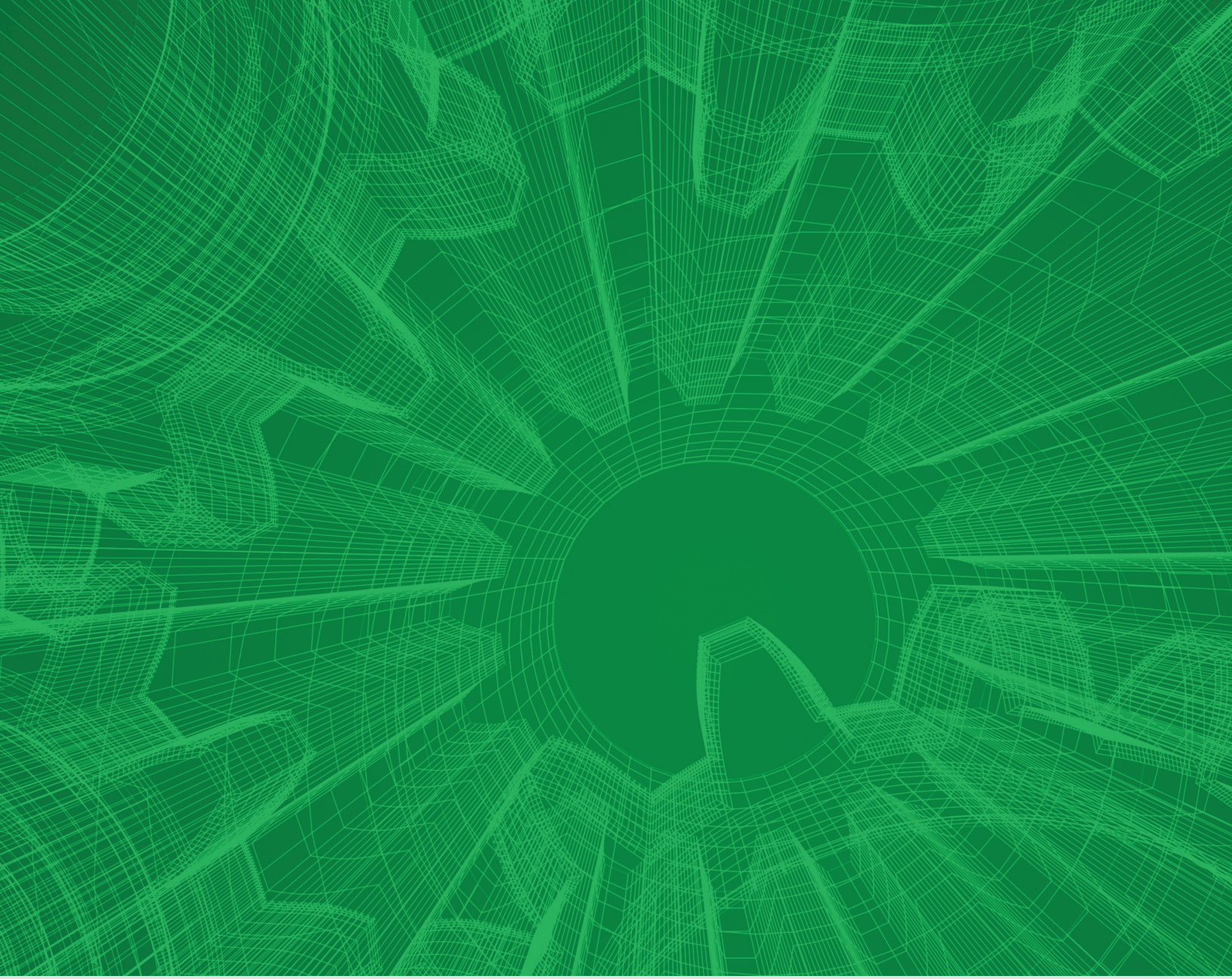
Technical Information

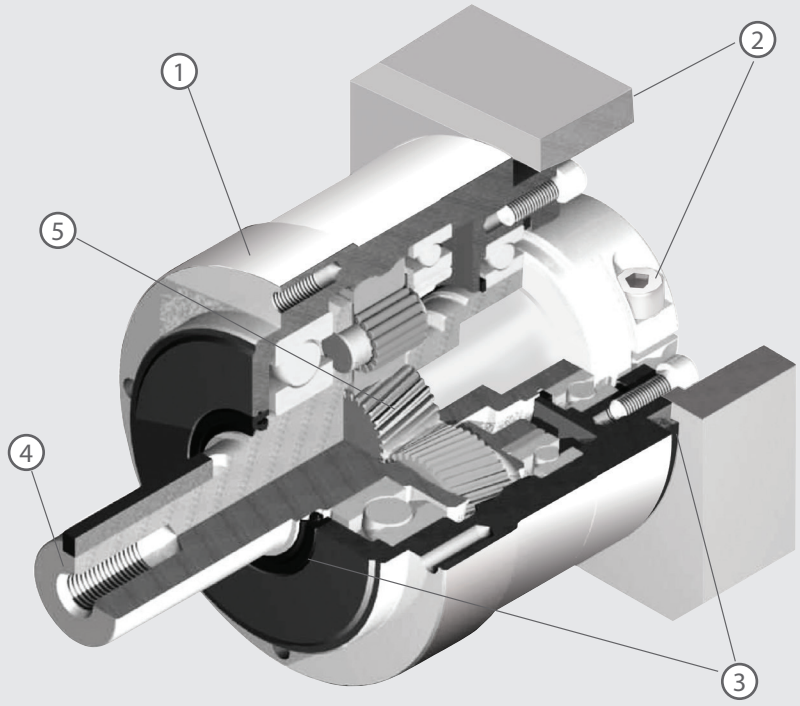


Options & Modifications

Build Your Ideal Gearbox

Nidec Drive Technology Corporation realizes that even with our vast range of products, you may not find exactly what you need for your application. We are highly capable of supplying custom solutions for OEMs, which include completely customized gearboxes or gear sets, modified standard designs and integrated product assemblies to meet unique application requirements.

We work closely with our OEM customers during early phases of development to create special designs that can overcome the harshest environments, tightest space constraints and most demanding positioning requirements. Whether your application requires weight relief, cost-down considerations, special coatings or materials of construction, Nidec Drive Technology can develop a product to meet your target.



1. Housing Coatings and Surface Finishes: White Epoxy, Steel-It, Nickel Plating, Black Oxide
2. Motor Mounting: Custom motor adapters, integrated assemblies
3. Ingress Protection: IP65 Protection available using special input seals, output seals and sealants
4. Output Shaft Materials of Construction & Modifications: 300 Series Stainless, 400 Series Stainless, 17-4PH Stainless, Nickel Plating, Special Width, Special Length
5. Lubrication: Food Grade, Low Temperature, High temperature, Vacuum-rated

Note: The following options and modifications may require minimum order quantities.
Contact Nidec Drive Technology for additional details.

Standard Planetary Washdown and Food Grade Options

Food, beverage, pharmaceutical and cosmetics equipment builders compete on their ability to deliver more innovative processing and packaging, with higher throughput and less downtime. Strict hygiene regulations require equipment to be cleaned often with water, steam and harsh chemicals that can quickly destroy ordinary machine components. These operating conditions pose challenges for gearbox manufacturers and Nidec Drive Technology is up to the task.

Nidec Drive Technology offers standard washdown and food grade options for our planetary products in a select group of configurations.

These options include stainless steel output shaft and fasteners, IP65 ingress protection, white epoxy, Steel-it paint or nickel plating and food grade lubrication. These options are outlined below. Our industry experts can help you determine the right protection for your application and environment.

Series	VRL			
Frame Size	050	070	090	120
1-Stage Ratios	3, 4, 5, 7, 10			
2-Stage Ratios	15, 16, 20, 25, 28, 30, 35, 40, 50, 70, 100			

* Nickel plating not available as standard option for VRL-050

Series	VRB			
Frame Size	042	060	090	115
1-Stage Ratios	3, 4, 5, 7, 10			
2-Stage Ratios	15, 16, 20, 25, 28, 30, 35, 40, 50, 70, 100			

* Nickel plating not available as standard option for VRB-042

Series	VRS		
Frame Size	060	075	100
1-Stage Ratios	3, 4, 5, 7, 10		
2-Stage Ratios	15, 16, 20, 25, 28, 30, 35, 40, 50, 70, 100		

* Nickel plating not available as standard option for VRS

Series	VRT		
Frame Size	064	090	110
1-Stage Ratios	4, 5, 7, 10		
2-Stage Ratios	16, 20, 25, 28, 35, 40, 50, 70, 100		

* Nickel plating not available as standard option for VRT

Model Code

VRB — 090C — 7 — K 3 — 19HB16 — XV

Series | Frame Size | Ratio | Output shaft style | Backlash | Adapter code | Washdown and Food Grade Options

Order Code		Description of Features
C		IP 65 Protection Only
W		Standard Grease. Food Grade White Epoxy
S		Standard Grease, Steel-It™ Paint
J		Standard Grease, Nickel Plated Output Housing
F		Food Grade Grease, Standard Paint
X		Food Grade Grease, Food Grade White Epoxy
G		Food Grade Grease, Steel-It™ Paint
K		Food Grade Grease, Nickel Plated Output Housing
	V	Stainless Steel Shaft & Fasteners, IP65 Protection

* First letter represents grease and coating combination. Second letter represents shaft material & ingress protection. Select "C" for IP65 protection only.

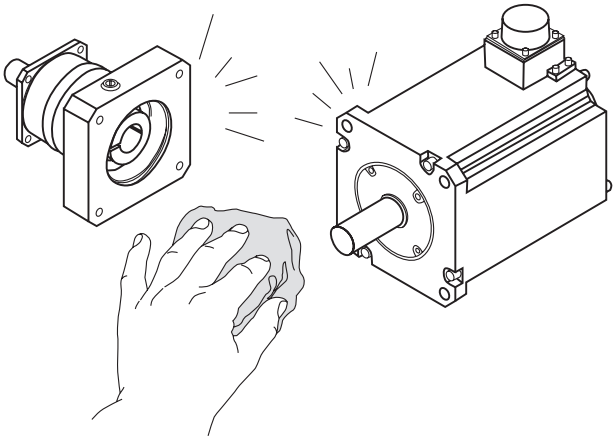
Installation Instructions and Safety Precautions

Inspection and Preparations

A. Upon delivery of the gearbox, confirm that you received the exact model that was specified on your purchase order.

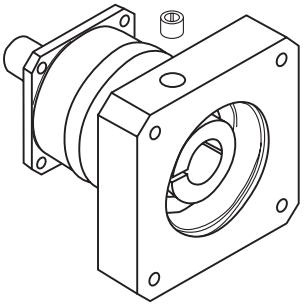
B. Inspect for shipping damage. Notify the shipping agent immediately if any damage is discovered.

C. Remove the protective covering from the output shaft.

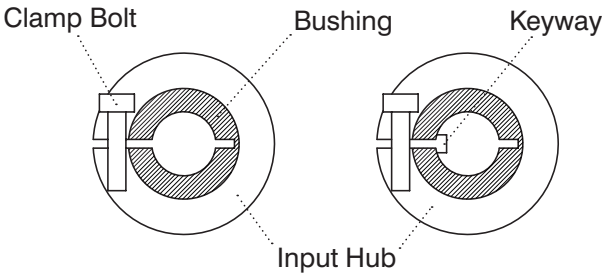


D. Clean and de-grease the motor mounting surface and shaft, as well as the gearbox mounting surface, input hub bore, and shaft bushing (if included). This cleaning is very important for the shaft and bushing, to prevent slip during motion.

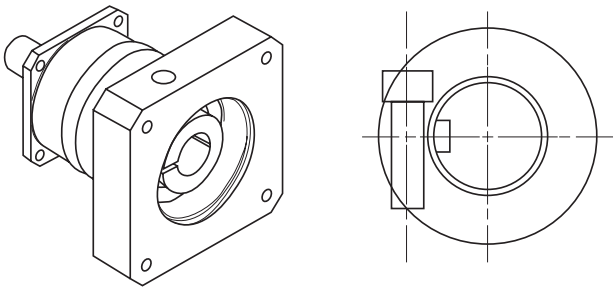
Motor Mounting



A. Remove the access hole plug, allowing access to the motor shaft clamp.

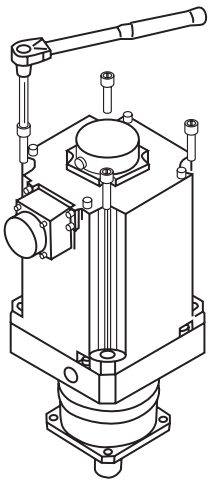


B. Carefully align the shaft bushing (if included) so that the opening in the bushing aligns with the opening in the input hub. It is also recommended that the motor shaft keyway (if present) aligns with the opening in the input hub clamp.



C. Rotate the gearbox input hub so that the clamp bolt is aligned with the access hole. Loosen the clamp bolt.

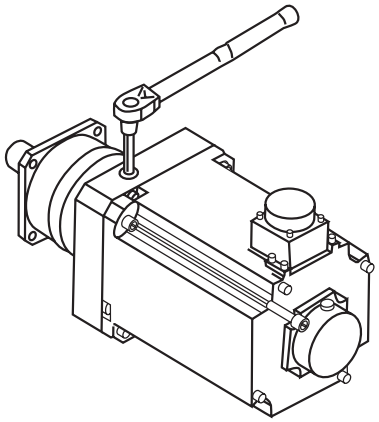
D. Remove the motor key (if supplied), as it is not required for proper installation and operation.



E. Slowly slide the motor into the gearbox, so that the motor shaft enters the gearbox input hub with motor shaft keyway (if present) aligned with gearbox input shaft clamp opening. Install the four motor flange bolts in a cross-wise pattern, to ensure proper alignment of motor to gearbox. Tighten the bolts to the proper torque using a torque wrench (see Table A).

Table A

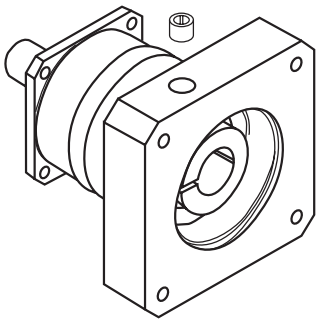
Motor Installation Bolt Size	Tightening Torque	
	(Nm)	(in lbs)
M3	1.1	9.7
M4	2.5	22.1
M5	5.1	45.1
M6	8.7	77
M8	21	186
M10	42	372
M12	72	637



F. Tighten the gearbox input shaft clamp bolt to the proper torque using a torque wrench (see Table B).

Table B

Clamp Bolt Size	Tightening Torque	
	(Nm)	(in lbs)
M3	1.9	16.8
M4	4.3	38.1
M5	8.7	77
M6	15	133
M8	36	318
M10	71	628
M12	125	1106



G. Re-install the access hole plug into the motor adapter plate. Assembly is complete.

Safety Precautions

A. Avoid use in wet or corrosive areas, unless the gearbox is specified for these environments.

B. Ambient temperature in the area of the gearbox must be in the range of 0° -40°C, unless the gearbox is built to withstand a different temperature range.

C. The gearbox (with motor) must be firmly attached to a vibration-free frame or fixture.

D. The gearbox has been lubricated and can be operated immediately.

E. At initial operation, check the direction of shaft rotation, then apply the load gradually.

F. Avoid excessive loads.

G. Ensure that the motor speed does not exceed the maximum RPM specified for the gearbox.

H. Watch for the following problems and discontinue motion immediately:

   a. Sharp increase in temperature
   b. Abnormal noise
   c. Unstable output speed

I. The gearbox is not designed to be disassembled.

J. The gearbox is lubricated for its lifetime with appropriate grease. No re-lubrication is required.

IP 65 Versions

If you have received an IP65 version of the gearbox, be sure to seal between the gearbox and motor interface with a sealant to ensure an IP65 rating of the gearbox / motor assembly. Also apply sealant to the access hole plug during step "G". Please contact Nidec Drive Technology with any questions.

Motor Mounting Codes

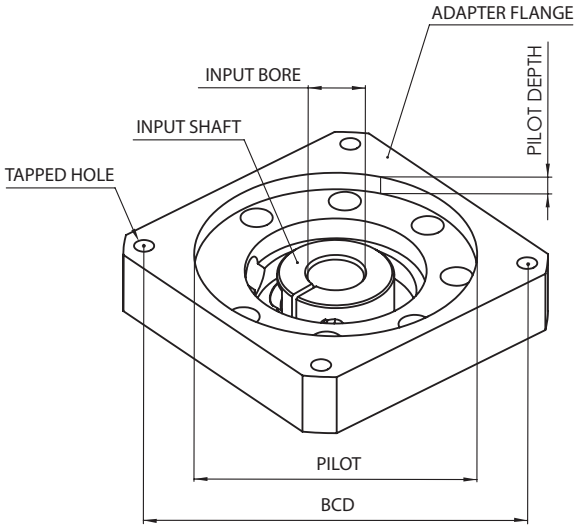
Our motor mounting codes can be configured automatically using our online selection tool. These tables supply the details behind these codes. The tables start with Input Bore measurement and the Part # Code, which are indicated at the end of every model code. For each Part # Code, the Pilot**,** BCD, Tapped Hole, and Pilot Depth, are explained.

Please note that even though the Part# Code may have the same letters (i.e. DC, FB, HA, etc), the Pilot and BCD dimensions may not be the same if a different input bore diameter. Locate the table by input bore diameter first, and then find the appropriate adapter Part# Code to check the dimensions. If you have any questions, contact Nidec Drive Technology for support.

Input Bore (mm)	Part# Code	Pilot (mm)	BCD (mm)	Tapped Hole	Pilot Depth (mm)
65	MA	114.3	200	M12	8
65	MB	200	235	M12	8
65	MC	180	215	M12	8
65	MD	180	265	M12	8
65	NA	230	265	M12	8
65	NB	230	265	M12	18
65	NC	230	290	M12	8
65	ND	230	265	M20	18
65	PA	250	300	M16	8
65	PB	250	320	M16	18
65	QA	300	350	M16	8
65	QB	280	325	M16	8

Input Bore (mm)	Part# Code	Pilot (mm)	BCD (mm)	Tapped Hole	Pilot Depth (mm)
48	KA	114.3	200	M12	8
48	KB	110	130	8.8	8
48	KC	130	215	M12	8
48	LA	180	215	M12	8
48	MA	180	265	M12	8
48	MB	200	235	M12	8
48	NA	230	265	M12	8
48	PA	250	300	M16	8

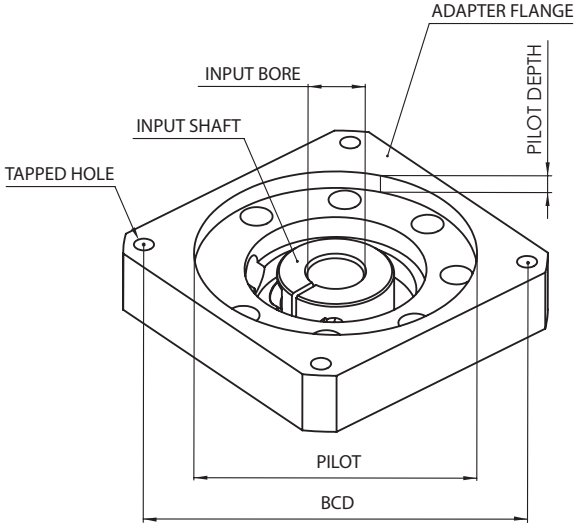
Input Bore (mm)	Part# Code	Pilot (mm)	BCD (mm)	Tapped Hole	Pilot Depth (mm)
38	HA	110	130	8.8	8
38	HB	110	145	M8	8
38	HE	110	130	M8	8
38	JA	130	165	M10	8
38	KA	114.3	200	M12	8
38	KB	130	215	M10	8
38	KC	130	215	M12	8
38	KD	95	200	M10	18
38	KE	114.3	200	M12	18
38	LA	180	215	M12	8
38	LB	180	215	M12	18
38	MA	180	265	M12	8
38	MB	200	235	M12	8
38	MC	215.9	184.15	13.7	5.5
38	MD	200	250	M8	18
38	NA	230	265	M12	8



Motor Mounting Codes

Input Bore (mm)	Part# Code	Pilot (mm)	BCD (mm)	Tapped Hole	Pilot Depth (mm)
28	FA	80	100	M6	8
28	FB	95	115	M6	8
28	FC	95	115	M8	8
28	FD	95	115	M6	8
28	FE	95	115	M8	6
28	GA	55.563	125.73	M6	8
28	GB	63.5	127	M6	8
28	GC	95	130	M8	8
28	GD	110	130	M8	8
28	GE	110	130	M10	8
28	GF	110	130	8.8	8
28	GG	110	135	M8	8
28	GH	95	135	M8	8
28	HA	110	145	M8	8
28	HB	110	145	M8	18
28	HC	110	145	10.5	8
28	HD	114.3	149.23	10.5	8
28	HE	95	145	M8	18
28	HF	110	145	M8	8
28	JA	110	165	M8	8
28	JB	110	165	M10	8
28	JC	130	165	M10	8
28	JD	130	174	M10	28
28	JE	130	165	M10	18
28	JF	114.3	160	M10	8
28	KA	114.3	200	M12	8
28	KB	130	215	M10	8
28	KD	114.3	200	M12	18
28	KE	150	185	M10	8
28	LA	180	215	M12	8
28	LB	180	220	M12	18
28	MA	200	235	M12	8
28	MB	200	250	M8	18

Input Bore (mm)	Part# Code	Pilot (mm)	BCD (mm)	Tapped Hole	Pilot Depth (mm)
19	DA	60	90	M5	6
19	DB	70	90	M5	6
19	DC	70	90	M6	6
19	DD	70	90	M6	16
19	DE	70	90	M5	11
19	EA	73.025	98.43	M5	11
19	EB	80	100	M6	6
19	EC	80	100	M6	16
19	ED	60	98.99	M6	6
19	FA	95	115	M8	6
19	FB	95	115	M8	16
19	GA	55.563	125.73	M6	11
19	GB	95	130	M8	6
19	GC	110	130	M8	11
19	GD	110	130	8.8	6
19	GE	95	130	M8	16
19	GF	100	125	M8	16
19	GH	95	135	M8	11
19	HA	110	145	M8	6
19	HB	110	145	M8	21
19	HC	110	145	10.5	11
19	HD	114.3	149.23	M8	11
19	HE	114.3	149.23	10.5	11
19	JA	130	165	M10	16
19	JB	115	165	M8	21



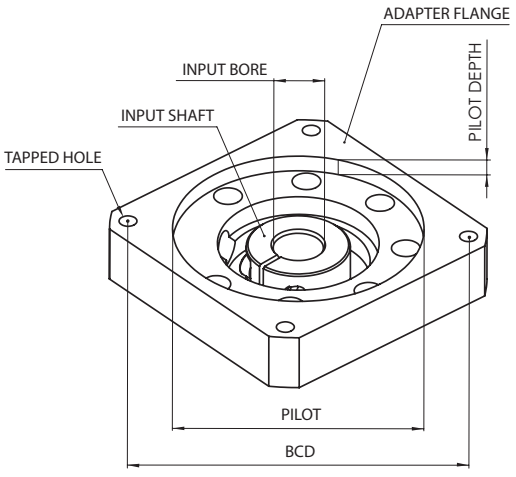
Motor Mounting Codes

Our motor mounting codes can be configured automatically using our online selection tool. These tables supply the details behind these codes. The tables start with Input Bore measurement and the Part # Code, which are indicated at the end of every model code. For each Part # Code, the Pilot**,** BCD, Tapped Hole, and Pilot Depth, are explained.

Please note that even though the Part# Code may have the same letters (i.e. DC, FB, HA, etc), the Pilot and BCD dimensions may not be the same if a different input bore diameter. Locate the table by input bore diameter first, and then find the appropriate adapter Part# Code to check the dimensions. If you have any questions, contact Nidec Drive Technology for support.

Input Bore (mm)	Part# Code	Pilot (mm)	BCD (mm)	Tapped Hole	Pilot Depth (mm)
14	BA	38.1	66.68	M4	5
14	BB	38.1	66.68	M5	5
14	BC	38.1	66.68	M5	10
14	BD	40	63	M4	5
14	BE	40	63	M5	5
14	BF	40	65	M5	5
14	BG	40	70	M4	5
14	BH	50	60	M4	10
14	BJ	50	70	M4	5
14	BK	50	70	M5	5
14	BL	50	70	M5	15
14	BM	50	70	M5	10
14	BN	50	70	M4	10
14	BP	36	70.71	M4	5
14	CA	60	75	M5	5
14	CB	60	75	M6	10
14	CC	60	80	M4	5
14	DA	50	95	M6	5
14	DB	60	85	M5	5
14	DC	60	90	M5	5
14	DD	70	85	6.5	5
14	DE	70	90	M5	10
14	DF	70	90	M6	5

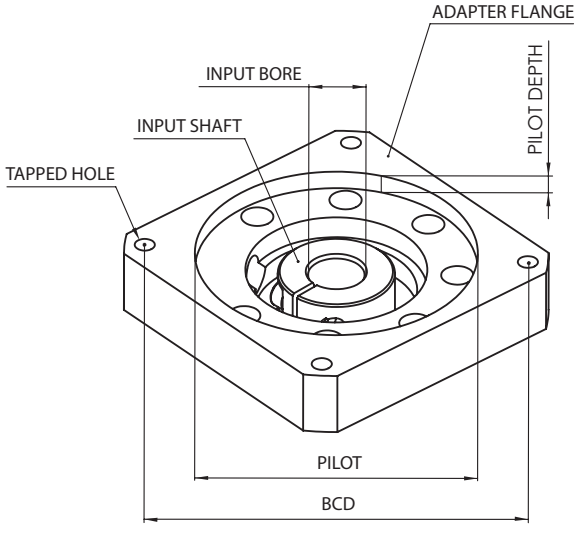
Input Bore (mm)	Part# Code	Pilot (mm)	BCD (mm)	Tapped Hole	Pilot Depth (mm)
14	DG	70	90	M6	15
14	DH	70	95	M6	5
14	DJ	60	95	M5	5
14	DK	36.8	82.024	M6	15
14	DL	62	91.924	M5	10
14	EA	50	100	M6	5
14	EB	73.025	98.43	M5	5
14	EC	80	100	M6	5
14	ED	80	100	M6	15
14	EE	73.025	98.43	M6	15
14	EF	50	98.43	M5	5
14	EG	60	98.995	M5	5
14	EH	80	105	M6	15
14	EJ	60	98.995	M6	10
14	EK	73.025	98.43	M6	5
14	EL	73	94	M6	5
14	EM	83	104	M8	10
14	FA	60	115	M6	5
14	FB	95	115	M8	15
14	GA	80	139.7	M6	5
14	GB	80	130	M5	20
14	GC	94	120	M8	10
14	JA	115	165	M8	10



Motor Mounting Codes

Input Bore (mm)	Part# Code	Pilot (mm)	BCD (mm)	Tapped Hole	Pilot Depth (mm)
8	AA	20.02	46.69	M3	5
8	AB	22	43.82	4.7	10
8	AC	22	48	M3	5
8	AD	22.22	50.8	M3	5
8	AE	25.4	38.89	4	10
8	AF	30	45	M3	5
8	AG	30	46	M4	5
8	AH	30	46	M4	10
8	AJ	30	46	3.5	10
8	AK	34	48	M3	10
8	AL	30	48	M3	5
8	AM	22	43.82	3.5	5
8	AN	40	50	M4	5
8	AQ	37.6	48	M3	5
8	BA	38.1	66.68	M4	5
8	BB	38.1	66.68	M5	5
8	BC	50	60	M4	10
8	BD	50	70	M4	5
8	BE	50	70	M5	5
8	BF	50	70	M5	10
8	BG	36	70.71	M4	5
8	BH	54	70	M4	5
8	BJ	50	58	M3	5
8	CA	50	80	M4	10

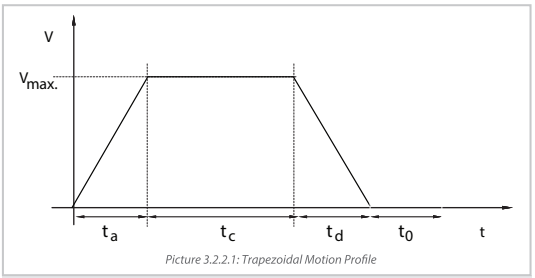
Input Bore (mm)	Part# Code	Pilot (mm)	BCD (mm)	Tapped Hole	Pilot Depth (mm)
S8	ZA	20.02	46.69	M3	5
S8	ZB	22	43.82	4.7	10
S8	ZC	22	48	M3	5
S8	ZD	22.22	50.8	M3	5
S8	ZE	25.4	38.89	4	10
S8	ZF	30	45	M3	5
S8	ZG	30	46	M4	5
S8	ZH	30	46	M4	10
S8	ZJ	30	46	3.5	10
S8	ZK	34	48	M3	10
S8	ZL	30	48	M3	5
S8	ZM	22	43.82	3.5	5
S8	ZN	40	50	M4	5
S8	ZQ	37.6	48	M3	5
S8	BA	38.1	66.68	M4	5
S8	BB	38.1	66.68	M5	5
S8	BC	50	60	M4	10
S8	BD	50	70	M4	5
S8	BE	50	70	M5	5
S8	BF	50	70	M5	10
S8	BG	36	70.71	M4	5
S8	BH	54	70	M4	5
S8	BJ	50	58	M3	5



Selection Flow Charts

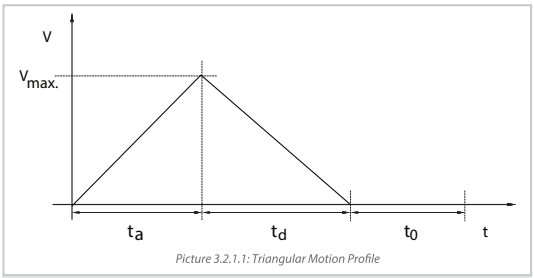
Gearbox Selection Procedure

Determine Type of Move and Profile Requirements



Picture 3.2.2.1: Trapezoidal Motion Profile

Trapezoidal Move



Picture 3.2.1.1: Triangular Motion Profile

Triangular Move

Select a Preliminary Frame Size & Series

Calculate / Compare
Max Operating Radial Load & Max Operating Axial Load

Max Operating Radial Load (N): $Fr_{MAX-O} = Max.\ of\ Fr_{O1}, Fr_{O2}, \cdots Fr_{On}$
Max Radial Load (N): Fr_{MAX-P}

Max Operating Axial Load (N): $Fa_{MAX-O} = Max.\ of\ Fa_{O1}, Fa_{O2}, \cdots Fr_{On}$
Max Axial Load (N): Fa_{MAX-P}

$[Fr_{MAX-P} \geqq Fr_{MAX-O}]$ — ***FALSE***

$[Fa_{MAX-P} \geqq Fa_{MAX-O}]$ — ***FALSE***

TRUE

Calculate: Max Operating Output Torque & Max Operating Output Speed

Max Operating Output Speed (rpm): $no_{MAX-O} = Max.\ of\ no_{O1}, no_{O2}, \cdots no_{On}$

Max Operating Output Torque (rpm): $To_{MAX-O} = Max.\ of\ To_{O1}, To_{O2}, \cdots To_{On}$

Select: Preliminary Reduction Ratio (R)
Calculate: Max Operating Input Speed (niMAX-O)

$ni_{MAX-O} = no_{MAX-O} \times R$

Compare Input Speed — ***FALSE***

$[ni_{MAX-P} \geqq ni_{MAX-O}]$

Compare the Max Input Speed (ni_{MAX-P}) to the Max Operating Input Speed: (ni_{MAX-O})

TRUE

Compare Output Torque — ***FALSE***

$[To_{MAX-P} \geqq To_{MAX-O}] \times f_0$

Compare the Max Acceleration Torque (To_{MAX-P}) to the Max Operating Output Torque (To_{MAX-O})

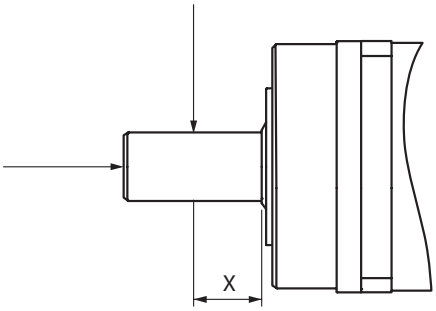
Apply Cycle Factor if needed

Cycle Factor

f_0	-1k cycles/hour	1-3k cycles/hour	3-5k cycles/hour	5-7k cycles/hour	7k-cycles/hour
< 1 hours/day	1.0	1.2	1.3	1.3	1.4
< 8 hours/day	1.3	1.5	1.6	1.9	1.9
< 16 hours/day	1.4	1.6	1.9	2.4	2.6
< 24 hours/day	1.5	1.9	2.4	2.9	3.1

Look up Data in Catalog: Green text
Calculate: Red text

Calculate: Average Operating Radial Load & Average Operating Axial Load



Average Operating Radial Load (N):

$$Fr_{AVG-O} = \sqrt[3]{\frac{no_{O1} \cdot t_1 \cdot |Fr_{O1}|^3 + no_{O2} \cdot t_2 \cdot |Fr_{O2}|^3 + \cdots + no_{On} \cdot t_n \cdot |Fr_{On}|^3}{no_{O1} \cdot t_1 + no_{O2} \cdot t_2 + \cdots + no_{On} \cdot t_n}}$$

Average Operating Axial Load (N):

$$Fa_{AVG-O} = \sqrt[3]{\frac{no_{O1} \cdot t_1 \cdot |Ft_{O1}|^3 + no_{O2} \cdot t_2 \cdot |Ft_{O2}|^3 + \cdots + no_{On} \cdot t_n \cdot |Ft_{On}|^3}{no_{O1} \cdot t_1 + no_{O2} \cdot t_2 + \cdots + no_{On} \cdot t_n}}$$

Calculate: Average Operating Output Torque & Average Operating Output Speed

Average Operating Output Torque (Nm):

$$To_{AVG-O} = \sqrt[10/3]{\frac{no_O \cdot to_1 \cdot |\mathrm{To}_{O_1}|^{10/3} + no_{2O} \cdot to_2 \cdot |To_{O2}|^{10/3} + \cdots + no_{On} \cdot to_n \cdot |To_{On}|^{10/3}}{no_{O1} \cdot to_1 + no_{O2} \cdot to_2 \cdots no_{On} \cdot to_n}}$$

Average Operating Output Speed (rpm):

$$no_{AVG-O} = \frac{no_{O1} \cdot to_1 + no_{2O} \cdot to_2 \cdots no_{On} \cdot to_n}{to_1 + to_2 + \cdots + to_n}$$

Calculate: Life

Bearing Life (Hours): $$Lh = 20{,}000 \bullet \left(\frac{To_{AVG-P}}{To_{AVG-O}}\right)^P \bullet \left(\frac{ni_{AVG-P}}{no_{AVG-O}}\right)$$

To_{AVG-P}: *Nominal Output Torque*

To_{AVG-O}: *Average Operating Output Torque*

ni_{AVG-P}: *Nominal Input Speed*

no_{AVG-O}: *Average Operating Output Speed*

There are 3 Life calculations that should be taken into account:

1. *Life of Needle Bearing*
2. *Life Due to Radial Load*
3. *Life Due to Thrust Load*

Increase One Frame Size

Lh ≥ **Required Life**

FALSE

TRUE

Ensure Proper Fit between Gearbox and Motor

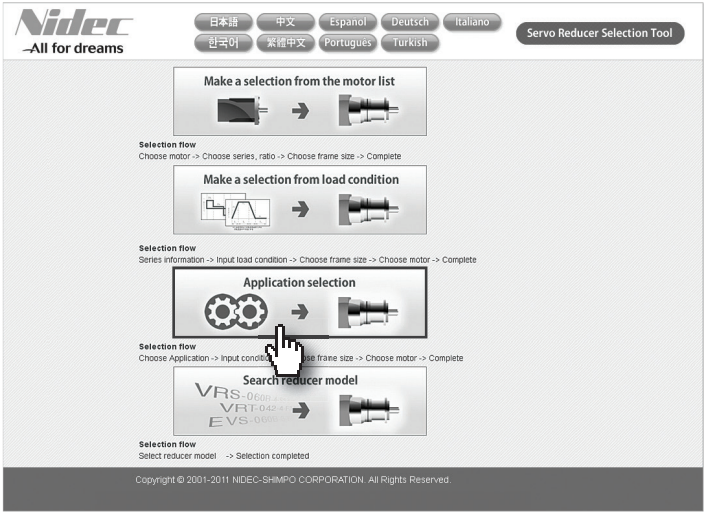
Gearbox Selection Complete

Look up Data in Catalog: Green text
Calculate: Red text
Contact Nidec Drive Technology for questions at (800) 842-1479

Online Planetary Sizing and Selection Tool

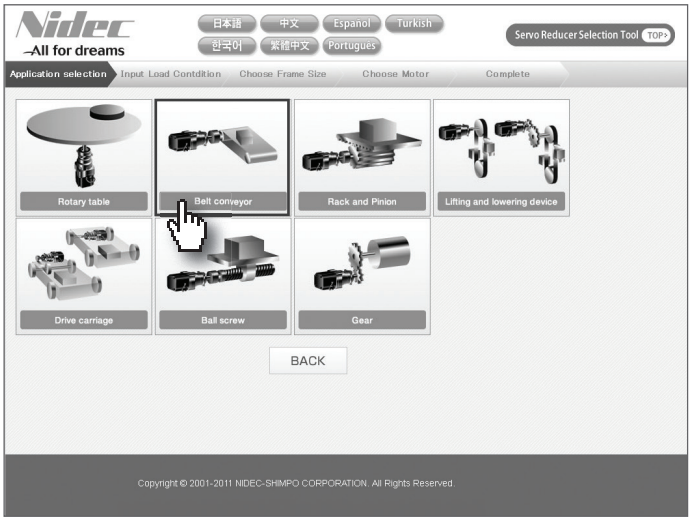
Nidec Drive Technology Corporation's online Selection Tool makes it simple to configure our planetary product. The online Selection Tool has an extensive list of Servo Motor Specifications, Requirements and Application Specifications. See the Selection Tool example screens below to guide, support and help you with your application needs.

Selection Tool Screen Example 1



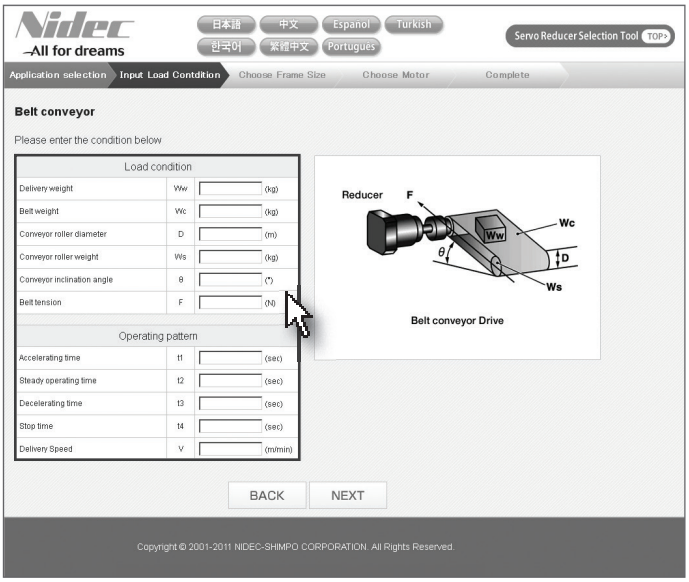
- Selection based on the Servo Motor Specifications
- Selection based on the Servo Motor Movement profile requirements
- Selection based on the Application Specifications includes all the above

Selection Tool Screen Example 2



- Select a application template based on your criteria

Selection Tool Screen Example 3

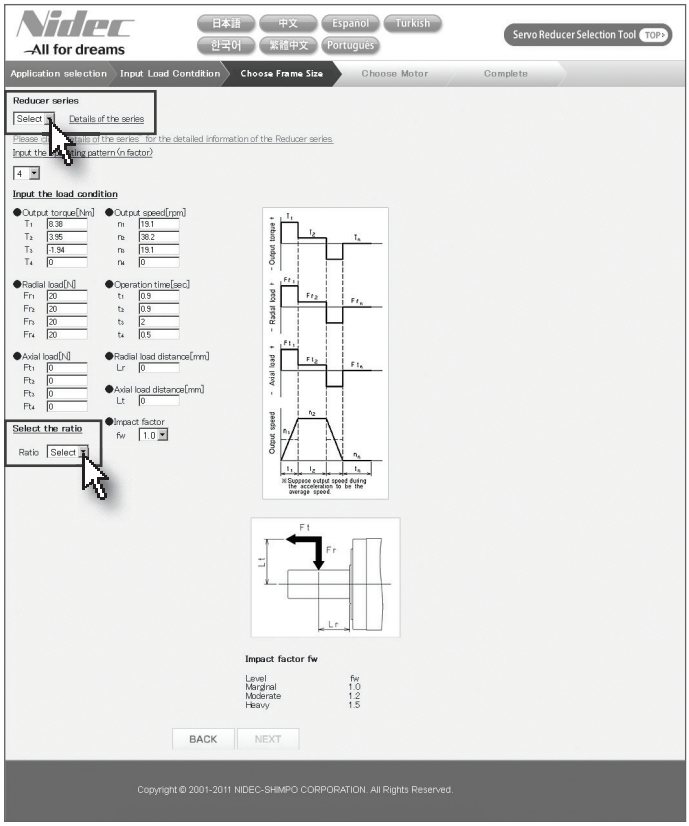


- Fill in all the information for your application

Load condition			
Delivery weight	Ww	10	(kg)
Belt weight	Wc	1	(kg)

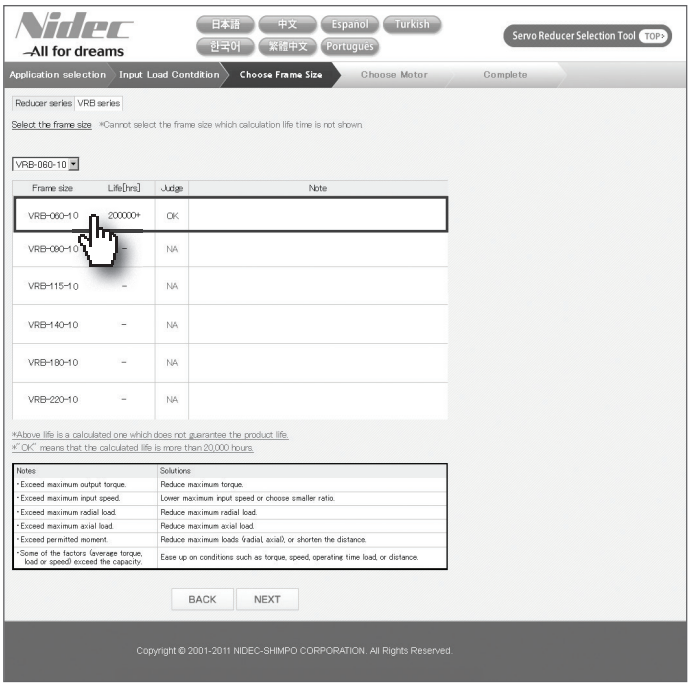
- Including the velocity, forces, mass, and move profile

Selection Tool Screen Example 4



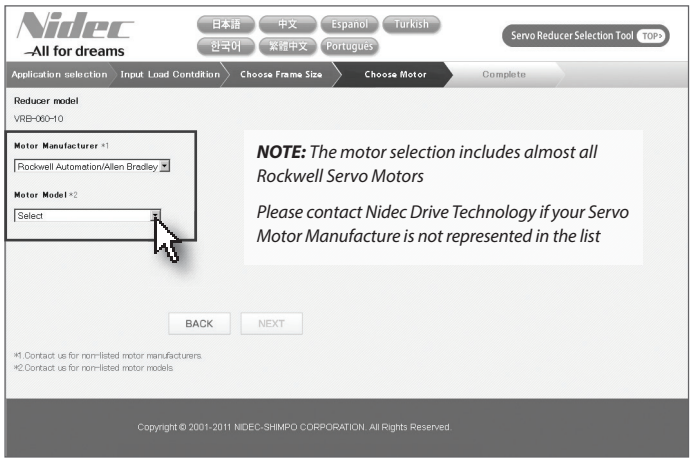
- Select a Nidec Drive Technology planetary gearbox series
- Select a Ratio that would put you near the rpm range for your application

Selection Tool Screen Example 5



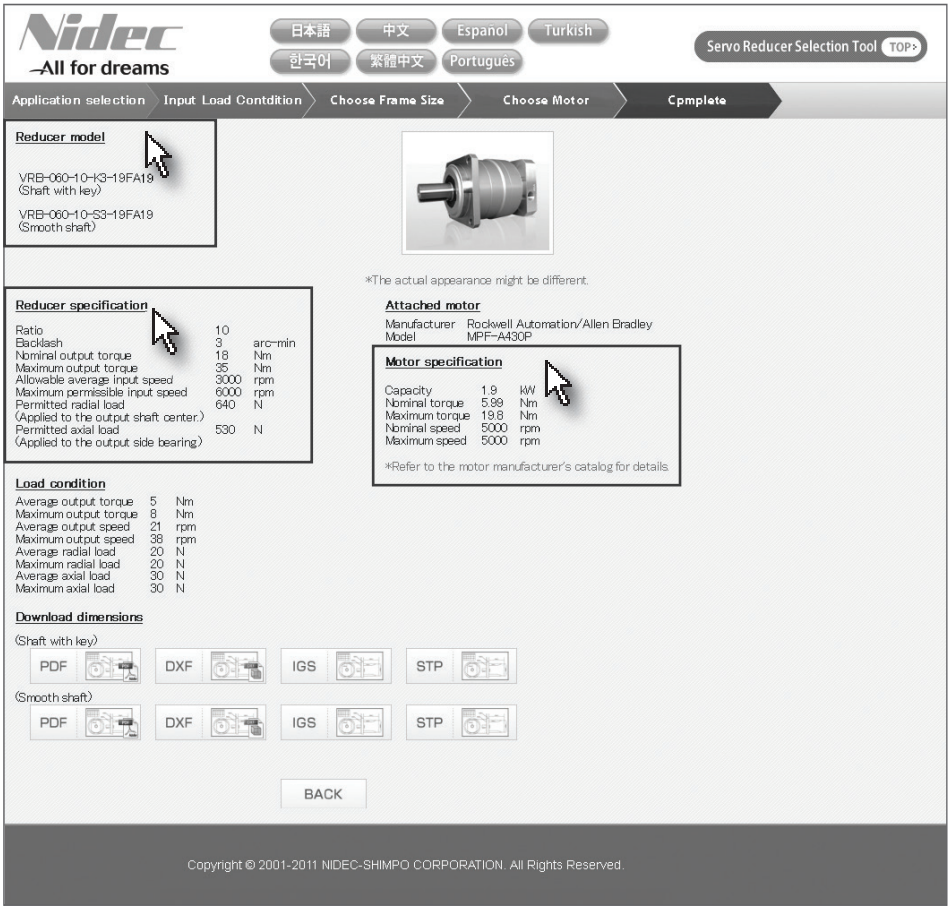
- The proper Nidec Drive Technology reducer frame size has been selected based on your application's criteria

Selection Tool Screen Example 6



- Select the Motor Manufacturer for your application from the list
- Select the appropriate motor via the "Motor Model drop down box"
- The manufacture Motor Model list includes new and former servo motors
- The sizing program does not select the servo motor drive

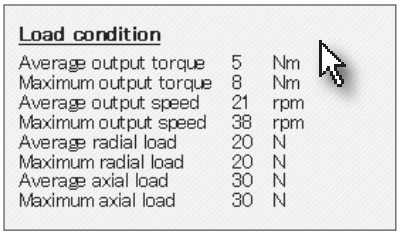
Selection Tool Screen Example 7



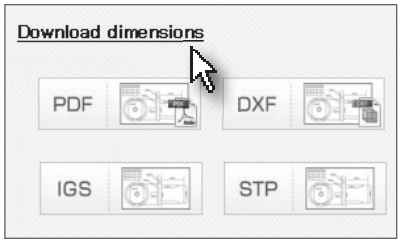
The resulting Load Condition can be helpful for sizing other related machine components

The Load Condition includes:

- Output Torque (Nm) and Output Velocity (rpm) of the Gearmotor



- These drawing formats can be downloaded: PDF, DXF, IGS, STP



Selection tool https://www.nidec-drivetechnology.co.jp/selection/all/