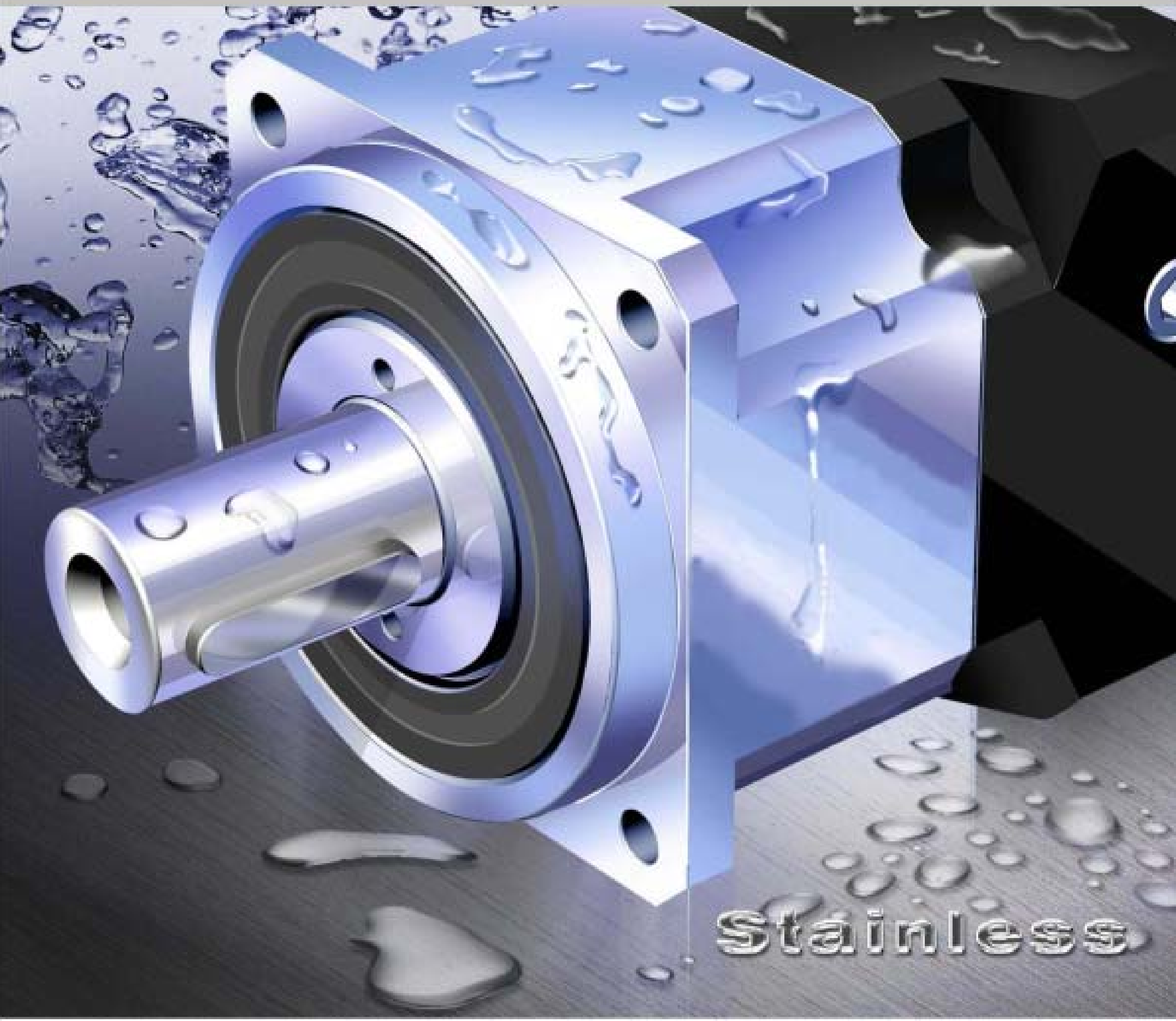
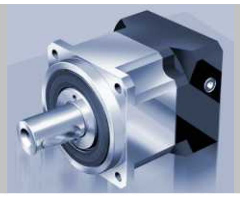
ROBOTECH CO., LTD.





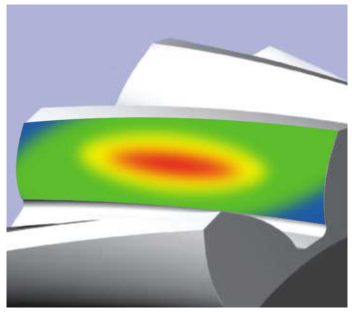
Characteristic Highlights

Equipped with ***solid needle roller bearings without cage,*** it provides maximum contact points to increase stiffness and generate higher output torque.

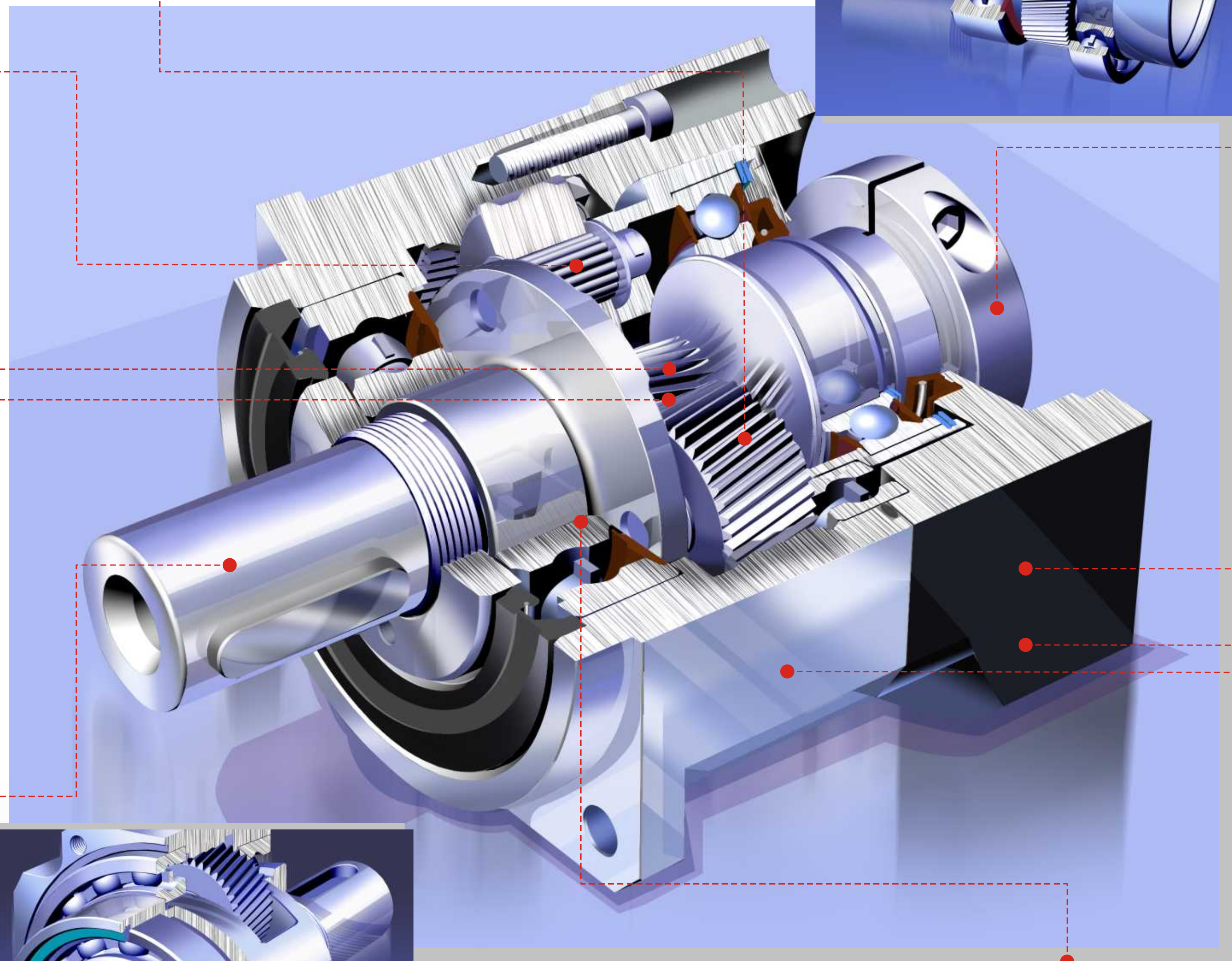
The helical gear design provides higher tooth contact ratio than regular spur gear, result of a quiet and smooth running also higher torque output and lower backlash.

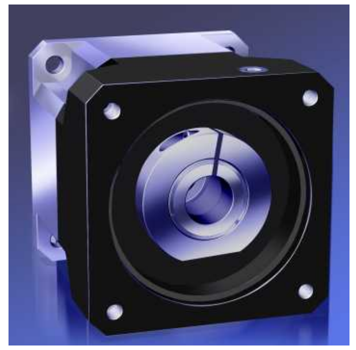
Extension straddle bearing design provide extra radial loading capacity.

Triple split collet with dynamic balanced set collar clamping system provides backlash free power transmission for greater concentricity and higher input speeds.

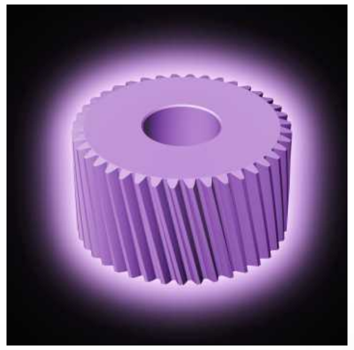


A high setting gear performance is achieved by using the ***HeliTopo technology*** which ***ease-off the tooth profile*** and ***crown the lead of the tooth.*** It optimizes the gears mesh alignment and overlapping the gears to maximum tooth contact surface.

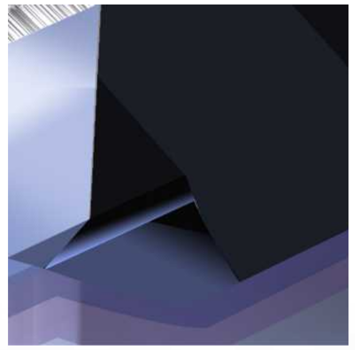




The unique ***motor adapter*** and ***bushing module system design*** fit most servomotors.

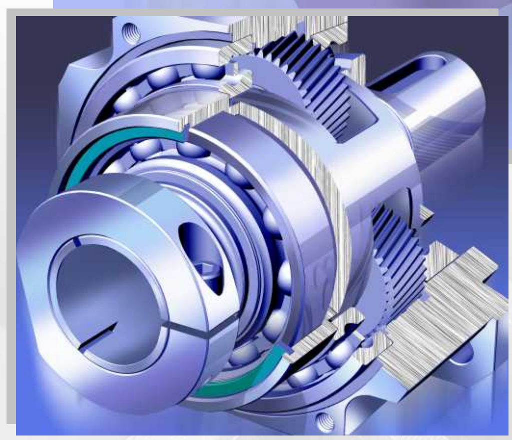


In-house plasma Nitriding heat treatment process, control the tooth surface hardness at ***840 Hv*** for wear-resistant and core hardness at ***30 Rc*** for toughness.



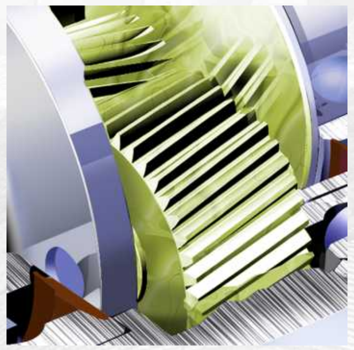
A special electroless nickel surface treatment on housing and ***black anodized*** on motor adapter make it extremely environmental resistance.

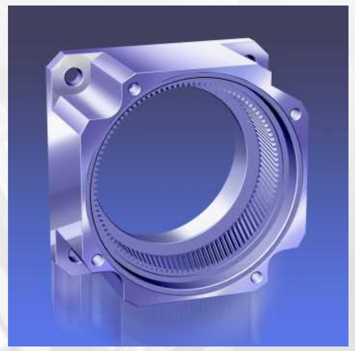
Whole piece planet carrier with output shaft design guarantee exceptional torsion rigidity.



Patented planet carrier design put the sun gear bearing directly into the planet carrier. It minimized the gear misalignment to gain higher accuracy.

Lubricated with ***NYOGEL 792D*** synthetic grease and seal to ***IP65*** standard. It prevent the leakage also maintenance free.





Single piece structured ring gear with housing allow larger gears to be installed. It delivered maximum power in a minimum package.

Specifications

Gearbox Performance

Model No.		RAB042	RAB060	RAB090	RAB115	RAB142	RAB180	RAB220	i[1]	Stages
Nominal Output Torque T_{2N}	Nm	20	55	150	310	600	1,200	1,900	3	1
		19	50	140	290	550	1,100	1,700	4	
		22	60	160	330	650	1,200	2,000	5	
		20	55	150	310	600	1,100	1,900	6	
		19	50	140	300	550	1,100	1,800	7	
		17	45	120	260	500	1,000	1,600	8	
		14	40	100	230	450	900	1,500	9	
		14	40	100	230	450	900	1,500	10	
		20	55	150	310	600	1,200	1,900	15	2
		19	50	140	290	550	1,100	1,700	20	
		22	60	160	330	650	1,200	2,000	25	
		20	55	150	310	600	1,100	1,900	30	
		19	50	140	300	550	1,100	1,800	35	
		17	45	120	260	500	1,000	1,600	40	
		14	40	100	230	450	900	1,500	45	
		22	60	160	330	650	1,200	2,000	50	
		20	55	150	310	600	1,100	1,900	60	
		19	50	140	300	550	1,100	1,800	70	
		17	45	120	260	500	1,000	1,600	80	
		14	40	100	230	450	900	1,500	90	
		14	40	100	230	450	900	1,500	100	
Max. Output Torque T_{2B}	Nm	3 times of Nominal Output Torque							3~100	1,2
Nominal Input Speed n_{1N}	rpm	5,000	5,000	4,000	4,000	3,000	3,000	2,000	3~100	1,2
Max. Input Speed n_{1B}	rpm	10,000	10,000	8,000	8,000	6,000	6,000	4,000	3~100	1,2
Reduced Backlash	arcmin	-	≤3	≤3	≤3	≤3	≤3	≤3	3~10	1
		-	≤6	≤6	≤6	≤6	≤6	≤6	15~100	2
Standard Backlash	arcmin	≤5	≤5	≤5	≤5	≤5	≤5	≤5	3~10	1
		≤8	≤8	≤8	≤8	≤8	≤8	≤8	15~100	2
Torsional Rigidity	Nm/arcmin	3	7	14	25	50	145	225	3~100	1,2
Max. Radial Load F_{2rB} [2]	N	780	1,530	3,250	6,700	9,400	14,500	50,000	3~100	1,2
Max. Axial Load F_{2aB} [2]	N	390	765	1,625	3,350	4,700	7,250	25,000	3~100	1,2
Service Life	hr	20,000							3-100	1,2
Efficiency η	%	>96							3~10	1
		>93							15~100	2
Weight	kg	0.5	1.3	3.7	7.8	14.5	29	48	3~10	1
		0.8	1.5	4.1	9	17.5	33	60	15~100	2
Operating Temp	^0C	$-10^0C \sim +90^0C$							3~100	1,2
Lubrication		synthetic gear grease (NYOGEL 792D)							3~100	1,2
Degree of Gearbox Protection		IP65							3~100	1,2
Mounting Position		all directions							3~100	1,2
Noise Level (n_1=3000rpm)	dB	≤68dB							3~100	1,2

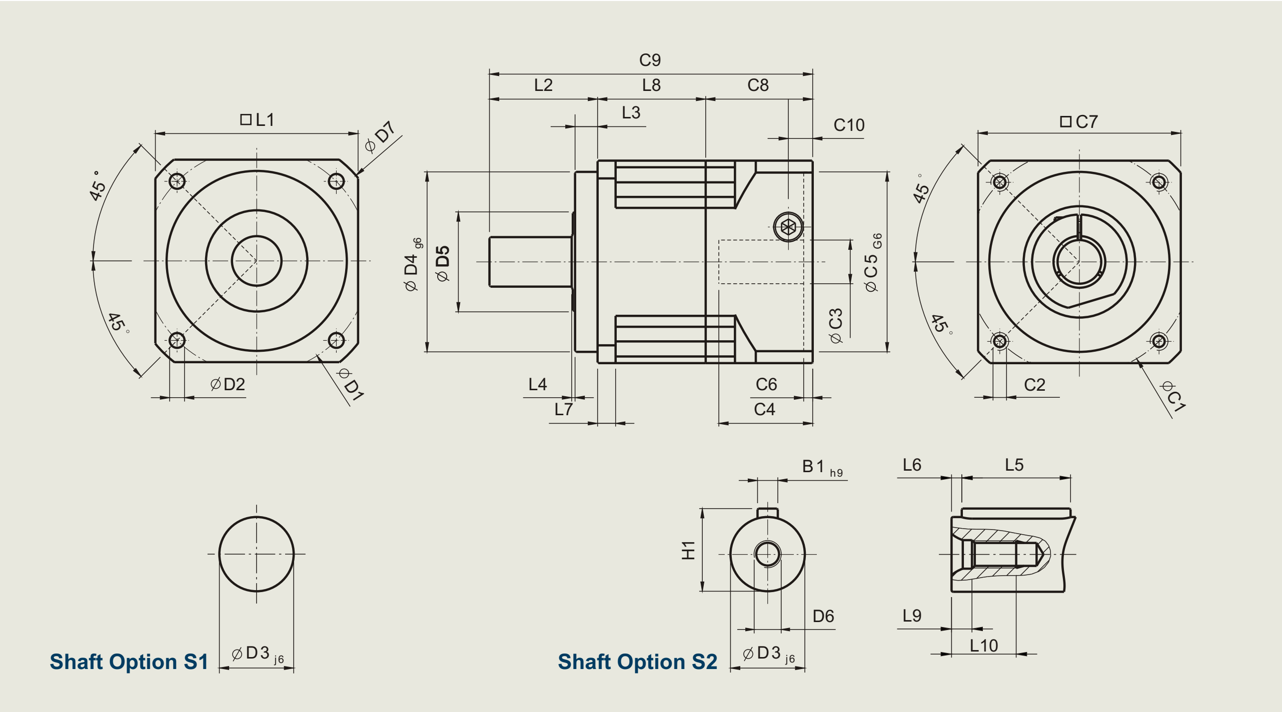
Gearbox Inertia

Model No.		RAB042	RAB060	RAB090	RAB115	RAB142	RAB180	RAB220	i	Stages
Mass Moments of Inertia J_1	$kg \cdot cm^2$	0.05	0.24	1.04	5.05	14.61	46.76	118.39	3	1
		0.04	0.18	0.71	3.67	10.57	33.53	81.87	4	
		0.04	0.17	0.64	3.34	9.66	30.31	73.00	5	
		0.03	0.15	0.56	3.01	8.68	27.07	64.06	6	
		0.03	0.15	0.52	2.85	8.24	25.57	59.89	7	
		0.03	0.14	0.49	2.73	7.88	24.37	56.56	8	
		0.03	0.14	0.48	2.66	7.65	23.63	54.51	9	
		0.03	0.14	0.47	2.62	7.54	23.23	53.40	10	
		0.04	0.04	0.22	0.70	3.50	10.19	31.69	15	2
		0.04	0.04	0.21	0.66	3.39	9.84	30.66	20	
		0.04	0.04	0.21	0.66	3.37	9.76	30.43	25	
		0.04	0.04	0.21	0.65	3.34	9.66	30.15	30	
		0.04	0.04	0.21	0.64	3.32	9.62	30.02	35	
		0.04	0.04	0.21	0.64	3.31	9.58	29.92	40	
		0.04	0.04	0.20	0.64	3.30	9.56	29.85	45	
		0.03	0.03	0.15	0.52	2.63	7.56	23.26	50	
		0.03	0.03	0.15	0.52	2.61	7.54	23.19	60	
		0.03	0.03	0.15	0.52	2.61	7.53	23.16	70	
		0.03	0.03	0.15	0.52	2.61	7.52	23.13	80	
		0.03	0.03	0.15	0.52	2.61	7.51	23.11	90	
		0.03	0.03	0.15	0.52	2.61	7.51	23.11	100	

1. Ratio ($i=N_{in} / N_{out}$)

2. F_{2rB} 、 F_{2aB} exert on the output shaft center at output speed of 100 rpm

Dimensions (1-stage, Ratio i=3~10)



Shaft Option S1

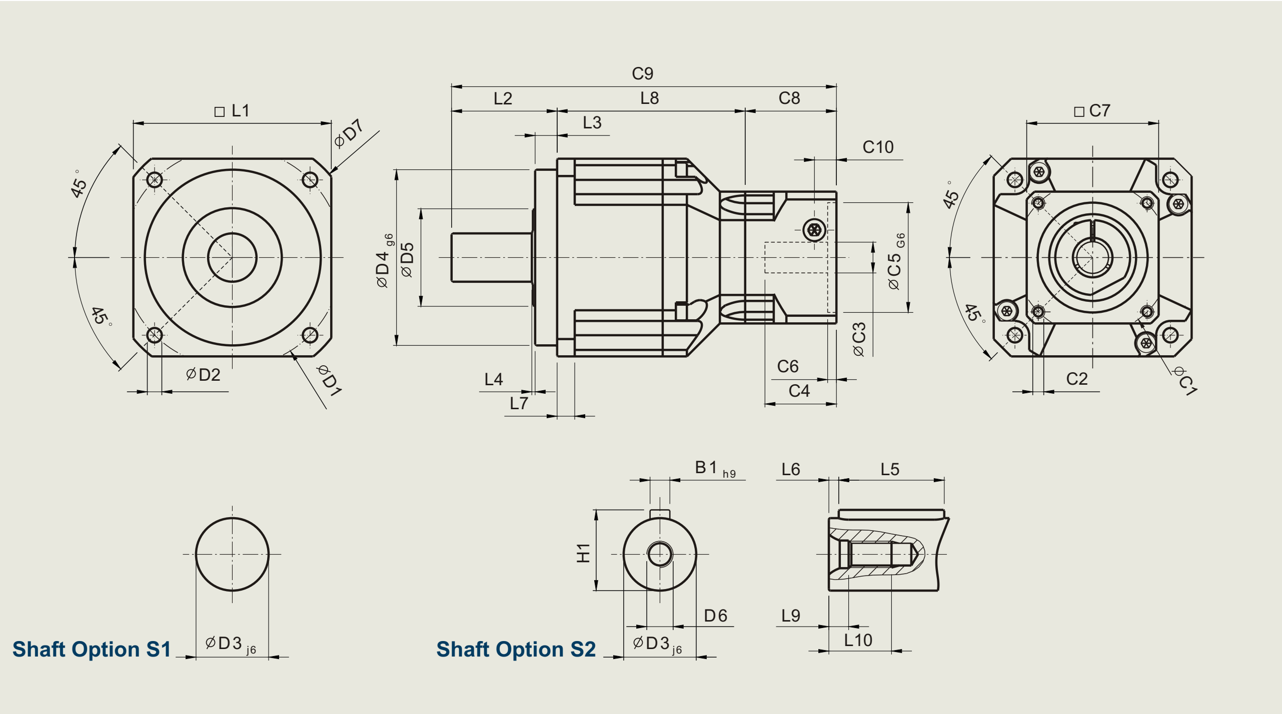
Shaft Option S2

[unit: mm]

Dimension	RAB042	RAB060	RAB090	RAB115	RAB142	RAB180	RAB220
D1	50	70	100	130	165	215	250
D2	3.4	5.5	6.6	9	11	13	17
$D3_{j6}$	13	16	22	32	40	55	75
$D4_{g6}$	35	50	80	110	130	160	180
D5	22	30	45	60	75	95	115
D6	M4 x 0.7P	M5 x 0.8P	M8 x 1.25P	M12 x 1.75P	M16 x 2P	M20 x 2.5P	M20 x 2.5P
D7	56	80	116	152	185	240	292
L1	42	60	90	115	142	180	220
L2	26	37	48	65	97	105	138
L3	5.5	7	10	12	15	20	30
L4	1	1.5	1.5	2	3	3	3
L5	16	25	32	40	63	70	90
L6	2	2	3	5	5	6	7
L7	4	6	8	10	12	15	20
L8	31	35	48	61	71.5	84.5	93
L9	3.2	4	6	9.5	12	15	15
L10	10	12.5	19	28	36	42	42
C1[3]	46	70	100	130	165	215	235
C2[3]	M4 x 0.7P	M5 x 0.8P	M6 x 1P	M8 x 1.25P	M10 x 1.5P	M12 x 1.75P	M12 x 1.75P
C3[3]	<11	<14	<19	<32	<38	≤48	≤55
C4[3]	25	30	40	50	60	82	82
C5[3] G6	30	50	80	110	130	180	200
C6[3]	3.5	4	4	5	6	6	6
C7[3]	42	60	90	115	142	190	220
C8[3]	29.5	41.5	48	61	71	96	100
C9[3]	86.5	113.5	144	187	239.5	285.5	331
C10[3]	8.75	10	11.25	13.5	16	18.25	20
$B1_{h9}$	5	5	6	10	12	16	20
H1	15	18	24.5	35	43	59	79.5

3. Depend on the dimensions of motor

Dimensions (2-stage, Ratio i=15~100)



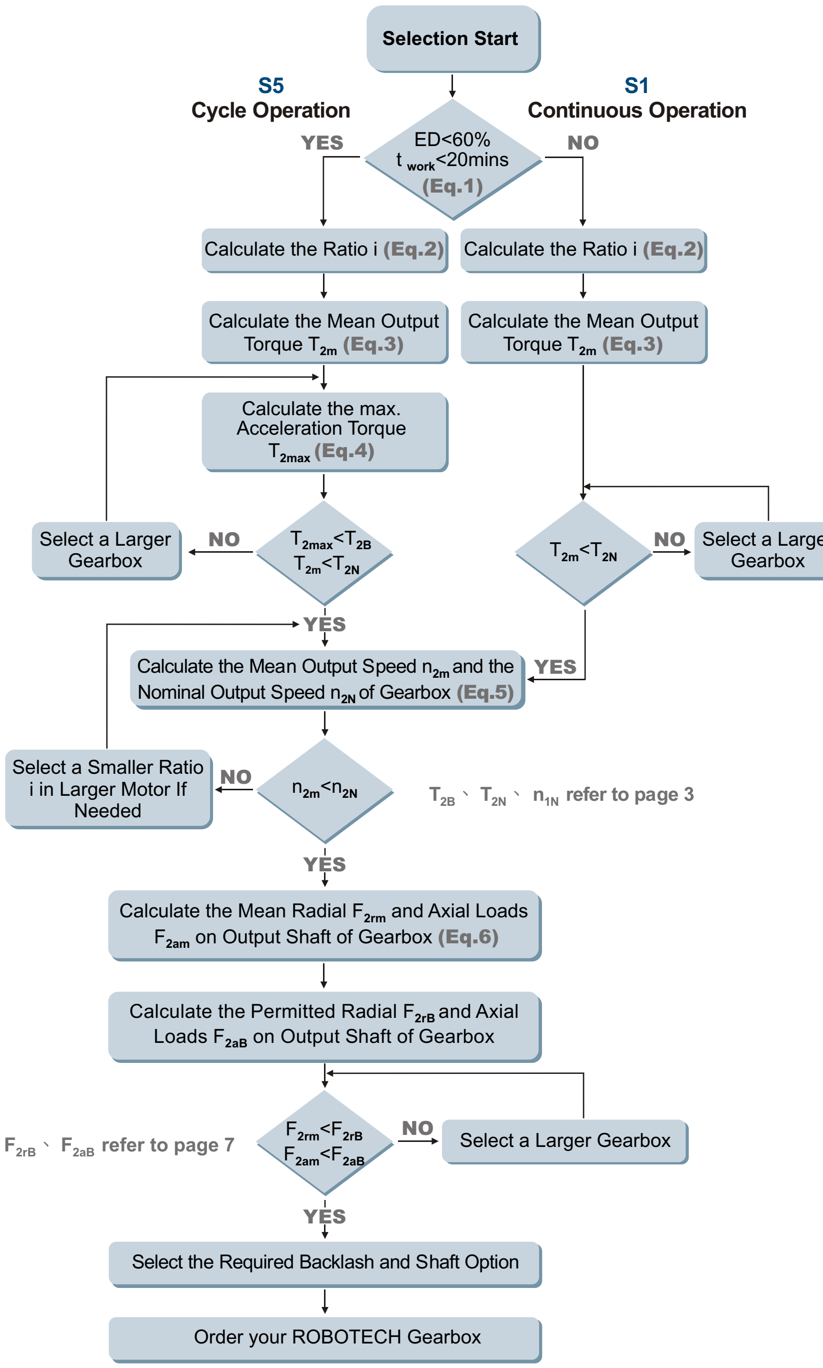
[unit: mm]

Dimension	RAB042	RAB060	RAB090	RAB115	RAB142	RAB180	RAB220
D1	50	70	100	130	165	215	250
D2	3.4	5.5	6.6	9	11	13	17
D3 j6	13	16	22	32	40	55	75
D4 g6	35	50	80	110	130	160	180
D5	22	30	45	60	75	95	115
D6	M4 x 0.7P	M5 x 0.8P	M8 x 1.25P	M12 x 1.75P	M16 x 2P	M20 x 2.5P	M20 x 2.5P
D7	56	80	116	152	185	240	292
L1	42	60	90	115	142	180	220
L2	26	37	48	65	97	105	138
L3	5.5	7	10	12	15	20	30
L4	1	1.5	1.5	2	3	3	3
L5	16	25	32	40	63	70	90
L6	2	2	3	5	5	6	7
L7	4	6	8	10	12	15	20
L8	58.5	72	85.5	113	135	161.5	178.5
L9	3.2	4	6	9.5	12	15	15
L10	10	12.5	19	28	36	42	42
C1[4]	46	46	70	100	130	165	215
C2[4]	M4 x 0.7P	M4 x 0.7P	M5 x 0.8P	M6 x 1P	M8 x 1.25P	M10 x 1.5P	M12 x 1.75P
C3[4]	≤11	≤11	≤14	≤19	≤32	≤38	≤48
C4[4]	25	25	30	40	50	60	82
C5[4] G6	30	30	50	80	110	130	180
C6[4]	3.5	3.5	4	4	5	6	6
C7[4]	42	42	60	90	115	142	190
C8[4]	29.5	29.5	41.5	48	61	71	96
C9[4]	114	138.5	175	226	293	337.5	412.5
C10[4]	8.75	8.75	10	11.25	13.5	16	18.25
B1 h9	5	5	6	10	12	16	20
H1	15	18	24.5	35	43	59	79.5

4. Depend on the dimensions of motor

Selection of the Optimum Gearbox

Selection of the Optimum Gearbox



Recommended (for S5 Cycle Operation)

The general design is given for

$\frac{J_L}{i^2} \leq 4 \times J_m$

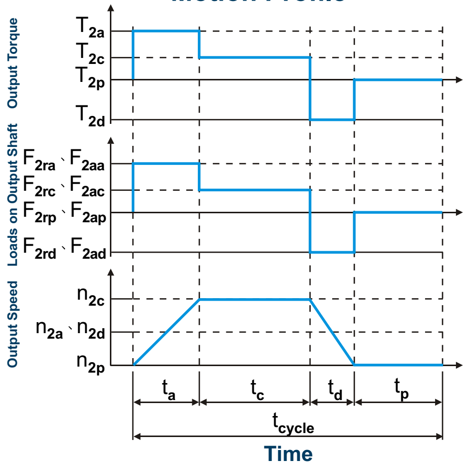
The optimal design is given for

$\frac{J_L}{i^2}$ J_m

J_L Load Inertia

J_m Motor Inertia

Motion Profile



1. $ED = \frac{t_a + t_c + t_d}{t_{cycle}} \times 100\%$, $t_{work} = t_a + t_c + t_d$

Index : a. Acceleration, c. Constant, d. Deceleration, p. Pause **(Eq.1)**

2. $i \quad \frac{n_m}{n_{work}}$

n_m Output Speed of the Motor

n_{work} Working Speed **(Eq.2)**

3. $T_{2m} \quad \sqrt[3]{\frac{n_{2a}\ t_a\ T_{2a}^3\ \ n_{2c}\ t_c\ T_{2c}^3\ \ n_{2d}\ t_d\ T_{2d}^3}{n_{2a}\ t_a\ \ n_{2c}\ t_c\ \ n_{2d}\ t_d}}$ **(Eq.3)**

4. $T_{2max} \quad T_{mB} \quad i \quad k_s$

where K_s is

K_s	No. of Cycles / hr
1.0	0~1,000
1.1	1,000 ~ 1,500
1.3	1,500 ~ 2,000
1.6	2,000 ~ 3,000
1.8	3,000 ~ 5,000

T_{mB} Max. Output Torque of the Motor

Efficiency of the Gearbox **(Eq.4)**

5. $n_{2a} = n_{2d} = \frac{1}{2} \times n_{2c}$

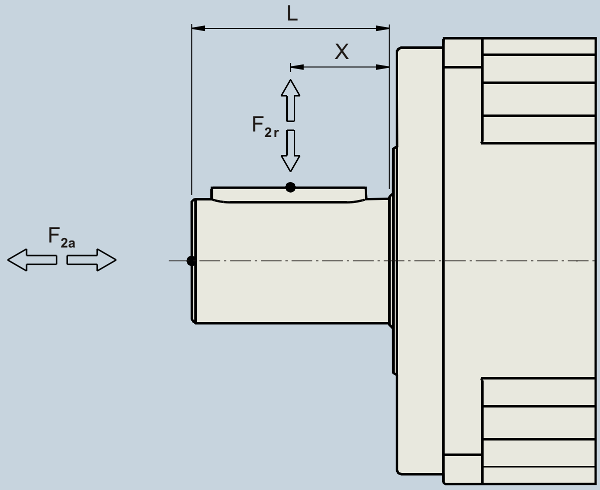
$n_{2m} = \frac{n_{2a} \times t_a \times n_{2c} \times t_c \times n_{2d} \times t_d}{t_a + t_c + t_d}$

$n_{2N} = \frac{n_{1N}}{i}$ **(Eq.5)**

6. $F_{2rm} = \sqrt[3]{\frac{n_{2a}\ t_a\ F_{2ra}^3\ \ n_{2c}\ t_c\ F_{2rc}^3\ \ n_{2d}\ t_d\ F_{2rd}^3}{n_{2a}\ t_a\ \ n_{2c}\ t_c\ \ n_{2d}\ t_d}}$

$F_{2am} = \sqrt[3]{\frac{n_{2a}\ t_a\ F_{2aa}^3\ \ n_{2c}\ t_c\ F_{2ac}^3\ \ n_{2d}\ t_d\ F_{2ad}^3}{n_{2a}\ t_a\ \ n_{2c}\ t_c\ \ n_{2d}\ t_d}}$ **(Eq.6)**

Permitted Radial and Axial Loads on Output Shaft of the Gearbox

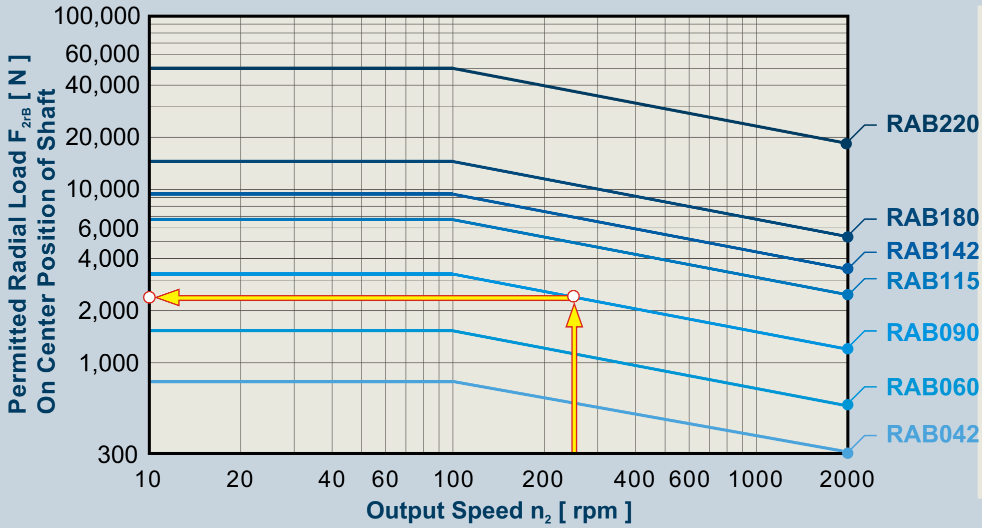


F_{2r} Radial Load
F_{2a} Axial Load

The permitted radial and axial loads on output shaft of the gearbox depend on the design of the gearbox supporting bearings.

ROBOTECH use the extension straddle oversized ball bearing design.

It can take heavy load from both axes.



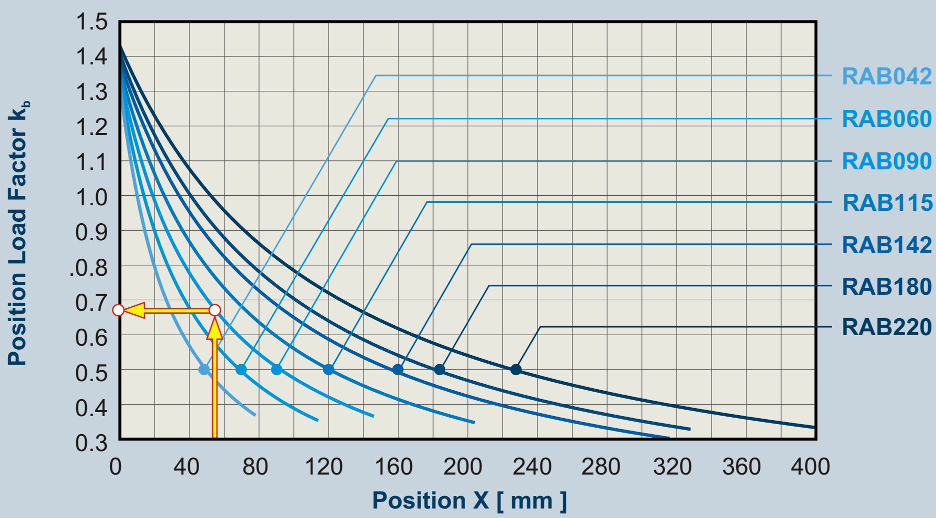
If radial force F_{2r} exert on the center of the output shaft X=1/2 x L.

Under various operating condition the lifetime is over 20,000 hours.

The permitted radial load is given on left diagram.

The permitted axial load can be calculated by using the formula:

F_{2aB}=0.2 x F_{2rB}



If radial force F_{2r} not exert on the center of the output shaft X<1/2 x L or X>1/2 x L

The permitted radial and axial load can be calculated by the position load factor K_b on the left diagram.

Radial load:

$F'_{2rB}=k_b \times F_{2rB}$

Axial load:

$F'_{2aB}=0.2 \times F'_{2rB}$

Ordering Code

RAB090 – 010 – S1 – P1 / MOTOR

Gearbox Size:
RAB042, RAB060, RAB090,
RAB115, RAB142, RAB180,
RAB220

Shaft Option:
S1: Smooth Output Shaft
S2: Output Shaft with Key and Screw

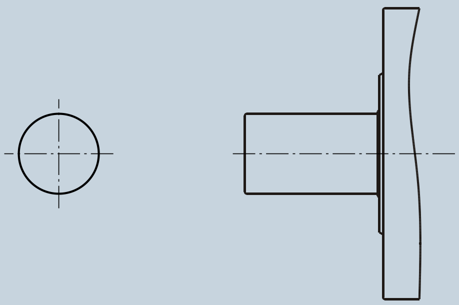
Motor Designation:
Manufacturer-Type

Ratio:
1 Stage: 3, 4, 5, 6, 7, 8, 9, 10
2 Stages: 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100

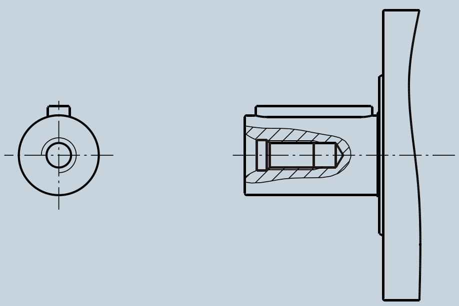
Backlash:
P1: Reduced Backlash
P2: Standard Backlash

Ordering Sample: RAB090-010-S1-P1 / SIEMENS 1FT6 041-4AF71

Servo gearbox output shaft available on:



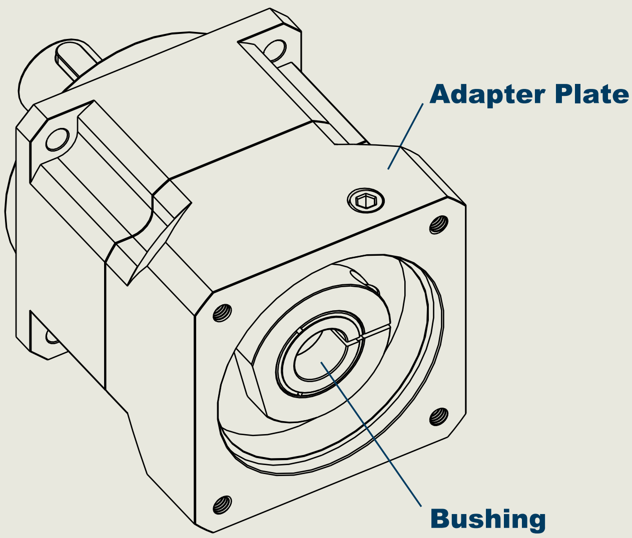
S1: Standard Output Shaft



S2: Output Shaft With Keyway and Screw

Keyway: Standard DIN 6885. Sheet 1

Screw: Standard DIN 332. Sheet 2



The dimensions of adapter plate depend on the motor.

High Precision Planetary Gearboxes

ROBOTECH CO., LTD.