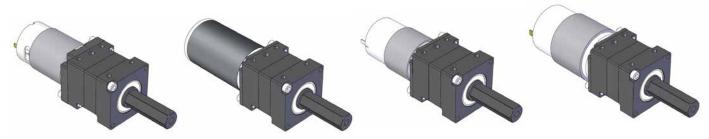
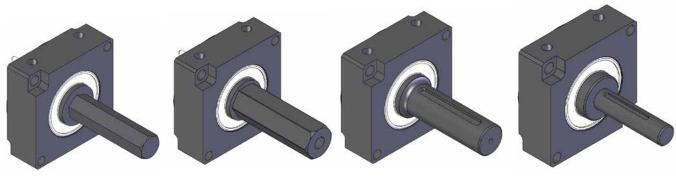


VersaPlanetary User's Guide



What's Included

Base VersaPlanetary P/N's 217-3563, 217-3561, 217-3562, 217-3560

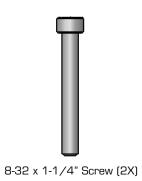


3/8" Hex Output Shaft

1/2" Hex Output Shaft

1/2" with 1/8" Keyway Output Shaft

CIM Motor Output Shaft





VersaPlanetary Input Coupler (1X)

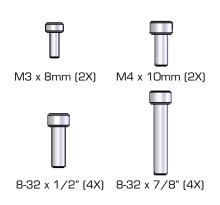


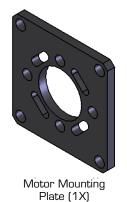
VersaPlanetary Motor Mount With Pilot P/N 217-3564 (1x)

201410



Motor Mount Kit P/N 217-2822









3/8" Motor Plate Spacer (4X)

1/4" Motor Plate Spacer (4X)

Note: The RS-550 Collar and AM-9015 Collar are very similar. Check to see which fits best on your motor shaft. Use the

tightest one that still fits.



BAG Motor Collar (1X)



RS-550 Motor Collar (1X)

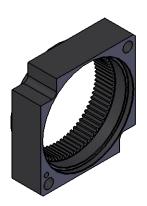


RS-775 Motor Collar (1X)



AM-9015 Motor Collar (1X)

Ring Gear Add-On Kit P/N 217-2816





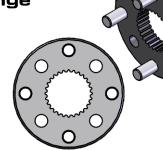
Ring Gear (2X)

8-32 x 1-3/4" Screw (2X)

3:1 Gear Change P/N 217-2817







18 Tooth Planet Gear (4X)

3:1 Carrier Plate (1X)



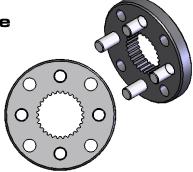








24 Tooth Planet Gear (4X)



4:1 Carrier Plate (1X)

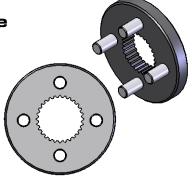


18 Tooth Sun Gear (1X)





27 Tooth Planet Gear (4X)



5:1 Carrier Plate (1X)

7:1 Gear Change P/N 217-3102



12 Tooth Sun Gear (1X)



30 Tooth Planet Gear (3X)



7:1 Carrier Plate (1X)





9:1 Gear Change P/N 217-3106







31 Tooth Planet Gear (3X)



9:1 Carrier Plate (1X)

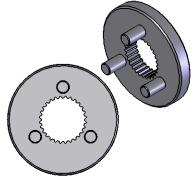
10:1 Gear Change P/N 217-2820



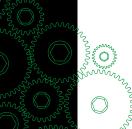
8 Tooth Sun Gear (1X)



32 Tooth Planet Gear (3X)



10:1 Carrier Plate (1X)





CIM Motor Output Shaft Kit P/N 217-2893

1/2" with 1/8" Keyway Output Shaft Kit P/N 217-2895

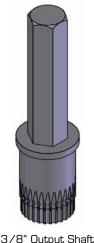


CIM Motor Output Shaft (1X)



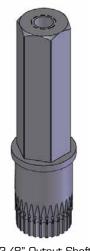
1/2" with 1/8" Keyway Output Shaft (1X)

3/8" Hex Output Shaft Kit P/N 217-2894



3/8" Output Shaft (1X)

1/2" Hex Output Shaft Kit P/N 217-2897



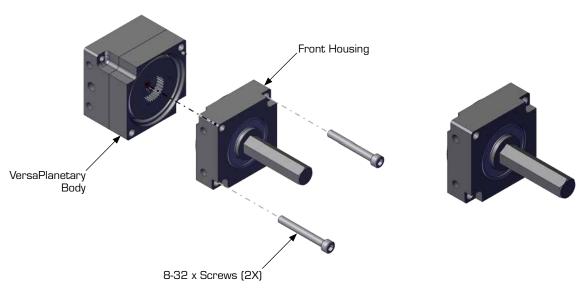
3/8" Output Shaft (1X)



VersaPlanetary Shaft Change

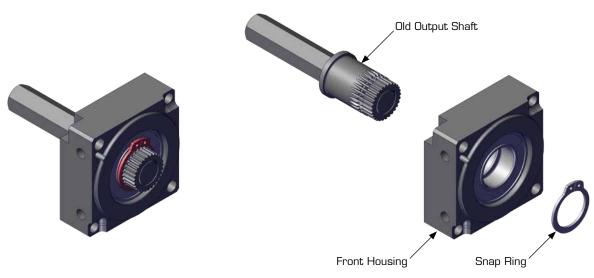
What you will need:

Snap Ring Pliers with tips smaller than .055" 9/64" Hex Key Alternate VersaPlanetary Output Shaft



Step 1:

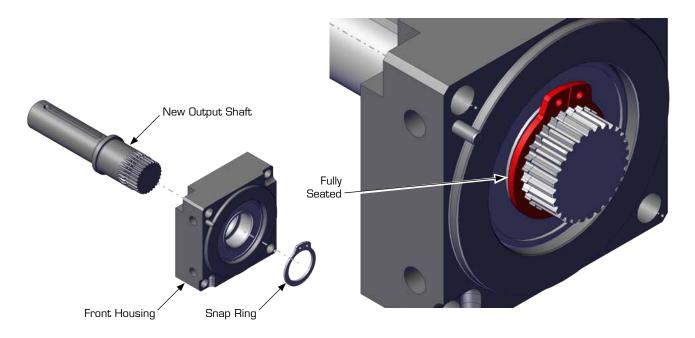
Remove (2X) 8-32 screws from the Front Housing and set the VersaPlanetary Body aside.



Step 2:

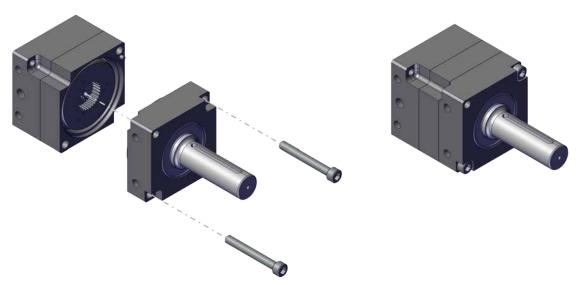
Use Snap Ring Pliers to remove the Snap Ring. Set aside the Old Output Shaft. Take care not to let the bearings slide out of the Front Housing.





Step 3:

Insert New Output Shaft and install Snap Ring using Snap Ring Pliers. Ensure that the Snap Ring is fully seated in the Snap Ring Groove.



Step 4:

Mount the Front Housing to the VersaPlanetary Body using the (2X) 8-32 Screws removed in Step 1.



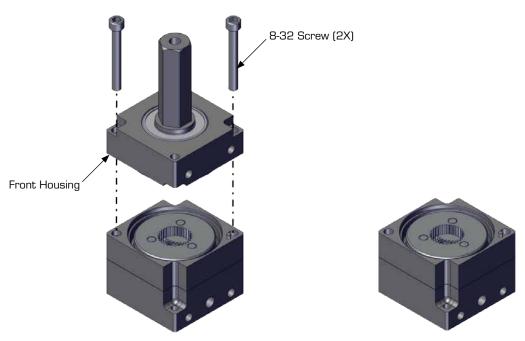
VersaPlanetary Multiple Stage Assembly

What you will need:

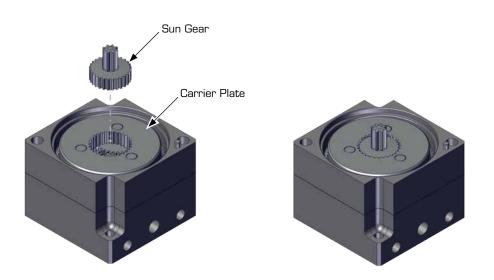
9/64" Hex Key

VersaPlanetary Ring Gear Add-On Kit (P/N 217-2816)

VersaPlanetary Gear Kit (P/N 217-2817, 217-2818, 217-2819, 217-2820)



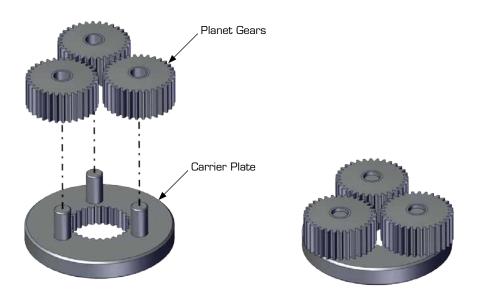
Step 1:Remove (2X) 8-32 Screws from the VersaPlanetary Front Housing. Set aside the Front Housing.



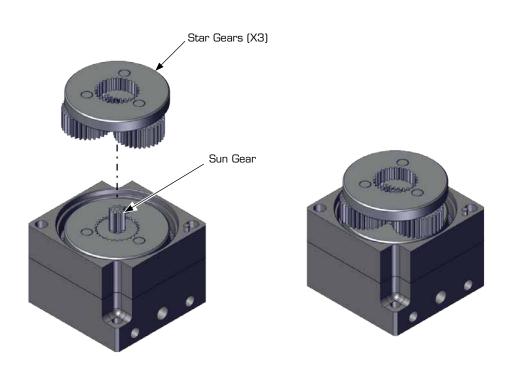
Step 2:

Insert the Sun Gear (included with the user selected Gear Kit) into the Carrier Plate.

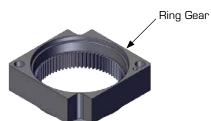


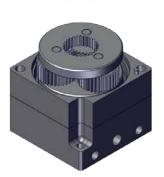


Step 3:Slide all included Planet Gears onto the Carrier Plate (included with the user selected Gear Kit) as shown. Step 4:



Step 4:Slide the assembly from Step 3 onto the Sun Gear as shown.



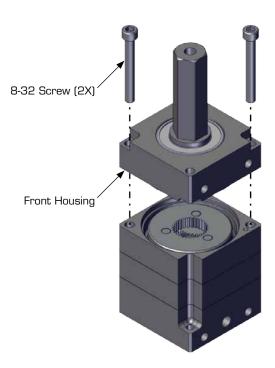






Step 5:

Slide the Ring Gear (included with the VersaPlanetary Ring Gear Add-on Kit) onto the assembly as shown.





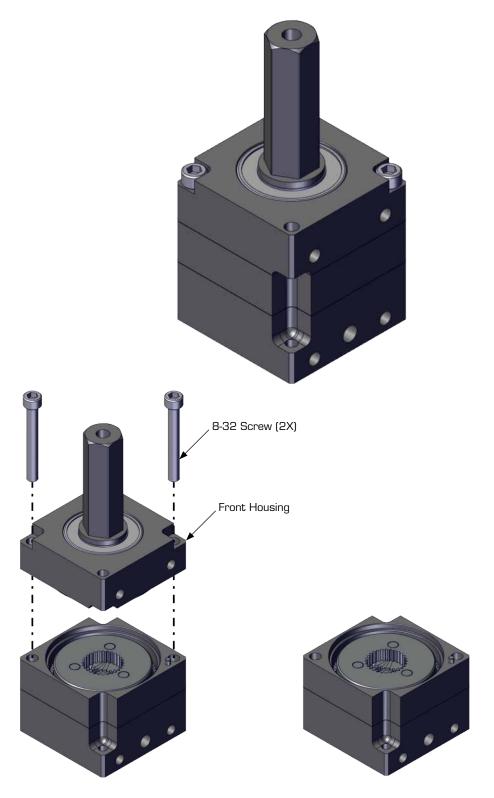
Step 6:

For a 3 Stage VersaPlanetary, repeat Steps 4 & 5. Otherwise, use (2X) 8-32 Screws to mount the Front Housing as shown.

# of Stages	Screw
1	8-32 x 1-1/4"
2	8-32 x 1-3/4"
3	8-32 x 2-1/4"

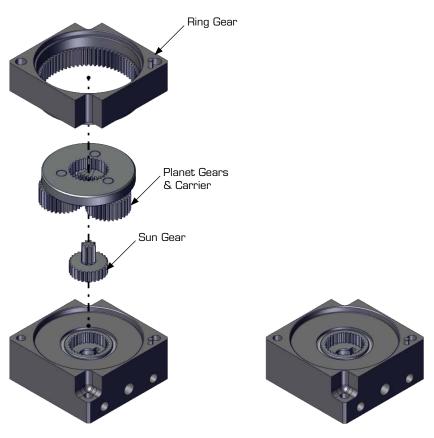


VersaPlanetary Gear Change

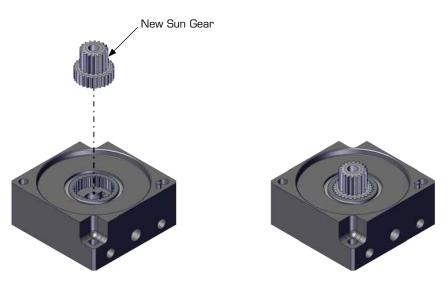


Step 1:Remove (2X) 8-32 Screws and the Front Housing.



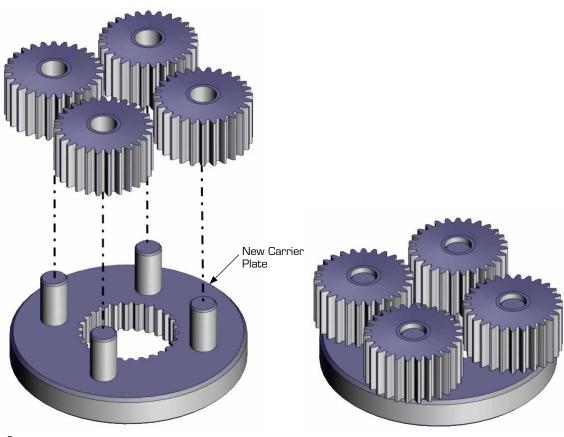


Step 2:Remove the old Ring Gear, Carrier Plate, Planet Gears and the Sun Gear.



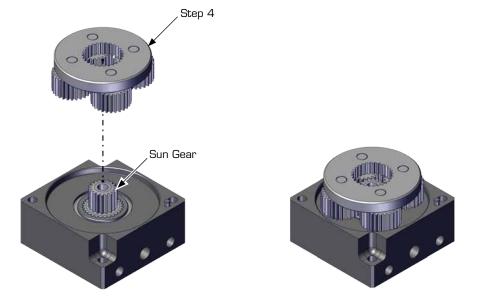
Step 3: Insert the new Sun Gear into the Carrier Plate as shown.





Step 4:

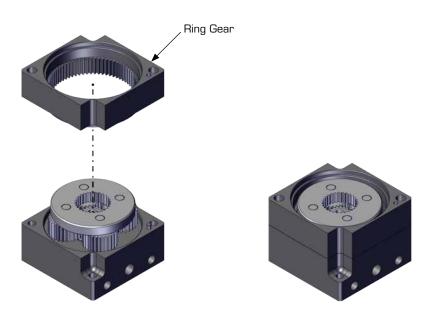
Slide the New Sun Gears onto the New Carrier Plate.



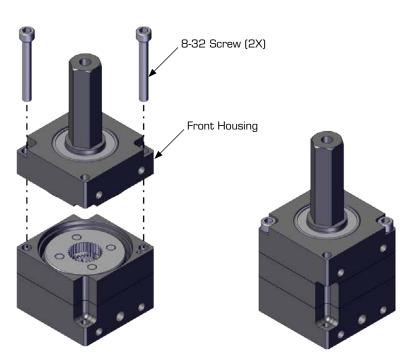
Step 5:

Slide the assembly from Step 4 onto the Sun Gear as shown.





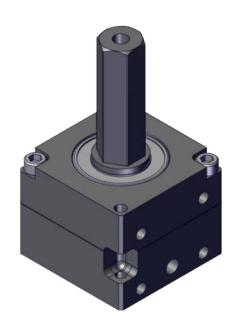
Step 6:Slide the Ring Gear onto the assembly as shown.

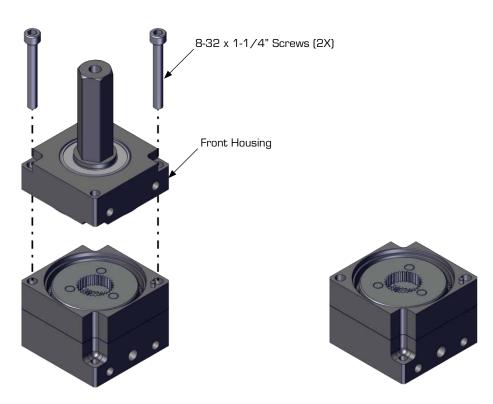


Step 7:Use (2X) 8-32 Screws to mount the Front Housing as shown.



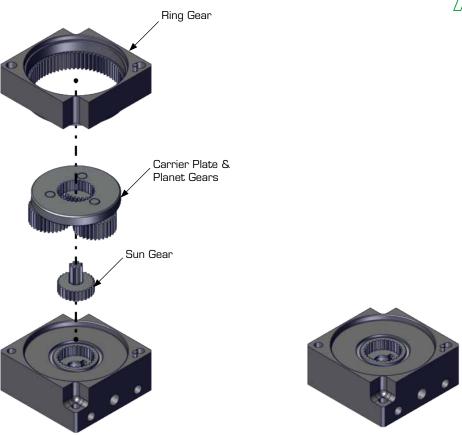
VersaPlanetary Direct Drive



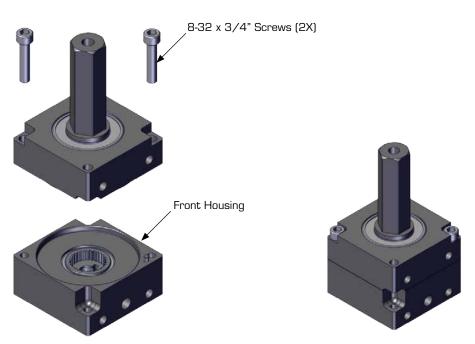


Step 1:Remove (2X) 8-32 Screws and the Front Housing.





Step 2:Remove the Ring Gear, Carrier Plate, Planet Gears, and the Sun Gear.



Step 3:Use (2X) 8-32 Screws to mount the Front Housing as shown.

Serving Servin

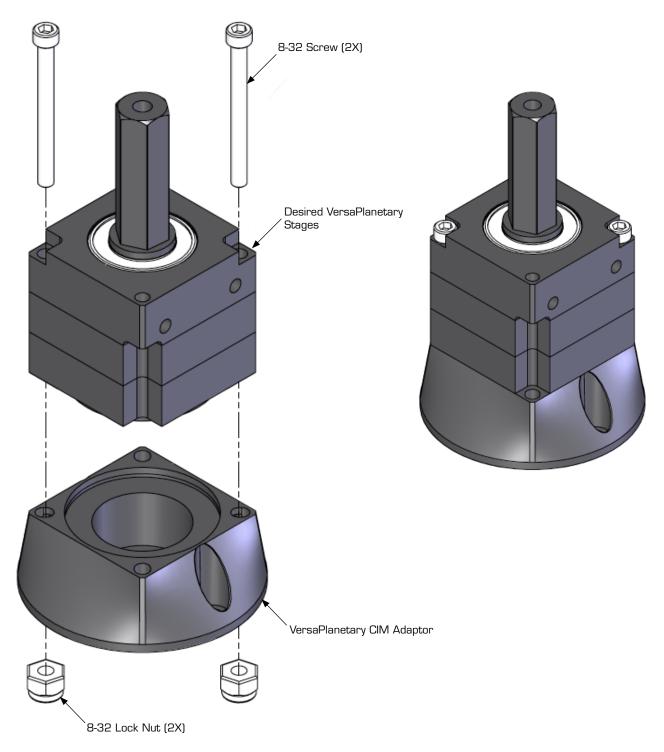
VersaPlanetary Single Stage Exploded View







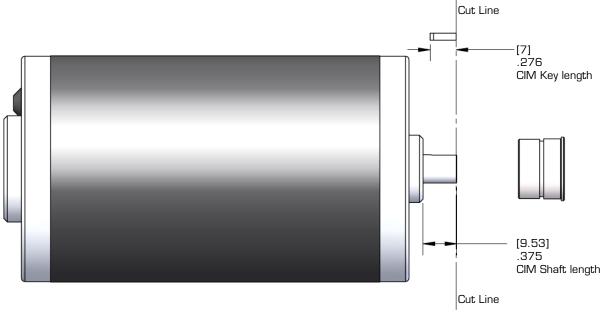
VersaPlanetary CIM Adaptor Instructions



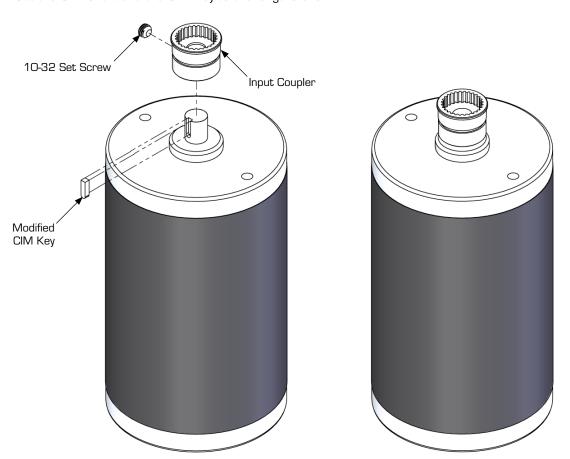
Step 1:

Attach VersaPlanetary CIM Adaptor to desired VersaPlanetary Gearbox Stages





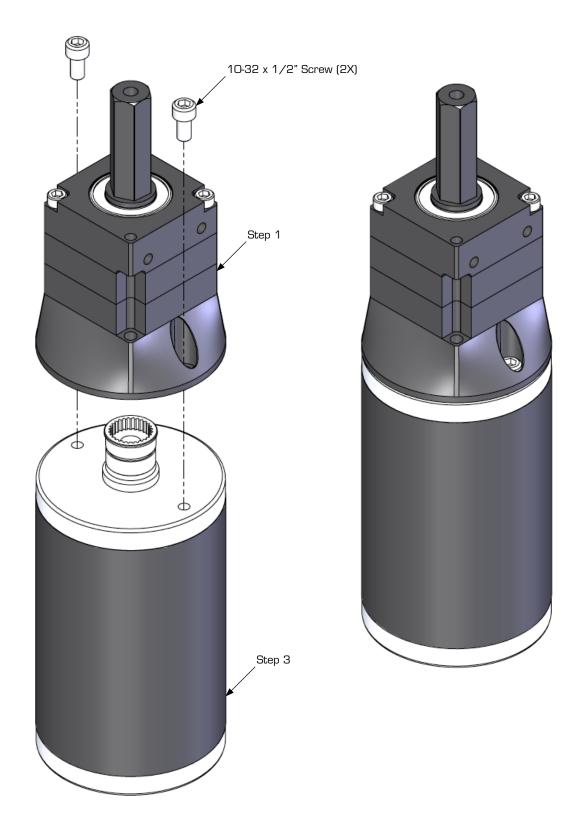
Step 2:Cut the CIM Shaft and the CIM Key to the lengths shown.



Step 3:

Insert Modified CIM Key into Keyway. Slide on Input Coupler and tighten Set Screw





Step 4:Attach VersaPlanetary CIM Adapter and desired VersaPlanetary stages (Step 1) to Modified CIM (Step 3).



VersaPlanetary Load Ratings

Introduction

The ratings in this guide are based on actual test data conducted by VEX Robotics on the final product versions of the VersaPlanetary gear box. All load ratings are based on a Safety Factor (SF) of 1.2 to accommodate manufacturing tolerance differences.

How to Use the Rating Tables

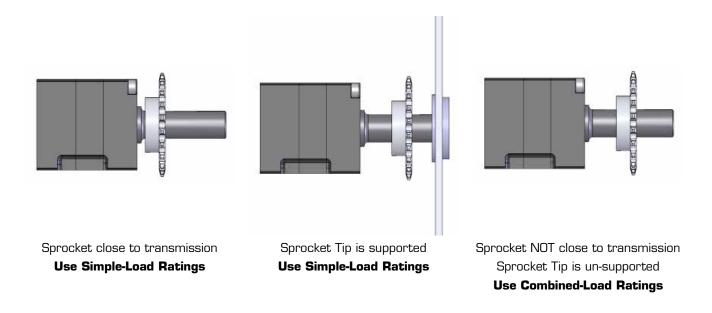
There are two types of rating tables in this guide:

- (1) Simple-Load Ratings
 - a. Conservative ratings based on a simplified loading case using just torsion.
- (2) Combined-Load Ratings
 - a. Load ratings that take bending loads into account as well as torsion.

Most users are recommended to mount their VersaPlanetary gearboxes in such a way that they can use the "Simple Load Ratings" table.

IMPORTANT NOTE:

The "Simple Loading Ratings" tables assume that the output of your shaft has minimal overhung loading (i.e. your sprocket is really close to the base of the shaft, or you support the tip of the shaft). See below examples.





The "Simple Load Ratings" tables use a red/green rating system. If the motor / gear ratio / output shaft combination you want to use is highlighted green, then it is within our maximum gear ratio recommendations. If the motor / gear ratio / output shaft combination is highlighted red, then the maximum motor torque will be capable of damaging the gearbox (with a significant enough load on the output shaft) and should be used with caution.

Example: User wants to use a RS-775 motor with a 2 stage gearbox with a 100:1 gear ratio and a 3/8" Hex Shaft. Is this combination recommended?

Using Table 3 (excerpt shown below), that combination is not recommended as indicated in red. However, all other gear ratio combinations are recommended for that motor.

Simple Load Ratings Tables

				Sta	ge 2		
Motor	Stage 1	3:1	4:1	5:1	7:1	9:1	10:1
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
414 0045	5:1	15	20	25	35	45	50
AM-9015	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
BB RS-550	5:1	15	20	25	35	45	50
BB K9-330	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
DD DC 775	5:1	15	20	25	35	45	50
BB RS-775	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
BAG Motor	5:1	15	20	25	35	45	50
BAG MOTOR	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
Mini CIM	5:1	15	20	25	35	45	50
IVIIIII CIIVI	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
CIM	5:1	15	20	25	35	45	50
CIIVI	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100

√Table 1 - 2 Stage Max Gear Ratio w∕ 1/	

				Stag	ge 2		
Motor	Stage 1	3:1	4:1	5:1	7:1	9:1	10:1
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
ANA 004E	5:1	15	20	25	35	45	50
AM-9015	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
DD DC EEO	5:1	15	20	25	35	45	50
BB K9-330	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
DD DO 775	5:1	15	20	25	35	45	50
BB K2-//5	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
DAC Makan	5:1	15	20	25	35	45	50
BAG WOTOR	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
BB RS-775 BAG Motor	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
54° - O154	5:1	15	20	25	35	45	50
Mini CIM	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
017.5	5:1	15	20	25	35	45	50
CIM	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100

Table 2 - 2 Stage Max Gear Ratio w/ 1/2" Round Output Shaft



				Stag	 ge 2		
Motor	Stage 1	3:1	4:1	5:1	7:1	9:1	10:1
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
AM 004E	5:1	15	20	25	35	45	50
AM-9015	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
BB RS-550	5:1	15	20	25	35	45	50
DD K3-33U	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
DD DC 775	5:1	15	20	25	35	45	50
DD R3-773	7:1	21	28	35	49	63	70
BB RS-775	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
BAG Motor	5:1	15	20	25	35	45	50
BAG MOLOI	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
Mini CIM	5:1	15	20	25	35	45	50
IVIIIII CIIVI	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
CIM	5:1	15	20	25	35	45	50
Cilvi	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100

Table 3 - 2 Stage Max Gear	Ratio w/ 3	3/8"	Hex Output Shaft
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				Stad	 ge 2		
Motor	Stage 1	3:1	4:1	5:1	7:1	9:1	10:1
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
*** ***	5:1	15	20	25	35	45	50
AM-9015	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
BB RS-550	5:1	15	20	25	35	45	50
	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
BB RS-775	5:1	15	20	25	35	45	50
	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
BAG Motor	5:1	15	20	25	35	45	50
DAG WIGGO	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
Mini CIM	5:1	15	20	25	35	45	50
	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100
	3:1	9	12	15	21	27	30
	4:1	12	16	20	28	36	40
СІМ	5:1	15	20	25	35	45	50
J	7:1	21	28	35	49	63	70
	9:1	27	36	45	63	81	90
	10:1	30	40	50	70	90	100

Table 4 - 2 Stage Max Gear Ratio CIM Motor Output Shaft

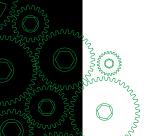




Table 5 – 3 Stage Max Gear Ratio w/ 1/2" Hex Shaft

				Sta	ge 3		
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
Motor AM-9015	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
AM-9015	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000
	100 9	300 27	400 36	500 45	700 63	900	1000
	9	27	36	45	63	81	90
	9 12	27 36	36 48	45 60	63 84	81 108	90 120
	9 12 15	27 36 45	36 48 60	45 60 75	63 84 105	81 108 135	90 120 150
	9 12 15 16	27 36 45 48	36 48 60 64	45 60 75 80	63 84 105 112	81 108 135 144	90 120 150 160
	9 12 15 16 20	27 36 45 48 60	36 48 60 64 80	45 60 75 80 100	63 84 105 112 140	81 108 135 144 180	90 120 150 160 200
	9 12 15 16 20 21	27 36 45 48 60 63	36 48 60 64 80 84	45 60 75 80 100 105	63 84 105 112 140	81 108 135 144 180	90 120 150 160 200
	9 12 15 16 20 21 25	27 36 45 48 60 63 75	36 48 60 64 80 84	45 60 75 80 100 105 125	63 84 105 112 140 147 175	81 108 135 144 180 189	90 120 150 160 200 210 250
	9 12 15 16 20 21 25 27	27 36 45 48 60 63 75 81	36 48 60 64 80 84 100	45 60 75 80 100 105 125	63 84 105 112 140 147 175 189	81 108 135 144 180 189 225 243	90 120 150 160 200 210 250 270
RS-550	9 12 15 16 20 21 25 27 28	27 36 45 48 60 63 75 81	36 48 60 64 80 84 100 108	45 60 75 80 100 105 125 135	63 84 105 112 140 147 175 189	81 108 135 144 180 189 225 243	90 120 150 160 200 210 250 270
RS-550	9 12 15 16 20 21 25 27 28 30	27 36 45 48 60 63 75 81 84	36 48 60 64 80 84 100 108 112	45 60 75 80 100 105 125 135 140	63 84 105 112 140 147 175 189 196	81 108 135 144 180 189 225 243 252 270	90 120 150 160 200 210 250 270 280 300
RS-550	9 12 15 16 20 21 25 27 28 30 35	27 36 45 48 60 63 75 81 84 90 105 108	36 48 60 64 80 84 100 108 112 120	45 60 75 80 100 105 125 135 140 150 175 180	63 84 105 112 140 147 175 189 196 210	81 108 135 144 180 189 225 243 252 270 315	90 120 150 160 200 210 250 270 280 300 350
RS-550	9 12 15 16 20 21 25 27 28 30 35 36	27 36 45 48 60 63 75 81 84 90 105	36 48 60 64 80 84 100 108 112 120 140	45 60 75 80 100 105 125 135 140 150 175	63 84 105 112 140 147 175 189 196 210 245	81 108 135 144 180 189 225 243 252 270 315	90 120 150 160 200 210 250 270 280 300 350
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40	27 36 45 48 60 63 75 81 84 90 105 108	36 48 60 64 80 84 100 108 112 120 140 144	45 60 75 80 100 105 125 135 140 150 175 180	63 84 105 112 140 147 175 189 196 210 245 252	81 108 135 144 180 189 225 243 252 270 315 324 360	90 120 150 160 200 210 250 270 280 300 350 360 400
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40	27 36 45 48 60 63 75 81 84 90 105 108 120	36 48 60 64 80 84 100 108 112 120 140 144 160 180	45 60 75 80 100 105 125 135 140 150 175 180 200	63 84 105 112 140 147 175 189 196 210 245 252 280 315	81 108 135 144 180 189 225 243 252 270 315 324 360 405	90 120 150 160 200 210 250 270 280 300 350 360 400 450
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40 45	27 36 45 48 60 63 75 81 84 90 105 108 120 135 147	36 48 60 64 80 84 100 108 112 120 140 144 160 180	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441	90 120 150 160 200 210 250 270 280 300 350 360 400 450
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40 45 49 50	27 36 45 48 60 63 75 81 84 90 105 108 120 135 147	36 48 60 64 80 84 100 108 112 120 140 144 160 180 196 200	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343 350	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441	90 120 150 160 200 210 250 270 280 300 350 360 400 450 490
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40 45 49 50 63	27 36 45 48 60 63 75 81 84 90 105 108 120 135 147 150 189	36 48 60 64 80 84 100 108 112 120 140 144 160 180 196 200	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245 250 315	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343 350 441	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441 450	90 120 150 200 210 250 270 280 350 360 400 450 490 500 630
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40 45 49 50 63 70	27 36 45 48 60 63 75 81 84 90 105 108 120 135 147 150 189 210	36 48 60 64 80 84 100 108 112 120 140 144 160 180 196 200 252 280	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245 250 315	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343 350 441 490	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441 450 567 630	90 120 150 160 200 210 250 270 280 300 350 360 400 450 490 490 500 630 700

				Sta	ge 3		
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
BB RS-775	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
BB RS-775	35	105	140	175	245	315	350
[36	108	144	180	252	324	360
BB RS-775	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000
	100 9	300 27	400 36	500 45	700 63	900 81	1000 90
	9	27	36	45	63	81	90
	9 12	27 36	36 48	45 60	63 84	81 108	90 120
	9 12 15	27 36 45	36 48 60	45 60 75	63 84 105	81 108 135	90 120 150
	9 12 15 16	27 36 45 48	36 48 60 64	45 60 75 80	63 84 105 112	81 108 135 144	90 120 150 160
	9 12 15 16 20	27 36 45 48 60	36 48 60 64 80	45 60 75 80 100	63 84 105 112 140	81 108 135 144 180	90 120 150 160 200
	9 12 15 16 20 21	27 36 45 48 60 63	36 48 60 64 80 84	45 60 75 80 100 105	63 84 105 112 140 147	81 108 135 144 180	90 120 150 160 200 210
	9 12 15 16 20 21 25	27 36 45 48 60 63 75	36 48 60 64 80 84	45 60 75 80 100 105 125	63 84 105 112 140 147 175	81 108 135 144 180 189	90 120 150 160 200 210
	9 12 15 16 20 21 25 27	27 36 45 48 60 63 75 81	36 48 60 64 80 84 100	45 60 75 80 100 105 125 135	63 84 105 112 140 147 175 189	81 108 135 144 180 189 225	90 120 150 160 200 210 250 270
BAG Motor	9 12 15 16 20 21 25 27 28	27 36 45 48 60 63 75 81	36 48 60 64 80 84 100 108	45 60 75 80 100 105 125 135	63 84 105 112 140 147 175 189	81 108 135 144 180 189 225 243	90 120 150 160 200 210 250 270
BAG Motor	9 12 15 16 20 21 25 27 28 30	27 36 45 48 60 63 75 81 84	36 48 60 64 80 84 100 108 112	45 60 75 80 100 105 125 135 140	63 84 105 112 140 147 175 189 196 210	81 108 135 144 180 189 225 243 252 270	90 120 150 160 200 210 250 270 280 300
BAG Motor	9 12 15 16 20 21 25 27 28 30 35	27 36 45 48 60 63 75 81 84 90	36 48 60 64 80 84 100 108 112 120	45 60 75 80 100 105 125 135 140 150	63 84 105 112 140 147 175 189 196 210	81 108 135 144 180 189 225 243 252 270 315	90 120 150 160 200 210 250 270 280 300 350
BAG Motor	9 12 15 16 20 21 25 27 28 30 35 36	27 36 45 48 60 63 75 81 84 90 105	36 48 60 64 80 84 100 108 112 120 140	45 60 75 80 100 105 125 135 140 150 175	63 84 105 112 140 147 175 189 196 210 245	81 108 135 144 180 189 225 243 252 270 315	90 120 150 160 200 210 250 270 280 300 350
BAG Motor	9 12 15 16 20 21 25 27 28 30 35 36 40	27 36 45 48 60 63 75 81 84 90 105 108	36 48 60 64 80 84 100 108 112 120 140 144	45 60 75 80 100 105 125 135 140 150 175 180	63 84 105 112 140 147 175 189 196 210 245 252	81 108 135 144 180 189 225 243 252 270 315 324 360	90 120 150 160 200 210 250 270 280 300 350 360 400
BAG Motor	9 12 15 16 20 21 25 27 28 30 35 36 40	27 36 45 48 60 63 75 81 84 90 105 108 120	36 48 60 64 80 84 100 108 112 120 140 144 160	45 60 75 80 100 105 125 135 140 150 175 180 200	63 84 105 112 140 147 175 189 196 210 245 252 280 315	81 108 135 144 180 189 225 243 252 270 315 324 360 405	90 120 150 160 200 210 250 270 280 300 350 360 400
BAG Motor	9 12 15 16 20 21 25 27 28 30 35 36 40 45 49	27 36 45 48 60 63 75 81 84 90 105 108 120 135	36 48 60 64 80 84 100 108 112 120 140 144 160 180	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441	90 120 150 160 200 210 250 270 280 300 350 360 400 450
BAG Motor	9 12 15 16 20 21 25 27 28 30 35 36 40 45 49 50	27 36 45 48 60 63 75 81 84 90 105 108 120 135 147	36 48 60 64 80 84 100 108 112 120 140 144 160 180 196	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343 350	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441	90 120 150 160 210 250 270 280 300 350 360 400 450 490
BAG Motor	9 12 15 16 20 21 25 27 28 30 35 36 40 45 49 50 63	27 36 45 48 60 63 75 81 84 90 105 108 120 135 147 150 189	36 48 60 64 80 84 100 108 112 120 140 144 160 180 196 200	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245 250 315	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343 350 441	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441 450	90 120 150 160 200 210 250 270 280 300 350 400 450 490 500
BAG Motor	9 12 15 16 20 21 25 27 28 30 35 36 40 45 49 50 63 70	27 36 45 48 60 63 75 81 84 90 105 108 120 135 147 150 189 210	36 48 60 64 80 84 100 108 112 120 140 144 160 180 196 200 252	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245 250 315	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343 350 441 490	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441 450 567 630	90 120 150 160 200 210 250 270 280 300 350 360 400 450 490 500 630



Table 5 – 3 Stage Max Gear Ratio w/ 1/2" Hex Shaft (Continued)

				Sta	ge 3		
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
Mini CIM	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000

				Sta	ge 3		
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
СІМ	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000

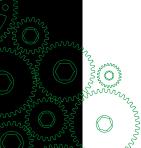




Table 6 – 3 Stage Max Gear Ratio w/ 1/2" Round Shaft

				Sta	ge 3		
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
AM-9015	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000
	100 9	300 27	400 36	500 45	700 63	900 81	1000 90
	9	27	36	45	63	81	90
	9 12	27 36	36 48	45 60	63 84	81 108	90 120
	9 12 15	27 36 45	36 48 60	45 60 75	63 84 105	81 108 135	90 120 150
	9 12 15 16	27 36 45 48	36 48 60 64	45 60 75 80	63 84 105 112	81 108 135 144	90 120 150 160
	9 12 15 16 20	27 36 45 48 60	36 48 60 64 80	45 60 75 80 100	63 84 105 112 140	81 108 135 144 180	90 120 150 160 200
	9 12 15 16 20 21	27 36 45 48 60 63	36 48 60 64 80 84	45 60 75 80 100 105	63 84 105 112 140	81 108 135 144 180	90 120 150 160 200
	9 12 15 16 20 21 25	27 36 45 48 60 63 75	36 48 60 64 80 84 100	45 60 75 80 100 105 125	63 84 105 112 140 147	81 108 135 144 180 189	90 120 150 160 200 210 250
	9 12 15 16 20 21 25 27	27 36 45 48 60 63 75 81	36 48 60 64 80 84 100	45 60 75 80 100 105 125 135	63 84 105 112 140 147 175 189	81 108 135 144 180 189 225 243	90 120 150 160 200 210 250 270
RS-550	9 12 15 16 20 21 25 27 28	27 36 45 48 60 63 75 81	36 48 60 64 80 84 100 108	45 60 75 80 100 105 125 135	63 84 105 112 140 147 175 189	81 108 135 144 180 189 225 243	90 120 150 160 200 210 250 270
RS-550	9 12 15 16 20 21 25 27 28 30	27 36 45 48 60 63 75 81 84	36 48 60 64 80 84 100 108 112	45 60 75 80 100 105 125 135 140	63 84 105 112 140 147 175 189 196	81 108 135 144 180 189 225 243 252 270	90 120 150 160 200 210 250 270 280 300
RS-550	9 12 15 16 20 21 25 27 28 30 35	27 36 45 48 60 63 75 81 84 90	36 48 60 64 80 84 100 108 112 120	45 60 75 80 100 105 125 135 140 150	63 84 105 112 140 147 175 189 196 210	81 108 135 144 180 189 225 243 252 270 315	90 120 150 160 200 210 250 270 280 300 350
RS-550	9 12 15 16 20 21 25 27 28 30 35 36	27 36 45 48 60 63 75 81 84 90 105	36 48 60 64 80 84 100 108 112 120 140	45 60 75 80 100 105 125 135 140 150 175	63 84 105 112 140 147 175 189 196 210 245	81 108 135 144 180 189 225 243 252 270 315 324	90 120 150 160 200 210 250 270 280 300 350
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40	27 36 45 48 60 63 75 81 84 90 105 108	36 48 60 64 80 84 100 108 112 120 140 144	45 60 75 80 100 105 125 135 140 150 175 180	63 84 105 112 140 147 175 189 196 210 245 252	81 108 135 144 180 189 225 243 252 270 315 324 360	90 120 150 160 200 210 250 270 280 300 350 360 400
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40	27 36 45 48 60 63 75 81 84 90 105 108 120	36 48 60 64 80 84 100 108 112 120 140 144 160 180	45 60 75 80 100 105 125 135 140 150 175 180 200	63 84 105 112 140 147 175 189 196 210 245 252 280 315	81 108 135 144 180 189 225 243 252 270 315 324 360 405	90 120 150 160 200 210 250 270 280 300 350 360 400
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40 45	27 36 45 48 60 63 75 81 84 90 105 108 120 135	36 48 60 64 80 84 100 108 112 120 140 144 160 180	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441	90 120 150 160 200 210 250 270 280 300 350 360 400 450
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40 45 49 50	27 36 45 48 60 63 75 81 84 90 105 108 120 135 147	36 48 60 64 80 84 100 108 112 120 140 144 160 180 196 200	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343 350	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441	90 120 150 160 200 210 250 270 280 300 350 360 400 450 490
R\$-550	9 12 15 16 20 21 25 27 28 30 35 36 40 45 49 50 63	27 36 45 48 60 63 75 81 84 90 105 108 120 135 147 150 189	36 48 60 64 80 84 100 108 112 120 140 144 160 180 196 200	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245 250	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343 350 441	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441 450	90 120 150 160 200 210 250 270 280 300 350 400 450 490 500 630
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40 45 49 50 63 70	27 36 45 48 60 63 75 81 84 90 105 108 120 135 147 150 189 210	36 48 60 64 80 84 100 108 112 120 140 144 160 180 196 200 252	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245 250 315	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343 350 441 490	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441 450 567 630	90 120 150 200 210 250 270 280 330 360 400 450 450 490 630 700

		Stage 3						
Motor	Stage 1 & 2	3	4	5	7	9	10	
	9	27	36	45	63	81	90	
	12	36	48	60	84	108	120	
	15	45	60	75	105	135	150	
	16	48	64	80	112	144	160	
	20	60	80	100	140	180	200	
	21	63	84	105	147	189	210	
	25	75	100	125	175	225	250	
	27	81	108	135	189	243	270	
	28	84	112	140	196	252	280	
	30	90	120	150	210	270	300	
BB RS-775	35	105	140	175	245	315	350	
	36	108	144	180	252	324	360	
	40	120	160	200	280	360	400	
	45	135	180	225	315	405	450	
	49	147	196	245	343	441	490	
	50	150	200	250	350	450	500	
	63	189	252	315	441	567	630	
	70	210	280	350	490	630	700	
	81	243	324	405	567	729	810	
	90	270	360	450	630	810	900	
	100	300	400	500	700	900	1000	
	9	27	36	45	63	81	90	
	9	27 36	36 48	45 60	63 84	81 108	90 120	
	12	36	48	60	84	108	120	
	12 15	36 45	48 60	60 75	84 105	108 135	120 150	
	12 15 16	36 45 48	48 60 64	60 75 80	84 105 112	108 135 144	120 150 160	
	12 15 16 20	36 45 48 60	48 60 64 80	60 75 80 100	84 105 112 140	108 135 144 180	120 150 160 200	
	12 15 16 20 21	36 45 48 60 63	48 60 64 80 84	60 75 80 100 105	84 105 112 140 147	108 135 144 180 189	120 150 160 200 210	
	12 15 16 20 21 25	36 45 48 60 63 75	48 60 64 80 84 100	60 75 80 100 105 125	84 105 112 140 147 175	108 135 144 180 189 225	120 150 160 200 210	
	12 15 16 20 21 25 27	36 45 48 60 63 75 81	48 60 64 80 84 100	60 75 80 100 105 125 135	84 105 112 140 147 175 189	108 135 144 180 189 225 243	120 150 160 200 210 250 270	
BAG Motor	12 15 16 20 21 25 27 28	36 45 48 60 63 75 81	48 60 64 80 84 100 108	60 75 80 100 105 125 135	84 105 112 140 147 175 189	108 135 144 180 189 225 243 252	120 150 160 200 210 250 270 280	
BAG Motor	12 15 16 20 21 25 27 28 30	36 45 48 60 63 75 81 84	48 60 64 80 84 100 108 112	60 75 80 100 105 125 135 140	84 105 112 140 147 175 189 196 210	108 135 144 180 189 225 243 252 270	120 150 160 200 210 250 270 280 300	
BAG Motor	12 15 16 20 21 25 27 28 30 35	36 45 48 60 63 75 81 84 90	48 60 64 80 84 100 108 112 120	60 75 80 100 105 125 135 140 150	84 105 112 140 147 175 189 196 210	108 135 144 180 189 225 243 252 270 315	120 150 160 200 210 250 270 280 300 350	
BAG Motor	12 15 16 20 21 25 27 28 30 35	36 45 48 60 63 75 81 84 90 105	48 60 64 80 84 100 108 112 120 140	60 75 80 100 105 125 135 140 150 175	84 105 112 140 147 175 189 196 210 245	108 135 144 180 189 225 243 252 270 315 324	120 150 160 200 210 250 270 280 300 350 360	
BAG Motor	12 15 16 20 21 25 27 28 30 35 36 40	36 45 48 60 63 75 81 84 90 105 108	48 60 64 80 84 100 108 112 120 140 144	60 75 80 100 105 125 135 140 150 175 180	84 105 112 140 147 175 189 196 210 245 252	108 135 144 180 189 225 243 252 270 315 324	120 150 160 200 210 250 270 280 300 350 360 400	
BAG Motor	12 15 16 20 21 25 27 28 30 35 36 40 45	36 45 48 60 63 75 81 84 90 105 108 120	48 60 64 80 84 100 108 112 120 140 144 160	60 75 80 100 105 125 135 140 150 175 180 200	84 105 112 140 147 175 189 196 210 245 252 280 315	108 135 144 180 189 225 243 252 270 315 324 360 405	120 150 160 200 210 250 270 280 300 350 360 400 450	
BAG Motor	12 15 16 20 21 25 27 28 30 35 36 40 45	36 45 48 60 63 75 81 84 90 105 108 120 135	48 60 64 80 84 100 108 112 120 140 144 160 180	60 75 80 100 105 125 135 140 150 175 180 200 225	84 105 112 140 147 175 189 196 210 245 252 280 315 343	108 135 144 180 189 225 243 252 270 315 324 360 405 441	120 150 160 200 210 250 270 280 300 350 360 400 450	
BAG Motor	12 15 16 20 21 25 27 28 30 35 36 40 45 49	36 45 48 60 63 75 81 84 90 105 108 120 135 147	48 60 64 80 84 100 108 112 120 140 144 160 180 196 200	60 75 80 100 105 125 135 140 150 175 180 200 225 245 250	84 105 112 140 147 175 189 196 210 245 252 280 315 343 350	108 135 144 180 189 225 243 252 270 315 324 360 405 441	120 150 160 200 210 250 270 280 300 350 360 400 450 490	
BAG Motor	12 15 16 20 21 25 27 28 30 35 36 40 45 49 50 63	36 45 48 60 63 75 81 84 90 105 108 120 135 147 150	48 60 64 80 84 100 108 112 120 140 144 160 180 196 200 252	60 75 80 100 105 125 135 140 150 175 180 200 225 245 250	84 105 112 140 147 175 189 196 210 245 252 280 315 343 350 441	108 135 144 180 189 225 243 252 270 315 324 360 405 441 450	120 150 160 200 210 250 270 280 360 360 400 450 490 500 630	
BAG Motor	12 15 16 20 21 25 27 28 30 35 36 40 45 49 50 63 70	36 45 48 60 63 75 81 84 90 105 108 120 135 147 150 189 210	48 60 64 80 84 100 108 112 120 140 144 160 180 196 200 252 280	60 75 80 100 105 125 135 140 150 175 180 200 225 245 250 315	84 105 112 140 147 175 189 196 210 245 252 280 315 343 350 441	108 135 144 180 189 225 243 252 270 315 324 360 405 441 450 567 630	120 150 200 210 250 270 280 300 350 360 400 450 490 500 630	
BAG Motor	12 15 16 20 21 25 27 28 30 35 36 40 45 49 50 63 70	36 45 48 60 63 75 81 84 90 105 108 120 135 147 150 189 210 243	48 60 64 80 84 100 108 112 120 140 144 160 180 196 200 252 280	60 75 80 100 105 125 135 140 150 175 180 200 225 245 250 315 350 405	84 105 112 140 147 175 189 196 210 245 252 280 315 343 350 441 490 567	108 135 144 180 189 225 243 252 270 315 324 360 405 441 450 567 630 729	120 150 200 210 250 270 280 300 350 360 400 450 490 500 630 700 810	



Table 6 – 3 Stage Max Gear Ratio w/ 1/2" Round Shaft (Continued)

		Stage 3					
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
Mini CIM	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000

				Sta	ge 3		
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
СІМ	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000

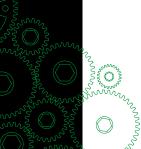




Table 7 - 3 Stage Max Gear Ratio w/ 3/8" Hex Shaft

		Stage 3					
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
AM-9015	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000
	100 9	300 27	400 36	500 45	700 63	900	90
	-						
	9	27	36	45	63	81	90
	9 12	27 36	36 48	45 60	63 84	81 108	90 120
	9 12 15	27 36 45	36 48 60	45 60 75	63 84 105	81 108 135	90 120 150
	9 12 15 16	27 36 45 48	36 48 60 64	45 60 75 80	63 84 105 112	81 108 135 144	90 120 150 160
	9 12 15 16 20	27 36 45 48 60	36 48 60 64 80	45 60 75 80 100	63 84 105 112 140	81 108 135 144 180	90 120 150 160 200
	9 12 15 16 20 21	27 36 45 48 60 63	36 48 60 64 80 84	45 60 75 80 100 105	63 84 105 112 140	81 108 135 144 180 189	90 120 150 160 200 210
	9 12 15 16 20 21 25	27 36 45 48 60 63 75	36 48 60 64 80 84	45 60 75 80 100 105	63 84 105 112 140 147	81 108 135 144 180 189 225	90 120 150 160 200 210 250
	9 12 15 16 20 21 25 27	27 36 45 48 60 63 75 81	36 48 60 64 80 84 100	45 60 75 80 100 105 125 135	63 84 105 112 140 147 175 189	81 108 135 144 180 189 225 243	90 120 150 160 200 210 250 270
RS-550	9 12 15 16 20 21 25 27 28	27 36 45 48 60 63 75 81	36 48 60 64 80 84 100 108	45 60 75 80 100 105 125 135	63 84 105 112 140 147 175 189	81 108 135 144 180 189 225 243	90 120 150 160 200 210 250 270
RS-550	9 12 15 16 20 21 25 27 28 30	27 36 45 48 60 63 75 81 84	36 48 60 64 80 84 100 108 112	45 60 75 80 100 105 125 135 140	63 84 105 112 140 147 175 189 196 210	81 108 135 144 180 189 225 243 252 270	90 120 150 160 200 210 250 270 280 300
RS-550	9 12 15 16 20 21 25 27 28 30 35	27 36 45 48 60 63 75 81 84 90	36 48 60 64 80 84 100 108 112 120	45 60 75 80 100 105 125 135 140 150	63 84 105 112 140 147 175 189 196 210 245	81 108 135 144 180 189 225 243 252 270 315	90 120 150 160 200 210 250 270 280 300 350
RS-550	9 12 15 16 20 21 25 27 28 30 35 36	27 36 45 48 60 63 75 81 84 90 105	36 48 60 64 80 84 100 108 112 120 140	45 60 75 80 100 105 125 135 140 150 175	63 84 105 112 140 147 175 189 196 210 245 252	81 108 135 144 180 189 225 243 252 270 315	90 120 150 160 200 210 250 270 280 300 350
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40	27 36 45 48 60 63 75 81 84 90 105 108	36 48 60 64 80 84 100 108 112 120 140 144	45 60 75 80 100 105 125 135 140 150 175 180	63 84 105 112 140 147 175 189 196 210 245 252 280	81 108 135 144 180 189 225 243 252 270 315 324 360	90 120 150 160 200 210 250 270 280 300 350 360 400
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40	27 36 45 48 60 63 75 81 84 90 105 108	36 48 60 64 80 84 100 108 112 120 140 144 160	45 60 75 80 100 105 125 135 140 150 175 180 200	63 84 105 112 140 147 175 189 196 210 245 252 280 315	81 108 135 144 180 189 225 243 252 270 315 324 360 405	90 120 150 160 200 210 250 270 280 300 350 360 400 450
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40 45	27 36 45 48 60 63 75 81 84 90 105 108 120 135	36 48 60 64 80 84 100 108 112 120 140 144 160 180	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441	90 120 150 160 200 210 250 270 280 300 350 360 400 450
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40 45 49 50	27 36 45 48 60 63 75 81 84 90 105 108 120 135 147	36 48 60 64 80 84 100 108 112 120 140 144 160 180 196 200	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245 250	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343 350	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441	90 120 150 160 200 210 250 270 280 300 350 360 400 450 490
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40 45 49 50 63	27 36 45 48 60 63 75 81 84 90 105 108 120 135 147 150	36 48 60 64 80 84 100 108 112 120 140 144 160 180 196 200	45 60 75 80 100 105 125 135 140 150 175 180 200 225 245 250 315	63 84 105 112 140 147 175 189 196 210 245 252 280 315 343 350 441	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441 450 567	90 120 150 160 200 210 250 270 280 300 350 400 450 490 500 630
RS-550	9 12 15 16 20 21 25 27 28 30 35 36 40 45 49 50 63 70	27 36 45 48 60 63 75 81 84 90 105 108 120 135 147 150 189 210	36 48 60 64 80 84 100 108 112 120 140 144 160 180 196 200 252 280	45 60 75 80 100 125 135 140 150 175 180 200 225 245 250 315 350	63 84 105 112 140 175 189 196 210 245 252 280 315 343 350 441 490	81 108 135 144 180 189 225 243 252 270 315 324 360 405 441 450 567 630	90 120 150 160 200 210 250 270 280 300 350 360 400 450 490 490 500 630 700

		Stage 3					
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
BB RS-775	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
BAG Motor	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	30						
	40	120	160	200	280	360	400
		120 135	160 180	200 225	280 315	360 405	400
	40						
	40 45	135	180	225	315	405	450
	40 45 49	135 147	180 196	225 245	315 343	405 441	450 490
	40 45 49 50	135 147 150	180 196 200	225 245 250	315 343 350	405 441 450	450 490 500
	40 45 49 50 63	135 147 150 189	180 196 200 252	225 245 250 315	315 343 350 441	405 441 450 567	450 490 500 630
	40 45 49 50 63 70	135 147 150 189 210	180 196 200 252 280	225 245 250 315 350	315 343 350 441 490	405 441 450 567 630	450 490 500 630 700



Table 7 - 3 Stage Max Gear Ratio w/ 3/8" Hex Shaft (Continued)

		Stage 3					
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
Mini CIM	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000

				Sta	ge 3		
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
CIM	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000



Table 8 – 3 Stage Max Gear Ratio w/ CIM Motor Shaft

		Stage 3						
Motor	Stage 1 & 2	3	4	5	7	9	10	
	9	27	36	45	63	81	90	
	12	36	48	60	84	108	120	
	15	45	60	75	105	135	150	
	16	48	64	80	112	144	160	
	20	60	80	100	140	180	200	
	21	63	84	105	147	189	210	
	25	75	100	125	175	225	250	
	27	81	108	135	189	243	270	
	28	84	112	140	196	252	280	
	30	90	120	150	210	270	300	
AM-9015	35	105	140	175	245	315	350	
	36	108	144	180	252	324	360	
	40	120	160	200	280	360	400	
	45	135	180	225	315	405	450	
	49	147	196	245	343	441	490	
	50	150	200	250	350	450	500	
	63	189	252	315	441	567	630	
	70	210	280	350	490	630	700	
	81	243	324	405	567	729	810	
	90	270	360	450	630	810	900	
	100	300	400	500	700	900	1000	
	9	27	36	45	63	81	90	
	12	36	48	60	84	108	120	
	15	45	60	75	105	135	150	
	15 16	45 48	60 64	75 80	105 112	135 144	150 160	
	16	48	64	80	112	144	160	
	16 20	48 60	64 80	80 100	112 140	144 180	160 200	
	16 20 21	48 60 63	64 80 84	80 100 105	112 140 147	144 180 189	160 200 210	
	16 20 21 25	48 60 63 75	64 80 84 100	80 100 105 125	112 140 147 175	144 180 189 225	160 200 210 250	
	16 20 21 25 27	48 60 63 75 81	64 80 84 100 108	80 100 105 125 135	112 140 147 175 189	144 180 189 225 243	160 200 210 250 270	
RS-550	16 20 21 25 27 28	48 60 63 75 81 84	64 80 84 100 108	80 100 105 125 135 140	112 140 147 175 189 196	144 180 189 225 243 252	160 200 210 250 270 280	
RS-550	16 20 21 25 27 28 30	48 60 63 75 81 84 90	64 80 84 100 108 112	80 100 105 125 135 140	112 140 147 175 189 196 210	144 180 189 225 243 252 270	160 200 210 250 270 280 300	
RS-550	16 20 21 25 27 28 30 35	48 60 63 75 81 84 90	64 80 84 100 108 112 120	80 100 105 125 135 140 150	112 140 147 175 189 196 210	144 180 189 225 243 252 270 315	160 200 210 250 270 280 300 350	
RS-550	16 20 21 25 27 28 30 35 36	48 60 63 75 81 84 90 105	64 80 84 100 108 112 120	80 100 105 125 135 140 150 175	112 140 147 175 189 196 210 245 252	144 180 189 225 243 252 270 315 324	200 210 250 270 280 300 350 360	
RS-550	16 20 21 25 27 28 30 35 36 40	48 60 63 75 81 84 90 105 108	64 80 84 100 108 112 120 140 144	80 100 105 125 135 140 150 175 180	112 140 147 175 189 196 210 245 252	144 180 189 225 243 252 270 315 324	200 210 250 270 280 300 350 360 400	
RS-550	16 20 21 25 27 28 30 35 36 40	48 60 63 75 81 84 90 105 108 120	64 80 84 100 108 112 120 140 144 160	80 100 105 125 135 140 150 175 180 200	112 140 147 175 189 196 210 245 252 280 315	144 180 189 225 243 252 270 315 324 360 405	160 200 210 250 270 280 300 350 360 400	
RS-550	16 20 21 25 27 28 30 35 36 40 45	48 60 63 75 81 84 90 105 108 120 135	64 80 84 100 108 112 120 140 144 160 180	80 100 105 125 135 140 150 175 180 200 225 245	112 140 147 175 189 196 210 245 252 280 315	144 180 189 225 243 252 270 315 324 360 405	160 200 210 250 270 280 300 350 360 400 450	
RS-550	16 20 21 25 27 28 30 35 36 40 45 49	48 60 63 75 81 84 90 105 108 120 135 147	64 80 84 100 108 112 120 140 144 160 180 196	80 100 105 125 135 140 150 175 180 200 225 245 250	112 140 147 175 189 196 210 245 252 280 315 343 350	144 180 189 225 243 252 270 315 324 360 405 441 450	160 200 210 250 270 280 300 350 360 400 450 490	
RS-550	16 20 21 25 27 28 30 35 36 40 45 49 50 63	48 60 63 75 81 84 90 105 108 120 135 147 150	64 80 84 100 108 112 120 140 144 160 180 196 200 252	80 100 105 125 135 140 150 175 180 200 225 245 250 315	112 140 147 175 189 196 210 245 252 280 315 343 350 441	144 180 189 225 243 252 270 315 324 360 405 441 450	160 200 210 250 270 280 300 350 360 400 450 490 500 630	
RS-550	16 20 21 25 27 28 30 35 36 40 45 49 50 63 70	48 60 63 75 81 84 90 105 108 120 135 147 150 189 210	64 80 84 100 108 112 120 140 144 160 180 196 200 252 280	80 100 105 125 135 140 150 175 180 200 225 245 250 315	112 140 147 175 189 196 210 245 252 280 315 343 350 441 490	144 180 189 225 243 252 270 315 324 360 405 441 450 567 630	160 200 210 250 270 280 300 350 360 400 450 490 500 630 700	

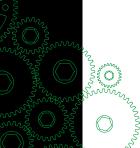
		Stage 3					
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
BB RS-775	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
BAG Motor	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	00	270	360	450	630	810	900
	90	270	000	-100			



Table 8 – 3 Stage Max Gear Ratio w/ CIM Motor Shaft (Continued)

		Stage 3					
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
Mini CIM	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000

				Sta	ge 3		
Motor	Stage 1 & 2	3	4	5	7	9	10
	9	27	36	45	63	81	90
	12	36	48	60	84	108	120
	15	45	60	75	105	135	150
	16	48	64	80	112	144	160
	20	60	80	100	140	180	200
	21	63	84	105	147	189	210
	25	75	100	125	175	225	250
	27	81	108	135	189	243	270
	28	84	112	140	196	252	280
	30	90	120	150	210	270	300
СІМ	35	105	140	175	245	315	350
	36	108	144	180	252	324	360
	40	120	160	200	280	360	400
	45	135	180	225	315	405	450
	49	147	196	245	343	441	490
	50	150	200	250	350	450	500
	63	189	252	315	441	567	630
	70	210	280	350	490	630	700
	81	243	324	405	567	729	810
	90	270	360	450	630	810	900
	100	300	400	500	700	900	1000





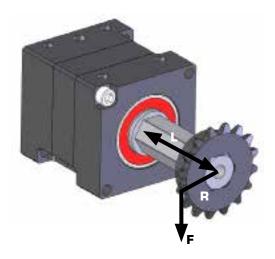
Combined Load Ratings Tables

The VersaPlanetary gearbox is designed to accommodate significant overhung loading with an unsupported shaft. However, as you will determine from this section, the torque carrying capability significantly increases if the gear, sprocket, or pulley is placed close to the mounting face or the end of the shaft is supported with another bearing.

The VersaPlanetary gearbox may fail in one of two different modes: (1) output shaft yield stress failure or (2) 10:1 carrier plate ultimate stress failure. However, improper lubrication combined with typical FRC practice robot driving time would also result in gear failure (eventually). Refer to the "VersaPlanetary User's Guide" for more information on proper maintenance.

Failure mode #2 (carrier plate failure) is not dependent upon the overhung loading and is solely determined by Table 9. However, all other failure modes listed in Table 9 are beam yield failures and that depend on both torsional failure and beam bending failure.

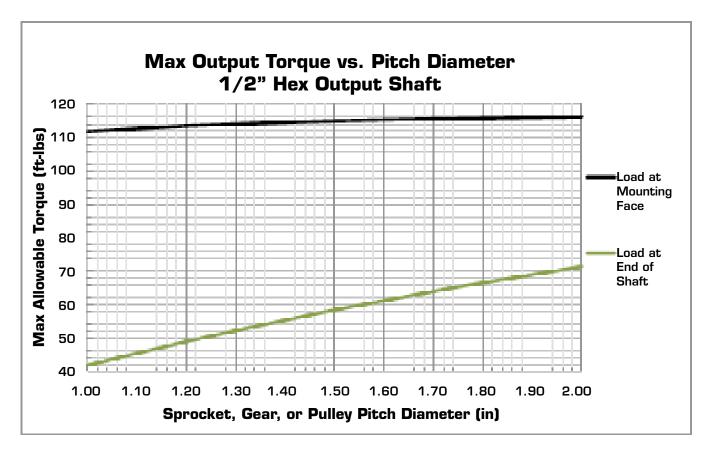
Failure mode #1 depends upon distance from the mounting face, gear / sprocket diameter, and torque load. Users should reference table 9 and the below charts to determine the maximum allowable loading for your design.

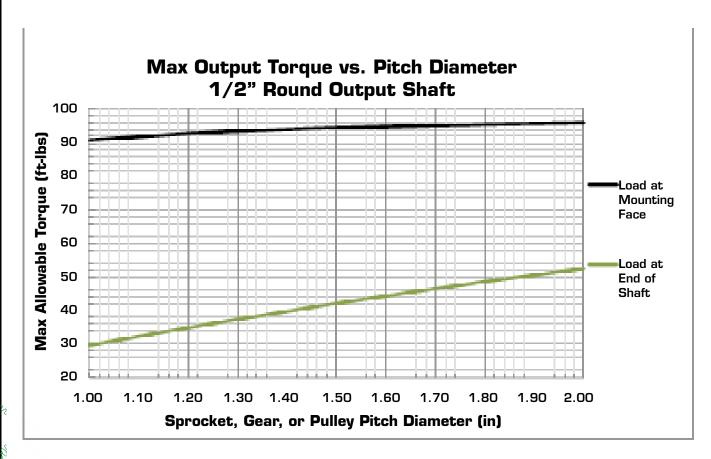


	Rated Load – Pure Torsion			
Failure Mode	N-m	ft-lbs		
1/2" Hex Shaft Yield Stress	157	116		
1/2" Round Shaft Yield Stress	130	96		
3/8" Hex Shaft Yield Stress	57	42		
CIM Motor Shaft Yield Stress	29	21		
7:1, 9:1, 10:1 Carrier Plate Yield Stress	100	74		

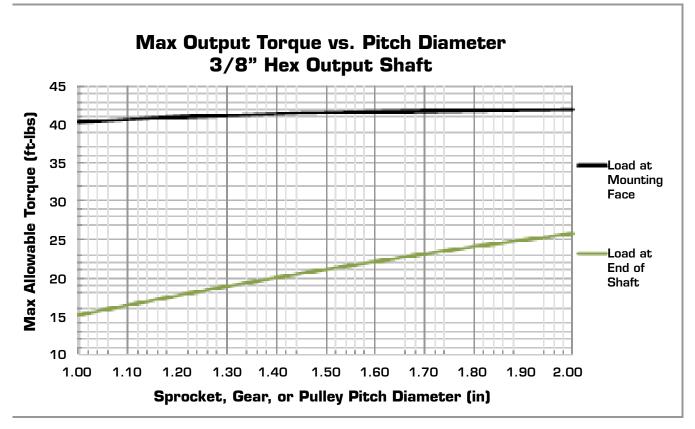
Table 9 - VersaPlanetary Output Torque Limits

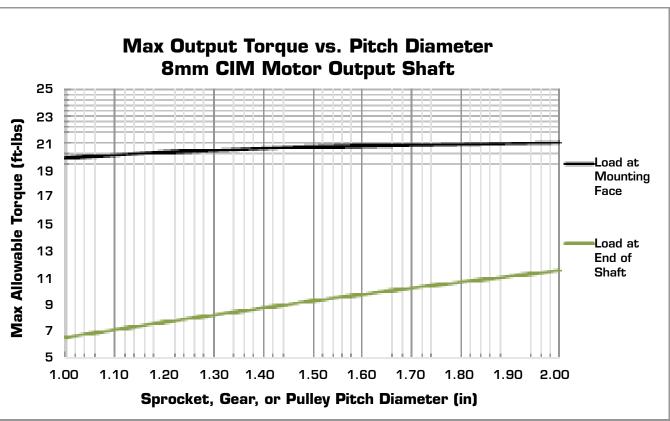






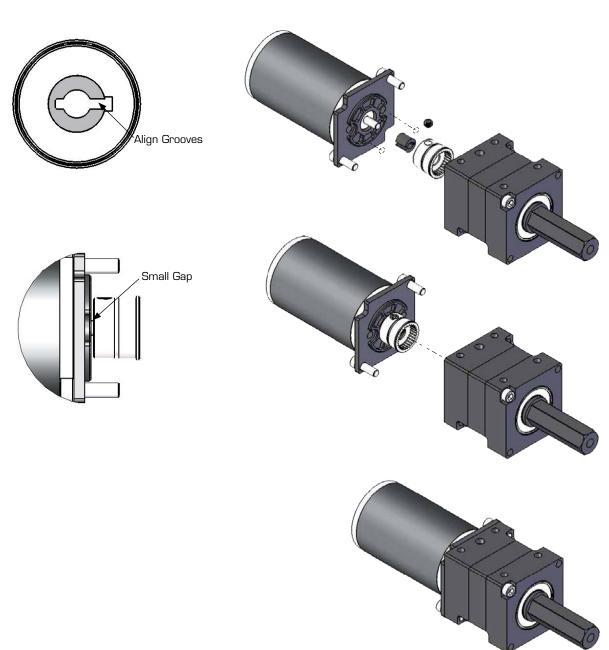








Appendix A VersaPlanetary Motor Mounting Guide



- 1. Assemble motor (BAG, 550, 775, AM9015) to correct plate(all 4 provided in base kit) using provided screws (M3 or M4)
- 2. Assemble coupler onto motor shaft using coupler for motor shaft type (tightest one that fits) and Align the grooves in the coupler.
- 3. Be sure to leave a slight gap between the coupler and plate and tighten the set screw (loctite recommended).
- 4. Assemble motor plate to input housing using provided 8-32 screws.