the required torque based on the load conditions and required life and select a reduction gear.**

Setting/verification item	Calculation formula	Selection examples (With horizontal rotational transfer)												
<b>(5) Verify the shock torque at the time of an emergency stop.</b>														
$P_{em}$ ——— Expected number of emergency stop times (times)	Based on the operation conditions.	For example, an emergency stop occurs once a month. $[P_{em}] = 1 \times 12 \times \text{required life (year)} [L_{ex}]$ $= 12 \times 20 = 240$ (times)												
$T_{em}$ ——— Shock torque due to an emergency stop (Nm)	 <p>Set the operation conditions that meet the following requirement:                      Shock torque due to an emergency stop <math>[T_{em}]</math> is equal to or less than the momentary maximum allowable torque <math>[T_{s2}]</math></p>	For example, $[T_{em}] = 5,000$ (Nm)												
$N_{em}$ ——— Speed at the time of an emergency stop (rpm)		For example, $[N_{em}] = 15$ (rpm)												
$t_{em}$ ——— Deceleration time at the time of an emergency stop (s)		For example, $[t_{em}] = 0.05$ (s)												
$Z_4$ ——— Number of pins for reduction gear		<table border="1"> <thead> <tr> <th>Model</th> <th>Number of pins (<math>Z_4</math>)</th> </tr> </thead> <tbody> <tr> <td>RS-50A/RS-50B</td> <td>52</td> </tr> <tr> <td>RS-260A/RS-260B</td> <td>60</td> </tr> <tr> <td>RS-320A/RS-320B</td> <td>60</td> </tr> <tr> <td>RS-400A</td> <td>60</td> </tr> <tr> <td>RS-900A</td> <td>58</td> </tr> </tbody> </table>	Model	Number of pins ( $Z_4$ )	RS-50A/RS-50B	52	RS-260A/RS-260B	60	RS-320A/RS-320B	60	RS-400A	60	RS-900A	58
Model	Number of pins ( $Z_4$ )													
RS-50A/RS-50B	52													
RS-260A/RS-260B	60													
RS-320A/RS-320B	60													
RS-400A	60													
RS-900A	58													
$C_{em}$ ——— Allowable number of shock torque application times	$C_{em} = \frac{775 \times \left( \frac{T_{s2}}{T_{em}} \right)^{\frac{10}{3}}}{Z_4 \times \frac{N_{em}}{60} \times t_{em}}$ <p>Note <math>[T_{s2}]</math>: Momentary maximum allowable torque, refer to the rating table on page 10.</p>	$C_{em} = \frac{775 \times \left( \frac{12,740}{5,000} \right)^{\frac{10}{3}}}{60 \times \frac{15}{60} \times 0.05} = 23,347$ (times)												
Verification of shock torque due to an emergency stop	Check the following condition: The allowable shock torque application count $[C_{em}]$ is equal to or greater than the expected emergency stop count $[P_{em}]$ If the tentatively selected reduction gear is outside of the specifications, change the reduction gear model.	$[C_{em}] 23,347 \geq [P_{em}] 240$ According to the above condition, the tentatively selected model should be no problem.												
<b>(6) Verify the thrust load and moment load.</b>														
$W_1$ ——— Radial load (N)	 <p> <math display="block">M = \frac{W_1 \times (\ell + a) + W_2 \times \ell_2}{1,000}</math>                     a: Refer to the calculation of the tilt angle on page 39.                 </p>	0 (N)												
$\ell$ ——— Distance to the point of radial load application (mm)		0 (mm)												
$W_2$ ——— Thrust load (N)		In this example, $W_2 = W_A + W_B = (2,000 + 100 \times 4) \times 9.8$ $= 23,520$ (N) Note $W_A, W_B$ : Refer to page 29.												
$\ell_2$ ——— Distance to the point of thrust load application (mm)		0 (mm) (As the workpiece center is located on the rotation axis)												
$M$ ——— Moment load (Nm)		RS-260A As dimension $a = 232.4$ (mm): $M = \frac{0 \times (0 + 232.4) + 23,520 \times 0}{1,000} = 0$ (Nm)												
Verify the thrust load and moment load	Check that the thrust load and moment load are within the range in the allowable moment diagram on page 37. When radial load $W_1$ is applied within dimension $b$ , use the reduction gear within the allowable radial load. $W_r$ : Allowable radial load, see the rating table on page 10. If the tentatively selected reduction gear is outside of the specifications, change the reduction gear model.	For this example, Thrust load $[W_2] = 23,520$ (N) Moment load $[M] = 0$ (N) As the above values are within the range in the allowable moment diagram, the tentatively selected model should be no problem.												
Select the reduction gear model that satisfies all the conditions of the above verification items. The actual reduction ratio is determined based on the motor speed, input torque, and inertia moment. Check with the motor manufacturer.		Based on the above verification result, RS-260A is selected.												

# Model code selection examples

## Reduction gear selection method (2): Tentatively select a reduction gear model and evaluate the service life.

Setting/verification item	Calculation formula	Selection examples (With horizontal rotational transfer)										
<b>(1) Tentatively select a desired reduction gear model.</b>												
Tentative selection of a reduction gear	Tentatively select a desired reduction gear model.	For example, tentatively select RS-260A.										
<b>(2) Verify the maximum torque for startup and stop.</b>												
Verification of maximum torque for startup and stop	<p>Check the following conditions: The allowable acceleration/deceleration torque <math>[T_{s1}]^{*1}</math> is equal to or greater than the maximum starting torque <math>[T_1]^{*2}</math> and maximum stopping torque <math>[T_3]^{*2}</math></p> <p>If the tentatively selected reduction gear is outside of the specifications, change the reduction gear model.</p> <p>*1 <math>[T_{s1}]</math>: Refer to the rating table on page 10. *2 <math>[T_1]</math> and <math>[T_3]</math>: Refer to page 31.</p>	$[T_{s1}]$ 6,370 (Nm) $\geq [T_1]$ 1,541.4 (Nm) $[T_3]$ 1,368.6 (Nm) According to the above conditions, the tentatively selected model should be no problem.										
<b>(3) Verify the output speed.</b>												
$N_{m0}$ — Average speed per cycle (rpm)	$N_{m0} = \frac{t_1 \times N_1 + t_2 \times N_2 + t_3 \times N_3}{t_4}$	$N_{m0} = \frac{0.5 \times 7.5 + 1.5 \times 15 + 0.5 \times 7.5}{20}$ = 1.5 (rpm)										
Verification of output speed	<p>Check the following condition: The allowable output speed <math>[N_{s0}]^{*1}</math> is equal to or greater than the average speed per cycle <math>[N_{m0}]</math></p> <p>If the tentatively selected reduction gear is outside of the specifications, change the reduction gear model. Contact us regarding use of the model at a speed outside the allowable output speed <math>[N_{s0}]^{*1}</math>.</p> <p>Note: The value of <math>[N_{s0}]</math> is the speed at which the case temperature is balanced at 60°C for 30 minutes.</p> <p>*1 <math>[N_{s0}]</math> and <math>[N_{s1}]</math>: Refer to the rating table on page 10.</p>	$[N_{s0}]$ 21.5 (rpm) $\geq [N_{m0}]$ 1.5 (rpm) According to the above condition, the tentatively selected model should be no problem.										
<b>(4) Verify the shock torque at the time of an emergency stop.</b>												
$P_{em}$ — Expected number of emergency stop times (times)	Based on the operation conditions.	For example, an emergency stop occurs once a month. $[P_{em}] = 1 \times 12 \times \text{required life (year)} [L_{ex}]$ $= 12 \times 20 = 240$ (times)										
$T_{em}$ — Shock torque due to an emergency stop (Nm)		For example, $[T_{em}] = 500$ (Nm)										
$N_{em}$ — Speed at the time of an emergency stop (rpm)		For example, $[N_{em}] = 15$ (rpm)										
$t_{em}$ — Deceleration time at the time of an emergency stop (s)		For example, $[t_{em}] = 0.05$ (s)										
$Z_4$ — Number of pins for reduction gear		<table border="1"> <thead> <tr> <th>Model</th> <th>Number of pins (<math>Z_4</math>)</th> </tr> </thead> <tbody> <tr> <td>RS-50A/RS-50B</td> <td>52</td> </tr> <tr> <td>RS-260A/RS-260B</td> <td rowspan="2">60</td> </tr> <tr> <td>RS-320A/RS-320B</td> </tr> <tr> <td>RS-400A</td> <td rowspan="2">58</td> </tr> <tr> <td>RS-900A</td> </tr> </tbody> </table>	Model	Number of pins ( $Z_4$ )	RS-50A/RS-50B	52	RS-260A/RS-260B	60	RS-320A/RS-320B	RS-400A	58	RS-900A
Model	Number of pins ( $Z_4$ )											
RS-50A/RS-50B	52											
RS-260A/RS-260B	60											
RS-320A/RS-320B												
RS-400A	58											
RS-900A												
$C_{em}$ — Allowable number of shock torque application times	$C_{em} = \frac{775 \times \left( \frac{[T_{s2}]}{[T_{em}]} \right)^{\frac{10}{3}}}{Z_4 \times \frac{[N_{em}]}{60} \times [t_{em}]}$ <p>Note <math>[T_{s2}]</math>: Momentary maximum allowable torque, refer to the rating table on page 10.</p>	$C_{em} = \frac{775 \times \left( \frac{1,225}{500} \right)^{\frac{10}{3}}}{40 \times \frac{15}{60} \times 0.05} = 30,729$ (times)										
Verification of shock torque due to an emergency stop	<p>Check the following condition: The allowable shock torque application count <math>[C_{em}]</math> is equal to or greater than the expected emergency stop count <math>[P_{em}]</math></p> <p>If the tentatively selected reduction gear is outside of the specifications, change the reduction gear model.</p>	$[C_{em}]$ 23,347 $\geq [P_{em}]$ 240 According to the above condition, the tentatively selected model should be no problem.										

## Reduction gear selection method (2): Tentatively select a reduction gear model and evaluate the service life.

Setting/verification item	Calculation formula	Selection examples (With horizontal rotational transfer)
<b>(5) Verify the thrust load and moment load.</b>		
$W_1$ — Radial load (N) $\ell$ — Distance to the point of radial load application (mm) $W_2$ — Thrust load (N) $\ell_2$ — Distance to the point of thrust load application (mm) $M$ — Moment load (Nm)	<p style="text-align: center;"> <math display="block">M = \frac{W_1 \times (\ell + a) + W_2 \times \ell_2}{1,000}</math>           a: Refer to the calculation of the tilt angle on page 39.         </p>	0 (N) 0 (mm) $W_2 = W_A + W_B = (2,000 + 100 \times 4) \times 9.8 = 23,520 \text{ (N)}$ Note $W_A, W_B$ : Refer to page 29. 0 (mm) (As the workpiece center is located on the rotation axis) RS-260A As dimension $a = 232.4 \text{ (mm)}$ : $M = \frac{0 \times (0 + 232.4) + 23,520 \times 0}{1,000} = 0 \text{ (Nm)}$
Verify the thrust load and moment load	Check that the thrust load and moment load are within the range in the allowable moment diagram on page 37. When radial load $W_1$ is applied within dimension $b$ , use the reduction gear within the allowable radial load. $W_r$ : Allowable radial load, see the rating table on page 10.  If the tentatively selected reduction gear is outside of the specifications, change the reduction gear model.	For this example, Thrust load $[W_2] = 2,548 \text{ (N)}$ Moment load $[M] = 0 \text{ (N)}$ As the above values are within the range in the allowable moment diagram, the tentatively selected model should be no problem.
<b>(6) Verify the reduction gear service life.</b>		
$L_h$ — Life (h)	$L_h = 6,000 \times \frac{N_0}{N_m} \times \left(\frac{T_0}{T_m}\right)^{\frac{10}{3}}$	$L_h = 6,000 \times \frac{15}{12} \times \left(\frac{2,548}{963.9}\right)^{\frac{10}{3}} = 191,552 \text{ (h)}$
$Q_{1cy}$ — Number of cycles per day (times)	$Q_{1cy} = \frac{Q_1 \times 60 \times 60}{t_4}$	$Q_{1cy} = \frac{12 \times 60 \times 60}{20} = 2,160 \text{ (times)}$
$Q_3$ — Operating hours per day (h)	$Q_3 = \frac{Q_{1cy} \times (t_1 + t_2 + t_3)}{60 \times 60}$	$Q_3 = \frac{2,160 \times (0.5 + 1.5 + 0.5)}{60 \times 60} = 1.5 \text{ (h)}$
$Q_4$ — Operating hours per year (h)	$Q_4 = Q_3 \times Q_2$	$Q_4 = 1.5 \times 365 = 548 \text{ (h)}$
$L_{year}$ — Reduction gear service life (year)	$L_{year} = \frac{L_h}{Q_4}$	$L_{year} = \frac{191,552}{548} = 349.5 \text{ (year)}$
$L_{ex}$ — Required life (year)	Based on the operation conditions	20 years
Verification of the service life	Check the following condition: $[L_{ex}]$ is equal to or less than $[L_{year}]$  If the tentatively selected reduction gear is outside of the specifications, change the reduction gear model.	$[L_{ex}] 20 \text{ (year)} \leq [L_{year}] 349.5 \text{ (year)}$ According to the above condition, the tentatively selected model should be no problem.
Select the reduction gear model that satisfies all the conditions of the above verification items. The actual reduction ratio is determined based on the motor speed, input torque, and inertia moment. Check with the motor manufacturer.		Based on the above verification result, RS-260A is selected.

## Product selection

# Model code selection examples

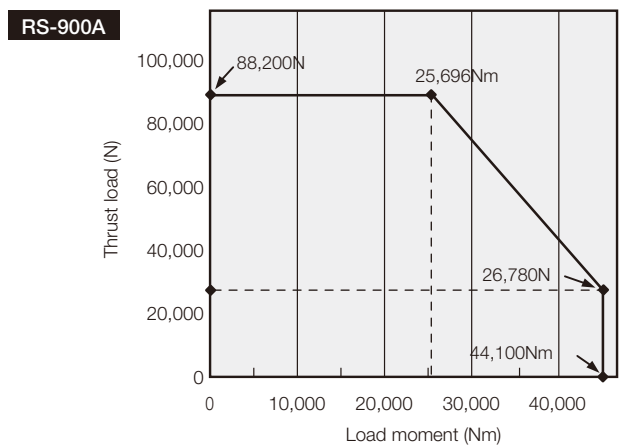
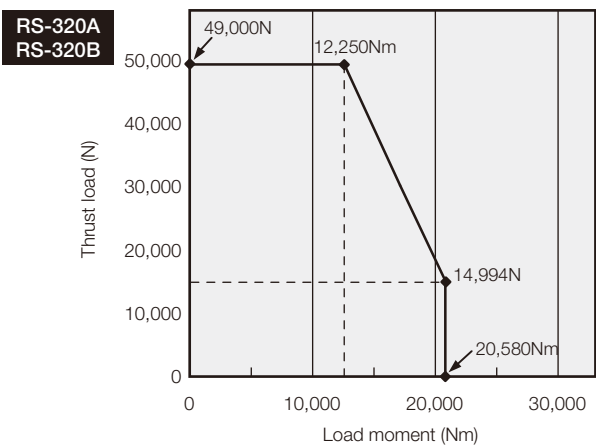
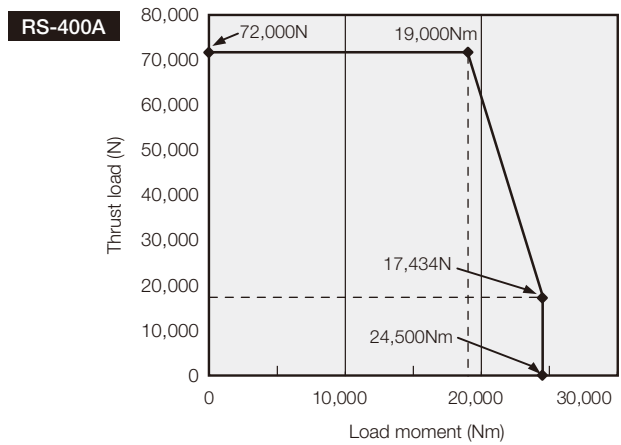
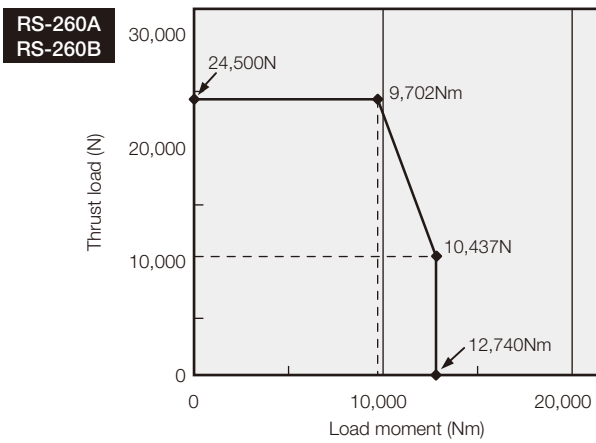
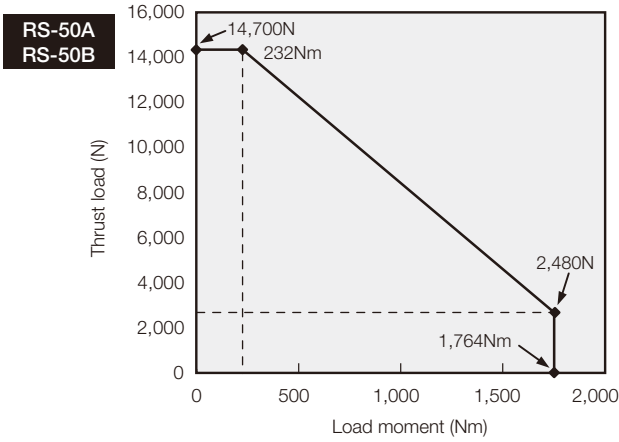
### Limitation on the motor torque

A limitation is imposed on the motor torque value so that the shock torque applied to the reduction gear does not exceed the momentary maximum allowable torque.

Setting/verification item	Calculation formula	Selection examples (With horizontal rotational transfer)
$T_{M1}$ ——— Motor momentary maximum torque (Nm)	Determine based on the motor specifications.	For example, $T_{M1} = 90$ (Nm)
$T_{M1OUT}$ ——— Maximum torque generated at the output shaft for the reduction gear (Nm)  (When an external shock is applied at the time of an emergency stop or motor stop)	$T_{M1out} = T_{M1} \times R \times \frac{100}{\eta}$ R: Actual reduction ratio $\eta$ : Startup efficiency (%), refer to the rating table on page 10.	For example, calculate the maximum torque generated at the output shaft for the reduction gear based on the specifications when RS-260A-120 was selected.  $T_{M1out} = 90 \times 120 \times \frac{100}{75}$ $= 14,400 \text{ (Nm)}$
$T_{M2OUT}$ ——— Maximum torque generated at the output shaft for the reduction gear (Nm)  (When a shock is applied to the output shaft due to hitting by an obstacle)	$T_{M2out} = T_{M1} \times R \times \frac{\eta}{100}$	$T_{M2out} = 10 \times 120 \times \frac{75}{100}$ $= 8,100 \text{ (Nm)}$
Limitation on motor torque value	Check the following condition: The momentary maximum allowable torque $[T_{S2}]^1$ is equal to or greater than the maximum torque generated at the output shaft for the reduction gear $[T_{M1OUT}]$ and $[T_{M2OUT}]$ . If the above condition is not satisfied, a limitation is imposed on the maximum torque value of the motor.  *1 $[T_{S2}]$ : Refer to the rating table on page 10.	$[T_{S2}] 12,740 \text{ (Nm)} \leq [T_{M1OUT}] 14,400 \text{ (Nm)}$ and $[T_{M2OUT}] 8,100 \text{ (Nm)}$ According to the above condition, the torque limit is set for the motor.

# Product selection

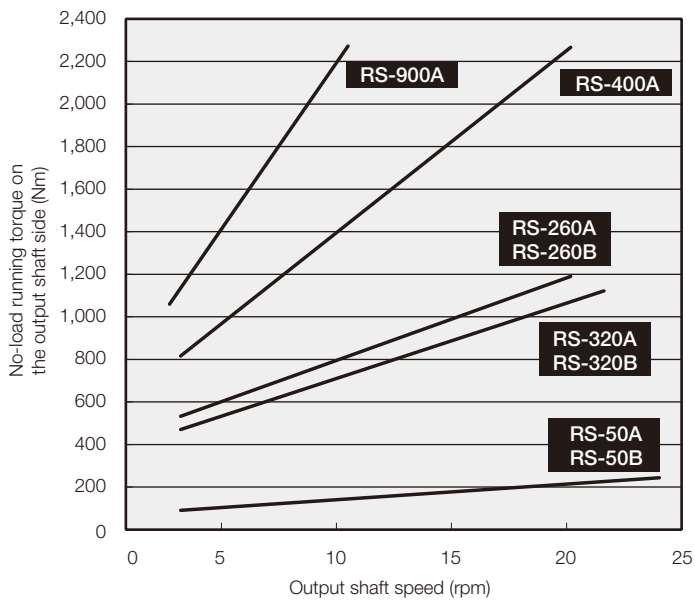
## Allowable moment diagram



When the load moment and the axial 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.

## Technical data

# No-load running torque



The no-load running torque that is converted to the input shaft side value should be calculated using the following equation:

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

(Measurement conditions)

Case temperature: 20°C

Lubricant:

RVGREASE™ LB00

(RS-50A, RS-50B, RS-260A, RS-260B, RS-400A)

Molywhite RE00

(RS-320A, RS-320B, RS-900A)



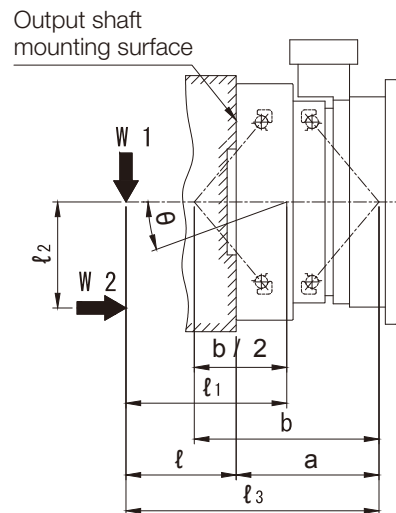
# Calculation of tilt angle and torsion angle

## Calculation of tilt angle

When a load moment occurs with an external load applied, the output shaft will tilt in proportion to the load moment (If  $\ell_3$  is larger than  $b$ )  
 The moment rigidity indicates the rigidity of the main bearing, and it is represented by the load moment value required for tilting the main bearing by 1 arc.min.

$$\theta = \frac{W_1 \ell_1 + W_2 \ell_2}{M_1 \times 10^3}$$

$\theta$  : Tilt angle of the output shaft (arc.min.)  
 $M_1$  : Moment rigidity (Nm/arc.min.)  
 $W_1, W_2$  : Load (N)  
 $\ell_1, \ell_2$  : Distance to the point of load application (mm)  
 $\ell_1$  :  $\ell + \frac{b}{2} + a - b$   
 $\ell$  : Distance from the output shaft installation surface to the point of load application (mm)



Model	Moment rigidity Reference value (Nm/arc.min.)	Dimensions (mm)	
		a	b
RS-50A	1,960	28.4	187.1
RS-50B		50.4	
RS-260A	8,320	232.4	319.3
RS-260B			
RS-320A	12,740	268.5	376.4
RS-320B		168.5	
RS-400A	19,600	264.2	369.8
RS-900A	37,730	325.4	433.4

## Calculation of torsion angle

Calculate the torsion angle when the torque is applied in a single direction, using an example of RS-260A.

- When the load torque is 50 Nm.....Torsion angle ( $ST_1$ )  
 When the load torque is within the lost motion range

$$ST_1 = \frac{50}{76.4} \times \frac{1 \text{ (arc.min.)}}{2} = 0.33 \text{ arc.min. or less}$$

- When the load torque is 1,300 Nm.....Torsion angle ( $ST_2$ )  
 When the load torque is within the rated torque range

$$ST_2 = \frac{1}{2} + \frac{2,100 - 76.4}{1,540} = 1.81 \text{ arc.min.}$$

- Note: 1. The torsion angles that are calculated above are for a single reduction gear.**  
**2. Contact us for the customized specifications for lost motion.**

Model	Torsional rigidity Reference value (Nm/arc.min.)	Lost motion		Backlash (arc.min.)
		Lost motion (arc.min.)	Measured torque (Nm)	
RS-50A	255	1.5	±14.7	1.5
RS-50B				
RS-260A	1,540	1.0	±76.4	1.0
RS-260B				
RS-320A	1,570	1.0	±94.1	1.0
RS-320B				
RS-400A	2,450		±117.6	
RS-900A	4,900		±264.6	

## Design points

# Reduction gear installation components

### 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 to the torque, as specified below, in order to satisfy the momentary maximum allowable torque, which is noted in the rating table.

The use of the serrated lock washers are recommended to prevent the hexagon socket head cap screws from loosening and to protect the seat surface from flaws.

#### • Hexagon socket head cap screw

<Bolt tightening torque and tightening force>

Hexagon socket head cap screw nominal size x pitch (mm)	Tightening torque (Nm)	Tightening force F (N)	Bolt specification
M5 × 0.8	9.01 ± 0.49	9,310	Hexagon socket head cap screw JIS B 1176: 2006 Strength class JIS B 1051: 2000 12.9 Thread JIS B 0209: 2001 6g
M6 × 1.0	15.6 ± 0.78	13,180	
M8 × 1.25	37.2 ± 1.86	23,960	
M10 × 1.5	73.5 ± 3.43	38,080	
M12 × 1.75	129 ± 6.37	55,100	
M16 × 2.0	319 ± 15.9	103,410	
M18 × 2.5	441 ± 22.0	126,720	
M20 × 2.5	493 ± 24.6	132,170	

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

**2.** If softer material, such as aluminum or stainless, is used, limit the tightening torque. Also take the transmission torque and load moment into due consideration.

<Calculation of allowable transmission torque of bolts>

$T = F \times \mu \times \frac{D}{2 \times 1,000} \times n$	T	Allowable transmission torque by tightening bolt (Nm)
	F	Bolt tightening force (N)
	D	Bolt mounting P.C.D. (mm)
	μ	Friction factor μ=0.15: When lubricant remains on the mating face. μ=0.20: When lubricant is removed from the mating face.
	n	Number of bolts (pcs.)

#### • Serrated lock washer for hexagon socket head cap screw

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

Corporation symbol: CDW-H

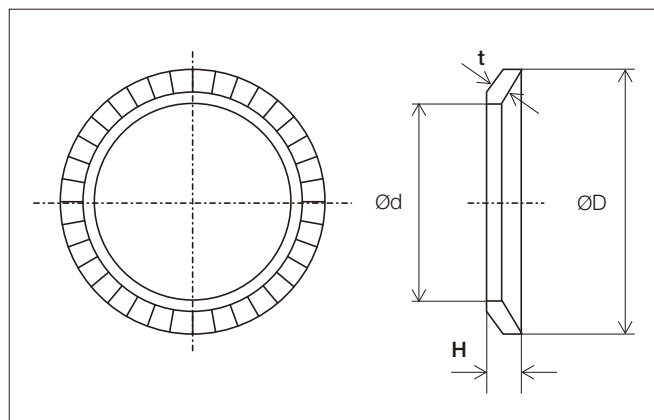
CDW-L (Only for M5)

Material: S50C to S70C

Hardness: HRC40 to 48

(Unit: mm)

Nominal size	ID and OD of Belleville spring washer		t	H
	Ød	ØD		
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
16	16.9	24	2.3	2.8
18	18.9	27	2.6	3.15
20	20.9	30	2.8	3.55



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

## Lubrication

- The standard lubrication method for the RS reduction gears is greasing. Before the reduction gear is shipped, it is filled with our recommended grease. (For the brand of the pre-filled grease, refer to the following table.)

When operating a reduction gear filled with the appropriate amount of grease, the standard replacement time due to deterioration of the 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

Model	RS-50A, RS-50B	RS-50A, RS-50B, RS-260A, RS-260B, RS-400A	RS-320A, RS-320B, RS-900A
Lubricant code	SB	LB	MW
Brand	RVOIL™ SB150	RVGREASE™ LB00	Molywhite RE00
Manufacturer	Nabtesco Corporation		
Ambient temperature	-10 to 40°C		

- It is recommended that the running-in operation is performed. Abnormal noise or torque variation may occur during operation due to the characteristics of the lubricant. There is no problem with the quality when the symptom disappears after the running-in operation is performed.

## Requirements for equipment design

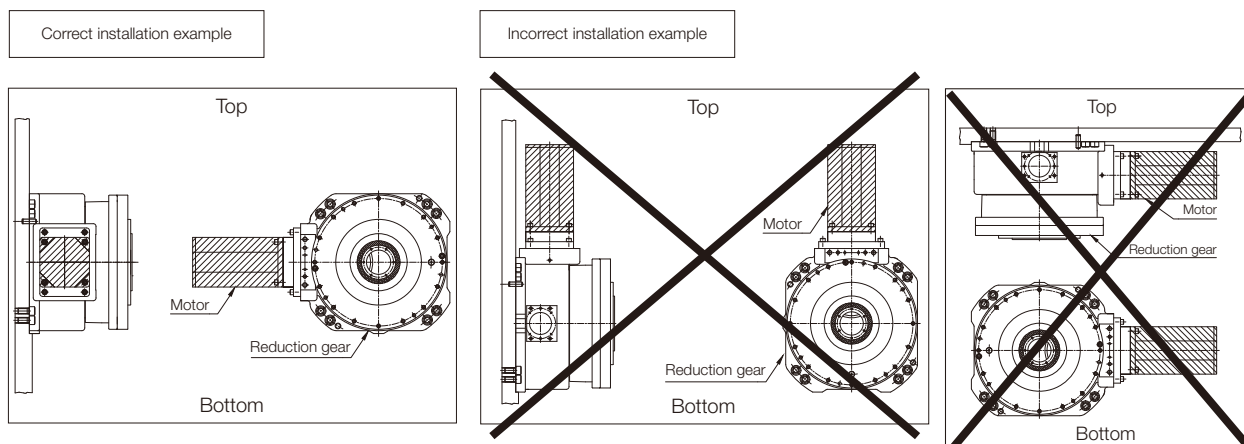
- If the lubricant leaks from the reduction gear or if the motor fails, the reduction gear must be removed. Design the equipment while taking this into consideration.
- As the center pipe at the center of the reduction unit is not designed to support a load, do not use the reduction gear in a way that applies a load to the center pipe. The oil seals may be deformed, which could eventually cause leakage of the lubricant.

## Attention for lifting reduction gear

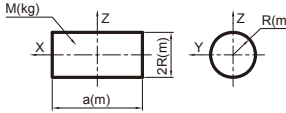
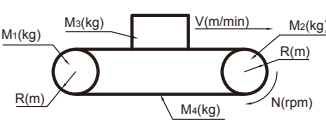
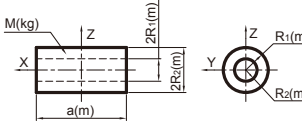
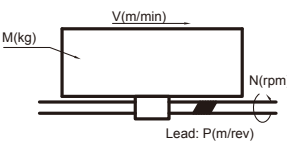
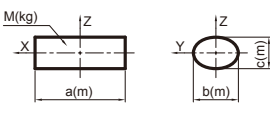
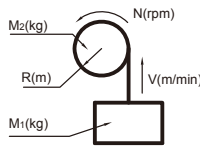
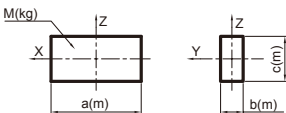
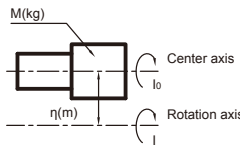
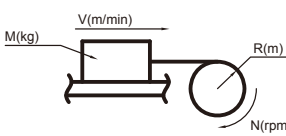
- Be sure that no load is applied to the center pipe or spline hole on the input unit when lifting. The oil seals on the output and/or input sides may become deformed, which could eventually cause leakage of the lubricant.

## Reduction gear installation

- For the horizontal shaft installation, do not install the reduction gear while the input shaft (motor) position faces upward. (Be sure to confirm that the input shaft position faces right, left, or downward during installation.)
- If you intend to use the reduction gear attached to the ceiling, contact our customer representative.



# Inertia moment calculation formula

Shape	I(kg <sup>2</sup> )	Shape	I(kg <sup>2</sup> )
<p>1. Cylinder solid</p> 	$I_x = \frac{1}{2} M R^2$ $I_y = \frac{1}{4} M \left( R^2 + \frac{a^2}{3} \right)$ $I_z = I_y$	<p>6. Horizontal movement by conveyor</p> 	$I = \left( \frac{M_1 + M_2}{2} + M_3 + M_4 \right) \times R^2$
<p>2. Cylinder hollow</p> 	$I_x = \frac{1}{2} M (R_1^2 + R_2^2)$ $I_y = \frac{1}{4} M \left\{ (R_1^2 + R_2^2) + \frac{a^2}{3} \right\}$ $I_z = I_y$	<p>7. Horizontal movement by lead screw</p> 	$I = \frac{M}{4} \left( \frac{V}{\pi \times N} \right)^2 = \frac{M}{4} \left( \frac{P}{\pi} \right)^2$
<p>3. Oval cross section</p> 	$I_x = \frac{1}{16} M (b^2 + c^2)$ $I_y = \frac{1}{4} M \left( \frac{c^2}{4} + \frac{a^2}{3} \right)$ $I_z = \frac{1}{4} M \left( \frac{b^2}{4} + \frac{a^2}{3} \right)$	<p>8. Up/down movement by hoist</p> 	$I = M_1 R^2 + \frac{1}{2} M_2 R^2$
<p>4. Rectangle</p> 	$I_x = \frac{1}{12} M (b^2 + c^2)$ $I_y = \frac{1}{12} M (a^2 + c^2)$ $I_z = \frac{1}{12} M (a^2 + b^2)$	<p>9. Parallel axis theorem</p> 	$I = I_0 + M \eta^2$ <p><math>I_0</math> : Moment of inertia of any object about an axis through its center of mass</p> <p><math>I</math> : Moment of inertia about any axis parallel to the axis through its center of mass</p> <p><math>\eta</math> : Perpendicular distance between the above two axes</p>
<p>5. General application</p> 	$I = \frac{M}{4} \left( \frac{V}{\pi \times N} \right)^2 = M R^2$		

# Troubleshooting checksheet

Check the following items in the case of trouble like abnormal noise, vibration, or malfunctions.

When it is not possible to resolve an abnormality even after verifying the corresponding checkpoint, obtain a "Reduction Gear Investigation Request Sheet" from the download page in our Website, fill in the necessary information, and contact our Customer Support Center at Tsu Plant.

[URL]: <https://precision.nabtesco.com/>

## The trouble started immediately after installation of the reduction gear

Checked	Checkpoint
	Make sure the equipment's drive section (the motor side or the reduction gear output surface side) is not interfering with another component.
	Make sure the equipment is not under a greater than expected load (torque, moment load, thrust load).
	Make sure the required number of bolts are tightened uniformly with the specified tightening torque.
	Make sure the reduction gear, motor, or your company's components are not installed at a slant.
	Make sure the specified amount of Nabtesco-specified lubricant has been added.
	Make sure there are no problems with the motor's parameter settings.
	Make sure there are no components resonating in unity.
	Make sure the input gear is appropriately installed on the motor.
	Make sure there is no damage to the surface of the input gear teeth.
	Make sure the input gear specifications (precision, number of teeth, module, shift coefficient, dimensions of each part) are correct.
	Make sure the flange and other components are designed and manufactured with the correct tolerances.

## The trouble started during operation

Checked	Checkpoint
	Make sure the equipment has not been in operation longer than the calculated service life.
	Make sure the surface temperature of the reduction gear is not higher than normal during operation.
	Make sure the operation conditions have not been changed.
	Make sure there are no loose or missing bolts.
	Make sure the equipment is not under a greater than expected load (torque, moment load, thrust load).
	Make sure the equipment's drive section is not interfering with another component.
	Make sure an oil leak is not causing a drop in the amount of lubricant.
	Make sure there are no external contaminants in the gear, such as moisture or metal powder.
	Make sure no lubricant other than that specified is being used.

▶ Area In North and South America / In Europe and Africa / In Asia and others  
 ▶ FAX USA: / Germany: / Nagoya Office:  
 1-248-553-3070 / 49-211-364677 / 81-52-582-2987

**Order Information Sheet** (Please complete the form below) and send it with your order. Date: \_\_\_\_\_

Company Name: \_\_\_\_\_

Dept. Name: \_\_\_\_\_

Name: \_\_\_\_\_

E-mail: \_\_\_\_\_

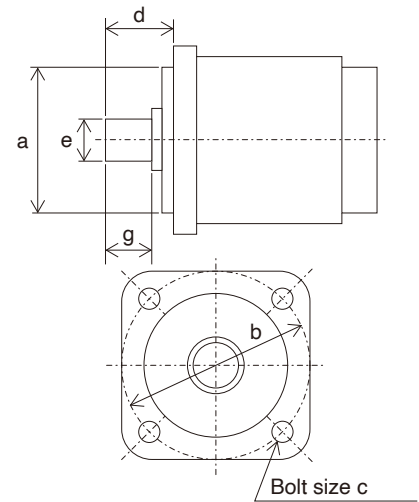
TEL. - -

FAX. - -

◆ **System configuration and selected motor**

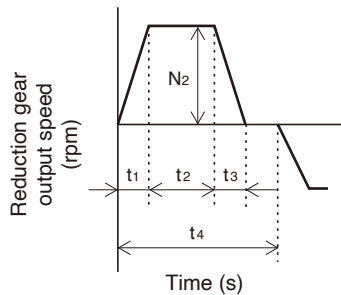
We would appreciate if you could provide your system configuration drawing that helps us to understand the speed, constant torque, and load inertia moment of the output shaft for the reduction gear.

**System configuration**



Motor model		<b>a</b>	Motor mounting pilot diameter (mm)	
<b>P</b>	Motor rated output (KW)	<b>b</b>	Motor mounting bolt P.C.D (mm)	
<b>T<sub>M0</sub></b>	Motor rated torque (Nm)	<b>c</b>	Motor mounting bolt size (mm)	
<b>T<sub>M1</sub></b>	Motor momentary maximum torque (Nm)	<b>d</b>	Motor shaft length (mm)	
<b>N<sub>M0</sub></b>	Motor rated speed (rpm)	<b>e</b>	Motor shaft diameter (mm)	
		<b>g</b>	Motor shaft effective length (mm)	

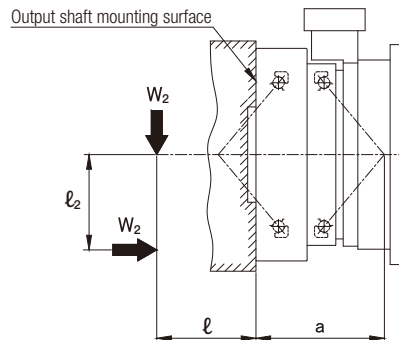
◆ **Operation pattern (output shaft for the reduction gear)**



<b>t<sub>1</sub></b>	Acceleration time (s)	
<b>t<sub>2</sub></b>	Constant speed operation time (s)	
<b>t<sub>3</sub></b>	Deceleration time (s)	
<b>t<sub>4</sub></b>	One operation cycle time (s)	
<b>Q<sub>1cy</sub></b>	Number of operation cycles per day (times)	
<b>Q<sub>2</sub></b>	Number of operating days per year (days)	
<b>N<sub>2</sub></b>	Constant speed (rpm)	
<b>T<sub>1</sub></b>	Max. torque for startup (Nm)	
<b>T<sub>2</sub></b>	Constant torque (Nm)	
<b>T<sub>3</sub></b>	Max. torque for stop (Nm)	

Please inform us of whether a key is attached or not, and when it is attached, also inform us of its dimensions.

◆ **External load (output shaft for the reduction gear)**



<b>W<sub>1</sub></b>	Radial load (N)	
<b>l</b>	Distance to the point of radial load application (mm)	
<b>W<sub>2</sub></b>	Axial load (N)	
<b>l<sub>2</sub></b>	Distance to the point of axial load application (mm)	

## Warranty

1. In the case where Nabtesco confirms that a defect of the Product was caused due to Nabtesco's design or manufacture within the Warranty Period of the Product, Nabtesco shall repair or replace such defective Product at its cost. The Warranty Period shall be from the delivery of the Product by Nabtesco or its distributor to you ("Customer") until the end of one (1) year thereafter, or the end of two thousand (2,000) hours from the initial operation of Customer's equipment incorporating the Product at end user's production line, whichever comes earlier.
  2. Unless otherwise expressly agreed between the parties in writing, the warranty obligations for the Product shall be limited to the repair or replacement set forth herein. OTHER THAN AS PROVIDED HEREIN, THERE ARE NO WARRANTIES ON THE PRODUCT, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
  3. The warranty obligation under the Section 1 above shall not apply if:
    - a) the defect was caused due to the use of the Product deviated from the Specifications or the working conditions provided by Nabtesco;
    - b) the defect was caused due to exposure to foreign substances or contamination (dirt, sand etc.)
    - c) lubricant or spare part other than the ones recommended by Nabtesco was used in the Product;
    - d) the Product was used in an unusual environment (such as high temperature, high humidity, a lot of dust, corrosive/volatile/inflammable gas, pressurized/depressurized air, under water/liquid or others except for those expressly stated in the Specifications);
    - e) the Product was disassembled, re-assembled, repaired or modified by anyone other than Nabtesco;
    - f) the defect was caused due to the equipment into which the Product was installed;
    - g) the defect was caused due to an accident such as fire, earthquake, lightning, flood or others; or
    - h) the defect was due to any cause other than the design or manufacturing of the Product.
  4. The warranty period for the repaired/replaced Product/part under the Section 1 above shall be the rest of the initial Warranty Period of the defective Product subjected to such repair/replace.
-

# Nabtesco®

Nabtesco Corporation

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