

Quick shipment is standard on all Grove Gear BRAVO® stock and modified stock gear reducers. A wide range of mounting styles are offered and are listed on the accompanying chart. Start with one of the stock reducer styles shown—add an accessory—and create a new mounting style.

**STYLE T, U OR J
HORIZONTAL
BASE**



Bravo®
Accessory Kits

**MOTORIZED
C FLANGE
QUILL INPUT**



(Style BMQ Shown)

NON-FLANGED



(Style B Shown)

Type	Stock Reducer Style	T Base Worm Over	U Base Worm Under	J Base Vertical Input
Single Reduction Solid Shaft	BMQ	TMQ	UMQ*	JMQ
Single Reduction Hollow Shaft	HMQ	THMQ	UHMQ*	JHMQ
Double Reduction Worm-Worm Solid Shaft	DMQ	DTMQ	DUMQ*	DJMQ
Double Reduction Worm-Worm Hollow Shaft	DHMQ	DTHMQ	DUHMQ*	DJHMQ
Double Reduction Helical-Worm Solid Shaft	DXMQ	DXTMQ	DXUMQ*	DXJMQ
Double Reduction Helical-Worm Hollow Shaft	DXHMQ	DXTHMQ	DXUHMQ*	DXJHMQ
Single Reduction Solid Shaft	B	T	U*	J
Single Reduction Hollow Shaft	H	TH	UH*	JH
Double Reduction Worm-Worm Solid Shaft	D	DT	DU*	DJ
Double Reduction Worm-Worm Hollow Shaft	DH	DTH	DUH*	DJH
Double Reduction Helical-Worm Solid Shaft	DX	DXT	DXU*	DXJ
Double Reduction Helical-Worm Hollow Shaft	DXH	DXTH	DXUH*	DXJH

* Not a recommended mounting style. Consult Factory for selection assistance.

Free Mod-Squad™ Service Or Assemble It Yourself!



**STYLE F
OUTPUT
FLANGE**



**STYLE FL
OUTPUT
FLANGE**



**STYLE R
REACTION
ARM**



F Short Output Flange	FL Long Output Flange	R Reaction Arm Shaft
FMQ	FLMQ	RMQ
FHMQ	FLHMQ	RHMQ
DFMQ	DFLMQ	DRMQ
DFHMQ	DFLHMQ	DRHMQ
DXFMQ	DXFLMQ	DXRMQ
DXFHMQ	DXFLHMQ	DXRHMQ
F	FL	R
FH	FLH	RH
DF	DFL	DR
DFH	DFLH	DRH
DXF	DXFL	DXR
DXFH	DXFLH	DXRH

Any of the modified stock gear reducers shown are available on a quick-shipment basis, factory assembled by the **Grove Gear Mod-Squad™**—at no charge for the labor! Just pay for the accessory item. To order, specify the stock reducer and the Gear Mod-Squad Service Number (see below).

Or **assemble it yourself** by ordering the appropriate stock reducer and accessory kit (see below).

Before ordering, check the dimensional information available in this catalog.

More Grove Gear BRAVO® accessories, options and assembly services are available. See next page.

Bravo®
Accessory Kits

Ordering Information

Style T, U or J - Horizontal Base

Series	Accessory Kit Only Catalog No.	Mod-Squad-Service Number			Weight (lbs)
		Style T	Style U	Style J	
512	G175231	T512	U512	J512	2
518	G175205	T518	U518	J518	2
520	G175206	T520	U520	J520	2
525	G175207	T525	U525	J525	3
534	G175208	T534	U534	J534	5

Style F - Short Output Flange

Series	Accessory Kit Only Catalog No.	Mod-Squad-Service Number Style F	Weight (lbs)
518	G175209	F518	1
520	G175210	F520	1
525	G175211	F525	2
534	G175212	F534	3

Style FL - Long Output Flange

Series	Accessory Kit Only Catalog No.	Mod-Squad-Service Number Style FL	Weight (lbs)
518	G175213	FL518	2
520	G175214	FL520	2
525	G175215	FL525	3
534	G175216	FL534	5

Style R - Reaction Arm

Series	Accessory Kit Only Catalog No.	Mod-Squad-Service Number Style R	Weight (lbs)
518	G175201	R518	1
520	G175202	R520	1
525	G175203	R525	2
534	G175204	R534	3

Refer to page 376 for reaction arm dimensions.

SOLID OUTPUT SHAFT Accessory Kits



SINGLE EXTENSION INCH DIMENSIONS*

Series	Accessory Kit Only Catalog No.	Weight (lbs)
512	CONTACT Factory	
518	G175236	2
520	G175237	3
525	G175521	3
534	G175238	6

SINGLE EXTENSION METRIC DIMENSIONS†

Series	Accessory Kit Only Catalog No.	Weight (lbs)
512	G175240	2
518	G175241	2
520	G175242	3
525	G175243	3
534	G175244	6

DOUBLE EXTENSION INCH DIMENSIONS*

Series	Accessory Kit Only Catalog No.	Weight (lbs)
512	CONTACT Factory	
518	G175221	3
520	G175222	4
525	G175223	4
534	G175224	7

DOUBLE EXTENSION METRIC DIMENSIONS†

Series	Accessory Kit Only Catalog No.	Weight (lbs)
512	G175245	3
518	G175246	3
520	G175247	4
525	G175248	4
534	G175249	7

* Shaft dimensions are in inches. These shafts will only fit into reducers with inch dimensioned output bores.

† Shaft dimensions are in millimeters. These shafts will only fit into reducers with metric dimensioned output bores.

* Shaft dimensions are in inches. These shafts will only fit into reducers with inch dimensioned output bores.

† Shaft dimensions are in millimeters. These shafts will only fit into reducers with metric dimensioned output bores.

Motorized C-Face Quill Input Bushing Kits

NEMA Bushing Kits ◊ - Inches

Frame Conversion	Input Quill Bore Size (Inch)	Accessory Kit Only Catalog No.	Weight (lbs)
180TC to 140TC	1-1/8 to 7/8	G175230	0.5
180TC to 56C	1-1/8 to 5/8	G175229	0.4
140TC to 56C	7/8 to 5/8	G175228	0.4

◊ Bushing reduces the bore size of input quill to accommodate a smaller motor shaft diameter. The application may also require a different input flange size. Bushings are not intended to be used in output bores.

IEC Bushing Kits ◊ - MM

Frame Conversion	Input Quill Bore Size (mm)	Accessory Kit Only Catalog No.	Weight (lbs)
D63 to D56	11 to 9	G175259	0.4
D71 to D63	14 to 11	G175251	0.4
D71 to D56	14 to 9	G175252	0.4
D80 to D71	19 to 14	G175253	0.4
D80 to D63	19 to 11	G175254	0.4
D90 to D80	24 to 19	G175255	0.4
D90 to D71	24 to 14	G175256	0.4
DF100/112 to D90	28 to 24	G175257	0.5
DF100/112 to D80	28 to 19	G175258	0.5

◊ Bushing reduces the bore size of input quill to accommodate a smaller motor shaft diameter. The application may also require a different input flange size. Bushings are not intended to be used in output bores.

Double Reduction Adapter Kits

Series	Accessory Kit Only Catalog No.	Primary Unit Size	Secondary Unit Quill Size	Weight (lbs)
518	G175225	518	0.625	1
520	G175225	518	0.625	1
525	G175226	518	0.875	1
534	G175227	518	1.125	1.5

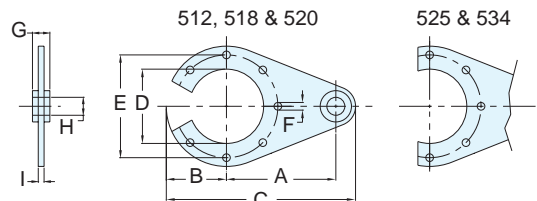
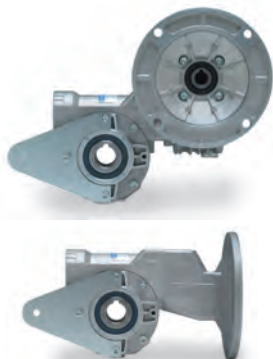
Protection Cap Accessory Kits

Series	Accessory Kit Only Catalog No.	Weight (lbs)
512	G175250	0.3
518	G175217	0.3
520	G175218	0.3
525	G175219	0.4
534	G175220	0.6



This protective cap covers the unused output bore for single extension assemblies. Check OSHA requirements and review installation manual to assure all safety requirements of gear reducer installation are met.

Style R Reaction Arm Dimensions



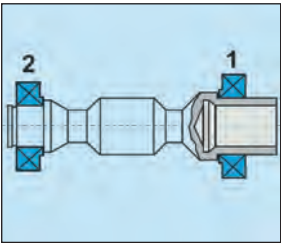
Style R - Reaction Arm Kits

Series	A	B	C	D	E	F	G	H	I
512	3.94	1.57	6.22	1.97	2.56	0.28	0.16	0.31	0.16
518	3.94	1.77	6.22	1.97	2.56	0.28	0.16	0.31	0.16
520	3.94	2.17	6.81	2.68	3.70	0.28	0.16	0.31	0.16
525	5.91	2.17	9.25	2.95	3.54	0.35	0.79	0.39	0.24
534	7.87	3.15	12.60	4.33	5.12	0.43	0.98	0.79	0.24

Refer to page 375 for accessory kits available.

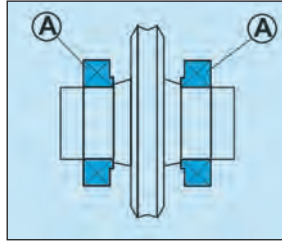
Grove Gear Bravo® reducers are available with many special options on request. Select from the common options below or contact Factory with specific application requests. Contact Factory for availability of reducers with special features.

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Technical Information



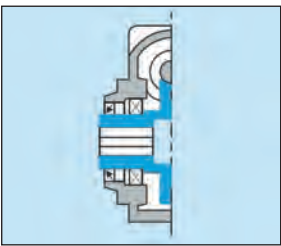
Tapered roller bearings on input worm shaft

REDUCER SIZE	1	2
512	--	--
518	--	--
520	32005X	30204
525	32007X	30205
534	32009X	30206



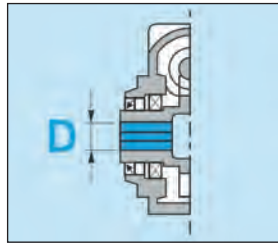
Tapered roller bearings on output shaft

REDUCER SIZE	A
512	--
518	--
520	32008X
525	32009X
534	32011X



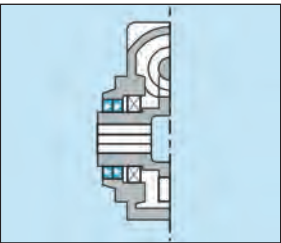
Stainless steel (AISI 303) or bronze output bore

REDUCER SIZE	MAX DIAMETER INCHES (MM)
512	0.550 (14)
518	0.875 (22.2)
520	1.1875 (30.16)
525	1.3125 (33.33)
534	1.625 (41.27)



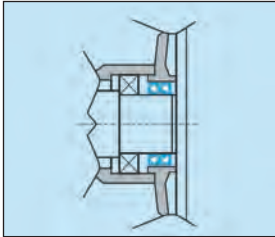
Non-standard output bore

REDUCER SIZE	MAX DIAMETER INCHES (MM)
512	0.550 (14)
518	0.875 (22.2)
520	1.1875 (30.16)
525	1.3125 (33.33)
534	1.625 (41.27)



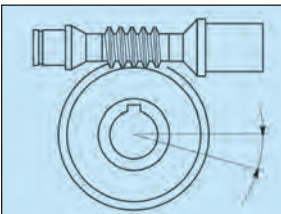
Double output seals

REDUCER SIZE(MM)	SEALSIZE
512	--
518	--
520	--
525	45/62/7
534	55/80/8



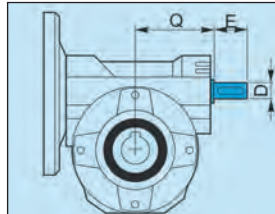
Double input seals

REDUCER SIZE(MM)	SEALSIZE
512	20/30/7
518	25/40/7
520	25/40/7 or 30/40/7
525	35/47/7
534	45/62/7



Minimum backlash gearing

ALL SIZES AVAILABLE. CONTACT FACTORY WITH REQUIREMENTS.



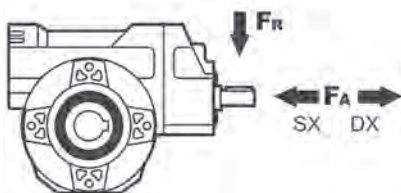
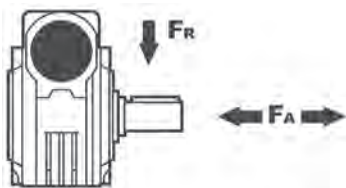
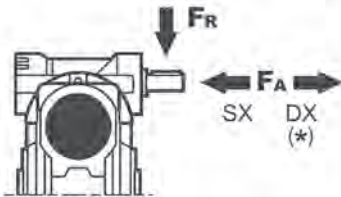
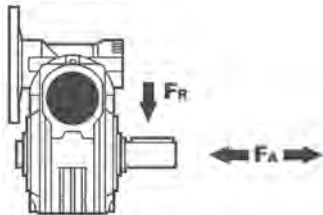
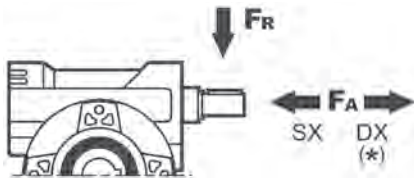
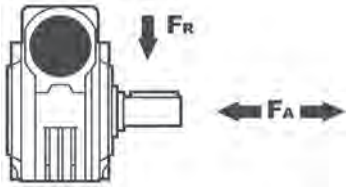
Double input worm shaft extension

ALL SIZES AVAILABLE. CONTACT FACTORY WITH REQUIREMENTS.

SPECIAL OPTIONS NOT PICTURED INCLUDE:

- Epoxy paint
- Custom mounting accessories
- Custom ratios
- NEMA input flange/ metric dimensioned output shaft combinations
- IEC input flange/ inch dimensioned output shaft combinations
- Special solid output shaft extensions

Maximum Overhung Load* and Thrust Load Ratings (lbs.)



Single Reduction Output Shaft Ratings*

Output RPM	Series									
	512		518		520		525		534	
	F_A	F_R	F_A	F_R	F_A	F_R	F_A	F_R	F_A	F_R
200	27	135	40	200	54	270	81	405	112	562
150	31	157	45	225	63	315	90	450	130	652
100	36	180	50	248	68	338	104	518	135	675
75	40	202	54	270	76	382	112	562	157	787
50	45	225	58	315	86	428	135	675	180	900
25	56	281	68	405	108	562	158	855	225	1125
15	63	315	90	450	126	629	180	899	261	1304

Single Reduction Input Shaft Ratings*

Input RPM	Series									
	512		518		520		525		534	
	F_A	F_R	F_A	F_R	F_A	F_R	F_A	F_R	F_A	F_R
1750	4	21	9	43	16	79	19	93	33	167

Double Reduction Worm-Worm Output Shaft Ratings*

Output RPM	Series							
	518		520		525		534	
	F_A	F_R	F_A	F_R	F_A	F_R	F_A	F_R
25	68	405	108	562	158	855	225	1125
15	90	450	126	629	180	899	261	1304

Double Reduction Worm-Worm Input Shaft Ratings*

Input RPM	Series							
	518		520		525		534	
	F_A	F_R	F_A	F_R	F_A	F_R	F_A	F_R
1750	9	43	9	43	9	43	9	43

Double Reduction Helical/Worm Output Shaft Ratings*

Output RPM	Series							
	518		520		525		534	
	F_A	F_R	F_A	F_R	F_A	F_R	F_A	F_R
75	54	270	76	382	112	562	157	787
50	58	315	86	428	135	675	180	900
25	68	405	108	562	158	855	225	1125
15	90	450	126	629	180	899	261	1304

Double Reduction Helical/Worm Input Shaft Ratings*

Input RPM	Series							
	518		520		525		534	
	F_A	F_R	F_A	F_R	F_A	F_R	F_A	F_R
1750	9	46	9	46	13	63	22	112

F_R = Radial load rating = overhung load (lbs)

F_A = Axial load rating = thrust rating (lbs)

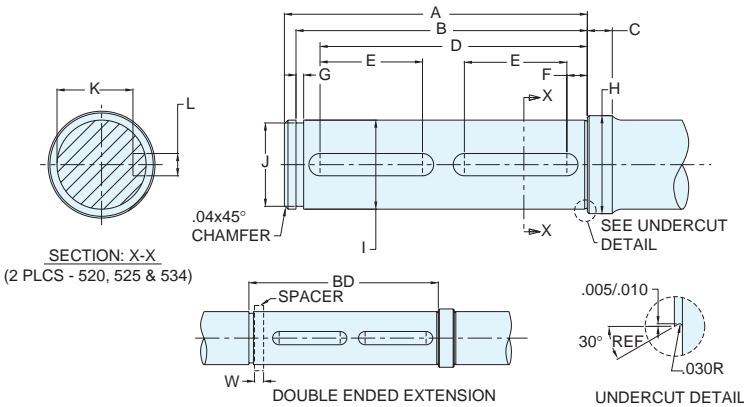
* Axial loads in the DX direction should be avoided.

‡ Overhung load is located at centerline of shaft extension for solid input/ output shaft style

Bravo® GEAR REDUCER DRIVE SHAFT RECOMMENDATIONS

ALUMINUM GEAR REDUCERS

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There are several possible methods to retain a drive shaft into the hollow bore of a gear reducer. A few common options are listed below:

- Retain drive shaft with a retaining ring (illustrated above)
- Retain drive shaft with a locknut
- Retain drive shaft with a thrust plate and fastener
- Retain drive shaft with a collar and setscrew
- Retain drive shaft with a recessed plate and fastener

DRIVEN SHAFT RECOMMENDATIONS ● HOLLOW BORE IN INCHES

Dimensions - Inches

Series	A	B +/- 0.0025	C	D	F	Retaining Ring Groove		Mfg. No. (Waldes Truarc)	H	I +/- 0.0005	E	Keyway		Double Extension Details	
						G +0.005/- 0.000	J +/- 0.002					K +/- 0.0025	L +/- 0.001	BD +/- 0.0025	W* +/- 0.001
518	2.80	2.6445	0.43	N/A	0.18	0.086	0.703	5160-75	0.88	0.749	1.15	0.6365	0.1875	3.0755	0.430
520	3.50	3.2725	0.30	3.00	0.23	0.086	0.937	5160-98	1.12	0.999	1.15	0.8565	0.250	3.5735	0.300
525	5.00	4.8225	0.13	4.25	0.22	0.103	1.058	5160-112	1.25	1.124	1.53	0.9785	0.250	4.9535	0.130
534	5.65	5.4315	0.53	5.00	0.28	0.120	1.405	5160-150	1.75	1.499	1.65	1.2815	0.375	5.9625	0.530

* Dimension "W" refers to the width of spacer used.

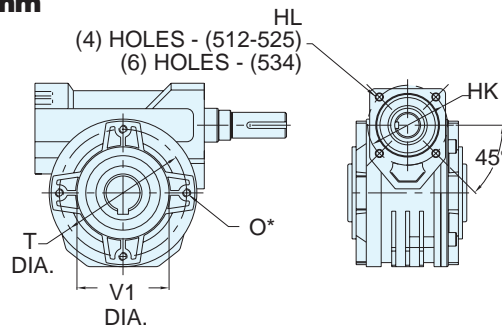
DRIVEN SHAFT RECOMMENDATIONS ● HOLLOW BORE IN MILLIMETERS

Dimensions - MM

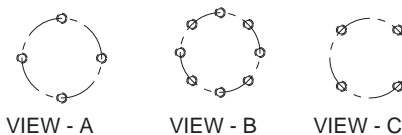
Series	A	B +/- 0.064	C	D	F	Retaining Ring Groove		Mfg. No. (Waldes Truarc)	H	I - 0.005/ -0.020	E	Keyway		Double Extension Details	
						G +0.12/- 0.00	J +/- 0.05					K +/- 0.05	L + 0.015/-0.000	BD +/- 0.064	W* +/- 0.02
512	60.5	56.223	10	N/A	5	1.1	13	5100-55	19.1	14	20.2	10.8	5	66.383	10.16
518	71.1	67.170	11	N/A	5	1.4	16	5160-66	22.4	18	30.2	14.5	6	78.118	10.92
520	88.9	83.120	8	76.2	5	2.3	23.5	5160-98	28.4	25	30.2	21.0	8	90.767	7.62
525	127.0	122.492	3	108.0	8	2.6	26	5160-106	31.8	28	40.2	24.0	8	125.819	3.30
534	143.5	137.960	14	127.0	9	2.6	32.8	5160-137	44.5	35	50.2	30.0	10	151.448	13.46

* Dimension "W" refers to the width of spacer used.

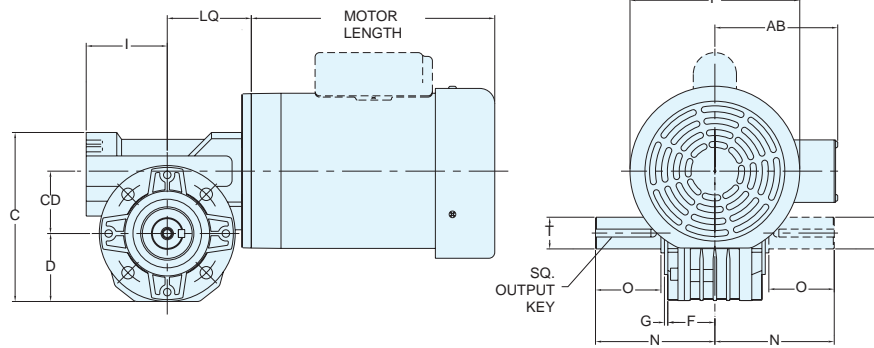
BOLT CIRCLE DIMENSIONS - mm



	O*	T DIA.	V1 DIA. (h8)	HL	HK DIA.	
512	4 - M6 x 9	VIEW - A	65	50	M5 x 11	44
518	4 - M6 x 14	VIEW - A	65	50	M6 x 15	59
520	4 - M6 x 9	VIEW - A	94	68	M6 x 16	59
525	8 - M8 x 17	VIEW - B	90	75	M8 x 17	80
534	4 - M10 x 8	VIEW - C	130	110	M6 x 16	90



GEAR+MOTOR™ DIMENSIONS



Bravo®
Technical Information

BMQ STYLE DIMENSIONS - Inches (MM)

Series	C	CD	D	F	G	I	N	O	T +0.000 -0.001	OUTPUT KEY
512	3.54 (89.9)	1.18 (30)	1.54 (39)	1.18 (30)	0.08 (2)	1.81(46)	2.48 (63.0)	1.01(25.7)	(14)*	(5)
518	4.76 (121)	1.77 (45)	1.93 (49)	1.38 (35)	0.08 (2)	2.16 (55)	2.97 (75.4)	1.26 (32.0)	0.750	3/16 x 1.00
520	5.33 (135)	1.97 (50)	2.15 (54.5)	1.50 (38)	0.12 (3)	2.56 (65)	3.94 (100.1)	2.05 (52.1)	1.000	1/4 X 1.62
525	6.69 (170)	2.48 (63)	2.76 (70)	1.77 (45)	0.19 (5)	3.11 (79)	4.85 (123.2)	2.36 (59.9)	1.125	1/4 X 2.00
534	9.15 (232)	3.35 (85)	3.72 (94.5)	2.52 (64)	0.14 (3.5)	3.86 (98)	5.55 (141.0)	2.36 (59.9)	1.500	3/8 X 2.00

* Tolerance is -0.005/ -0.0020.

NEMA MOTOR MOUNTING DIMENSIONS - Inches

Series	AB		LQ		P	
	56C/140TC	180TC	56C/140TC	180TC	56C/140TC	180TC
518	5.31	N/A	3.33	N/A	7.16	9.22
520	5.31	N/A	3.51	N/A	7.16	9.22
525	5.31	N/A	4.08	N/A	7.16	9.22
534	5.31	6.44	4.83	5.35	7.16	9.22

Refer to page 663 for NEMA motor length dimensions.

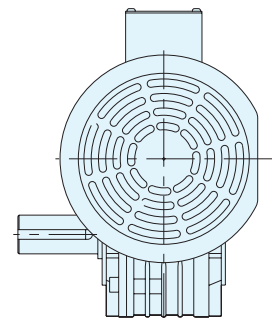
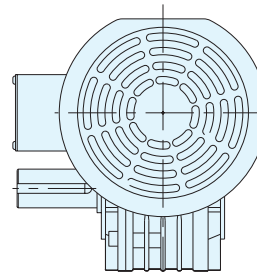
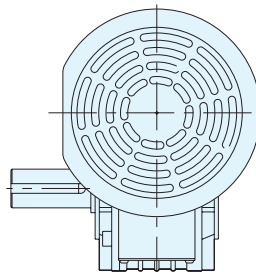
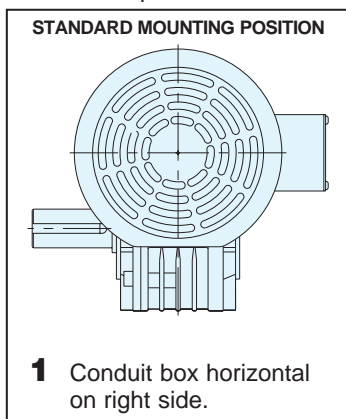
IEC MOTOR MOUNTING DIMENSIONS -Inches

Contact Factory for outline drawings of specific IEC BRAVO® Gear+Motor™ combinations.

Refer to page 663 for IEC motor dimensions.

MOTOR MOUNTING POSITIONS

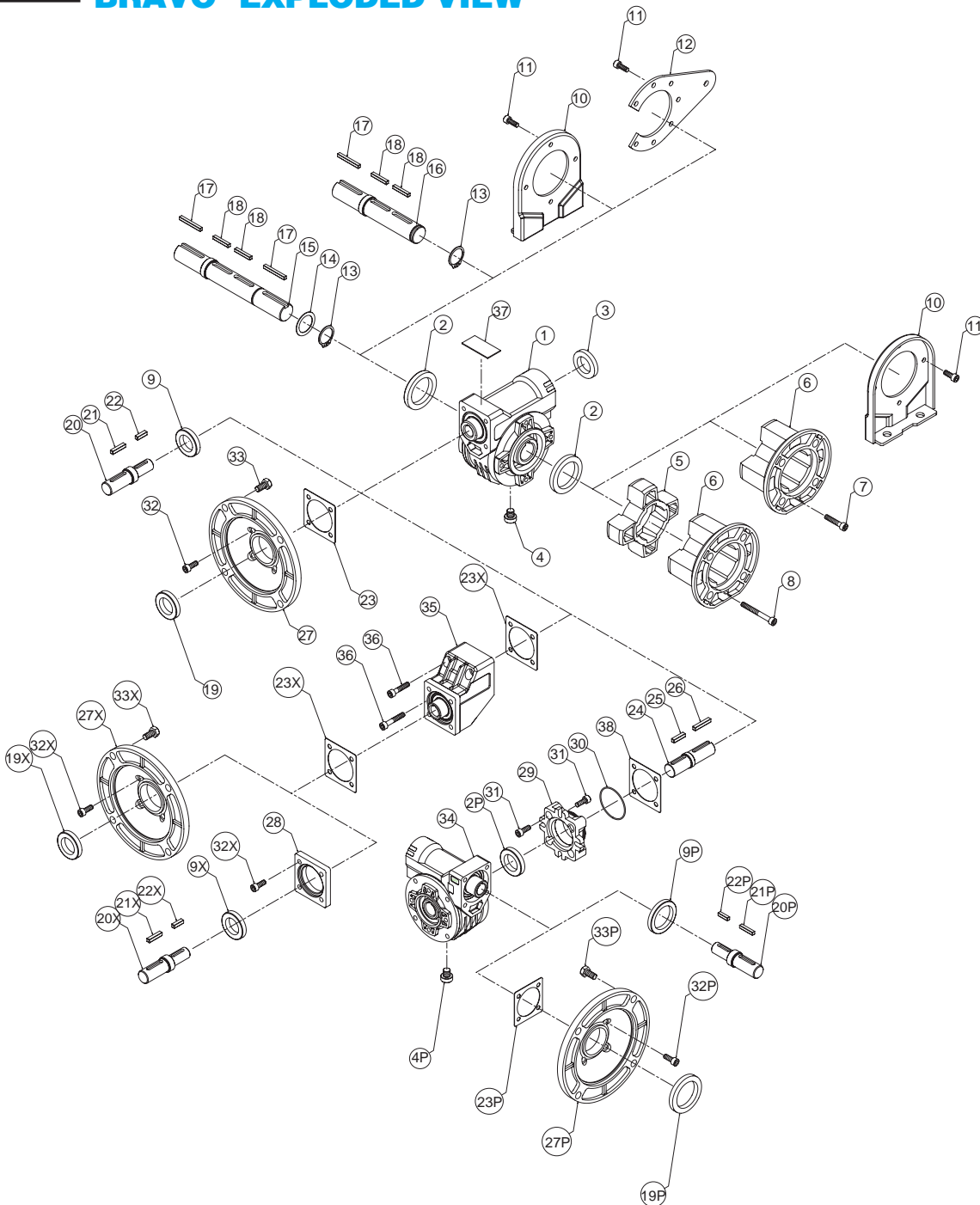
Conduit box position viewed from input side of reducer.



Bravo® MOUNTING STYLE GUIDE

ALUMINUM GEAR REDUCERS BRAVO® EXPLODED VIEW

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Technical Information



ITEM #	DESCRIPTION						
1	GEAR MODULE	11	SOCKET HEAD CAPSCREW	20,20P,20X	INPUT SHAFT - NON-MOTORIZED INPUT	29	CONNECTOR FLANGE - DOUBLE REDUCTION
2,2P	OIL SEAL - OUTPUT	12	REACTION ARM	21,21P,21X	KEY - INPUT (EXTENSION)	30	O-RING
3	RCA SEAL PLUG	13	RETAINING RING	22,22P,22X	KEY - INPUT (INTERNAL)	31	SOCKET HEAD CAPSCREW
4,4P	DRAIN PLUG	14	SPACER	23,23P,23X	GASKET	32,32P,32X	SOCKET HEAD CAPSCREW
5	FL-SPACER	15	OUTPUT SHAFT - DOUBLE EXTENSION	24	CONNECTOR SHAFT	33,33P,33X	HEX HEAD CAPSCREW
6	F-FLANGE	16	OUTPUT SHAFT - SINGLE EXTENSION	25	KEY	34	PRIMARY GEAR MODULE - DOUBLE REDUCTION
7	SOCKET HEAD CAPSCREW	17	KEY-OUTPUT (EXTENSION)	26	KEY	35	HELICAL STEP MODULE - DOUBLE REDUCTION
8	SOCKET HEAD CAPSCREW	18	KEY-OUTPUT (INTERNAL)	27,27P,27X	FLANGE - MOTORIZED INPUT	36	SOCKET HEAD CAPSCREW
9,9P,9X	OIL SEAL - NON-MOTORIZED INPUT	19,19P,19X	OIL SEAL - MOTORIZED INPUT	28	INPUT COVER	37	NAMEPLATE
10	HORIZONTAL BASE					38	GASKET

General Operation

1. Run the motor which drives the reducer and check the direction of reducer output rotation. Consult motor nameplate for instructions to reverse the direction of rotation.
2. Attaching the load: On direct coupled installations, check shaft and coupling alignment between speed reducer and loading mechanism. On chain/sprocket and belt/pulley installation, locate the sprocket or pulley as close to the oil seal as possible to minimize overhung load. Check to verify that the overhung load does not exceed specifications published in the catalog.
3. High momentum loads: If coasting to a stop is undesirable, a braking mechanism should be provided to the speed reducer output or the driven mechanism.

CAUTION The system of connected rotating parts must be free from critical speed, torsional or other type vibration, no matter how induced. The responsibility for this system analysis lies with the purchaser of the speed reducer.

Installation Instructions

The following instructions apply to standard Grove Gear Bravo® type reducers with base or flange mounting in motorized and non-motorized single and double reduction options.

1. Mount the unit to a rigid flat surface using grade 5 or higher fasteners. The mounting fasteners should be the largest standard size that will fit in the base mounting hole. Shim as required under flange or base feet which do not lie flat against the mounting surface.
2. Carefully follow lubrication instructions and installation manual furnished with the gear reducer. All standard Bravo® reducers are properly filled at Factory with sufficient lubricant quantity for nearly any mounting position.

BRAVO aluminum gear reducers: Series 512-525 utilize a vent-free design and are Factory filled with synthetic oil formulated for lifetime lubrication & wide operating temperature range (+5F to +220F). It is not necessary to change the lubricant unless the reducer is used in a severe environment. If these reducers will be used in severe environment or if lubricant must be replaced, contact Factory.

3. Connect motor to speed reducer.

CAUTION DO NOT CHANGE MOUNTING POSITIONS WITHOUT CONTACTING FACTORY. Altering the mounting position may require special lubrication provisions which must be factory installed.

CAUTION Do not operate the reducer without making sure it contains the correct amount of oil. Confirm that mounting position on nameplate matches application requirement per Figure 1. Do not overfill or underfill with oil, or injury to personnel, reducer or other equipment may result.

CAUTION A unit cannot be used as an integral part of a machine superstructure which would impose additional loads on the unit other than those imposed by the torque being transmitted either through a shaft-mounted arrangement, and any shaft mounted power transmitting device. (e.g. sprockets, pulleys, couplings)

CAUTION For safe operation and to maintain the unit warranty, when changing a factory installed fastener for any reason it becomes the responsibility of the person making the change to properly account for fastener grade, thread engagement, load, tightening torque and the means of torque retention.

Lubrication

Carefully follow lubrication instructions and installation manual furnished with the gear reducer. All standard Bravo® reducers are properly filled at Factory with sufficient lubricant quantity for any mounting position.

Change oil only when performing maintenance that requires gearbox disassembly or if the reducer is operated in a severe environment. If oil must be replaced, use only Mobil PAG 460.

Mobil PAG 460 is H1 Food Grade approved lube.

CAUTION Lubricant should be changed more often if gear reducer is used in a severe environment. (ie: humid, wet, caustic, etc)

CAUTION Do not mix different lubricants in the reducer.

SPECIAL LUBRICATION REQUIREMENTS — Sizes 518-534

- Reducer is mounted with input worm shaft vertical
- Input speed is sustained less than 900 RPM

NOTE: The reducer may require modifications to assure proper lubrication in these applications. Contact Factory for more detail.

For lubrication requirements of helical reducers (primaries of helical worm reducers and ratio multipliers), contact Factory.

Lubrication type	Series				
	512	518	520	525	534
Oil (ounces)	2.2	3.0	5.2	13	41

16 oz. = 1 pint	1 quart = .9463 liter
2 pints = 1 quart	1 gallon = 3.785 liter
4 quarts = 1 gallon	1 lb = .4535 kg.
1 gallon = 128 oz.	